BIBLIOGRAPHIC DATA SHEET	1. CONTROL NUMBER PN-AAK-378	2. SUBJECT CLASSIFICATION (695) LD00-0000-0000

3. TITLE AND SUBTITLE (240) Preparing shelter policies, programs, and project for urban settlements: a training workshop for senior

4. PERSONAL AUTHORS (100) professionals, November 5 - November 30, 1979, Washington, DC.; volume II -- week #3 and week #4

5. CORPORATE AUTHORS (101)

AID/DS/H

6. DOCUMENT DATE (110) 1979	7. NUMBER OF PAGES (120) 711 p.	8. ARC NUMBER (170)

9. REFERENCE ORGANIZATION (130) DS/H

10. SUPPLEMENTARY NOTES (500)

(Volume I, week #1 and week #2, 528 p.: PN-AAK-377; Volume III, materials presented by participants, 565 p.: PN-AAK-379

11. ABSTRACT (950)

12. DESCRIPTORS (920)	13. PROJECT NUMBER (150)	
meetings professional personnel housing urban areas urban planning urban development	—	
	14. CONTRACT NO.(140) DS/H	15. CONTRACT TYPE (140)
	16. TYPE OF DOCUMENT (160)	

AID 590-7 (10-79)

LIST OF CONTENTS
VOLUME II OF WORKSHOP NOTEBOOK: Week #3 and Week #4

SHELTER PROJECTS

CASE STUDY

SHELTER SECTOR WORKSHOP: WEEK #3 LOGISTIC NOTES
November 19-25, 1979

Day and Date	Time	Code	Program Event	Person Responsible	Location	Notes
Monday Nov 19	9-12	35.P 37.P	Site Selection and Sites and Services Projects	Malcolm Rivkin Joseph Handwerger	AIA Board Room	Two separate presentations will be made -- for the physical interest group
	9-12	36.P	Alternative Financing Mechanisms	James Christian	AIA Conference Room #2	For the financial interest group
	2-5	38.P	Sites and Services Workshop	Joseph Handwerger Jack Hjelt	AIA Board Room	Two separate presentations will be made -- for the physical interest group
	2-5	39.P	Financial Plan Preparation	Edward Robbins	AIA Conference Room #2	For the financial interest group
	7:30	40.S	Film Night	Peru, Tanzania Indonesia	Workshop Office, Room 1101 Park Central Hotel	
Tuesday Nov 20	8:30-5:00	41.S	Field Trip to Baltimore, Maryland	Malcolm Rivkin	Chartered bus	Assemble in Hotel lobby at 8:30 a.m.
Wednesday Nov 21	9-12	42.P	Upgrading Projects	David Leibson	AIA Board Room	
	2-4	43.P	Social and Economic Components of Shelter Projects	Jack Hjelt	AIA Board Room	
	7:30	44.S	Mexico Slide Presentation	Edward Robbins	Workshop Office, Room 1101	
Thursday Nov 22	Free Day		THANKSGIVING HOLIDAY			
Friday Nov 23	9-12	46.P	WORKSHOP III	Alfred Van Huyck	AIA Board Room	Malawi, Cameroon, Tanzania
	1-2:30	47.S	World Bank Presentation	Anthony Churchill	AIA Board Room	
	2:30-4	48. TW/SE	Tunis Case Study	Edward Robbins	AIA Board Room	
	4-5	49. TW/SE	Introduction to Team Exercises	David Oakley	AIA Board Room	
Saturday Nov 24	8:30-1	50.S	Field Trip to Mount Vernon	Washington International Center	WIC bus departs from 1630 Crescent Place, N.W. Tour to Mt. Vernon and Arlington Cemetery	Optional trip; must be at 1630 Crescent Place, N.W. by 8:30 with WIC yellow ticket to get on the bus.
Sunday Nov 25	Free Day					

Office of Housing
Agency for International Development

SHELTER TRAINING WORKSHOP

November 5-30, 1979

<u>AID SHELTER INSTITUTE</u>

PROGRAM PACKAGE ON TECHNIQUES OF HOUSING SITE SELECTION

Monday, November 19, 1979
9:00-10:00 a.m.

Code 35.P

Presented by Goldie W. Rivkin

Contents

OUTLINE

Techniques of Housing Site Selection

I. Introduction

In the past, land cost has often been the principal factor in selection of sites for lower income housing. The cheaper the site, the more acceptable its use for shelter. While this approach has been appealing to many governments, it has frequently led to inappropriate choices, for which the total cost to government and residents alike has proven extremely high. For example, an inexpensive site at a peripheral location has sometimes resulted in excessive travel time and costs to places of employment. A piece of cheap land, subject to flooding, landslides, or other natural disasters, has often resulted in poor living environments along with excessive costs for building and re-building.

Site cost is only one of several factors to be evaluated in site selection. The choice of site is one of the most important elements in the shelter production process. It should be regarded with seriousness and should be conducted within a structured framework of analysis which considers many factors of suitability. Such a structured framework should be applied to location decisions for all forms of shelter effort: upgrading, sites and services, conventional new dwelling units and housing estates.

Site selection should be conducted in advance of project design but at a point when some general parameters of a project are known--e.g. income levels to be served, type and number of units or lots to be produced (project scale), range of acceptable capital costs for the units and project as a whole.

The final choice of site will affect both project cost and project design (density, utilities pattern). Therefore, it is desirable to firm up the choice of site(s) prior to proceeding with a detailed use and financial program.

The Tools for Housing Site Selection

Aerial Photography

Land Use Mapping

Land Vacancy Mapping

Location Inventories of Roads,
   Utilities (water, sewage, electricity, etc.)

   Services (schools, transport, health facilities)

Land Plan Designations and Controls

Land Capability Analysis
   Topography
   Soil Quality
   Flooding
   Landslides

Land Ownership Data

Land Cost Data

Community Structure and Organization

II. The Tools

The first stage in a selection process is to obtain an inventory of potentially suitable sites within the study area (metropolitan region, city, town). Several tools are available--or can be available--to assist in making this inventory. The tools are identified on the accompanying chart.

A. Aerial Photography

Aerial photography is an excellent means to view the development pattern of an urban community, and from it, evaluations can be made on description and such matters as existing uses, densities, circulation systems, topography, etc. Vacant land can be readily identified from aerial photos. (See session and background material on aerial photography.) If other tools below are not available, use of aerial photos can provide short cuts to site identification.

B. Land Use Mapping

Relationships of potential housing sites to existing employment and commercial centers and to existing residential areas can be examined through land use maps of present conditions.

C. Land Vacancy Mapping

Vacant sites which meet size criteria of the proposed housing development can be identified and arrayed from photography and land use maps.

D. Location Inventories of Utilities and Services

The most desirable sites are those served by present systems of water, sewer, roads, schools, health facilities, etc.--or which require modest extensions of such systems. It is important to identify the locations of these systems and facilities and their capacities to absorb new growth.

E. Land Plan Designations and Controls

Equally important is the need to identify and map plans for new land uses and for new utilities systems. Presently, vacant sites may have stipulated uses which conflict with shelter. New industrial sites may provide employment opportunities for housing sites to be developed in the future. Planned extensions of water and sewer systems may become available to service presently undeveloped land.

A corollary need is to review the development controls currently in place, since existing systems of zoning or building restrictions may conflict with proposed densities or use patterns of housing projects.

F. Land Capability Analysis

Is a site buildable? This is the question to be answered in making assessments of land which may be vacant or otherwise available for shelter production. Information is necessary on topography (slopes), the quality of the soil and its bearing capacity, and on whether the land is subject to flooding, landslides or other hazards that would impede its conversion to housing sites.

G. Land Ownership Data

Who owns the land, and can it be readily mobilized for housing production? Is the ownership public, private, or tribal? Is it several parcels or under consolidated control? Does the tenure or lotting situation affect the ease or difficulty of mobilization for housing?

H. Land Cost Data

Land cost is an important factor, although only one of many to examine. A cost analysis should be made of each site in the inventory.

I. Community Structure and Organization

These become especially important factors in assessing site priorities for upgrading. If there is a strong community organization in a potential area, this can be of enormous assistance in organizing and carrying out an effort which involves improvements, granting of tenure, or rehousing of an existing population. The strength of internal neighborhood organization has been a principal factor in the success of the massive Kampong upgrading program in Jakarta. It has been a factor in the selection of Mellassine for an AID sponsored improvement project in Tunis. Such information can be obtained from interviews.

ACCOMPANYING GRAPHICS

Two factor maps are included to demonstrate the utility of identifying and mapping key urban features as an aid in site selection.

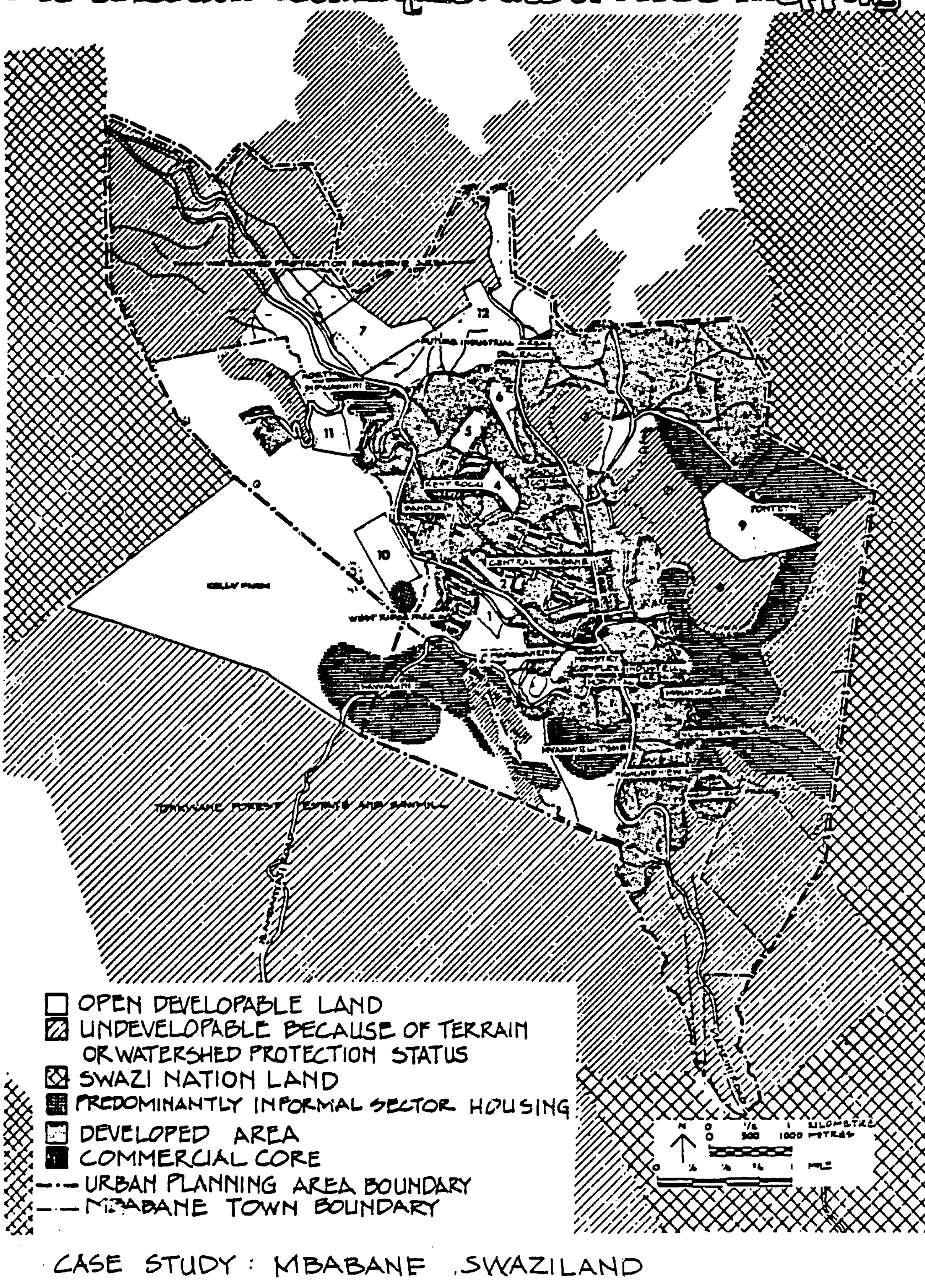
1. Case Study Mbabane, Swaziland

The Mbabane graphic displays locations of developed areas (including informal settlements), land which is undevelopable by virtue of terrain or soil conditions, and land which is constrained from development by virtue of its tenure status. As a result, a substantial number of vacant and potentially available sites are clearly displayed, both inside and outside the city limits.

2. Case Study, Tunis

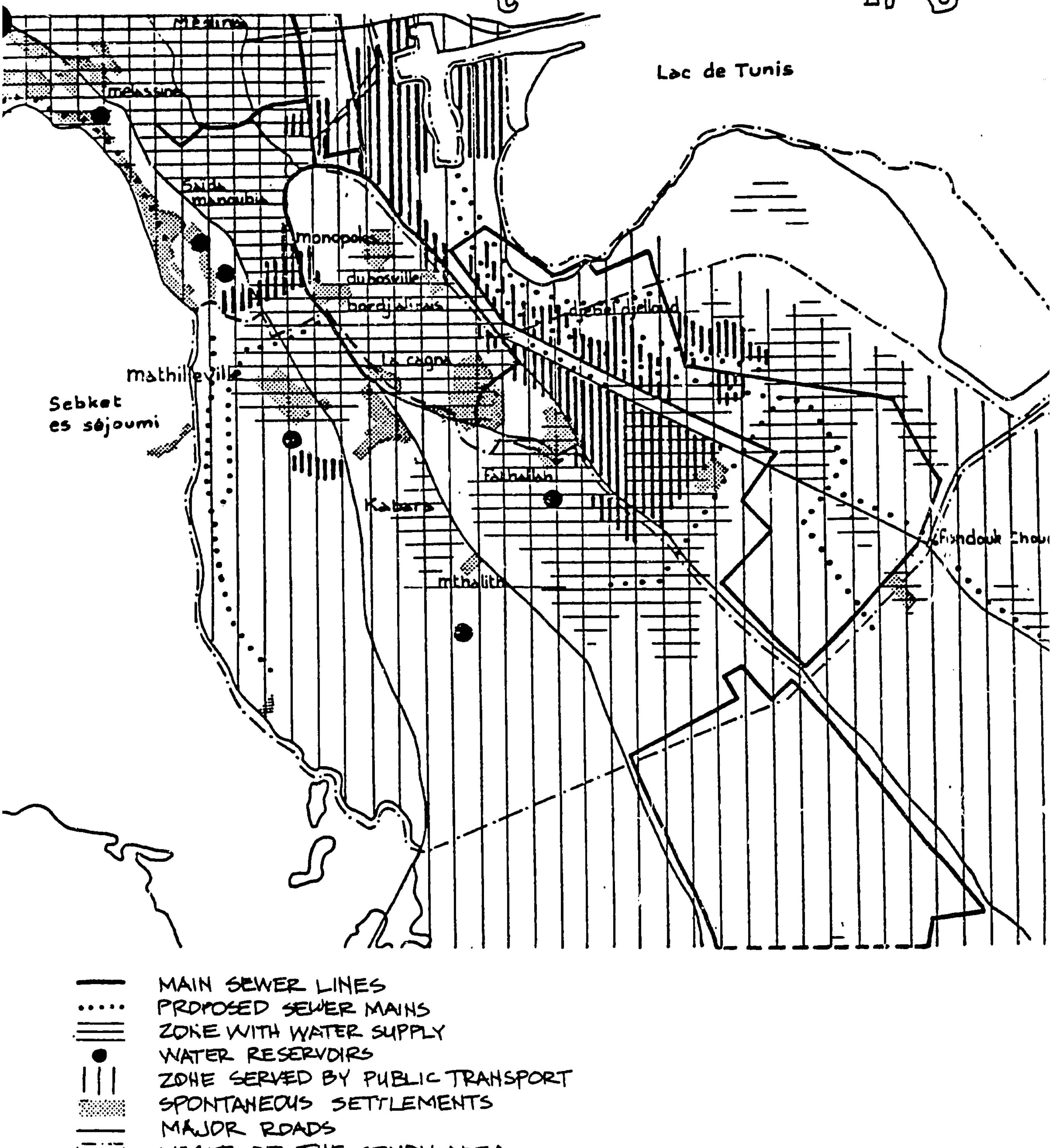
The Tunis map does not show developable or vacant area, since it was prepared for a different purpose. It does display several important urban features which, along with an inventory of vacant land, are critical to site selection: existing and proposed water systems, areas served by public transportation, location of industrial employment, principal roads, etc. Vacant sites could be placed on the map to show their relationship to these features.

Site Selection Techniques: Use of Area Mapping



CASE STUDY: MBABANE, SWAZILAND

Site Selection Techniques: Use of Area Mapping



- MAIN SEWER LINES
- PROPOSED SEWER MAINS
- ZONE WITH WATER SUPPLY
- WATER RESERVOIRS
- ZONE SERVED BY PUBLIC TRANSPORT
- SPONTANEOUS SETTLEMENTS
- MAJOR ROADS
- LIMIT OF THE STUDY AREA
- EXISTING INDUSTRY
- INDUSTRIAL ZONE

CASE STUDY: TUNIS

III. <u>Method for Housing Site Selection</u>

Once the available information has been compiled and arrayed, there will be an inventory of potentially available sites--again, whether the project type is sites and services, upgrading, new contractor built units, etc. The inventory may--and probably will--contain several locations from which to choose.

How can selection be made?

The best site is one which is better than the other alternatives. The exercise leading to choice should be one which evaluates the various options in relation to each other on each of several factors.

There are many ways in which to conduct such an evaluation. To demonstrate the <u>process</u>, however, we are displaying below one such method which involves a "matrix" as the form of evaluation. The job of filling in the blanks of the matrix can be performed by the housing agency, an interagency committee, or by a consultant technician.

This matrix format allows for each site to be compared with each other on the basis of 15 separate factors. In this example, each of the factors is given the same relative importance. It is entirely possible, however, to weight certain factors more heavily than others (e.g. land cost, accessibility to employment) and devise a numerical scoring system accordingly. In this example, the weighting is identical.

Each factor is scored on a range of 1 to 4. The most favorable condition is rated "1" and the least favorable rated "4". Thus, that site or sites which receive the lowest total score will appear to be the most favorable for site selection.

Method for Housing Site Selection

--The best site is one which is better than the other alternatives.

--Site cost is only one of many factors to evaluate.

--Site selection should be a process of evaluating alternative sites in relation to several factors of performance.

EXAMPLE: A matrix approach allows factors to be weighted, rated, and summed for each alternative.

In the following case each factor is weighted equally. (Some may be made more important than others and assigned differential weights to give them more significance.)

The ratings used here are:

1. Excellent
2. Good
3. Fair
4. Poor

The site with the lowest total score may be judged the best for selection.

The Evaluation Matrix

	Site I	Site II	Site III	Site IV
A. Size (expansion potential)				
B. Accessibility to Employment				
C. Accessibility to Utilities				
D. Accessibility to Services				
E. Public Transportation				
F. Topography				
G. Soil Quality				
H. Absence of Flooding				
I. Site Cost				
J. Site Ownership				
K. Site Availability				
L. Plan Designations				
M. Mixed Use/Density Potential				
N. Acceptability to Users				
O. Acceptability to Decision Makers				
Total Score				

Comments on the Factors to Evaluate

A. Site size refers to the ability of the land to accommodate the preliminary program at densities contemplated and to its ability to permit project expansion at later stages.

B. C. D. Accessibility to employment, utilities, and services can be rated along a numerical scale.

E. Public transportation. How adequate (frequency, routes, destinations, travel time) are the public transportation options?

F. G. H. Physical factors. How buildable is the site? Ratings can be established for the ease or difficulty of these various physical factors.

I. Site Cost. The sites can be rated on relative cost of land.

J. Site Ownership. Thes sites can be rated on the ease or difficulty of assembly under present tenure conditions.

K. Site availability. The sites can be rated on the relative ease or difficulty of preparing them to receive housing within the time frame of the project.

L. Plan Designations. The sites can be rated on the relative lack of conflict with existing plans, codes, and ordinances.

M. Mixed Use/Density Potential. Although not normally a factor in site selection, the potential of land for a mixed project involving various building types, land uses, income levels, and the opportunity for cross-subsidy of lots and infrastructure, is becoming increasingly important throughout the developing world. While "mixing" may not be in an initial program, the potential should be considered and land assessed from this standpoint.

N. Acceptability to Users. Judgements should be made, based on existing social and shelter conditions, on how acceptable the site location will be to target groups.

O. Acceptability to Decision-Makers. Again, judgement in rating is required -- this time, "political" judgement as to the ease or difficulty of gaining governmental support for mobilization of the alternative sites.

In an upgrading situation, a 16th factor to include would be Community Organization within the alternative neighborhoods--the relative strengths or weaknesses.

READING MATERIAL

AID SHELTER INSTITUTE
TECHNIQUES OF HOUSING SITE SELECTION

Chapter II, The Types of Improvements Contemplated, from "A Pre-Feasibility Study for Upgrading the Spontaneous Settlements of Tunis, Tunisia", pp 30-40, prepared for USAID by PADCO, Inc., 1976.

The attached section spells out the criteria and a method for selecting neighborhoods in Tunis as locations for an upgrading program. Although the subject matter deals with upgrading rather than new housing, the system employed spells out a priority setting process which can be used in any site selection activity.

MISSING PAGE
NO. 14 - 29

Chapter II

THE TYPES OF IMPROVEMENTS CONTEMPLATED

Program Objectives

Based on experience in the field and existing data, the following list of objectives seems appropriate, given the particular conditions and problems prevailing in the ZSS:

1. To maintain the existing housing stock to the fullest extent possible by recognizing selected spontaneous settlements as permanent communities and legalizing occupancy by the sale of public lands to the present illegal occupants;

2. To plan the improvement of selected areas to prevent the unnecessary removal of existing spontaneous housing and keep as many existing units as possible;

3. To improve, in selected areas, vehicular access, water supply, sewage disposal, electricity supply and community facilities to raise the levels of community health and public safety;

4. To evaluate the prospects of making loans available to all residents of the selected areas to purchase land and make house improvements or replace houses;

5. To keep as many existing families as possible in the selected areas, but to provide financing for off-site land and housing for those families that must be displaced and to provide minimum road access and community facilities;

6. To require legalization of all lots by the purchase of public lands by residents and to try to get legalization of all houses in their present condition without requiring that houses be improved or replaced.

As a measure to determine which areas are most suitable for the proposed upgrading project, the following list of tentative criteria has been established in order to evaluate the given areas, to make the maximum impact possible, and serve the most ideal population group.

Firstly:

> Only areas should be selected in which the remaining residents can be given legal title to the land and the house or the land with some form of guarantee that the house will not be demolished by government action within forecasted time span of at least 20-25 years;
>
> Only areas should be selected in which previous plans prepared in anticipation of a demolition program can be revised according to objectives and guidelines of the housing improvement program; and
>
> Only project areas in which a social and economic survey will be undertaken on a 100 percent sample basis should be selected.

Secondly: Appropriate areas should be chosen if they satisfy physical, social and economic criteria which would include:

ZSS Criteria of Choice for Upgrading

1. <u>ZSS Size and Density</u>:

   To make the maximum impact possible given the types of improvements and costs contemplated.

2. <u>Urgency of Improvement</u>:

   To choose those problem areas most in need in order to make the maximum possible impact.

3. <u>Proximity to Existing Infrastructure</u>:

   To minimize major off-site expenses and maximize on-site improvements.

4. <u>Proximity to Employment and Transportation Options</u>:

   To insure that residential development near employment be encouraged to minimize family transport expenses and trip time.

5. <u>ZSS Topography and Physical Structure</u>:

   To insure ease of servicing and minimize demolition and relocation of D.U.

6. <u>ZSS Consolidation and Social Stability</u>:

   To guarantee that the community concerned is served and able to pay for the measures contemplated.

7. <u>ZSS Soil and Sub-Soil Conditions</u>:

   To facilitate and minimize expensive technical servicing.

Thirdly: Based on given data and further analysis, the following guidelines should be tentatively established in order to assure the ultimate success of the project:

Criteria:

- The required percentage of public land within the existing land area of the project should be determined;
- The maximum percentage of the aggregate total houses in a project that could be removed off-site and still satisfy project objectives;
- The percent of overall project costs in the initial project areas selected which could be paid for off-site infrastructure improvements;
- If replacement housing loans are considered, an acceptable percentage should be determined of the remaining housing stock in the project area;
- The initial project area sizes should be ascertained (i.e., number of D.U. concerned); and
- The average acceptable cost per house should be projected.

Project Site Priorities for Upgrading

The criteria on which to base a choice for project site selection are listed in the previous section and include such factors as population size, proximity to employment and infrastructure, community structure, site topography and ease of servicing. Figures 8-10 illustrate the location of the ZSS and types of services offered. They are designed to serve as a quick reference for comparisons of the sites, based on the above criteria.

During the course of the Mission in Tunisia, relevant data, when available, was gathered for all sites identified by the District of Tunis as ZSS (see Table 5). In addition to statistical information, on-site visits provided insight into the ZSS living conditions and talks with public officials helped to determine the degree of urgency of the problem by site.

In general, it was found that the ZSS closest to the city center are most appropriate for the type of program proposed. They are areas with large populations, few public services and a lack of land tenure.

Beyond the most inner ring of ZSS are numerous smaller sites with similar characteristics in relatively close range of employment possibilities. These areas, because of their size and isolation from view, are the most vulnerable to be ultimately displaced or ignored. However, because they are often in proximity to vacant land, they may best be integrated into a project which would allow the community to expand and improve simultaneously, rather than being strictly an improvement project.

A third type of site is found at the extreme limit of employment and infrastructure options. These areas have, for the most part, unrecognized title to the land and have been built without authorization. They are in the process of transformation and growth and might also be best integrated into an expanded project allowing for future controlled growth.

Table 6 lists the possible sites by population size and rates each of the ZSS by its response to the criteria listed. The matrix is useful for identifying those sites of highest priority and is based on observations made by the Mission. The choice of priorities of the different sites is meant to be suggestive, since an overall upgrading program should make continual re-evaluation of the project sites in a continuing process during and after project sites are selected. Nevertheless, those sites of first priority proposed by public officials and the Mission coincide.

Sites of First Priority

Those sites of first priority are Jebel Lahmar, Saida Manoubia and Mellassine. A detailed description of the sites, based on available data, may be found in Chapter V. The sites were chosen because they satisfied most of the criteria of choice. They are, incidentally, the areas for which most research has been done and have been most often labeled by officials as "problem areas".

Table 5

SPONTANEOUS SETTLEMENTS
HABITAT SPONTANE

	ZONE	AREA / SURFACE	D.U./HA. / LOG./HA.	PERS./HA. / HAB./HA.	#D.U. / PARC LOG.	POP. / POPUL.
1.	Dj. Lahmar	57 ha	95	1 000	5 415	57 000
2.	Saida Manoubia	42 ha 25	96	800	4 056	33 800
3.	Mellassine	51 ha 25	83	630	4 253	32 290
4.	Bortal Hayder	25 ha 75	35	800	901	20 600
5.	La Cagna	16 ha 75	95	900	1 591	15 075
6.	J. Jelloud	20 ha	80	690	1 600	13 800
7.	Fathallah	9 ha	120	1 450	1 080	13 050
8.	Ras Tabia	19 ha 75	70	600	1 382	11 850
9.	El Agba	38 ha 25	36	260	1 377	9 945
10.	Kram Ouest	22 ha 25	55	400	1 223	8 900
11.	Hrairya	14 ha 50	70	600	1 015	8 700
12.	Hammam lif	16 ha	60	450	960	7 200
[illegible]	Mathilleville	14 ha 5	45	400	652	5 800
14.	Dubosville	9 ha 50	80	600	760	5 700
15.	Den Den	4 ha 75	90	900	427	4 275
16.	Douar Hicher	6 ha 75	25	200	418	3 350
17.	Afrane	2 ha 75	95	1 000	261	2 750
18.	Ariana	4 ha 25	80	600	340	2 550
19.	Bordj Ali Rais	3 ha 7	70	650	262	2 437
20.	Zahrouni	6 ha 75	40	350	270	2 362
21.	Fondouk Choucha	7 ha 25	50	400	262	2 1000
22.	Khadra	5 ha	55	350	275	1 750
23.	Lalla Manoubia	8 ha 75	25	200	218	1 750
24.	Mthalith	4 ha 75	40	380	190	1 660
25.	Ettadhamen	6 ha 25	25	200	156	1 250
26.	Antit	3 ha	48	410	144	1 230
27.	Manouba	5 ha 25	25	200	131	1 050
28.	Monopoles	2 ha 50	60	400	150	1 000
29.	Bardo	2 ha	55	410	110	820
[illegible]	Borgel	3 ha 25	30	250	97	812
31.	Rades	3 ha 25	25	180	81	585
	TOTAL/TOTAUX	446 / m 50			30 061	275 440

Table 6

SITES POTENTIELS ET CRITERES DE CHOIX POUR UN PROJET D'AMELIORATION

POTENTIAL PROJECT SITES AND CRITERIA FOR SELECTION

COMMUNE MUNICIPALITY	TYPOLOGIE D'HABITAT SPONTANE ZSS SUB-TYPE	SITES	CRITERES/CRITERIA								
			TAILLE ET DENSITE SIZE AND DENSITY	URGENCE D'AMELIORATION URGENCY FOR IMPROVEMENT	PROXIMITE D'INFRASTRUCTURE PROXIMITY TO INFRASTRUCTURE	NATURE D'OCCUPATION DU SOL LAND OWNERSHIP STATUS	PROXIMITE D'EMPLOIS PROXIMITY TO EMPLOYMENT	FACILITE D'AMELIORATION (TOPOGRAPHIE, ETC.) EASE OF SERVICING (TOPOGRAPHY AND COMMUNITY LAYOUT)	NIVEAU D'EVOLUTION CONSOLIDATION (LEVEL OF EVOLUTION)	ACCES AUX TRANSPORTS PUBLICS PROXIMITY TO PUBLIC TRANSPORTATION	QUALITE DU SOL SOIL CONDITIONS
T	A	Jebel Lahmar	X	X	X	X	X	Z	Y	X	X
T	A	Saida Manoubia	X	X	X	Y	X	X	X	Y	Y
T	A	Mellassine	X	X	X	X	X	X	X	X	Y
B	C	Bortal Hayder	X	X	X	Y	Y	X	Y	X	X
T	A	La Cagna	X	Y	X	Y	X	Y	X	X	X
T	A	Jebel Jelloud	X	Y	X	Y	X	X	X	X	X
T	B	Sidi Fathallah	X	X	X	Y	X	Z	Y	X	X
B	C	Ras Tabia	Y	X	X	O	Y	Y	Y	X	X
T	C	El Agba	Y	Y	Y	X	Y	X	X	X	X
G	B	Kram Ouest	Y	X	Y	Y	X	X	Y	X	Y
T	A	Hrairia	Y	Y	X	X	Y	X	X	X	X
H	B	Hammam Lif	Y	Y	Y	O	Y	Y	Y	Y	X
T	A	Mathilleville	Y	Z	X	X	X	X	X	X	X
T	A	Dubosville	Y	Z	X	X	X	X	X	X	X
T	C	Den Den	Y	Y	Z	X	Y	X	X	X	X
M	C	Douar Hicher	Y	Y	Z	X	Z	X	Y	Y	X
T	B	Afrane	Y	X	X	X	X	Z	Z	X	Y
A	A	Ariana	Y	Y	X	O	Y	X	X	Y	X
T	A	Borj Ali Rais	Y	Y	X	X	X	X	X	X	X
T	C	Zahrouni	Z	Z	X	X	Z	X	Y	X	X
BA	C	Fondouk Choucha	Z	Z	Z	O	Z	X	Y	Y	X
T	B	Khadra	Z	X	X	Y	X	X	Y	X	X
M	C	Lalla Manoubia	Z	Y	Z	X	Z	X	Y	Y	X
T	C	Mthalith	Z	Z	Z	O	Y	Y	Y	Y	X
M	C	Ettadhamen	Z	Y	Z	X	Z	X	Y	Y	X
T	C	Antit	Z	Y	Y	X	Y	Y	Y	Y	X
M	C	Manouba	Z	Z	Z	X	Z	X	Z	Y	X
T	B	Monopoles	Z	Y	X	O	X	Z	Y	X	X
B	A	Bardo	Z	Z	X	O	X	Y	Y	X	Y
T	B	Borgel	Z	Y	X	Y	X	X	Y	X	Y
R	C	Rades	Z	X	Z	Y	Y	X	Y	Y	Z

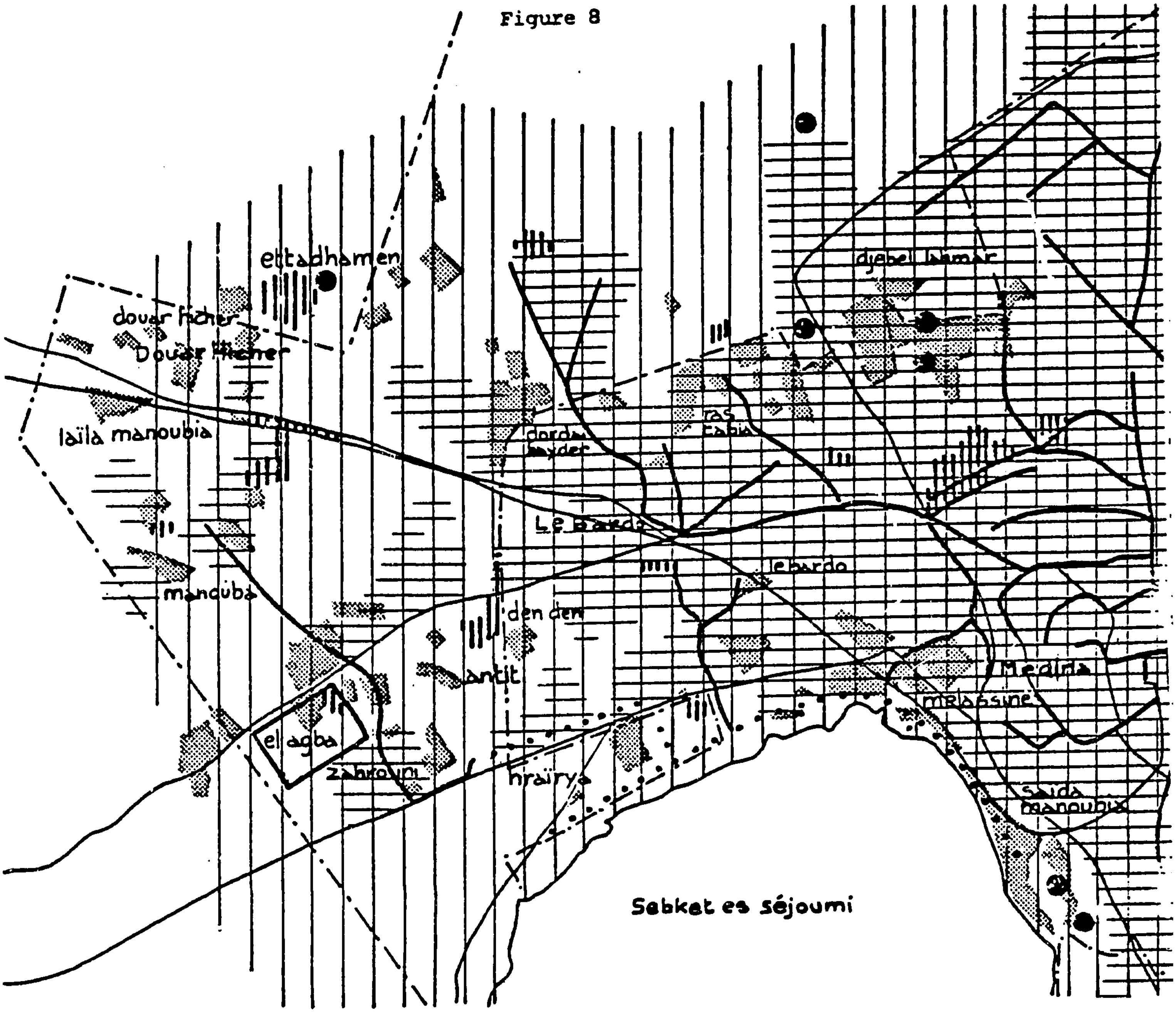
REPONSE/RESPONSE

X = BONNE/GOOD
Y = MOYENNE/FAIR OR PARTIAL
Z = MAUVAISE/POOR
O = INCONNUE/UNKNOWN

COMMUNE/MUNICIPALITY

T - TUNIS
B - BARDO
G - LA GOULETTE
H - HAMMAM LIF
M - MANOUBA
A - ARIANA
BA - BEN AROUS
R - RADES

Figure 8



RAILROAD
CHEMIN DE FER

MAIN SEWER LINES
EGOUTS PRINCIPAUX

PROPOSED SEWER MAINS
PROJETS D'EGOUTS

ZONE WITH WATER SUPPLY
ZONE ALIMENTEE EN EAU

WATER RESERVOIRS
RESERVOIRS

ZONE SERVED BY PUBLIC TRANSPORT
ZONE DESSERVIE PAR LES TRANSPORTS EN COMMUN

SPONTANEOUS SETTLEMENTS
HABITAT SPONTANE

MAJOR ROADS
ROUTES PRINCIPALES

LIMIT OF THE STUDY AREA
PERIMETRE DE L'ETUDE

EXISTING INDUSTRY
INDUSTRIES EXISTANTES

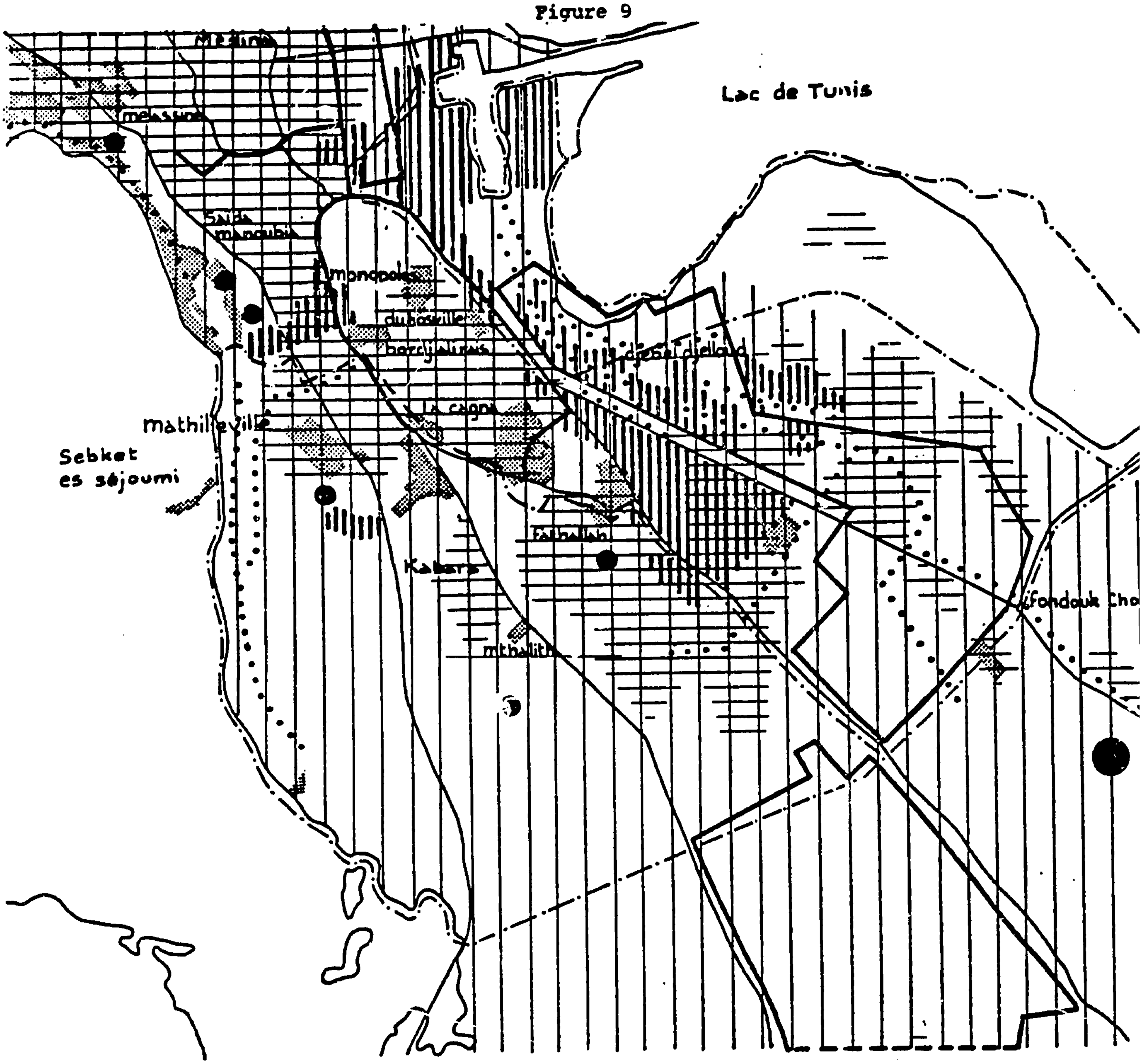
INDUSTRIAL ZONE
ZONES INDUSTRIELLES

0 1 2 3 KM.

ZONE OUEST
(WEST)

BASE MAP SOURCE: EFH Team

Figure 9



MAIN SEWER LINES
EGOUTS PRINCIPAUX

PROPOSED SEWER MAINS
PROJETS D'EGOUTS

ZONE WITH WATER SUPPLY
ZONE ALIMENTEE EN EAU

WATER RESERVOIRS
RESERVOIRS

ZONE SERVED BY PUBLIC TRANSPORT
ZONE DESSERVIE PAR LES
TRANSPORTS EN COMMUN

SPONTANEOUS SETTLEMENTS
HABITAT SPONTANE

MAJOR ROADS
ROUTES PRINCIPALES

LIMIT OF THE STUDY AREA
PERIMETRE DE L'ETDUE

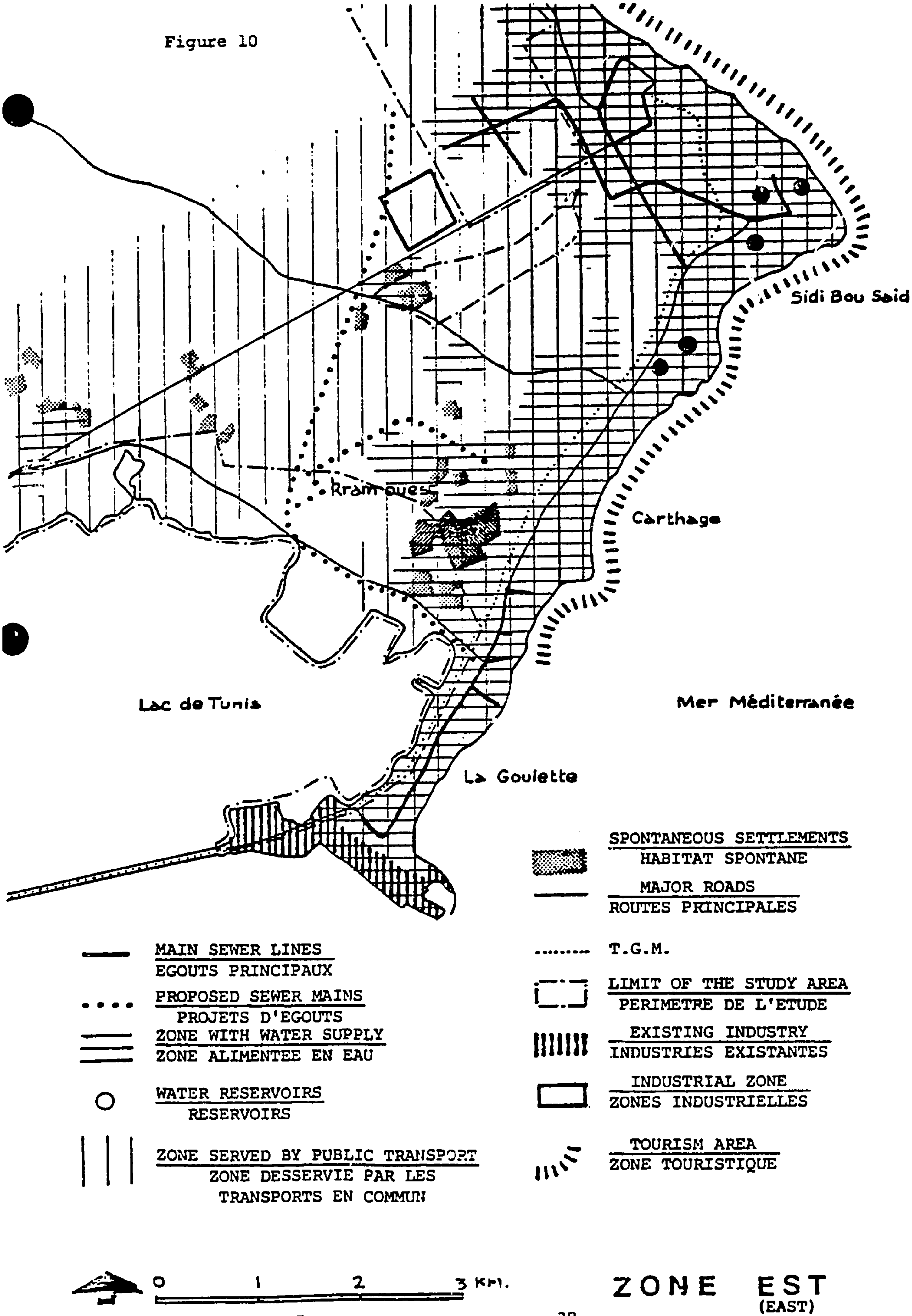
EXISTING INDUSTRY
INDUSTRIES EXISTANTES

INDUSTRIAL ZONE
ZONES INDUSTRIELLES

0 1 2 3 KM

ZONE SUD

Figure 10



ZONE EST
(EAST)

Sites of Second Priority

The sites listed as second priority by population size are: Bortal Hayder, Cagna, Jebel Jelloud (Garjouma), Sidi Fathallah, Ras Tabia, Kram Ouest, Dubosville, Hrairia, Afrane, Borj Ali Rais, Khadra, Monopoles, Bardo and Borgel.

Improvements for the above sites should not be programmed in the same fashion. The types of programs envisioned may vary, depending on the characteristics of each site.

Bortal Hayder, Ras Tabia, Kram Ouest, Khadra, Bardo and Borgel are areas that have not achieved a maximum consolidation. They are also in proximity to either housing projects or possible project sites. Rather than simply implement the types of infrastructure improvements foreseen in the first priority sites, a structuring of the surrounding urban fabric for future housing growth will be necessary.

On the other hand, Cagna, Jebel Jelloud, Hrairia, Borj Ali Rais and Monopoles have already achieved maximum consolidation and a program approach would be similar to the first type, providing needed services and land tenure. Dubosville has been added to this category, although on-site visits reveal that, on the whole, the site is not urgently in need of improvements. Fringe areas, though, should be considered.

Afrane and Sidi Fathallah are older, unstructured ZSS that have not developed in a fashion which would permit easy servicing. Improvement projects may find it necessary to restructure a large part of the communities. The two areas, however, are in close proximity to the industrial zone and have a high incidence of employment; thus, they may be able to pay for more expensive measures.

Sites of Third Priority

Those classified as third priority are Agba, Den Den, Douar Hicher, Ariana, Zahrouni, Lalla Manoubia, Ettadhamen, Antit, Manouba and Rades.

All of these areas, with the exceptions of Ariana and Rades, are found in the west and represent a new type of ZSS growth, which has title to the land but little access to public services. The reason for this is mainly that they are situated beyond or at the edge of existing urban infrastructure.

Ariana, in the north, and Rades, to the east, are particular cases. Ariana is a small community in proximity to a large upper-income area; it does not have legal land occupancy.

Rades is located on land close to the Lake of Tunis, which is subject to flooding and undesired by other land uses.

The said communities in the west are in a process of transformation and growth; a project in that area would be best applied to control and planning for future growth. Rades and Ariana could be improved with the advent of housing projects in the area and the integration of the sites into an overall project fabric.

Sites of Fourth Priority

Those sites classed as fourth priority are found in the metropolitan area of Tunis but not in close proximity to the growing urbanized zone. These include: Mathilleville, Hammam Lif, Fondouk Choucha and Mtalith. They share many of the characteristics of rural housing, with the exception of Hammam Lif.

Hammam Lif is a particular case because of its proximity to the suburb of that name. In reality, the suburb is a satellite village of Tunis and highly independent. The problem should be treated separately from the ZSS in Tunis, as it predominantly affects that community.

All of the sites should be monitored, future growth controlled, and services installed when means are available.

The rating of priority of sties for upgrading should not be misinterpreted. The given priority refers to their appropriateness for the types of improvements contemplated. All areas identified should be monitored on a regular basis and specific actions taken by the authorities to insure that an acceptable level of urbanization is taking place. Government policy concerning the ZSS and, in particular, the new areas of growth will have to be modified. Not recognizing the right of existence of the ZSS will only contribute to the irregular development of the areas concerned.

In essence, appropriate types of programs should be generated which will encourage a more systematic urban development in newer areas, and rectification of existing problems in older ones.

Office of Housing
Agency for International Development

SHELTER
TRAINING
WORKSHOP

November 5-30, 1979

ALTERNATIVE FINANCING MECHANISMS

Monday, November 19, 1979

9:00 a.m. - 12:00 noon   Code 36.P

Presented by:

James W. Christian

ALTERNATIVE FINANCING MECHANISMS

A. INTRODUCTION

The "informal" sector of an economy or of an urban area may be distinguished from the "formal" sector by the extent to which government regulates or is, in a functional sense, cognizant of the activities carried on in the sector. To illustrate, the majority of "informal" sector transactions tend not to be taxed or registered in the national income accounts; similarly, though interest rate ceilings may be prescribed by law, there is no mechanism through which they can be enforced in the "informal" sector.

The urban areas of developing countries, therefore, display a dual nature that poses distinct problems for the establishment of institutional mechanisms for the delivery of shelter finance services to the target group.

First, the AID Shelter Sector Strategy implies the need for "formalization" of the "informal" sector, at least in the shelter dimension. Yet the "informal" sector already has financial mechanisms that are based on pragmatism and/or tradition, while conventional financing institutions are necessarily embedded in the "formal" sector. Formalization of shelter finance in the informal sector thus entails dis-placing at least some informal sector financial practices and customs as well as adapting the procedures of formal sector financial institutions to the traditions of the informal sector.

Second, successfully providing affordable shelter financing to low-income families typically requires the introduction of nonconventional financial techniques, such as graduated payment mortgages, with which formal sector financial institutions are generally unfamiliar.

Third, this dualism which exists in the urban sector typically necessitates the adoption of new savings mobilization, loan underwriting, and delinquency control procedures by formal sector financial institutions.

Dualism in the urban sector presents clear challenges to the development of shelter finance systems in Third World countries. Shelter finance institutions must not only establish a strong financial resource base and sound management procedures to assure their viability, they must also develop an understanding of two rather different markets. From this understanding, they must devise financial techniques, organizational structures, and operational procedures that serve the needs of both without jeopardizing the soundness of the institution.

B. DEALING WITH SAVINGS

Virtually all families save in one form or another. Much of this saving is not, however, recognized in the national income accounts; indeed, what may be regarded as saving by individual families may be recorded in the national income accounts as consumption, depending on the form it takes. For example, many families save by purchasing jewelry, which would be regarded in the national income accounts as consumption. Saving in this form is, of course, nonproductive--it satisfies the need of the family to hold a portion of its wealth in relatively liquid form but does not generally permit the idle resources that those savings represent to be channelled to productive uses. One of the major contributions to economic development that housing finance institutions can make is that of mobilizing sterile savings and putting them to productive use.

Not all informal sector savings are sterile, however. As noted above, traditional saving and lending mechanisms do exist in the informal sector. In West Africa, communal rotating credit societies, known as the _ton-tin_, successfully mobilize informal sector savings and provide credit to the member of the society. In Egypt, _gamiyas_ function in a similar fashion; in Kenya, this type of institution is known as the _obilimba_ or _harambee_, in Nigeria as the _esusu_, and in Sudan as the _sanduk_. These informal sector societies provide ample evidence of the saving capacity of low-income families, yet the fact that they are small groups without real credit facilities means that they do not enjoy the benefit of scale economies. The adaptation of formal sector techniques to these societies could, therefore, substantially improve the efficiency with which savings are mobilized and credit extended to families in the informal sector.

One such effort has been made in Mauritania with the establishment of the caisse populaire; principles similar to those practiced by the ton-tin are employed, but the saving base is much wider than those of individual ton-tin. The caisse populaire, therefore, realizes economies of scale.

C. ALTERNATIVE LENDING TECHNIQUES

1. Shelter Finance in the Informal Sector

There are several ways in which informal sector families finance shelter, none of which can be deemed as efficient as long-term credit.

(a) Self-financing: Self-financing follows the pattern of "mattress" saving and/or saving through incremental purchase of building materials, liquidating or borrowing against dowries, and borrowing from relatives.

(b) Informal Sector Financial Mechanisms: The rotating credit societies mentioned earlier--the ton-tin, gamiya, harambee, etc.--provide a source of shelter financing, as well as financing for other purposes, that is in many ways superior to self-financing approaches.

(c) Contractor/Merchant Financing: In many countries, building contractors and suppliers of building materials accept time-payment plans, usually for a maximum of no more than four or five years and with implicit interest charges ranging upward to 15-20 percent, depending on the country and the length of the payment period.

The existence of such mechanisms in the informal sector clearly establishes the existence of a market for shelter finance services, one which formal sector institutions can serve if they are willing to adjust their policies and procedures to accommodate the needs of the market.

2. Adjusting Formal Sector Activities

The long-term level-payment mortgage offered by depository housing finance institutions has brought decent housing within affordable range of middle-income families because the extension of the term to maturity from, say, 5 years to 10, 15, or 20 years significantly lowers the monthly payment required to amortize the loan and thus claims a sufficiently small part of the family's monthly income to ensure its ability to repay the loan. But it is well known that as the term to maturity is extended beyond 15 or 20 years the resulting reduction in required monthly payments diminishes to insignificant amounts. Further extensions of maturity do not, therefore, offer much hope of extending the benefits of homeownership to low- and moderate-income families.

The reason why the level-payment mortgage is so common among depository housing finance institutions is that, like other depository institutions, they depend for loanable funds on the confidence of their depositors in the safety and security of their savings. It follows that the institutions, to justify this confidence, must observe high standards of prudent lending. Primary consideration is then given to the mortgagor's current ability to amortize the loan on the presumption that if the mortgagor can afford the payment now, he can afford it in the future.

There are, however, alternatives to the level-payment mortgage that are proving effective in extending the lending frontier to low- and moderate-income families while still providing a sufficient degree of safety to the lending institutions and their depositors.

(a) Graduated Payment Mortgages: Graduated Payment Mortgages (GPM) permit a finance institution, within limits, to tailor the borrower's payments to his current <u>and anticipated future</u> income by setting the initial loan installments below the amount prescribed by a level-payment mortgage and increasing the amount of the installment periodically, usually on the anniversary date of the loan.

b) <u>Blocked Compensating Balance Mortgages</u>: Blocked Compensating Balance Mortgages (BCBM), in their prototypical form, provide a 100 percent mortgage against the property and a pledged savings account amounting to 10 percent or 20 percent of the mortgage as a delinquency reserve.

The advantages of the blocked compensating balance approach over the conventional loan outweigh the disadvantages. First, from the homeowner's point of view, the fact that the funds he would ordinarily have used as a downpayment are instead employed as a blocked compensating balance is immaterial since he cannot liquidate either without selling the house, and if his payment record is good, there will be a sizable balance available to him upon satisfaction of the loan that is not available to him under conventional techniques. Second, although the homeowner pays more interest over the life of the loan, it would under normal circumstances be no more, or very little more, than interest plus the premium for mortgage insurance. Furthermore, his compensating balance is recoverable upon satisfaction of the loan whereas the insurance premiums are not. Third, should events make it impossible for a homeowner to make his mortgage payment for a few months, he need not feel guilty or be subjected to pressure by the lender to make up his payments. Fourth, and perhaps most important, if the lender accepts the blocked compensating balance as adequate protection against risk, the homeowner can obtain a loan for which he might not otherwise qualify.

From the point of view of the lender, more interest is earned over the life of the loan without undue concern over delinquency control and collection. Moreover, the blocked compensating balance prevents any loss through delinquency for a sufficiently long period to develop repayment experience with each borrower and to provide adequate lead-time for foreclosure if that repayment experience is bad, again without any loss through delinquency.

These basic features are clearly subject to modification to recognize differences in administrative cost, local custom, etc. Indeed, an adaptation of this approach is employed by CNEL in Tunisia with its contract saving system, and another variant has been developed for use in Jordan.

3. Home Improvement Lending

Home improvement loans recognize two vital factors in the shelter search of low-income families: (a) the evolutionary process of shelter construction and improvement, and (b) the value of the existing stock. Home improvement loans can be tailored to extremely low debt-servicing capacity. They also can reach a very large target population, thereby giving a housing program a greater statistical impact, an effect that cannot be achieved by programs reliant on raw land development.

Home improvement loans also are flexible and may be designed to fit the needs of any individual family. They may be directed at infrastructure as well as at housing units and construction materials.

D. OTHER POSSIBLE MECHANISMS

To preserve the greatest degree of flexibility, project designers may also consider mechanisms which are specifically attuned to certain characteristics of the project or its target population. If infrastructure is the essential component of a project, user charges may offer the best mechanism for recovering project costs. If community organizations exist in a stable form, they may be used as the borrower. Taxes may be another mechanism.

All such mechanisms, however, imply that an organization with a capital base adequate to carry the financing for a long term is available (e.g., utility company, government, cooperative). The mechanisms, therefore, do not obviate the need to establish a process which lengthens the term of the financing and adjusts amortization of project costs to reflect the project beneficiaries' debt-servicing capacity. These organizations by their intervention also do not establish a process of resource mobilization except in the case of cooperatives established for just that purpose.

Office of Housing
Agency for International Development

SHELTER TRAINING WORKSHOP

November 5-30, 1979

AID SHELTER INSTITUTE

PROGRAM PACKAGE ON

SITES AND SERVICES PROJECTS
DESIGN PRINCIPLES

Monday, November 19, 1979, 10 a.m.-Noon

Presented by Joseph Handwerger

and

SITES AND SERVICES
PROJECT LAYOUT EXERCISE

Monday, November 19, 1979, 2 p.m.-4 p.m.

Code 37.P

Contents

SITES AND SERVICES: A LOW-COST SHELTER SOLUTION—THE EL SALVADOR EXPERIENCE

An audiovisual presentation by Joseph Handwerger, Consultant to the Office of Housing, AID/Washington, D.C.

Squatter settlements and overcrowded inadequate housing are an international phenomenon resulting from rapid urban migration, population growth and inadequate resources.

One solution currently in use by developing nations to meet the growing demand for minimum cost shelter in urban areas is the concept of "sites and services." This concept has become a popular means of providing shelter to the growing urban majority who cannot afford conventionally or publicly financed housing units except under highly subsidized schemes. The emphasis is placed on development of affordable shelter on a cost-recovery basis. The element of cost recovery enhances project replicability, sustained and expanded service levels over time as well as broadened distribution of limited public resources for greater benefit to lower-income urban populations.

Under sites and services schemes, urban land is subdivided into lots which are provided with varying levels of public utility services and community facilities. Core units may be incorporated into the schemes as well as a variety of community services. Services may include credit systems for construction and building improvement loans, on-site building material supply centers, waste collection systems, transportation facilities, technical assistance for mutual and self-help construction, health and education programs. Service levels vary depending on residential income levels, community needs and available public resources. Construction is carried out primarily by local residents to maximize shelter production while minimizing labor costs to residents.

Mr. Joseph Handwerger, a U.S. planner and architect experienced in the housing problems of developing nations, made a slide presentation to conferees which focused on a group of issues and concepts in the development of sites and services projects. He illustrated some of these concepts through slides of a sites and services program in El Salvador financed by the World Bank and developed by the Salvadorean Foundation for Development and Low-Cost Housing (FSVM)*.

The slides covered a small group of projects, all developed by the FSVM, which demonstrate in a convincing way that a properly structured, implemented and managed sites and services project can be not only a healthy and convenient environment but an attractive community in which to live.

A basic goal of these projects has been the minimizing of initial construction and associated costs while planning and providing for improvement and upgrading over time. Indigenous materials and labor-intensive construction methods have been utilized wherever practical. Contract work, technically aided mutual help and self-help have all been employed in the construction process.

*The FSVM was originally organized in 1968 to aid in resettling families left homeless by the flood of the Acelhuate River in San Salvador.

FSVM sites were selected to yield between 400 and 1,000 plots per site, which is considered large enough to achieve economies of scale in construction, but not so large as to concentrate too many low-income families in a given area.

Lot sizes are relatively small, ranging from 60 square meters in San Salvador to 120 square meters in secondary cities where land costs were lower. Gross densities however are moderate—27 to 80 plots per hectare—due in part to substantial open space requirements of the local codes. Roughly 50% of the sites are devoted to residential plots. Each site is also provided with schools, health clinics and at least one market, multi-purpose community center and sports field.

The sites are layed out in efficient grids of pedestrian walkways providing access to each lot and containing water and sanitary sewerage pipes and storm water drainage channels. Roads, generally a high-cost element in site development, are minimized. Peripheral roads serve small parking areas and cul-de-sacs, providing access for emergency and service vehicles. The walkway system links each lot with other lots and community facilities. Vehicular crossing of pedestrian walkways have been minimized for safety of pedestrians. Community facilities are generally located in the interior of the site as are small commercial zones. Larger commercial and market areas are at the site entry points or bus stops, providing easy service access.

An innovative feature of the planning is the incorporation of small parks providing open space and social meeting places and reducing the usual monotony of large-scale grid development.

All lots are serviced with individual water, sewerage, storm water drainage and optional electric tower connections. Street lighting is installed along major access roads and at main circulation points.

Two service levels or options to purchasers were provided: level one consists of a serviced plot with an enclosed sanitary unit containing a water closet, shower and wash basin; level two consists of the level one elements and a basic dwelling of about 17 square meters. This structure consists of an asbestos cement roof, brick walls, wood frame and galvanized metal doors and windows and concrete floor.** Most of the initial unit construction is built by aided mutual help. Credit toward down payment costs is earned in this work. Parts of the rear and front walls and interior partitions are built by self-help.

Units were designed to be logically and easily constructed and expanded through mutual and self-help labor. Resident labor took place for the most part on weekends, after work or on holidays with many family members participating.

Bricks are an available local material in El Salvador. Good quality bricks are made by small-scale entrepreneurs in wood-fired kilns. To the largest degree possible, indigenous materials and labor intensive construction methods were employed to reduce foreign exchange expenditures, to benefit local employment and to provide some training in building trades during the technically assisted self-help activities.

**Since El Salvador is an area susceptible to earthquakes, the units were designed with reinforced concrete columns, bond beams and foundations. In actual construction, a special hollow-core brick was used to eliminate the need to form reinforced concrete columns.

The basic structural elements of community facilities, such as schools, were constructed on contract but walls were completed through mutual help as was community landscaping.

While piping was laid by contract, back-filling was performed by mutual help. The FSVM felt that this would give the future residents a sense of identification with these underground networks.

Precast channels were used for storm water drainage. Surface drainage of storm water was provided as opposed to more costly piped drainage in order to reduce infrastructure costs.

A precast water closet was used. While many purchasers expressed the desire for a tank-type flushing toilet, the FSVM provided only these precast units. They felt that the cheaper water closet would help keep costs low and help make units affordable. Those who could afford a flush toilet could have them installed, and did. This decision by FSVM illustrates an important conceptual principle, that of postponing all but essential elements for affordability by the lowest possible income levels. While the ideas of minimizing standards and eliminating elements is well understood, the principle of postponement and upgrading over time is equally critical.

When a site was ready for occupancy, a lottery was held to determine who would have first choice of unit location. Up to this point work was done by mutual help since no one knew which unit would be his.

With the allocation of units, self-help improvement of units begins. At this point building material loans are made available. For this program individual loans were let on the order of US$50 to US$200. Purchasers were permitted to erect temporary shelters on the plots so that they could live on-site to work on their dwellings during off-work hours. Residents who previously lived in squatter settlements often disassembled and re-erected their squatter shacks on their new plots.

Self-help construction and improvements on allocated units brings forth a mixture of modern materials and draftsmanship joined by traditional elements. Extraordinary individualization of windows, doors, walls and color schemes evolves, all of which enliven and enrich the community.

The residents of these sites and services projects in El Salvador have major investments of personal time and labor committed through mutual and self-help construction. The method has created a true sense of "community." The economic benefits of their labor flows directly to themselves. And who can put a value on the spiritual benefit of having been instrumental in providing with one's own hands a decent place to live for oneself and one's family.

Before . . . .

Pictures courtesy of Fondo Nacional, El Salvador

. . . . and after self-help community development

Agency for International Development
Shelter Training Institute

Design Principles in Planning Sites and Services Projects for Low Income Households

10 am - noon, Monday, November 19, 1979

Objectives of the Session:
Introduce principles of design of sites and services projects for low income housing, particularly with respect to economy and efficiency of site layout, infrastructure, and the dwelling unit itself.

Describe the analytic process and key design decisions which determine the form of projects, their scale, and standards for utilities, services and dwelling units. Discuss how priorities may be established.

Show how different approaches and design solutions emerge out of consideration of a given country's climate and culture as well as conditions of a particular site such as topography or land use relationships.

Illustrate these points with project examples from El Salvador and speaker's research findings.

Subjects:

A. Design Considerations

1. Densities - in relation to project scale, location (access to employment and services), climate, social or cultural characteristics of the people, plot sizes, dwelling unit features, size of neighborhood or social groupings; families per hectare as the measure.

2. Nature of infrastructure - (water, sewer, drainage, electricity, roads and footpaths), respecting range of possible standards and acceptable alternatives, progressive development, access to individual lots, connections to larger municipal systems; units of measurement.

3. Community services and facilities (health, education, welfare, recreational, religious, commercial, solid waste or garbage disposal).

4. Special physical issues (topography, existing amenities, context, topography, views), or special climatic considerations.

5. Techniques for relieving monotony.

B. Other Considerations that Bear on Design

1. Trade-offs and compensation (e.g. reduction in some standards to save money that could go instead to some higher priority services). Process of analyzing alternatives, weighing the allocation of resources, staying within project cost constraints established on the basis of affordability, replicability.

2. Self-help vs. contract labor.

3. Maintenance requirements and indigenous materials.

4. Incremental staging of development infrastructure (unserviced plot, partially, then fully serviced plot) and dwelling unit (sanitary core, core house, house expansion and embellishment); transformation of raw, untidy appearance over time; what can be left "undesigned".

5. Acceptance issues and identification of needs for innovation and bring research and development efforts to bear on such needs.

6. Economies of scale in construction; standardization of components.

7. Importance of the residents' initiative as well as contributions of construction labor.

Agency for International Development
Shelter Training Institute

General Principles to Consider in Decisions on The Design of the Dwelling Unit for Low Income Families

For a long time, shelter projects have emphasized architectural solutions. Although some attractive products have resulted, it is clear that they cannot continue to have a central role in shelter strategy for low income households. These projects typically require major subsidies for low income occupants. Given the scale of need in light of today's rapid urban growth rates, a nation's limited resources must be spread more widely and achieve significantly greater impact. A better approach is to concentrate on basics.

A. Meet the target group's basic shelter requirements.

1. Typical living standards prevalent for the target group (densities, structures, building materials, adaptation to climate, accessibility to employment opportunities, shelter, utilities, transportation expense).

2. Household size and composition, economic social and cultural activities associated with the dwelling unit itself, the residential environs.

3. Priorities respecting the dwelling, infrastructure, community facilities and services, other social or economic needs.

B. Recognize and make full advantage of the target group's energies and capacity for taking initiative in providing shelter for itself.

1. Ascertain most serious constraints, e.g. insecure tenure; excessively restrictive land use and building codes that inhibit use of local materials, gradual improvement/expansion of the dwelling unit, installation of infrastructure in incremental stages over time, occupation of sites in locations convenient to employment or services, etc.

2. Establish opportunities for active participation of the target group in all project phases--from initial design through construction and eventual maintenance and upgrading.

C. Recognize the principle of target group affordability as a primary cost constraint from the outset of the design process.

D. Fundamental decision.

1. Devise mix of dwelling unit design solutions most appropriate for target groups (in respect to cost, functional, staging criteria and flexibility in future use).

2. Select most suitable building materials (with regard to availability, need to stimulate production of local substitutes for imports, acceptability of innovations, ease of transport and on-site handling, cost to the target group family, comfort--there may be conflicts among some of these criteria and a need to weigh the relative merits of the alternatives.

3. In conjunction with the decisions on materials, outline construction system and procedures (considering availability of skills, training and supervision requirements, staging).

Agency for International Development
Shelter Training Institute

Sites and Services Site Layout Exercise

2 pm - 4 pm, Monday, November 19, 1979

Objectives of the Session:

1. Simulate, in a very simplified way, the decision process in applying design principles for site, infrastructure and plot layout.

2. Provide opportunity for course participants to study the physical and cost implications (or other aspects) of alternative or incremental service standards in a sites and services project.

3. Establish some background and preparation for the major team project in the final week of the course.

Description of the Exercise:

1. Teams comprised of four to six course participants will be asked to manipulate a limited number of design elements (plot densities, roads, water and sanitation facilities) on a hypothetical site. The object will be to minimize cost and maximize such other objectives as the respective teams assign high priority.

2. Each team will be given a sturdy piece of cardboard, about 24" x 36", representing a site of approximately 12 hectares. Colored paper, trimmed to dimensions of appropriate scale (1 cm = 5 m) will also be provided, representing strips of plots and community facilities such as school, health clinic, community center, athletic playing field, market and open space or religious institution. Flexible tapes of varying widths and colors will be included to represent utilities lines and roads of different dimensions. Scissors, centimeter scales, double-back cellophane tape, writing equipment and paper will be available for each team as well.

3. Each set of materials will be organized with reference to a somewhat different set of assumptions and a different density of development. For example, one will be scaled for a density of 30 dwelling units per hectare and lot proportions that reflect particular dwelling styles and prevailing densities for low income families. Another will be scaled for 45 dwelling units per hectare and different climatic or cultural conditions. A third will be scaled for development as intense as 60 to 80 units per hectare, again, with a brief outline of significant characteristics to establish a general context. They may be more than one team working with a given density.

4. Participants may select the "problem" most similar to conditions with which they deal in their respective countries.

5. The director of the exercise (Mr. Handwerger) will direct that half the members of each team concentrate on plot development (dwelling design, materials, room functions and arrangement, placement of sanitary unit) while the other half focuses on the site layout.

6. After introducing the exercise to the entire group, the director will circulate among the teams to offer assistance, comment on the approaches being tested, and respond to points that arise in the process of the work.

7. About 90 minutes will be devoted to the individual team. For the last half hour of the session the group will reconvene as a whole to hear presentations of the team solutions and discuss their observations.

<u>Background to the Plot Dimensions and Densities Assigned in the Design Exercise</u>

Team I — Setting: Middle Eastern city, temperate climate, moderate but seasonal rainfall, moderate humidity, seasonal heavy winds. Lot size: <u>6.03 m x 16.66 m = 100 m^2</u>; Lot proportions: 1 : 2.76. With 60% of the site in residential use, it is theoretically possible to get about <u>720</u> lots of this size on a 12 ha site. In this case, <u>gross density</u> (number of lots ÷ total site area) would be <u>60</u> and net density, 100 lots (or households) per residential hectare.

Team II — Setting: Large Latin American capital city; temperate climate, arid. Lot size: <u>7.07 m x 21.21 m = 150 m^2</u>; Lot proportions: 1 : 3. With 65% of the site in residential use, it would be theoretically possible to get about 520 lots of this size on a 12 ha site. In this case <u>gross density</u> would be <u>43.3</u> and net density would be 66.7 plots per residential hectare.

Team III — Setting: Southeast Asian capital city; hot, humid climate; heavy rainfall. Lot size: <u>6 m x 13 m = 80 m^2</u>; Lot proportions 1 : 2.17. With 65% of the site in residential use, it would be theoretically possible to get about 975 lots of this size on a 12 ha tract. In this case <u>gross density</u> would be <u>81</u> plots per hectare and net density, 125 plots per residential ha.

Team IV — Subsaharan African New Town; Lot size <u>12 m x 27 m = 324 m^2</u>; Lot proportions: 1: 2.25. With 60% of the site in residential use, it would be theoretically possible to get about 220-225 lots of this size on a 12 ha tract. In this case <u>gross density</u> would be about 18 plots per ha and net density would be about 30 plots per residential hectare.

Team V — Western African capital city; Lot size <u>13.3 m x 15 m = 200 m^2</u>; Lot proportions: 1 : 1.28. With 60 % of the site in residential use, it would be theoretically possible to get about 360 plots on the site. Gross density, in this case would be <u>30</u> plots per hectare and net residential density, about 50 plots per ha.

<u>Recommended Readings</u>

on

<u>Sites and Services</u>

The following readings are recommended for preparation in advance of the course sessions on November 19. All are reproduced in this packet.

<u>Sites and Services Projects: A World Bank Paper</u>, April 1974. Introduction and pages 1-14.

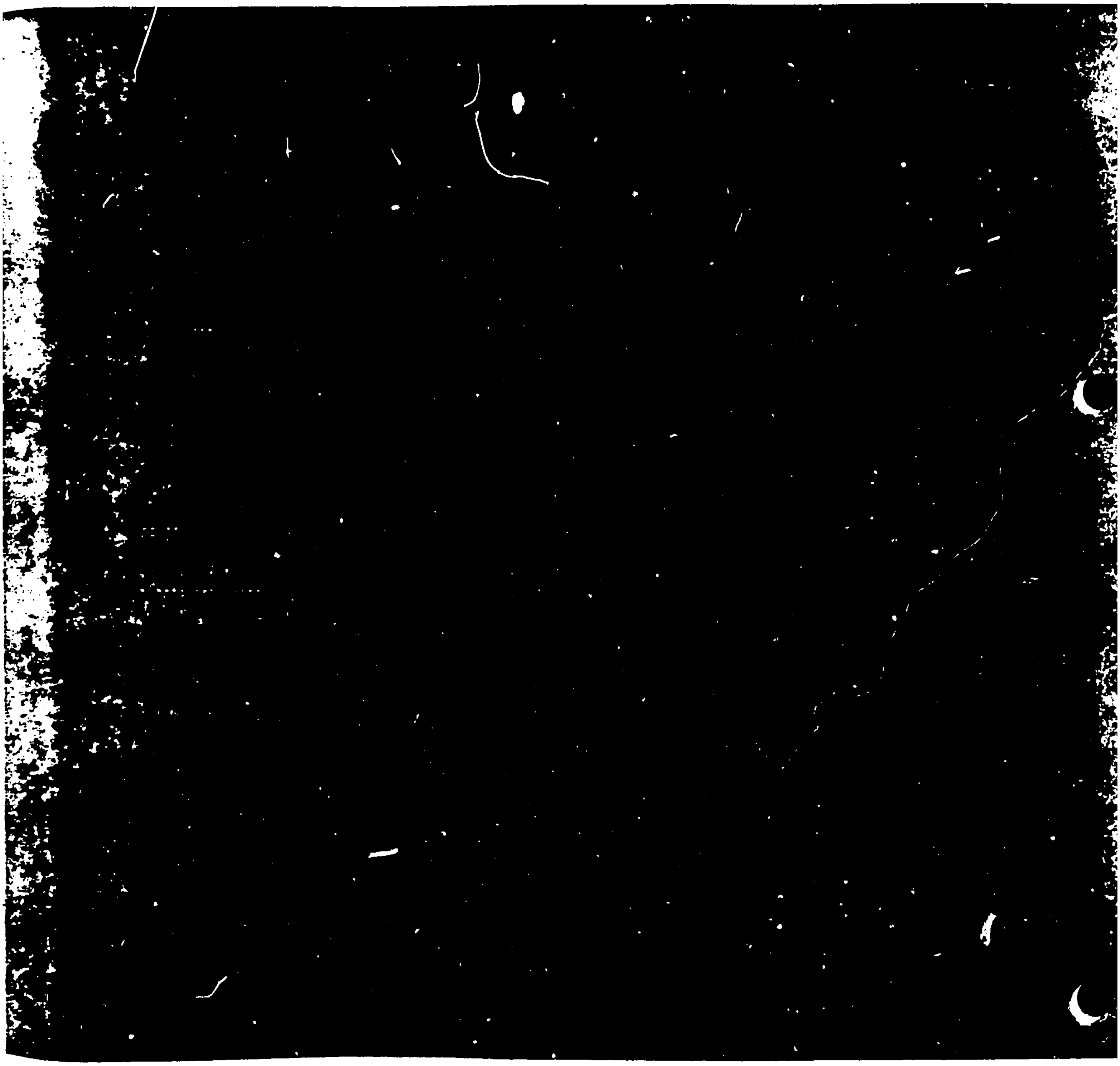
This material provides an overview of the issues and cumulative experience in the design of sites and services projects. The Planning and Physical Design Annex on p. 44 is a useful checklist of physical planning factors.

<u>Sites and Services Projects, Survey and Analysis of Urbanization Standards and On-Site Infrastructure</u>, 1974.. Introduction and pages 1-29.

Here is a study of physical aspects of Sites and Services based on a survey and analysis of World Bank projects. It attempts to develop guidelines and present them in an easily usable format. Emphasis is on physical layout and aspects of on-site infrastructure including water supply, sewerage, roads, surface drainage and electricity. These pages also provide a good introduction to the terminology used in sites and services work. A helpful list of references on the subject appears on page 29. The Annex includes illustrations of site layouts in several World Bank projects.

SITES AND SERVICES PROJECTS

A World Bank Paper



April 1974

SITES AND SERVICES PROJECTS

A World Bank Paper

April 1974

World Bank
1818 H Street, N.W.
Washington, D.C. 20433 U.S.A.

SITES AND SERVICES PROJECTS

CONTENTS

CONTENTS (continued)

INTRODUCTION

The interest of the Bank in supporting sites and services projects, providing urbanized land and supporting services for low income communities, stems from several basic considerations set out in more detail in the Urbanization Sector Working Paper of June 1972:

- Growth in urban population of developing countries is expected to exceed 4% per annum for the next two decades. In many cities, population growth will exceed 6% per annum. In a considerable number, population will double and urban area triple in less than a decade.

- To accommodate this growth by conventional permanent housing of even "minimum" cost standards would far exceed available resources. Currently, the supply of such housing is generally only a fraction of the increase in number of urban families.

- Put another way, except for the richer developing countries, most urban families cannot afford conventional housing unless subsidized on a scale that the public authorities could not possibly support beyond relatively small programs.

- A growing proportion -- often over a third -- of the urban population lives in squatter settlements which, though overcrowded, unhygienic and lacking in basic services, provide accommodation at prices that can be afforded. Self-help is central to this construction and, under certain conditions, leads to subsequent upgrading.

- Better housing in terms of space and construction standards is generally of lesser priority to these poor urban families than better employment, education, water supply, health, etc.

The prospect of the supply of dwellings and urban services continuing to lag far behind the growth in urban population, with consequent further proliferation of slums and squatter settlements, intensified overcrowding, and deteriorating levels of services, is making reconsideration of current urban development policies mandatory. But there are other reasons of productivity and efficiency no less pressing:

- the present high level of urban unemployment represents a resource which could and should be better utilized;

- existing patterns of urban development, largely unplanned and uncontrolled, represent an inefficient use of resources. Provision of housing, transport and other services appears to be much more expensive than need be. Sites of squatter dwellings, in particular, often prove extremely costly to supply with adequate services;

- environmental considerations are largely neglected;

- to reconstruct is much more costly than to ensure better patterns of development in the first place.

In these circumstances, the provision of new tracts of urbanized land in convenient locations with the basic supporting services needed to produce viable low income communities can present many advantages and yet fall within both general resource availabilities and the ability of recipients to pay. Such "sites and services" projects can provide:

- a greatly increased supply of building plots with urban infrastructure and services that are both economical of resources yet cannot readily be supplied on an unorganized basis;

- efficient new townships within more efficient urban development patterns;

- much better physical living conditions than are available in unplanned squatter settlements with greater opportunities for subsequent upgrading;

- restraint on the growth of unplanned squatter settlements;

- increased scope for self-help construction providing dwellings at minimum cost while stimulating non-monetary savings and income;

- significantly improved employment opportunities and training;

- security of tenure and a basis for community development;

- more adequate social services;

- better general environment.

Upgrading schemes to improve conditions in existing squatter settlements through provision of public utilities and community services can, under appropriate conditions, secure similar benefits.

To achieve these objectives it is necessary in the design of the projects to find solutions to a series of difficult issues, involving careful balancing of alternatives. The purpose of this paper is to set out some of the main issues which need to be considered in designing individual site and services projects and to suggest major components of a Bank approach to these problems. Since the experience of the Bank in this field is very short, the guidelines indicated are preliminary in nature. The paper should accordingly be regarded more as a framework in which to consider individual projects than as a manual providing specific directives for design or evaluation. In view of the recent publication of the Urbanization Sector Working Paper, the wider aspects of national urbanization and housing policies are not dealt with here. The no less important context of the development of the overall urban planning process in individual cities or towns is similarly referred to only briefly. 1/

As Bank financing can only provide a marginal contribution to the total of investment in urban dwellings and services required in developing countries, it follows that for a significant impact to be made, the site and services projects must be capable of repetition on a much wider scale without such assistance. This means that:

- the projects must provide a package of benefits that is widely accepted by potential occupants as well worth the charges made;

- such charges must be small, rentals or mortgage payments not exceeding a limited proportion, generally about 20%, of the income of occupants;

- any costs not covered by the occupants must be within the capacity of the public authorities to bear on the scale of a large continuing program.

As a corollary to this need to limit the burden on public authorities, if the project is to be replicable on a wide scale, any element of subsidy introduced on welfare or other grounds must necessarily be small. The penury of basic resource and financial means of the authorities makes this inevitable.

The issues are considered in this paper under three main groups:

- Project design which should be closely related to the income groups chosen and involves problems of scale, scope (or coverage), standards, location, and employment and self-help aspects;

- Project financing which involves not only the division of costs between occupants and public authorities but also a range of subsidiary questions including direct and indirect cross-subsidization between income groups;

1/ A paper analyzing comparative costs and interrelations between major elements of the infrastructure requirements of site and services projects is under preparation as a complement to this present paper. Other aspects may be given more extended treatment in subsequent notes.

- Project organization which covers the roles of authorities, private enterprise and community groups; land acquisition; regulations on land, construction and other activities; and the management of occupant selection, revenue collection, sales and eviction.

It is obvious that these groups of issues are closely interrelated. A fourth group of issues concerns the methodology of evaluation which is, in part, concerned with such interrelations. The following sections deal with each of the three groups of issues indicated above. Problems of methodology are largely dealt with in the course of the discussion of the other issues but also in a final section.

PROJECT DESIGN

The "Design Population" and Project Scale

The stratum of the urban population for which the project is to be designed should be considered both in relation to the needs of this particular stratum and the repercussions that meeting these needs will have on other income groups. Typically, well over half the urban population and sometimes more than four-fifths will have incomes below the level adequate for paying for conventional housing. Within this large section of the population, there will inevitably be considerable variations not only in income levels but also in the priority of felt needs. Those groups with relatively high incomes, for example, will generally be more prepared to pay somewhat higher charges for larger sites with better amenities, and to live farther from their work places even if higher transport costs for the family are involved. Among the poorest groups, incomes are likely to be inadequate to make regular payments for dwellings and certainly not payments large enough to cover a major part of the costs of a site and services scheme. Central location in the search for employment is, for these poorer groups, likely to be of greater significance than somewhat better living quarters.

The first issue that arises is that if a sites and services project is designed to meet the needs of those who can afford to pay a reasonable part of the costs incurred (see below), the poorest elements of the population will tend to be excluded from the scheme. The greater the level of amenities provided the smaller will be the proportion of the lower income groups that can be provided with serviced sites.

For several reasons, the choice of a population group representing a fairly large middle stratum of the lower income groups will generally appear the most appropriate, at least for the start of any large scale site and services program. It should be possible to recover a major part, if not all, of the relevant costs of the project from this group where design is appropriate -- and hence provide the basis for a large scale ongoing program. Considerably greater flexibility in site location is feasible as compared with lower income groups. By dealing with the needs of this group, the pressure on existing squatter settlements, from where many of the occupants will come, will be lessened. This will itself benefit the poorer groups remaining in the squatter settlements since overcrowding will tend to be less and rents lower than without the site and services program.

A complementary program of upgrading of existing squatter settlements can attack the problem of an equitable balance of assistance to those in lower income groups. A major problem to be faced is that costs of upgrading existing poor squatter settlements are likely to be difficult to recover directly from the occupants. However, in view of the low income groups involved, it can reasonably be held that insofar as any general subsidies are considered justifiable, these should be centered on improvements in existing squatter settlements rather than on lowering the charges on those moving to the better conditions of the new sites and services project. Upgrading will also usually involve destruction of some dwellings in the squatter settlements with consequent problems of providing for the rehousing of those evicted. However, if the upgrading program is conducted <u>at the same time</u> as the main sites and services project, space will concurrently be released by some occupants moving to the new sites and services area. In such circumstances, the individuals evicted can, with compensation, be counted on to organize their own resettlement.

Further contributions to improving conditions of the poorest income groups can be provided by arrangements permitting rental of rooms in the sites and services project and/or by reserving a limited number of "free plots" in the project to compensate those dispossessed in existing settlement upgrading. Rental of rooms can both improve the supply of this cheap form of accommodation and augment the funds available for dwelling construction in the sites and services area. The provision of "free sites" in what may well be inconvenient locations for the families involved, however, appears generally less desirable than direct compensation for dispossessed families leaving the choice to them between remaining in their present area or moving.

A second issue, closely related to the composition of the target population group is that of scale, <u>the size of the project and of the program for sites and services in relation to the target population</u> and its needs. If average conditions are to be significantly improved, the site and services program as a whole should provide for both the continuing growth in the population stratum for which it is designed -- deriving from natural growth, immigration and upward mobility -- and also for the backlog of effective demand reflected in existing overcrowded slum and squatter settlements. Unless the program exceeds the requirements for the growth in target population, conditions in existing squatter settlements will tend to deteriorate as a result of increasing resident density.

The program should therefore be designed to reach a scale larger than needed for the growth in population stratum involved and subsequently be reduced to that scale when the backlog has been diminished. Individual projects should be of a scale large enough to make a sizeable contribution to reaching this objective. This usually involves a size running into the tens of thousands of inhabitants. Fortunately, the constructional requirements of site and services programs of this scale are normally within the capacity of the domestic construction industry. Finance and technical assistance in Bank projects can help meet the problem of "getting over the initial hump", and developing an adequate ongoing program. Bank finance for such projects may also be of particular assistance in launching first or "demonstration" projects which of their nature are considered more risky than established programs.

The scale of the efforts made to improve existing squatter or slum areas should be closely related to that of the sites and services program. Upgrading of such areas raises many problems if introduced in isolation. Unless alternatives are provided for the continuing growth in population, the improvements will, as noted above, tend to be offset by higher densities and overcrowding. The improvements will indeed create pressures to increase rents sometimes leading to eviction of existing tenants unless there are offsetting factors to reduce densities and rents for example from increased site and services availabilities.

Great importance consequently attaches to conceiving sites and services projects within a more general framework of housing policy for the urban population as a whole and, in particular, policies towards eradicating existing squatter settlements and slums. Under the usual conditions of fast population growth, a larger backlog of demand for dwellings and few resources, the additional pressures created by eradication policies are likely to nullify much of the benefit of new projects. In particular, such policies may make it impossible adequately to relate the design of the sites and services project, the occupants, and the financial contributions, or to avoid complications from upgrading.

Cessation of general policies of slum eradication so as to prevent the creation of additional demand for dwellings until supply is made more adequate by a continuing sites and services program may, therefore, need to be made a condition of Bank involvement in sites and services projects or in complementary upgrading schemes undertaken as an integral part of the overall program. This does not of course exclude limited slum eradication for particular central areas necessitated by other schemes of sufficient priority.

Scope of Sites and Services Projects

The often posed issue of how precisely to define the sites and services concept appears as arid as that of whether the projects should be treated as a process for improving living conditions or in terms of a physical end-product of dwellings, community services, etc. Inevitably, since the term "sites and services" is customarily used to cover a variety of projects in which urban land is developed primarily for the benefit of lower income groups, it must be given a wide meaning covering both the process and physical product. The appropriate coverage of the package of physical facilities and institutional organization provided under such projects will vary according to local conditions because, inter alia:

- the poorest strata of populations vary greatly in income levels, education, and social customs from country to country and city to city;

- physical conditions of terrain and building supplies greatly affect construction methods, costs, and potential for self-help;

- the degree to which employment opportunities, social services, and other amenities are available apart from those created by the project varies widely between cities;

- individual site locations and transportation facilities within a city vary widely in relation to specific employment, social services and other amenity opportunities.

It is accordingly probably best to consider the scope of sites and services projects in terms of certain basic ingredients plus other additional or complementary components. It should be stressed, however, that these other more variable components may be no less essential for the achievement of the underlying objective of improving the living conditions and productivity of the urban poor and to the success of the project. In this section, physical components are considered while recognizing that strong links exist with the organizational structure dealt with in later sections.

Building plots for dwellings are an essential component whether looked at from the restricted aspect of removing impediments preventing poor urban families from providing more adequately for themselves, or from the perhaps more positive viewpoint of providing cheaply essential facilities that cannot readily or so cheaply be provided by these families acting individually. Also basic are the provision of water supplies, waste disposal, and access ways, both for residents and for such public authorities as fire, police and solid waste collection services. Street lighting is now also generally considered an essential ingredient. In practice, land levelling, drainage where required by the terrain, and sewage disposal tend to be three of the main components of project costs. No less important than the inclusion of these basic elements, however, is their inclusion in a way that will facilitate upgrading as the community develops and incomes and standards are raised (see para 32).

Among the variable components, the provision of social services is an essential aspect of preparation of sites and services projects. Health and education facilities, community centers, police posts, and recreation areas all deserve consideration for inclusion. Standards of services are considered below. Here it is only necessary to note that such services may be excluded after consideration either because they are being provided within the site area under separate programs or because they are being provided off-site in the near vicinity of the project site.

The inclusion or exclusion of economic services is analogous. Possible components include sites for markets and commercial activities, and sites for small industries and handicrafts. Adequate employment opportunities are not only an essential part of the purpose of the sites and services projects; they are also basic to the improvement of living conditions and the dynamics of the long-term success in developing the project beyond the initial provision of serviced sites. More bluntly, the potential for repayment and development of a viable extensive long-term program is highly dependent on occupants earning sufficient income. As in the case of several services, whether such elements are included in the project must depend in part on how far, and where, such facilities are available outside the project.

The project may also include the development of primary urban infrastructure necessary for the provision of services to the project area. Primary water supply, electric generation and sewerage are examples where such provision of incremental primary capacity <u>may</u> be most conveniently handled as ancillary to the project. Access roads to the project site boundary also need to be considered. While generally it should be possible to ensure in the course of project related discussions that adequate provision for transport is being made outside the project, it may occasionally be justified to include provision of transport facilities such as local buses.

The project may include in addition to the building plot, provision of core units comprising usually rudimentary sanitary and washing facilities and sometimes elementary cooking fixtures. There is some evidence that core units generally seem to be considered costly by occupants in relation to the amenity provided. Under certain circumstances, however, for example where earthquake risks are important or where high densities have to be accommodated, inclusion of core units may be justified by the necessity of ensuring certain standards and the economies of supervised mass construction. (See also para 29 with respect to the relationship with overall living standards and incomes.)

The possibility of inclusion of <u>complementary schemes for the upgrading of existing squatter areas</u> or slums has already been noted in relation to developing an integrated approach to overall housing policies. Apart from subsidy considerations, the appropriate extent and composition of the upgrading effort will largely depend on the physical characteristics of the settlements, the economic-social characteristics of the residents and the prospects for more extensive upgrading in the future -- the existing site characteristics may limit the possibility of upgrading without total redevelopment.

The scope of the site and services project may also include the <u>provision of credit</u> to occupants of the project sites. Credit for building materials and, in certain cases, paid labor, can advance the timing when the project becomes fully "productive" in the sense of arriving at the end-product of dwellings rather than the intermediary product of serviced land. Credit for small industry and handicrafts can perform a similar function for employment. As facilities for such credit to individuals who do not possess conventional forms of collateral are often nonexistent or rudimentary, the project can justifiably include such credit, if other conditions particularly those concerning administration are met. (See below paras 80 and 114.)

Finally, the project may include various kinds of technical assistance. Technical assistance in the management and monitoring of the project may extend to assistance in self-help construction methods and other ancilliary training. Technical assistance may also be required for feasibility studies and institutions for supervised financing in connection with small industry components of the project. Of great importance where appropriate, technical assistance may be provided to the appropriate national or municipal agencies in the development of an ongoing program from the initial project and including the linkages with general housing policy.

Design Standards

The issue of how to define appropriate design standards for site and services projects does not permit of any simple solution. The several objectives of site and services projects -- securing economies of land development, mobilizing self-help, improving living conditions, providing employment, income redistribution, control of urban growth patterns, ensuring aesthetically attractive neighborhoods etc. -- are not entirely consistent and there are often "trade-offs" between them. Similarly, absolute standards of services are hard to rationalize without reference to local conditions, income levels and customs which affect both the demand for the services and the cost of supplying them. Standards of existing service networks may be more or less easy to adapt without repercussions on the rest of the network. A pragmatic approach to determining project design standards is accordingly required.

The choice of standards for the facilities provided in a site and services project is in practice bounded by several constraints. Existing norms of dwellings, urban services, education, etc., for the income group involved set a lower level of requirements that must be met or exceeded for the project to be an acceptable solution. These requirements are basically performance standards rather than technical construction standards. It is, moreover, the totality of living conditions rather than each separate aspect that needs to be considered. For instance, a smaller parcel of land per family than current norms may be acceptable in the context of higher levels of services, employment opportunities, etc.

Upper limits for the standards and the facilities provided may be set by either of two constraints. The first is the obvious one of the maximum costs that can be afforded and is dependent on income levels of the target population and the part of project cost that can be justifiably borne by the public authorities (see discussion below). It is, however, also important to check that the standards being adopted for the publicly provided services are not so high as to create a demand for settlers' rights from higher income groups so strong that it cannot be effectively contained by the procedures for settler selection.

In practice, standards that substantially exceed minimum acceptable norms are likely also to exceed the financial/resource constraints imposed by the requirements of a large-scale program. In these circumstances, rather than attempting to define in advance what is the "right" service level for each component (say water supply in terms of desirable gallons per day or distance from a tap, or the provision of an inside tap) it seems more realistic to adopt an ad hoc iterative approach geared to the actual physical conditions of the individual site.

Under an iterative approach, initial planning standards for the various publicly provided services, size of plots, etc., can be chosen for costing purposes on the basis of existing norms, what is known of preferences of the population stratum concerned and what self-help contribution can be counted on. The cost of improving or reducing individual levels of service on the total cost can then be explored, 1/ including the trade-offs between component standards. A larger unit-building plot or wider frontage for example increases the costs of a given standard of utility service. A higher level of water supply services may involve higher sewage disposal costs. Higher densities may involve a change from cess-pool to more expensive sewerage systems. By checking the impact of changes in the initially selected service levels, the total costs can, by trial and error, be limited to the resource availabilities. At the same time, the standards of service can be adjusted so that the advantages of improving any one of them would be more than offset by the reduction in the others that would be entailed in keeping total costs below the ceiling. The pattern of facilities to be provided can be roughly tested for realism by comparison with the pattern of household budgets in the income category concerned. Some variations of standards may be included in initial project phases specifically to test relative acceptance.

Obviously, this iterative process cannot be an exact exercise since many value judgments on benefits obtained or foregone will be involved. It is the more important that the standards are chosen in full consideration of preserving flexibility and facilitating future upgrading. In the course of time, the felt needs of the initial settlers should become sufficiently obvious to indicate desirable changes in the original design. Even if great care is taken in ascertaining the preferences of potential settlers, the need for subsequent modification of design standards in the light of actual experience should be anticipated and projects designed, phased and monitored accordingly. Similarly, design standards should

1/ The use of shadow-prices for costing purposes is discussed below in paras 46-47.

anticipate future upgrading which will also help offset original errors in relative standards. Thus, for example, if sufficient width of right of way is preserved for roadways and paths, it should not be of too much concern if the initial choice of width of surfacing and surface standards are somewhat below the appropriate balance; the priorities chosen by the community in subsequent upgrading should provide the necessary correction.

Standards for the inputs not provided by the authorities should be interrelated with the design standards of the basic infrastructure and social services provided. In practice, the main element here is likely to be the building codes which regulate the construction of dwellings by the settlers -- either through self-help or local building teams or, more often, a mixture of the two. In order to maximize the self-help contribution and stimulate savings and construction, the emphasis here should be on determining minimum limits within which the builders can exercise as large a degree of choice as is consistent with an economical use of land and socially desirable neighborhoods. Limits on spatial positioning, and on use of certain materials, will however be needed to cover general safety considerations. Where earthquake hazards are serious and where population densities are high, more severe limitations will be needed. But the traditional detailed building codes and materials specifications applicable to contractor-built conventional housing are likely to be quite inappropriate and involve far too heavy costs for the settler.

Control of aesthetic standards appears generally preferable through indirect methods rather than through detailed specifications on dwelling construction. The organization of provision of building materials and technical assistance in self-help construction can provide the basis for limiting building excesses while avoiding the monotony of standardization of dwellings. The street layout, design and placement of public service buildings in the area and the provision of trees for planting by community groups can all help produce attractive surroundings. Monotony may also be relieved by the careful placing of commercial and small industrial establishments within the project area. But it has to be recognized that in the first years of a new site and services area, the prolonged process of self-help development of sites and community development is unlikely to produce a picturesque tidy settlement.

Similar considerations to those outlined above for site and services projects apply to the selection of standards for upgrading of existing squatter settlements. As has already been noted, physical site characteristics may limit the scope of upgrading, and this applies as much to standards as to the types of improvements introduced. As in the case of site and services, total resource availabilities in relation to operating an adequate ongoing program will set upper limits to possible standards. Consideration has also to be given to not raising standards to levels at which the benefits are effectively quickly passed on to richer income groups.

Location

Closely connected with the scope of project and with standards is site location. For several reasons, sites and services projects have often been located at considerable distances from city centers. Land is generally much cheaper on the outskirts of cities and tracts of such land may already be in government possession. Moreover, squatter settlements often already exist in peripheral locations and to this extent the relevant population stratum is already used to living in such areas. It is also generally easier to assemble fairly large tracts of land in outer locations. But probably at least as influential as these factors has been the desire of certain authorities, from aesthetic or social considerations, to keep low income settlements well away from the modernizing central business districts.

The appropriate selection of sites is, however, of the utmost importance to the success of the projects; experience demonstrates that selection of isolated sites has been a major cause of failure resulting from rejection by the target population, even when other conditions have been favorable. Access to employment opportunities without substantial travel costs is in this context by far the most important aspect. In most of the developing countries, indeed, walking or bicycling are, because of low incomes, the prevalent modes of transport of the lower income groups. Even when significant new employment opportunities in the immediate vicinity are associated with the project, accessibility to other employment sources is likely to limit the locations within which appropriate sites may be found.

Apart from access to employment opportunities, there are several other site characteristics relevant to site selection. A multitude of small sites is likely to be more costly to develop than a few larger sites quite apart from being more difficult to administer. As total costs of construction are low by comparison with conventional housing projects and land preparation costs correspondingly constitute a relatively high proportion, expenses of land levelling and other earth-moving assume considerable significance for total costs. The gradients and other physical land characteristics have accordingly a particular importance in choice of sites. The availability of off-site services such as water supply, sewerage, electricity and solid waste disposal with surplus capacity is also relevant. In certain cases, a link between a site and services project and other new urban area developments can result in economies. For example, arranging for a slightly larger diameter water main to the other development project may provide the water capacity for the site and services project at relatively low cost.

In the preceding paragraphs, location has been considered primarily in terms of the desirable features for ensuring success of the project as such while keeping development costs down to manageable levels. It is also necessary to consider location in the context of the overall urban development programs so that the wider objectives of contributing to improved urban patterns can be ensured. In many cases, outline plans for the zoning of the urban area by main categories will already have been drawn up. If these plans are found to be competently prepared and sites are available which meet the criteria outlined above while conforming to the plan zoning, the limitations imposed by the plans can generally be accepted. Though not necessarily conforming to the optimum location from the point of view of future urban patterns -- and this is a concept in any case almost impossible in practice to define closely -- the implementation of the project under these conditions should nevertheless represent a significant step in the efforts to improve the urban pattern and constituent institutions in the urban planning process.

In other cases, existing urban plans may be inadequate and outdated or, while zoning of residential areas may be generally appropriate, regulations on permitted densities may effectively preclude use for site and services projects. In such cases, it will be necessary to secure a designation or redesignation of urban areas for purposes of the site and services projects. It would obviously be unrealistic to require detailed urban plans or, more importantly, a well-developed continuing planning process, as a prerequisite for choice of a limited area for a site and services project -- though discussion of the site and services project and program should be designed to stimulate such planning action. It should however be possible to select project areas which have a high probability of being consistent with future plans for zoning and even to precipitate related decisions, for example in defining industrial or commercial zones adjacent to the areas chosen for the site and services projects.

As in the case of selecting standards for a given site, the choice of site location involves so many factors with extensive interlinkages that it is probably best dealt with by a pragmatic approach testing the variations that would be produced by a change in site. This approach is particularly justified where, as is generally the case, the number of potential sites is in fact quite limited. An initial selection process based on such factors as accessibility and minimum size will limit further the number of feasible sites. If what then seems likely to prove the best site or package of sites is next investigated in depth, as indicated above, the trade-offs between costs and standards of moving to one of the other feasible sites can be more easily evaluated. This process is likely to raise the issue of the appropriate value to be placed on the unimproved land constituting the alternative sites. This topic is discussed below in the section on methodology.

Employment and Self-help Aspects

Improvement of employment opportunities -- or income creation -- is a basic purpose of site and services projects. The terms, however, need to be interpreted widely enough to encompass self-help. Although rarely reflected adequately in national accounts, self-help construction of dwellings and community services represent creation of capital as much as if the labor and profit elements had all been monetized. The output of the self-help element is income in the form of savings equivalent to the difference between the market value of the dwellings and community services less the monetized inputs of materials, paid labor, etc. The resulting capital produces income in the form of housing services -- to which a market rental value can be imputed -- and the amenities of the public services.

The design of the sites and services projects accordingly needs to take into account not only employment creation in the sense of wage-paid employment but also the extent of stimulation of self-help output (= income). So far as the construction of the project infrastructure and self-help dwellings are concerned, it will often be appropriate in evaluating the project to use a shadow price for the real cost of labor involved. The reason is that in the majority of cases most of the labor involved does not represent a reduction in the availability of labor for other purposes but rather a reduction in unemployment. The opportunity cost is correspondingly low.

Consideration of the employment and self-help creation aspects through, for example, use of shadow prices can influence design in two ways. First, any given design may be produced by more or less labor and self-help intensive methods. The use of shadow prices may indicate the desirability of a switch to more labor-intensive methods even if nominal costs are raised. Second, and probably more importantly, the consideration of these aspects may indicate the desirability of a change in layout, standards and architectural designs in order to facilitate the use of self-help and labor-intensive methods.

PROJECT FINANCING

Total Project Costs

The main issue raised in the calculation of total costs of the project is usually that of valuation of land. It seems clear that, even if the land is already in possession of the public authorities, land values should be estimated and included in the total costs of the project. The value of the land is likely to be an important part of the total value of the project and often a major part of the government's contribution to the project. Not to include the value of land already government-owned, moreover, makes it more difficult to place the project in the context of the feasibility of an enlarged ongoing program. A market valuation based on existing conditions of land use regulations and availability for such uses appears the most appropriate for this purpose. The fact that the social cost may be different can be taken into account in the economic evaluation and as a consideration in determining any subsidy policy. The difference between market valuation of the total site and the lower actual financial outlay where all or part of the land is already publicly owned can be treated as an implied government or public contribution to the project cost.

A subsidiary issue is whether the Bank should include land acquisition costs among the items against which it is prepared to disburse its contribution. Acquisition of land whether by market purchase or in terms of compensation payments under preemption procedures raises practical problems of valuation. It is often difficult for even local assessors to ensure that "market" prices are not somewhat inflated by collusive practices and much more difficult for an outside agency. As an adequate basis for disbursement against other elements of site and services projects generally exists, it is our present policy:

- to exclude land costs from disbursement eligibility;

- to obtain assurances that land prices used are reasonably comparable with existing local levels;

- to include land costs (with a comparable valuation for land already held) in total project costs for purposes of economic evaluation and the allocation of costs between public authorities, commercial interests and settlers;

- to agree that reimbursement of land costs by settlers can be channeled into a rotating fund which may be used, <u>inter alia</u>, for future land purchases for site and services programs.

A minor issue concerns the valuation of administrative expenses or at least that part which is supplied by the public administration and customarily not costed. The local administrative effort put into the preparation of the project and completion of the physical work can perhaps be neglected for costing purposes as analogous to similar uncosted inputs for preparation of other projects. However, the local administrative input involved in the ongoing project should be costed as a management expense to be met as a current cost under schedules for charging.

Allocation of Project Costs

A central issue in preparation of sites and services projects is the allocation of the total costs of the project, both capital 1/ and current, between the public authorities, private commercial interests, and the settlers. A clear distinction should be made between the basic allocation of costs and the division of the repayment or current charges

1/ Including interest during construction.

that is decided upon after taking into account other factors. Allocation of total costs between public sector, commercial interests, and the settlers is aimed at providing a rational basis for considering charges on settlers and commercial interests and is related to general policies for charging the costs of public services. The final division of the repayment of costs may, however, need to take into account subsidies granted to the settlers as part of special social policies related to poor income groups.

As a general rule, public services which are supplied without special charge to other parts of the community are considered as attributable to the public authorities rather than to the settlers or commercial interests. Thus both the capital and current operating costs of primary schools and health centers are generally considered as chargeable against the public budget to be met out of general taxation (including income and property taxes) or borrowing. Recreational spaces may also fall within this category.

The provision of roads presents a somewhat more difficult issue. Private developers may or may not have to bear the costs of roads within their development areas; some roads, however, are usually being provided without specific charge in other urban areas. As an initial guide, the rule may be followed that the settlers in site and services projects should not have attributed to them costs which significant groups of higher income do not have to bear. Common practice is for the primary roads, including access roads to the site boundary where needed, to be attributed to the public sector and for paths and secondary roads within the site to be apportioned between the public sector, commercial interests and the private settlers in proportion to their respective areas of land use.

In the case of water, sewerage and electricity, capital costs of any extension of trunk mains to the site boundary are generally considered as part of the development of the basic municipal system with the costs attributed to the entities concerned to be met through their general rate structure. The on-site infrastructure costs for provision of domestic water and sewerage to settlers and commercial users is directly attributable to them, the on-site infrastructure costs associated with provision of these utilities to schools and other public services being allocated to the public sector. Differing classes of settlers will usually have to be distinguished where the level of service varies significantly, e.g. some dwelling plots may have individual connections and others rely on communal facilities. In the case of electricity, street lighting may be considered as a public outlay or as one directly attributable to settlers and commercial users according to local norms, but individual connections to plots will in any case be attributable to the settlers connected.

It is customary also to allocate the land costs between the public sector and the settlers on the basis of proportionate net land use for the different public and private activities. However, there may be cases where the valuation per unit area should vary, e.g. where the overall site area contains flood-land of little use except for recreation. In many cases, project costs such as land clearance and levelling cannot be precisely divided among the various uses. In such cases it is common practice to attribute such costs in proportion to the amount of land used for each purpose.

Charging for Sites and Services

From the primary objectives of helping the poorer urban groups to improve their living standards but at costs which will allow the projects to be replicated on a wide scale several parameters emerge for charging of settlers:

- the settlers, provided they fall within the design group, should not generally be charged more than the allocated costs; 1/
- they should meet as much of the costs allocated to them as is consistent with their incomes, if possible the full costs;
- they should not, however, be treated worse in the charging of services provided than other richer income groups;
- any subsidies should not be so large as to increase the attraction of becoming a settler to the point where the selection process would be undermined and benefits transferred to higher income groups;
- direct subsidies should not be so high as to prevent extension of the program by the authorities; and indirect subsidies (e.g. via low interest rates) should not be so great as to create similar problems.

In practice, these considerations may be hard to reconcile. Current public housing policies for dwellings for higher income groups may include substantial subsidies both direct (for example low land

---

1/ There may be a case for the upper end of the group to be charged rather more in order to cross-subsidize those at the lowest level (see paras 67-69). It is also sometimes contended that settlers generally should be charged market value rather than cost and that this will automatically reduce selection problems. For reasons discussed subsequently in para 85 this is generally not appropriate.

charges) and indirect (particularly low interest rates) such as to make it difficult in equity to charge the full allocated costs to the site and services tenants. Yet to accept such subsidization for site and services on a comparable scale might undermine the possibility of developing a large-scale program. In such cases, the only solution may be agreement with the authorities on modifications in the existing housing program such as would permit appropriate site and services charging without offending equity. Unless subsidies are kept within sufficiently narrow limits to permit repetition of the project on a large scale, the project can hardly be justified for Bank financing.

Capital costs allocated to settlers are generally recovered in two parts, an initial down-payment and a charge to amortize the remainder and interest over a period of years. Both elements give rise to issues. The size of the down-payment has to take into account the savings immediately available, the level of incomes and the expenditures which will be needed for building materials, etc., for the dwelling construction. If placed too high, completion of dwellings will be delayed. On the other hand, a moderately high down-payment may help in the selection process while lowering later payments and the risks of default. Savings availability is usually underestimated and, particularly in the initial stages of a site and services program, it may be prudent to err on the high rather than the low side. Some variation in the down-payment ratio may also be desirable, lower ratios being applied to smaller plots with fewer services and higher ratios to those where for instance a core unit is supplied. In practice, down-payments tend to be in a range of 10-20% of the allocated capital costs.

The length of the amortization period and applicable interest rate raise further issues. A long amortization period for repayment is indicated by the long life of the assets created and the poverty of the settlers. On the other hand, a shorter period will help the constitution of a revolving fund for further site and services projects and accelerate the time when the plot is fully owned or the lease cleared. A compromise between the various considerations usually indicates a repayment period of 15-25 years. Unless a subsidy is specifically being incorporated by means of a lower interest rate either on grounds of equity or because of the limits on incomes, the interest rate should at least equal the rate at which the public authorities can borrow long-term funds locally plus an allowance for defaults and collection costs. Ideally, the interest rate should be reasonably related to the general interest rate structure which would attract long-term savings and allocate them with due regard to supply and demand for credit. This implies an interest rate sufficiently high to give a positive rate of return after allowance for inflation. Generally, where subsidies are necessary it is preferable to provide them directly rather than through interest rates. It is recognized, however, that this may not always be feasible.

A case can be made for charging below the calculated recovery rate during an initial period of three or four years while the dwelling is being constructed and outgoings correspondingly high, with a compensatory higher charge in later years. Where politically and administratively feasible, such a system has advantages particularly since it can be assumed that incomes of the settlers will grow over time. In such cases of low then rising payments, it may be particularly appropriate to aim at full recovery of allocated costs.

Different rates of amortization and interest are likely to be appropriate to elements of the capital cost of the project other than the basic dwelling site and services. Such components as credit for building materials or small industry should be aligned to comparable commercial rates.

Apart from the capital costs of utility service connections allocated to settlers (see above), the current costs of water and sewerage and electricity supplies to individual plots will need to be covered by a periodic charge. Though often combined with the amortization/interest payments, this element is theoretically distinct and flexibility should be maintained to allow for future variations in cost of supply. So far as practical, charges should be related to use but this may only be estimable in a rough and ready manner if undue costs of administration are to be avoided.

In some cases, current charges may customarily cover not only operating charges and amortization of the trunk system but also the cost of distribution and individual connections. There is accordingly a danger of double charging being involved which may not be appropriate for the income groups of the site and services projects in terms of current social policy. Insofar as the charges of the utility undertaking do cover such items, then the corresponding capital costs included in the project should be allocated to the utility undertaking and not to the settlers.

Subsidies

How far settlers can justifiably be subsidized in meeting the part of the total costs of the project allocated to them is a troublesome issue since socio-political judgments are inevitably involved. In certain cases, because of local institutional conditions, the costs of public services allocated to settlers may be greater than would be justified by comparison with the costs borne by other sectors of the population. For example, capital costs of various public services provided free elsewhere may have to be allocated to the settlers for want of adequate capacity, management or financial, in other municipal agencies. In such cases, it may be appropriate for the government to lend to the project agency, and for the agency to charge settlers, at a lower interest rate than would otherwise prevail. Whether such "interest subsidization" should be regarded as a true subsidy or as a means of government finance for public services which should not be borne by the settlers is a matter of semantics.

There may be social reasons for some provision of subsidies to settlers in view of their under-privileged position and difficulties in obtaining credit. The general case against subsidization of specific expenditures such as housing is strong, including notably the distortion of expenditure patterns as compared with income payments and the danger that the subsidies are in practice derived from taxation of the poor. However, the benefits that may be derived in stimulating self-help to enable the poor to improve their living conditions may be held to offset such disadvantages. It may indeed be argued that use of subsidies in such projects can be equivalent to shadow-pricing the cost of labor. A more restricted argument against subsidization of settlers is that it makes the problem of selection even more difficult than it need be.

It is important, however, to recognize that the issue of subsidies is likely to be very limited in extent. If the project is to be replicable on a large scale, which should be a condition for Bank financing as noted above, the extent of subsidies that can be afforded will in any case be small. If the condition of replicability is met, the subsidies are small, and organizational difficulties created are not serious, there appears little basis for opposing an element of subsidy as part of a general social policy. However, it may still be desirable to restrict the subsidy to the poorer elements of the project population and to provide for a tailing off of the subsidy. The greatest benefit in terms of stimulation of self-help construction will be in the early years of the project when outlays for construction are high. In later years, and as real incomes grow, the rationale for the subsidy is likely to be removed.

The social basis for limitation of charging to the covering of costs allocated to settlers does not apply to other income groups which may be provided with facilities within the project. There appears no reason why commercial and industrial sites included in the project -- or dwelling sites for higher income groups which may be included for example for purposes of social balance -- should not be charged at market value. In this way, any surplus between costs and market value created by the process of urbanization can be secured for the public authorities. This process may also be considered as a form of cross-subsidization allowing the public authorities to charge less for facilities provided to the poor income groups than would otherwise have been the case.

Another form of differential charging analogous to cross-subsidization can occur in developing a sites and services project in parallel with a project for higher income groups. The higher income group development may then be charged with the costs of the infrastructure which would have been incurred if developed by itself, the sites and services project being charged only with the increment in such costs necessary to supply both projects together.

Different plots for dwellings, even if of equal size, have differing degrees of attractiveness within a site and services area. Necessarily, some provide more convenient access to transport, community services etc. than others. Where such differentiation is marked, there is a strong case for special selection procedures resulting in higher charges to those obtaining more favorable sites.

Procurement and Disbursement

As noted in O.P.M. No. 2.40, "Procurement", the Bank normally requires its borrowers to obtain goods and services (other than consultant services) through international competition in accordance with the Bank's "Guidelines on Procurement". However, because of the fragmented and diverse nature of the works in "sites and services" projects, it is not always practicable to require international competitive bidding. Contracts should be sized and grouped in such a way as to attract the widest possible bidding from both large and small firms. Foreign contractors are unlikely to be interested in bidding except on the larger "packages", and, in appropriate circumstances, the Bank is prepared to consider "local competitive bidding" (i.e. advertising only in local media), with the award going to the lowest evaluated bidder. One objective of sites and services projects is to improve employment opportunities, and the Bank may agree with the borrower that civil works should be executed under labor-intensive methods, either under contract or by force account.

Disbursement from the loan/credit account for civil works and equipment is made in accordance with O. P. M. No. 3.30, "Disbursement." Since the foreign exchange component of civil works contracts is generally small, the Bank may agree to increase its participation and finance a portion of local currency expenditures. Disbursements are then made against total expenditures at a previously agreed percentage (higher than the foreign exchange component) of the contract value. Whether the civil works contracts are based on unit prices or lump sums, disbursements are made only against acceptable evidence that the work has been performed satisfactorily. Disbursements for civil works and equipment can be either to reimburse the borrower, in which case evidence of full payment to the contractor/supplier is required, or to make part payment directly to the contractor.

Part of the proceeds of a loan/credit is in some instances passed on by the borrower to local government agencies, development banks, building societies, etc. for lending to plot holders for the purchase of construction materials or other components of dwelling construction or improvements. These intermediaries basically operate in two ways. They may purchase house building materials in bulk to be resold on cash or credit terms to householders. In this case the bulk purchase invoices or bills of lading would be the required evidence for Bank disbursement, either to reimburse the borrower/intermediary or to make payment directly to suppliers. In the alternate case where the intermediaries simply lend to householders who then purchase materials and/or labor in the open market, a tabulation of payments by the intermediary institution would constitute evidence for Bank disbursement, similar to the procedure used for agricultural credits. Disbursements against any portion of the loan/credit designated for credits to small industry should be made in accordance with procedures similar to those used by DFC for projects comprised of numerous relatively small sub-projects.

PROJECT ORGANIZATION

General Considerations

It is not possible in this note to deal at all fully with the highly complex problems of organization involved in site and services projects. The complexities arise largely from the number of different disciplines required to contribute to ensure success in achieving the objectives, from the wide choice of design features, from the difficulties of assessing in advance the detailed practical problems of implementation and from the large number of beneficiaries involved. The large variety of inputs implies difficult coordination of many agencies. Because of the complexities and uncertainties, moreover, participation of the settlers is essential for good initial design and subsequent adaptation as well as to ensure individual commitment. The large number of beneficiaries however poses a need for intermediary groupings. As a consequence, organizational aspects are usually more difficult and critical than other technical aspects. Put another way, project design, including scope and management features, needs to be closely geared to local administrative feasibility.

In this context, two major issues should be considered; first, the general extent of regulation imposed by the authorities on the construction of settlers' dwellings, and second, the role of project management, or other agencies, and of community groups within this general extent of regulation. The two issues are closely interrelated. The more "directionist" the general policy, the greater the administrative problem area of the project management and associated organizations; the more competent and flexible the local groups, the less the need for central direction.

One school holds strongly that intervention by public authorities beyond the minimum construction of infrastructure and community services should be kept as small as possible. If left to themselves, the settlers will produce their dwellings more quickly and expeditiously than if constrained by organizations imposed by the authorities and create a community structure which will be efficient for both social purposes and physical upgrading of the area. They will organize themselves for the purposes and to the extent they deem necessary, including provision of materials, and will find solutions both lower cost and more imaginative than those of the authorities. Given land, title and services, the settlers will look after themselves as they are demonstrably doing even under the much less favorable conditions of the illicit squatter areas. The well-intentioned intervention of experts from another milieu -- whether domestic or foreign -- is, in this view, counterproductive. The imposition of official views, mutual self-help group structures etc., cannot fit individual family requirements. And overhead administrative costs will be high involving, inevitably, many different layers of organization.

The opposing school draws attention to the technological innovation possible under administered group action and the resulting scope for economies in materials use, in bulk purchasing, in efficient and attractive land utilization, in utility connections, etc. Organized group action can reduce the burden, in part psychological, of such tasks as digging foundations which, at individual family level, are lengthy and may result in flagging enthusiasm. More basically, the group spirit may not develop quickly or even spontaneously and stimulation, particularly through help in organization, can have great community benefits including the development of subsequent detailed programs for upgrading of the area. Uncontrolled dwelling development, particularly where densities are high, risks, in this view, to degenerate into inefficient and unattractive new slums with limited social cohesion.

To say that the right solution lies somewhere between these two schools is not very helpful. The resolution of the issues in fact hinges on local conditions of physical constraints, of social norms, of administrative competence and of the income levels involved (which partly determines the extent to which technological innovation, particularly of permanent building construction, is relevant). Certain organizational features however appear basic, while others are necessary to meet certain types of local conditions, and others again can be provided with the option of settlers not to use them if they do not feel the benefits of the services offered to be worthwhile. An examination of organization proposals and project design against this categorization may be helpful in appraising individual projects.

At the level of central government and municipality, the development of administrative units specifically responsible for site and services projects appears generally a sine qua non of efficient organization. Housing ministries or departments, public housing agencies or public works departments may have many of the necessary skills to initiate and control such projects. But the historic concentration on conventional housing solutions generally constitutes a dangerous bias which is not easily remedied.

Where the site and services unit in charge of the program is best located will obviously depend on the local political and administrative structure. There are some obvious advantages of situating it within, though as a separate unit of an existing housing agency. But if the individual projects are to be conceived as part of a major national program for remedying living conditions of the poorer elements of the urban population, it is essential that the unit be given the political/administrative strength to be able to reach solutions to the problems which inevitably arise with cooperating agencies, e.g. in the timely provision of necessary utilities or transport.

In the initial stages of such a program, particularly for the first major project, high level political support is most important since both prejudices and vested interests are likely to be involved in such aspects as ensuring adequate project size, location, provision of staff, or obtaining of agreements with cooperating agencies. Governmental, and more specifically ministerial, attitudes must, indeed, be a key factor in evaluating the prospects of success of site and services projects. What is being attempted in sites and services projects is to reduce the constraints impeding the poor in providing a solution to their needs. To be successful, it is necessary both to comprehend and to tackle the combination of institutions, rules and particular interests that operate against a solution.

At the level of individual project management, it is useful to distinguish between the period of pre-construction, basic infrastructure construction, and subsequent development of the serviced sites though the three will overlap particularly where project construction is phased over a number of years. Several aspects of the pre-construction or pre-settling organization are dealt with in subsequent paragraphs. It need only be noted here that these aspects, including settler selection and legal title are not only of great importance to the success of site and services projects but also have considerable lead-times. Discussion with interested groups of the target population during the intermediate stages of project preparation can not only help to improve the design but also provide a link to group participation in later stages of project development if devised as a method of mutual involvement rather than simply as orientation courses. The physical construction in terms of land levelling, installation of infrastructure, core units, etc., while requiring careful planning, phasing and supervision, does not call for particular comment. It is with the organization of the project in terms of development from this base or as a continuum from the participation in project preparation that the major problems arise.

The organizational requirements for the success of the project as a whole should be distinguished from those for the project management agency per se as several aspects of the overall requirements may best be handled by other agencies. The requirements for success in terms of dwelling construction and community development evidently go far beyond what is needed simply to ensure that the proposed physical works executed by the authorities are satisfactorily constructed. The issue is where to limit the management's responsibility.

There is, indeed, an evident danger of project management being overwhelmed as a result of attempting to handle all aspects itself in the interests of a "fully integrated approach." It is accordingly desirable to draw up a list of the functions to be performed in the launching of a successful program, to determine who will handle each of them (with a bias towards relieving the burden on the management agency itself) but also to provide for possibilities of intervention by the management agency in the case of failure to perform adequately by any of the agencies involved. So far as Bank projects are concerned, complementary programs by other agencies including bilateral sources may cover such aspects as technical assistance in dwelling construction or community groups such as cooperatives. Sociological inputs into project design are not only of great importance but also lend themselves to such technical assistance. It is nevertheless necessary to ensure that these complementary programs appear adequate for their purpose and that a sufficient monitoring system is introduced to signal difficulties to the project as a whole before they get out of hand. In view of the inherently heavy institutional input required to deliver benefits to large numbers of poor people and the number of agencies likely to be involved, it is necessary in this respect to pay close attention to the streamlining of procedures and the sensitivity of the agencies to the problems of working with the poor.

A major organizational requirement of project management is that of flexibility, or adaptability of the project design in the light of experiences during implementation. For this, there are two reasons of particular strength. In the first place, even with good preliminary study and preparation of the project, it is difficult acc_ tely to gauge the reactions of settlers in practice. Secondly, the administrative competence, or feasibility of project management to undertake certain tasks, should grow in the course of time. Thus, it may be desirable to begin with a relatively simple organizational structure for building regulation, group development or technical assistance and to proceed to a more ambitious organization only in the light of experience of successful innovation.

To incorporate this flexibility into the project design requires provision for more intensive monitoring than is usually required in a project where the main problems may be to ensure that original specifications are met. Both physical and institutional progress, and the reactions of settlers need to be evaluated on a more or less continuous basis, at least in the early stages of the project. For these functions to be adequately carried out requires advance preparation before the arrival of the settlers including collection of basic data on the background conditions of the settlers.

Selection of Settlers

The very fact of the rapidly growing needs for dwellings which it is the purpose of site and services projects to meet makes it inevitable that selection of settlers from among possible applicants should cause serious problems. If the program is large enough in relation to the intended population group, the problem of too few sites for too many applicants should eventually be overcome; but this is likely to take many years. In any case, even where a project large in relation to existing population is introduced, problems of selection will arise in deciding allocation of the initial sites becoming available.

There is accordingly a problem of finding ways of reducing or restraining the number of applications to manageable proportions. One response to this problem often advocated is simply to raise the price which settlers are asked to pay until the demand is choked back to the supply available at any time. By effectively auctioning the sites, it is held that not only will the problems of selection be resolved but that it should also be possible to create a surplus -- between costs and market value -- which would be made available for further increasing the supply of sites or otherwise helping the housing situation while at the same time eliminating the need for any subsidies.1/

1/ As sites and services programs are extended on a large scale and the backlog of demand is reduced, costs and market values should increasingly tend to coincide.

Clearly social policy as well as economic opportunism is legitimately involved in deciding how far to follow this line. Rationing by the power of the purse is unlikely to be generally acceptable for such socially oriented programs as health, housing or education. In practice, aiding the poorer elements in the provision of dwellings and employment opportunities may be indefinitely deferred by an attempt to do this through "trickle down" from vacated dwellings of richer groups. Moreover, the logic of this approach would involve designing the lots and general layout specifically for the richer groups so as to maximize the surplus. Given the realities of political power, the practical possibilities of extracting this surplus for the benefit of other income groups is generally at least questionable. Nevertheless, as already indicated above, there is reason to consider some cross-subsidization in sites and services projects and also to limit any subsidy element.

There are moreover a number of other factors apart from immediate ability to pay which are likely to deserve consideration in settler selection including:

- security of income;
- evidence of commitment to a self-help dwelling and community development effort;
- individual family needs in terms of income of dependents and existing conditions;
- the social cohesiveness of groups to be located in sections of the project so as to facilitate community organization, self-help groups etc.;
- relationship to existing squatter settlements or slums;
- some mixing of income and community groups to improve overall community cohesiveness;
- location in relation to customary work (for example, the avoidance of choice of a distant site for a docker's family) or to new employment facilities.

What constitutes the appropriate income range for selection of settlers is, as has been stressed earlier, of the essence of the project design rather than a separate exercise. The project, as has been emphasized, should be designed for an income group rather than income group limitations decided in relation to project design. The relationship between income and what can be afforded for payments to the project agency deserves, however, further discussion. It is evident that it is a family income, rather than income of an individual earner that is involved.

Perhaps the best test of what can be afforded for purposes of establishing an income range is what is in fact being afforded at present.

Investigation into family budgets in existing squatter settlements will generally provide a reasonable indication of the proportion of incomes devoted to housing and public services. In making comparisons with charges to be imposed on settlers, an allowance has of course to be included for settlers' outgoings on self-help housing construction and any additional expenses that may be incurred, for example for transport. While there are several rules of thumb as to the proportion of income that can reasonably be expected to be available for housing and allied expenses, these should be treated with caution until tested against local norms. Size of family, availability of garden crops, etc., can significantly alter such norms even between comparable family income groups in different parts of the same country.

Security of income, often evidenced by employers' certification, is often sought as a further step both towards ensuring viability of the project and in screening down the number of applicants. Obviously such screening can be subject to abuses and, unless carefully handled, can produce a bias against the self-employed or those with intermittent but overall adequate income, e.g. from dock or construction work. At an early stage in the program, however, some bias towards regularity of income may be justified as a "trade-off" for a more favorable basis for the periodic payments necessary to ensure the project's success in terms of repeatability, particularly if the group structure (see below) is weak. The obtaining of evidence of commitment to a self-help housing and community development effort, usually through interview techniques, though of legitimate concern is also subject to abuses if there is no appeal. The making of an initial downpayment, customarily in the 10%-20% of range of total allocated costs, can also provide evidence both of ability to finance and commitment. As a further screening device, applicants already in possession of another abode in the town may be excluded. Such additional provisions, however, may run contrary to other considerations, particularly the fostering of community groups, besides being very difficult to enforce in practice.

As between applicants satisfying income and commitment qualifications, priority may be accorded on the basis of relative family needs. Size of family is usually a major consideration here. This may be further related to absence of any reasonably permanent accommodation, or loss of accommodation as for example due to inevitable destruction of some dwellings in concurrent squatter area improvement schemes.

The social cohesiveness of groups of settlers located together in the sites and services project areas is clearly of great importance in facilitating group effort and reducing the burden on project management. Preference may accordingly be given to selecting groups from within existing overcrowded or unimprovable squatter settlements or slums, particularly where the local social organization permits the transfer of an embryo organization to the site and services area. Selection of groups from within existing squatter settlement and choice of their spokesmen or leaders may be made with the help of the leaders in the existing areas, emphasis perhaps being laid on young families living with parents in particularly crowded conditions. When a site and service project area is located next to an existing squatter area, a system of "spillover" with priorities determined within the existing squatter settlement may be particularly appropriate. Religious and tribal organizations may provide similar opportunities.

Such considerations do not of course prevent consideration also of a mixing of social groups within a large neighborhood to improve overall community cohesiveness. Evidently both the desirability and practicability of such mixing and the size of grouping units needs to be strongly influenced by local socio-political conditions.

Other factors may be introduced in the selection process such as distance from the settlers' existing work places. The relative importance of such factors as a rational basis for selection, however, like many of the others above, is highly dependent on local circumstances.

Whatever system of relative weights is given, some inequities are bound to result as in any rationing system. Whether on the basis of individual or small group selection, a "first come, first served" element of selection is likely to prevail even though this may be modified by a lottery selection from among qualified candidates. Such pressures make the more important advance preparation and good timing for the introduction of the selection system. If the processing of applicants can be reasonably related to the rate at which sites become available, many of the worst issues and pressures of the selection process can be diminished.

<u>Land Acquisition and Site Regulation</u>

Problems of initial land acquisition by the authorities are too wide a subject to be treated here except to stress the need to ensure that whatever process is used to secure the necessary land, including allocation of existing public land, should be related to the possibilities for an expanded long-term program. The creation of a revolving fund for municipal land purchase may, in this context, have considerable relevance as a part of project design.

The general <u>terms of land tenure</u> raise several issues of great importance since security of tenure is not only one of the most intense of "felt needs" of settlers but also a very important stimulus to their investment of time and money in constructing dwellings on the land they occupy. Freehold is generally held to give the greatest security of tenure even though it is often subject to preemptive governmental action. It appears important not to overstress this advantage. Leaseholds may be considered equally secure if long-term, say over thirty years, while providing the municipality with somewhat greater flexibility for subsequent development of urban pattern in keeping with the growth of the town. In some African countries, an occupancy permit or other apparently limited assignation may provide sufficient sense of proprietorship under existing norms.

Problems of tenure in upgrading schemes for existing squatter settlements raise in some ways more fundamental issues. In many cases such settlements have been built by illicit invasion of private or public lands. The grant of legal title of the squatters is clearly a basic consideration in obtaining community support and providing a stimulus to self-help improvement of these neighborhoods. On the other hand, to grant such title is to acquiesce in an illegal action which, quite apart from questions of equity for the landowners concerned, may encourage further invasion of private or government land -- in areas, moreover, which probably do not correspond to the desired urban pattern. Even the provision of public services such as water and electricity to squatter settlements may be considered as a *de facto* recognition of settlers' acquisition by illegal action which may have repercussions in making future control of the pattern of urban growth more difficult.

It has to be recognized that this issue of condoning or approving illegal seizure of urban land cannot simply be dismissed as recognition of a *fait accompli* against rich landowners who can well afford the sacrifice. Too many other issues of equity and administrative feasibility are involved. In practice, many subsidiary "rights" are involved as the original settlers sell or lease their holdings to others in the poor income groups. In other cases, original landowners, or the intermediaries to whom they may have sold their "rights", may still have sufficient control on occupied land -- or political influence -- to reap much of the benefit of any neighborhood improvements that may be introduced through actual or threatened eviction. More generally, in such amorphous conditions, it is administratively difficult to establish which individuals are the "occupants" to whom title should be given and what is the extent of their occupancy.

It is at this point that the relation of improvement schemes for existing squatter settlement to the overall program for site and services becomes of paramount importance. If the site and services program is sufficiently large to lessen the prospect of further illicit invasion of land, then the arguments against approving titles for occupants of existing settlements are much reduced. Moreover, the more that pressures and scarcity values are reduced by large scale site and services programs the more feasible it is to provide for some generalized security for tenure by constraints on eviction with provision for appeals -- rather than to attempt immediate registration of precise rights and titles for all the individuals involved.

The qualifying construction undertakings by settlers in site and services projects will naturally vary according to the balance between administrative regulation and freedom in dwelling construction that is decided on. Two issues, however, are of general occurrence -- the time requirements imposed on settlers for the construction of their dwellings, including restrictions placed on temporary dwellings, and the policy towards renting of accommodation.

A framework is necessarily required relating tenure to building a dwelling or at least its first stages, for this is one of the main objectives of the project. If the project is well conceived and the settlers well chosen, it is in their own interest to press ahead with construction as quickly as possible and they should have the necessary resources. In such conditions, there is danger in stipulating tight construction periods which can cause resentment when unforeseen or temporary difficulties delay construction.

One method commonly used to facilitate rapid construction is that of allowing a temporary shack on the site for a limited period during which it is estimated that the occupant should be able to complete a more permanent dwelling. The issue arises as to how long these shacks should be tolerated. While the eventual removal of such structures can be justified, there is again a danger of too strict regulation. In favor of the limited period, say two or three years, is the desire both to stimulate permanent construction and to avoid excessive population densities resulting from the temporary shack being maintained for a second family after the permanent dwelling has been constructed. On the other hand, construction of the permanent structure is likely to extend over several years to complete and there may be very valid reasons, such as unemployment or illness, for deferment.

A solution of such issues may be found in deferring the acquisition of the full title to the plot until certain minimum conditions of construction of an approved basic dwelling unit and removal of temporary structures have been carried out. What constitutes a "basic dwelling unit" should be interpreted generously since the regulations must be consistent with the need for occupants to expand their dwellings over a considerable time period in line with the growth in size of their families and of their resources. As in other cases of enforcing compliance among settlers, group pressure is, moreover, generally preferable to that by the authorities.

Regulation of renting of accommodation by settlers raises two problems, that of controlling densities and that of avoiding exploitation. In general (as noted in para. 10 above) renting of part of the dwelling built in a site can help both to relieve pressures in existing squatter settlements and to provide the capital required for extending the dwellings beyond the first core rooms. In most cities of the developing world, there is a high demand for rented accommodation from single person, from families recently arrived and from transient workers. Provided reasonably high stipulated densities per plot are not exceeded, renting may therefore considerably widen the beneficial impact of the project. To avoid extortionate rents being charged is obviously difficult if an underlying shortage exists though some provision for control or appeal may curb the worst excesses particularly if an effective local group social structure has emerged.

Extended sub-letting of the dwelling or sale of the rights to the site and the dwelling raises a different set of issues. Without going into the many variations which have been devised in practice to prevent abuses, it would seem that two features should generally be incorporated. In any large community changes of residence and mobility of the labor force are likely to be desirable not only for individual families but also for the community in terms of economizing transport for example. The poorer the income groups covered, moreover, the more frequent are likely to be pressures for resale. If attempts are made to forbid resale, the probability is that clandestine arrangements will be made.

These considerations suggest that adequate compensation should be paid to settlers giving up their sites not only in terms of repayment of amounts already amortized by the settler but also for the value of dwellings constructed on the site. On the other hand, to prevent project benefits being siphoned off by absentee landlords requires control on acquisition of the vacated site. It is accordingly generally stipulated that vacated sites should be offered in the first place to the project agency for reallocation, the new tenant assuming the periodic payment obligations outstanding as well as meeting the compensation payments for structures. Providing, however, that the new settler is of a class generally eligible for a plot allocation, there appears little reason not to allow direct resale subject to the new tenant accepting the outstanding repayment obligations. Again, a system of initial allocation but deferment of full tenure rights till a satisfactory level of dwelling is constructed may facilitate control in this case of resale.

Participation of Local Groups in Project Management

It is almost impossible to talk meaningfully of the development or organization of community groups to participate in the decision-making process without reference to the particular conditions of individual projects. Very much depends on the existing social structure in the communities involved and here the differences are great not only between countries but between cities within a country and indeed often between religious or ethnic groupings within a single city. In cities such as Jakarta, the social structure may be highly organized whereas different "barrios" in a single Latin American city may display marked variations in community cohesiveness. Yet the active involvement of the local communities, the selection of leaders or spokesmen, and the provision for participation in decision-making are as essential as the support at ministerial level for the success of site and services programs.

If there is no simple formula for determining how best to approach the organization of the settler population into groupings which will provide adequate communication with project management, it appears at least evident that a first step is to examine what structure already exists. Insofar as existing structures can be used, with adaptation, for the purpose, the prospects are less risky than untried alternatives. However, issues are likely to arise where existing structures are based on political, tribal or religious affiliations such that incorporation into the formal system of project organization may be taken to favor a particular group. The answer here may be to deal with a variety of group structures to avoid exclusive reliance on any one or, where this is practical, the establishment of an inter-group committee to advise the project management.

The importance of local group participation in the initial stages of site and services projects, particularly in project design and settler selection has been referred to above. Participation in the administration of the ongoing project both as regards development and maintenance is no less important and a few of the many aspects are discussed below. Two general points, however, deserve emphasis. It is essential that the role of local groups in management of the ongoing project be thought through in advance of settler arrival. If the administration assumes full responsibility for various functions initially, it is likely to find it difficult to divest these at a later date. The second point is closely related. Hasty attempts to impose a local group structure or to provide too much "assistance" in their running are likely to result in diminished leadership and efficacy. Hence the importance of adapting existing local organizations if reasonably possible.

Of particular concern is likely to be the role of local groups in collection of rents and other charges from settlers, including eviction procedures. Difficulties of collection of site and other charges have in practice proved a major reason for failure of site and services programs. Any public scheme for provision of dwellings — and notably so-called low-cost housing projects — is liable to be faced with greater problems of collection than in the case of private developments. Not to pay the government is often considered "fair game" and underlying biases in this direction may be increased by political campaigns. Where facilities are provided on a communal basis, as for example water supply through public fountains, it is difficult moreover to apply pressure on defaulters through cutting off of supply. Fairly high allowances have accordingly to be made for debt default in the estimated financial flows in site and services projects.

It is here that success in involving the settlers in the initiation and administration of the project can have perhaps its clearest reflection. Where particularly high levels of collections have been secured, they have generally been associated with strong local group involvement both in decision-making and collection. Convenience of payment by settlers can be combined with community pressure on defaulters and, indeed, also with group help for families which have suffered particular temporary misfortunes. Merit allocations of funds for local community development where groups exceed a standard ratio of collections can help deal with problems of corruption and provide a stimulus to the group system. Similarly, decisions on evictions and their implementation can often be handled more expeditiously through a local group structure than through direct intervention of the authorities which may incur hostilities of a more general nature.

As previously noted in discussing the regulation of construction on the site and services plots, the extent to which standardization is desirable will vary greatly according to local conditions. The issue of desirable level of group organization for construction is similarly related to the type of construction permitted, encouraged, or enforced. The more standardized the construction, the easier it is to organize groups and define equivalent contributions of work. More generally, it is necessary to find a balance between the advantages of group construction activities, particularly evident where foundation work or [illegible] loads are involved, and the difficulties of maintaining a cooperative effort.

The difficulties of maintaining a cooperative construction effort are many. Not only do work periods and free time of settlers vary but leadership may be lost and enthusiasm wane with time. To ensure a minimum of fairness of effort, it may be necessary to construct several dwellings to the same stage before allocating the lots among the participants as otherwise those whose dwellings are first constructed may fail to make their full contribution to their neighbors. It will also be necessary to make provision for substitution of local-paid labor for a settler-labor input where for any reason this cannot be provided. In these circumstances formal cooperative building efforts may be kept to a minimum with the stress laid rather on providing facilities for group action when this corresponds to a felt need and to pilot dwelling construction which may demonstrate thepossibilities and advantages of such group efforts.

A somewhat easier area for other group activities in development and maintenance of site and services schemes is likely to be found in such voluntary activities as staffing of community centers and in activities permitting more flexible timing such as maintenance of local footpaths and open spaces. Cooperative socities can make a substantial contribution not only in the collection of small savings but also in the organization of the supply of construction materials -- credit, allocation and collection of repayments.

METHODOLOGICAL ASPECTS

The discussion of the previous sections is generally indicative of the methodology to be followed in site and services project preparation and appraisal. A checklist of points which need to be covered in evaluating such projects is provided in Annex I. This section is concerned with various points of methodology in the formal evaluation of project benefits and costs not covered in the preceding discussion.

Evaluation Methods

Several different bases can be envisaged for evaluating site and services projects, corresponding to different facets of these multipurpose programs. All, however, face problems of appropriate valuation of certain inputs such as land and labor and of outputs outside the monetary system and hence subject to valuation only by imputation. These problems of valuation can lead to very difficult theoretical issues on which divergence of viewpoints cannot readily be resolved. To overcome such difficulties, it is generally convenient to take admittedly conservative valuations as a basis for evaluations. If the resultant general evaluation is acceptable, greater refinement would provide even more favorable results but is unnecessary.

One approach which partly avoids these issues is a program-budgeting or minimum-cost approach which defines a series of minimum objectives in terms of physical standards and measures the costs of achieving these objectives as compared with alternative programs for achieving the same objectives. The precise value of the outputs may not need to be known. If the project can be shown to be self-financing (in the sense of settlers' payments covering allocable costs without subsidy) and replicable (in the sense that the cost of publicly financed facilities is within budgetary constraints for an adequate sized program), the minimum cost approach may be considered sufficient. In practice, however, difficulties of defining physical objectives -- or making allowances for minor variations from them -- are considerable since differing approaches inevitably result in differing qualities of output. A minimum cost analysis can accordingly only be rough. It should also be noted that an analysis of the extent to which allocable costs will be covered by settlers' payments, is in any case necessary as also a comparison with alternative possible programs to meet the main objectives.

An alternative approach is a cost/benefit analysis comparing costs with benefit values for various components of the project. Current charges for comparable accommodation can, for example, be used as a basis for valuing the benefits of the self-help dwellings constructed, the costs of the dwellings including, besides financial outgoings on materials and paid labor, an imputed value for the unpaid labor input based upon local wage rates. Similarly the costs of supplying water can be compared with benefit values calculated on the basis of typical charges paid for a comparable water supply in existing squatter settlements. A separate analysis can be made for industrial or commercial elements of the project. The streams of benefit and costs will, of course, also cover maintenance costs and need to be discounted in the normal way.

This alternative approach not only raises questions of comparability of the values used for imputation of costs and benefits, some of which are discussed in more detail below. It also raises problems of evaluating the expenditures on community services such as schools and health dispensaries included in the project and corresponding benefits.1/ For these expenditures, usually a small part of total project costs (including dwelling construction), a rough minimum cost approach can be considered as warranted,2/ or even a common sense evaluation of the effectiveness of the project in meeting accepted social needs at a reasonable cost.

The project however will have among its purposes and benefits many other types of benefit than the provision of dwellings, public utilities and community services. The provision of employment is usually one of the main objectives. This can itself be treated in several ways. So far as the employment creation is represented by costs of construction in the project total, including self-help labor, it will generally be appropriate to allow for this benefit by shadow pricing of the labor cost element. There may however be other elements of employment creation, particularly where

---

1/ This is so if rental values for imputation of benefit purposes are taken from areas which usually have significantly less of such facilities. Expenditures may include allowances for self-help labor on community schemes.

2/ In some cases comparison of benefits from the dwellings constructed with total expenditures, including community services, will yield a satisfactory rate of return obviating the need for an extensive evaluation of these costs.

industrial and commercial elements are included in the project. Here the best approach is probably through production/gains or via separate evaluation of these elements of the project with allowance for shadow pricing.1/

Looked at from another viewpoint, the capital for the infrastructure of the site and services project which constitutes a large part of the "project" as financed by the Bank can be regarded as a kind of seed capital which promotes savings, output and investment which would not otherwise have occurred. This aspect which largely overlaps with others considered above can be considered in terms of the gearing effect between these capital inputs and the total value of the capital created. Much the same approach is to evaluate the self-help element separately and compare it with the total of other expenditures. While explicitly recognizing the element of double-counting involved, this aspect of project benefits may nevertheless deserve inclusion in the evaluation because of its significance for the development of economic policies.

Other Aspects

Economies in transport costs to and from places of employment due to locational advantages of the site and services areas may provide the basis for the calculation of additional benefits for insertion in the cost-benefit analysis. In certain cases these can be of sufficient significance to warrant inclusion though generally this will not be the case. For instance, high land costs of central sites may not have been reflected on the benefit side by a premium allowance in the imputation of the value of the dwellings created to take into account the transport advantages of the site. In a few cases, there may be diseconomies of transport costs as an offset to the other benefits of the project.

A more difficult benefit to evaluate, though one which can be of considerable importance, derives from the effect of the additions to the stock of dwellings on the level of rents or other accommodation charges in existing squatter settlements. If, as is likely to be the case, the increase in dwellings due to the project is sufficient to restrain the rise in rents existing settlements, there is a consumer surplus created for the tenants of these settlements. This of course may be offset by a decline in capital values to the owners, but nevertheless be very relevant to the purposes of the project in securing an improvement in the distribution of income. Unfortunately, the extent of this benefit is very hard to gauge since the impact should be measured not against the present rent levels but against the levels that would have prevailed without the project. Due to continuing in-migration, actual rents may be little lower than before but still appreciably less than they would have been without the project.

1/ The analysis could be further extended to consider secondary employment creation, e.g. in the building materials industries. Adequate information for such an analysis generally does not exist.

One of the most important of the benefits, the achievement of a better physical pattern of urban expansion is similarly almost impossible to measure. Added to the difficulty of forecasting what would have been the pattern without the project is the difficulty of adequately measuring the benefits from the improved pattern. Other benefits such as improved employment opportunities outside the project area as a result of better location, improvement of health, more attractive physical environment, the increased general motivation and reduction of crime may not be fully reflected in the calculation of benefits on the basis of imputed rent. Unfortunately, they face insuperable difficulties of measurement. Insofar as such benefits are expected to be substantial, they nevertheless deserve mention as supplementary benefits additional to the conservatively measured cost/benefit ratios.

The treatment of land values deserves special consideration. Three aspects are relevant. The first is the financial cost in terms of cash outlays. This is required for cash flow analysis and does not call for particular comment. The second is the financial valuation which includes in addition to the cash outlays the market value of land already in possession of the authorities. This is required in evaluating the contribution of the authorities to the project, the assets of the project during and at the end of its span, and the fiscal replicability of the project on a wider scale. It is also relevant as a basis for comparison of unimproved land use costs of two alternative sites roughly similar in terms of their repercussions on the urban structure. 1/ The third aspect is the economic value or opportunity cost relevant to the economic analysis of costs and benefits.

The market value of urban land depends on the size of the town and level of economic activity, the location of the site relative to the urban pattern, the physical site characteristics, the provision of public services, the regulations on type of land use and type of building permitted and the degree of monopoly prevailing. These factors are amenable to policy changes and thus values are strongly related to current policies. A favorable change in zoning and building regulations can increase the market value of a central site ten times or more, and a prohibition reduce it correspondingly. Monopolistic conditions further complicate the picture. Consolidation of a number of parcels of land may, in this context, result in increased values being placed on sites which are held back from sale. It is nevertheless

1/ For this limited purpose of locational choice, it is not necessary to obtain a closer approximation to economic costs of land use (including evaluation of difference in position with and without the project) since the adjustment needed to the market prices will be roughly the same for the alternative sites. Where, however, the "externalities" of the two sites are markedly different and use of the market price basis gives closely similar results for the alternative sites, then an evaluation of opportunity costs of the two sites may be required (see below).

generally possible to make a rough evaluation of the market value based on effectively permitted uses under existing regulations. To the extent that the land is owned by the government, comparison with similar plots in private hands, or evidence of what the government might obtain for the land if sold or leased on the market with uses restricted to existing zoning regulations, can indicate the market value. 1/

It is however the economic valuation of the land use for purposes of cost/benefit analysis that occasions the greatest difficulty. The concept of opportunity cost of urban land is at best hazy even if narrowly defined in terms of the benefits foregone by alternative users as measured by the price they would be prepared to pay for its use. The question of what uses should be permitted introduces the wider field of evaluating the urban planning process and the assumptions regarding provision of services appropriate to any given use. It is, in practice, often difficult to determine the range of appropriate alternative uses. Moreover, the use of large tracts of land for sites and services projects is likely to be associated with changes in zoning regulations which have a wide impact on land values. In this dilemma existing regulations generally have to be taken as given and the interest on prices which have to be paid for the land (rent if it is leased) -- or are imputed from values of similar land -- as representing the opportunity cost of land use.

The repercussions on the urban pattern can then be treated as benefits (or as deductions from the opportunity cost), providing they are positive, or as additional costs if they are negative. To evaluate these repercussions, or "externalities," is however extremely difficult in concept and even more in practice. Basically, what is required is to know the advantages and costs associated with the urban structure over the lifetime of the project had the project not been undertaken so as to be able to compare these with the situation with the project. What could, or would, occur without the project is usually impossible to determine with any accuracy, such are the uncertainties involved; and many of the benefits or negative repercussions are of a social nature that cannot be quantified on a comparable basis. A larger area of squatter settlements and greater overcrowding in existing settlements without the project than with the project can generally be assumed; but the location and size of the additional squatter settlement or the value of land so occupied cannot be readily established. Nor can the repercussions of the project on other

---

1/ In some cases, all land or all urban land may be nationalized, or a municipal "land-bank" may have been created with land for public purposes acquired in advance of needs. It is often argued that in such cases, the financial value of the land is of at best doubtful relevance. However, in terms of the net fiscal position of the authorities, revenues foregone by not selling or leasing the sites for other purposes can be considered the equivalent of costs incurred in other cases when the authorities have to purchase land for the project.

land uses whether in the immediate neighborhood of the project or elsewhere be readily given a value.

Fortunately, it is generally not necessary to attempt a detailed evaluation of the externalities of the project. Provided the steps indicated in the section on location are followed (paras 36-41), it can at least be assumed that the conformity with the planning process ensures that the net externalities are both important and positive. The annual land charges based on the opportunity cost of the land as represented by the market price without adjustment for externalities thus overstate the net economic costs of using the site. Provided, therefore, that the project is viable on this basis of costing, as should usually be the case, this will be sufficient. Where, however, it appears that such a valuation is a quite inadequate measure of the net economic cost, it is necessary at least to indicate the direction and importance of the underestimation. The effect of using a lower or higher economic cost of the site can then be explored in the sensitivity analysis.

For purposes of economic evaluation, the appropriate life of the assets may need to be considerably different from the basis used for drawing up repayment schedules. The land itself and permanent improvements such as levelling can be taken as having a continuing life and the cost stream will therefore be composed simply of interest on the land value without any amortization — or rent in the case of leaseholds. Structures, including dwellings, roads and social service facilities are also likely to have an average life substantially beyond the repayment period.

From the foregoing, it is apparent that no singly method of evaluation should be considered as "the" appropriate method in view of the variety of relevant elements which no single approach yet encompasses. It is conceptually difficult and practically impossible to combine all elements of benefits and costs into a single index. It will accordingly generally be desirable to discuss the evaluation in terms of a variety of approaches which will supplement each other to give a more rounded view of the project as a whole while making clear where these approaches overlap so as to avoid double counting. In this context, sensitivity tests can be used not only to demonstrate the effect on cost/benefit ratios of introducing more or less favorable assumptions but also to introduce illustrative values for certain of the benefits that cannot be readily measured.1/

1/ This note does not consider problems associated with correct choice of interest rate in evaluation procedures. While this has particular relevance to such long-life projects, the issues raised deserve wider consideration than appropriate in the context of site and services projects.

Evaluation of Upgrading Programs

For projects or parts of projects principally concerned with the upgrading of existing settlements, most of the problems of evaluation of site and services areas also apply. Here, the increase in rental value as a result of the project provides probably the most readily applicable technique for assessing major benefits. What has happened to rental values as a result of similar programs in the past, if such information can be obtained even in rough form, will generally provide an adequate guide to such benefit calculations.

ANNEX

ANNEX

BRIEF CHECKLIST FOR SITE & SERVICES PROJECTS

BACKGROUND & FRAMEWORK

National and local urbanization trends; A brief statement on urbanization policies, programs and priorities.

The Housing Sector - a brief description; Housing needs, supply and patterns of effective demand; housing policies, programs, and institutions.

Summary of knowledge of existing low-income settlements - squatter areas, Site and Services squatter area upgrading schemes; and other non-conventional approaches to housing.

Specific situation in project cities with regard to urban development and living conditions.

PROJECT FORMULATION

Intended Project Scope, Scale and Beneficiaries:

(a) Determination of prospective project beneficiaries particularly in terms of income groups with capacity and willingness to pay for housing services of the type proposed in Site and Services.

(b) Present numbers and likely growth in relation to proposed scale of project.

(c) Scope of project in terms of desirable main components.

Location of the Project:

(a) Identification of possible sites on basis of land availability

(b) Evaluation of alternative locations in terms of:-
- Proximity to sources of employment

- Compatibility with desirable patterns of urban development
- Relative off-site (trunk) infrastructure requirements
- Land, ownership and tenure patterns
- Natural features
- Cost of land

(c) Selection of preferred locations for the project

Planning and Physical Design

(a) Site Layout:
- Land use Plan: proportions of private and public land uses.
- Circulation Plan defining vehicular and pedestrian circulation.
- Subdivision Plan and Plot layout on basis of over-all economy of infrastructure networks, simplicity and flecibility.
- Determination of appropriate plot size, shape and configuration on basis of functional requirements, local tradition and preferences and minimization of infrastructure frontage.
- Intensity of Development: Gross and Net densities of plots and population

(b) Planning and Design of infrastructure:
- Determination of eventual levels of services and standards and choice of initial levels consistent with economic capacity; on-site requirements; off-site trunk requirements:
- Water
- Sewerage
- Roads and footways
- Surface drainage
- Street lighting and electricity
- Gas, telephone, other

(c) Planning and Design of Social infrastructure - analysis of requirements for community facilities: existing/available facilities in the area that can be utilized by the project, and new facilities that must be provided; staffing and maintenance requirements; design standards and costs:
- Education: schools, playgrounds, vocational training
- Health: clinics and maternity wards
- Community centers, social halls
- Recreation, parks and open spaces
- Markets, commercial and small industries
- Religions
- Refuse collection
- Police, fire and postal services
- Public transportation
- Other

(d) Planning for Employment Generation - modern and traditional sectors

Project Costs

(a) Detailed estimates of total project costs (first costs):
- Land aquisition, compensation
- Site preparation including topo/survey works, earthworks, clearing and levelling, staking out of plot boundaries, road centering, etc.
- Off-site public utilities including project specific trunk infrastructure and plants.
- On-site public utilities including water supply, sewerage, surface drainage, roads and footways, public lighting and electricity, telephone
- Community facilities including project specific schools, health clinics, community centers, markets, shops, small industries, fire, police, postal, garbage disposal.
- Plot development including all costs associated with development of individual plots in the form of construction costs and/or materials loan
- Supervision
- Engineering
- Administration
- Technical assistance
- Project preparation prior to formal implementation
- Allowances for inflation, price escalation
- Allowances for physical contingencies and uncertainties
- Other

(b) Estimates of recurrent costs for operation and maintenance of project

Financing Plan

(a) Cost recovery - determination of formula for recovering of costs:
- Definition of allocable cost categories
- Apportionment of total costs recoverable from users detailed breakdown by components -
- Apportionment of total costs recoverable from other

(b) Formulation of financing terms for users:
- Estimate of total housing expenditure to be borne by users.
- Terms for repayment of capital costs - down payment and amortization of balance
- Terms for repayment of loans - monthly amortization
- Monthly standing charges covering recurrent costs
- Other costs if any, e.g. property tax, ground rent, etc.

(c) Formulation of financing plan for the project indicating:
- Proportion, form and nature of Bank loan and/or credit
- Proportion, form and nature of financing by National Government
- Proportion, form and nature of financing by local authority
- Other sources of finance
- Interest rates and terms for borrowed funds

Administrative and Organizational Aspects:

(a) Analysis and proposals for major administrative requirements of the project:
- Advertising of the project to inform prospective users without interference of interested intermediaries
- Processing of applications, selection and notification of users
- Allocation of plots
- Collection of fees, dues, rents, loan repayments, etc.
- Management of materials loan fund and distribution of loans
- Delivery of technical assistance to users
- Supervision of private construction
- Management and operation of publicly owned community facilities
- Management and operation of community-owned facilities
- Management and operation of municipal services
- Monitoring of development of individual plots
- Overall administration of project

(b) Staffing Requirements:
- Assessment of staffing requirements
- Availability of local personnel
- Expatriate staff requirements
- Training of local staff

(c) Executing Agency: determination and establishment of authority. agency or department of government to be responsible for construction, operation and maintenance of the project:
- Functional requirements
- Financial requirements
- Constitutional and organizational structure
- Personnel

Legal Aspects:

(a) Classification of rights, liabilities and legal relationships of the users and the project administration with respect to all components of the projects
(b) Provisions and conditions for transfer of rights
(c) Provisions for minimization of abuses, redress of grievances and administration of sanctions
(d) Definition of possible and preferred land tenure arrangements on the Selected Sites both throughout the life of the project and at the completion of the contractual arrangements

ANNEX

PROJECT EVALUATION

Economic Analysis

(a) Direct rates of return (using shadow pricing and sensitivity analysis)

- Of dwellings constructed
- Of other quantifiable components

(b) Income redistribution effects

(c) Employment generation

(d) Comparison of with and without the project situations in terms of development of the physical urban framework, social development (planning and implementing instructions, etc.)

Affordability Analysis

(a) Government potential for developing a large-scale program

(b) Ability of low-income groups to meet the corresponding changes.

WORLD BANK OFFICES

Headquarters: 1818 H Street, N.W., Washington, D.C. 20433, U.S.A.
New York Offices: c/o United Nations, Room 2245, Secretariat Buildings, New York, N.Y. 10017, U.S.A.
120 Broadway (15th Floor), New York, N.Y. 10005, U.S.A.
European Office: World Bank, 66, avenue d'Iéna, 75116 Paris, France
London Office: World Bank, New Zealand House (15th Floor), Haymarket, London, SW1 Y4TE, England
Tokyo Office: World Bank, Kokusai Building, 1-1 Marunouchi 3-chome, Chiyoda-ku, Tokyo 100, Japan
Eastern Africa: World Bank Regional Mission, Extelcoms House, Haile Selassie Avenue, Nairobi, Kenya; mailing address--P.O.Box 30577
Western Africa: World Bank Regional Mission, Immeuble Shell, 64, avenue Lamblin, Abidjan, Ivory Coast; mailing address--B.P.1850
Afghanistan: World Bank Resident Mission, P.O.Box 211, Kabul, Afghanistan
Bangladesh: World Bank Resident Mission, Bangladesh Bank Building (4th Floor), Motijheel Commercial Area, G.P.O. Box 97, Dacca, Bangladesh
Cameroon: World Bank Resident Mission, Immeuble Concorde, angle avenue El Hadj Ahmadou Ahidjo et avenue J.F.Kennedy, Yaoundé, Cameroon; mailing address--B.P.1128
Colombia: Resident Mission Banco Mundial, Edificio Aseguradora del Valle, Carrera 10 No. 24-55, Piso 17, Bogota D.E., Colombia
Ethiopia: World Bank Resident Mission, I.B.T.E. New Telecommunications Building (First Floor), Churchill Road, Addis Ababa, Ethiopia; mailing address--IBRD Mission, P.O. Box 5515
Ghana: World Bank Resident Mission, c/o Royal Guardian Exchange Assurance Building, Head Office, High Street (5th floor), Accra, Ghana; mailing address--P.O.Box M27
India: World Bank Resident Mission, 53 Lodi Estate, New Delhi 3, India; mailing address--P.O. Box 416
Indonesia: World Bank Resident Staff, Jalan Wahid Hasyim 100, Jakarta, Indonesia; mailing address--P.O. Box 324/JKT
Nepal: World Bank (IBRD) Resident Mission, R.N.A.C. Building (First Floor), Kathmandu, Nepal; mailing address--P.O. Box 798
Nigeria: World Bank Resident Mission, 30 Macarthy Street, Lagos, Nigeria; mailing address--P.O. Box 127
Pakistan: World Bank Resident Mission, P.O. Box 1025, Islamabad, Pakistan
Saudi Arabia: World Bank Resident Mission, Electric Company Street, Riyadh, Saudi Arabia; mailing address--P.O. Box 5900
Sudan: World Bank Resident Mission, 28 Block 2H, Baladia Street, Khartoum, Sudan; mailing address--P.O.Box 2211
Tanzania: World Bank Resident Mission, N.I.C. Building (7th Floor,B), Dar es Salaam, Tanzania; mailing address--P.O. Box 2054
Thailand: World Bank Regional Mission, Udom Vidhya Building, 956 Rama IV Road, Sala Daengh, Bangkok 5, Thailand
Upper Volta: World Bank Resident Mission, avenue Monseigneur Thevenoud, Ouagadougou, Upper Volta; mailing address--B.P.622
Venezuela: World Bank Resident Mission, Centro Andres Bello, Avenida Andres Bello, 113-E, Mariperez, Caracas, Venezuela
Zaire: World Bank Resident Mission, Building UZB, avenue des Aviateurs, Kinshasa 1, Republic of Zaire; mailing address--P.O. Box 14816
Zambia: World Bank Resident Mission, Kulima Tower (13th Floor), Katunjila Road, Lusaka, Zambia; mailing address--P.O. Box 4410

World Bank
Headquarters:
1818 H Street, N.W.
Washington, D.C. 20433, U.S.A.
Telephone: (202) 477-1234
Cable address: INTBAFRAD
WASHINGTONDC

The following material is excerpted from a 1974 report by Praful C. Patel of the World Bank Transportation and Urban Projects Department:

<u>Site and Services Projects Survey</u>
<u>Analysis of Urbanization Standards</u>
<u>and On-Site Infrastructure</u>

This study was undertaken to provide background information and guidance for Bank staff involved in urban projects. In addition to the portions reproduced in the following pages, the full report contains brief descriptions of the projects analyzed, as well as data on infrastructure standards and costs per plot.

A. INTRODUCTION

1. Purpose and Scope. The purpose of this paper is a study of the physical aspects of Site and Services based on a survey and some analysis of such projects. It is intended, therefore, to present the information and develop guidelines in a readily available and usable format. The range of questions arising from Sites and Services is very wide and the paper does not attempt to be fully comprehensive, rather emphasis has been given to the physical layout and aspects of on-site infrastructure including water supply, sewerage, roads and surface drainage and electricity. The analysis seeks to identify, for each component covered, the principal determinants of cost and efficiency. These variables are then compared with the corresponding parameters in each project studied.

2. Data Sources. The data base used in this analysis derives from a survey of the literature on existing and planned site and services schemes, including Bank proposals. Because of the large number of variables to be considered and the paucity of information, any figures given--especially the monetary values-- are, at best, only in a range and intended therefore to serve as a guide. It is impossible for a general study such as this do justice to the widely varying conditions of geography, practices and needs from country to country.

3. Costs examined and analyzed in this study include the capital costs of urbanization specifically confined to costs of on-site infrastructure presented as a unit cost per plot. These unit costs are derived from the total development costs given in the individual surveys which contain the detailed cost breakdowns. No attempt has been made to refine these costs through a breakdown of values added into labor, materials or foreign and local currency inputs.

4. Standards. The figures indicated as normal ranges for the various standards are ranges derived from a variety of documents on commonly used standards and codes, and reports or recommendations by international agencies. They are not meant to be absolute, nor their sources exhaustive. They simply reflect the range of data available on site and services at the time, and provide a basis for assessing the appropriateness of standards proposed in future projects.

5. Survey. Specific data on on-site infrastructure components of site and services is rather scarce, especially in terms of costs. However, a wide selection of literature with a varying quality of data on existing and planned site and services schemes is available and was scanned to determine those with sufficient data required for a survey of on-site infrastructure costs per plot. Revelant data from this initial scanning process is summarized in the 'Scanning Survey of Sites and Services: Summary Chart' (see Annex A). Cases for the Survey of on-site infrastructure costs per plot were selected from this chart.

6. Fifty-two site and services programs in 14 countries were selected for a survey of on-site infrastructure costs per plot, which included all of the proposals with Bank involvement. This survey describes individual infrastructure components by their standards and corresponding costs in a standardized format. (Data from this Survey is summarized in a data matrix and summary charts of individual components in Annex A; the detailed survey sheets are compiled in Annex B).

7. A more detailed survey was conducted of ten of the site and services projects in which the Transportation and Urban Projects Department of the Bank was involved at the time. These included Nicaragua, Senegal, Indonesia, Jamaica, Botswana, Zambia, El Salvador, Tanzania, Kenya and Korea. (Data from this survey is summarized in a data matrix and comparison chart in Annex A; the individual surveys are compiled in Annex C. Abstracts of the full project reports from which the site and services components were extracted for the survey are compiled in Annex D and the relevant maps and layout plans for each of the projects are contained in Annex E).

B. SITE & SERVICES

8. The term 'site and services' has probably never been defined adequately and many different standards and service combinations have in different places come within the definition of the word. In order to define the scope of this survey the following definition was tentatively used:

> Site and Services is the subdivision of urban land and its servicing with varying combinations and levels of public utilities and community facilities for residential and commercial use. Generally, the objective of site and services is to provide an economically accessible physical framework to a specific target low-income population for their shelter and related employment needs. Site and services schemes normally rely heavily on the efforts of community residents, with or without outside assistance, to attain their objectives.

9. The principal physical components comprising site and services are land, public utilities and community facilities:

PHYSICAL COMPONENTS OF SITE AND SERVICES

LAND:	The subdivided site containing residential building plots described by their size, the density of the project in which they are located, and their location in relation to employment and other urban services.
PUBLIC UTILITIES:	Both basic utilities such as water and sanitation and desirable utilities such as electricity, public lighting, sidewalks, paved roads, gas installations, telephones, etc.
COMMUNITY FACILITIES:	Local urban services which act as a link to a larger array of government and private services such as schools, small businesses, markets, shops, police and fire protection, religious and cultural, social welfare centers such as clinics, employment agencies and day care or kindergarten schools.

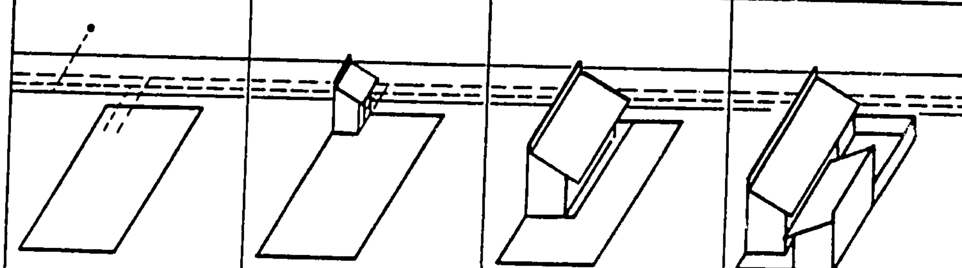
World Bank—8855

3a

A GENERALIZED PHYSICAL TYPOLOGY FOR SITE AND SERVICES PLOTS
Showing hierarchy of alternative levels of services.

TYPE OF PROVISION			1		2		3		4	
WATER SUPPLY	4	Individual Connection multi-tap. Full provision								
	3	Individual Connection - single tap. Skeletal Reticulation								
	2	Communal Standpipe from piped distribution								
	1	Communal Standpipe from local supply source								
	0	Not provided. Responsibility of Plot Owner (Spring, well, rain)								
SEWERAGE	4	Individual w.c. Waterborne sewerage								
	3	Individual Privy. Aqua privy, septic tank etc.								
	2	Communal w.c.s. Waterborne sewerage								
	1	Communal Ablution Units. Septic tank privies								
	0	Not Provided. Responsibility of Plot Owner (Self-dug pit etc.)								
ROADS AND DRAINAGE	3	Main roads bituminised, rest all gravel. Drainage system.								
	2	Main road bituminised, rest gravel and earth								
	1	Main road gravel, rest all earth formed. Open cut drainage								
	0	All earth formed. Open channel drainage								
ELECTRICITY	3	Street Lighting + Distribution Lines and Individual Connections								
	2	Street Lighting + Distribution Lines								
	1	Street Lighting only								
	0	Not provided								
DWELLING	3	COMPLETE PACKAGE Sanitary Core, Living and Cooking Area. [illegible]m²								
	2	SANITARY CORE + Minimum Shell (Composed / partial Room) [illegible]m²								
	1	SANITARY CORE [illegible]m²								
	0	Not Provided. Responsibility of Plot Owner. (Technical Assistance and/or Materials loan may be provided.)								

ALTERNATIVE INITIAL LEVELS OF SERVICES AND POSSIBLE STAGING

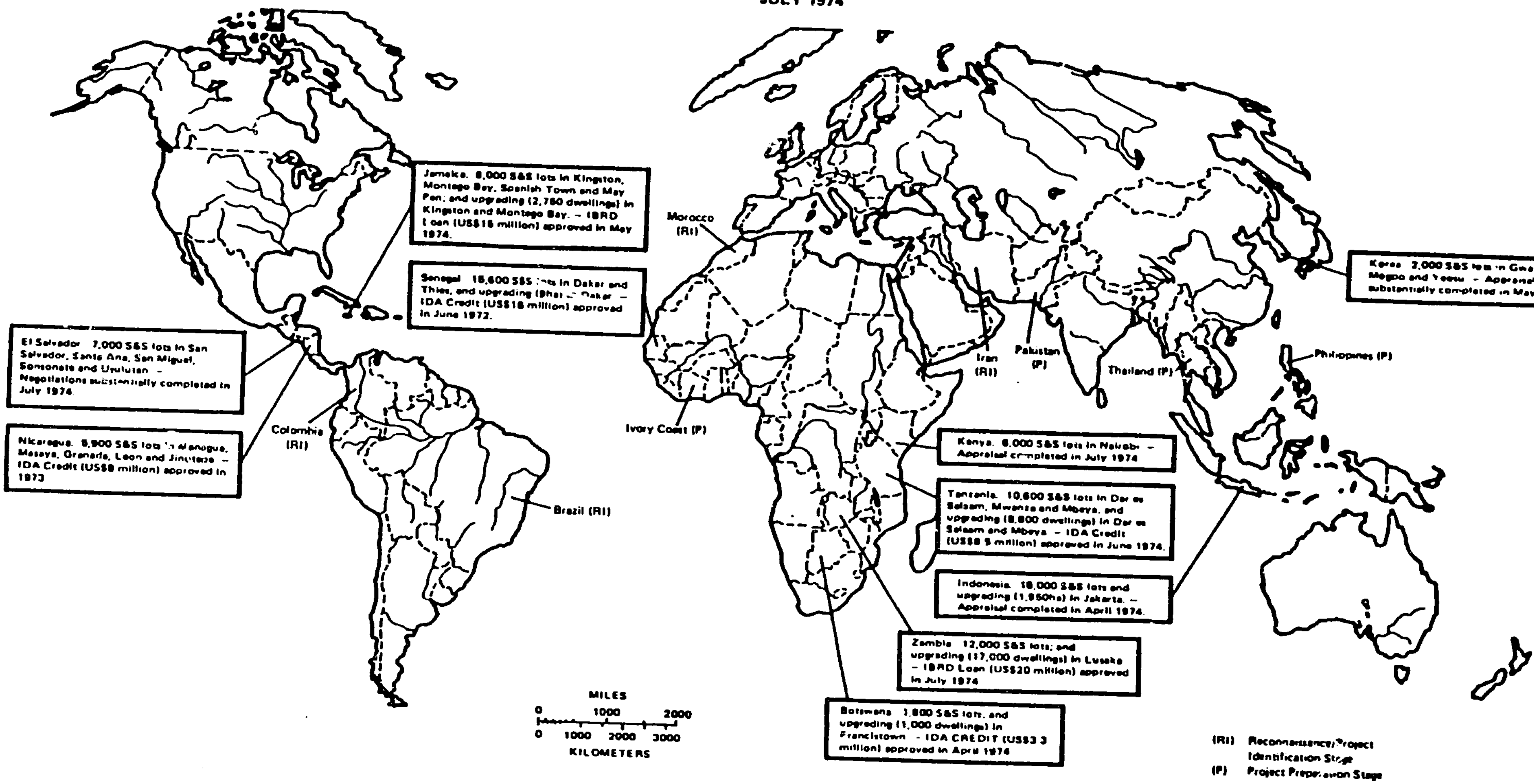


1	2	3	4
SUBDIVISION WITH BASIC SERVICES - Plot with Communal Services or with Communal water and individual pit latrine or with individual water and sewerage connections.	SUBDIVISION WITH BUILT SANITARY CORE - Plot with individual services in a built superstructure.	SUBDIVISION WITH BUILT SANITARY CORE & MINIMAL LIVING AREA - Plot with individual services in a built superstructure and built living area (1 room/roof & floor/core/shell etc.)	SUBDIVISION WITH FULLY DEVELOPED DWELLING - Plot with individual services and a built dwelling

10. <u>Bank Involvement</u>. The Bank's involvement in urban housing is relatively recent and has mainly been in the form of site and services and squatter upgrading (improvement of existing substandard settlements) projects. The map on the opposite page shows the status of Bank projects in this field as of July 1974.

The survey and analysis in the present study are focused on the site and services components of these projects.

BA..K INVOLVEMENT IN SITE & SERVICES AND UF..RADING PROJECTS
JULY 1974



4a

C. PHYSICAL STANDARDS: SITE DESIGN & PLOT LAYOUT

11. Physical layout is of obvious importance in determining cost levels and functional viability of a site and services development. Once designed, the layout becomes the primary determinant of subsequent commitment in terms of major cost factors such as land requirements, infrastructure lengths, administration, maintenance, as well as the overall performance of the development. Deficiencies in the initial layout plan pose an unnecessary handicap from the outset for any development.

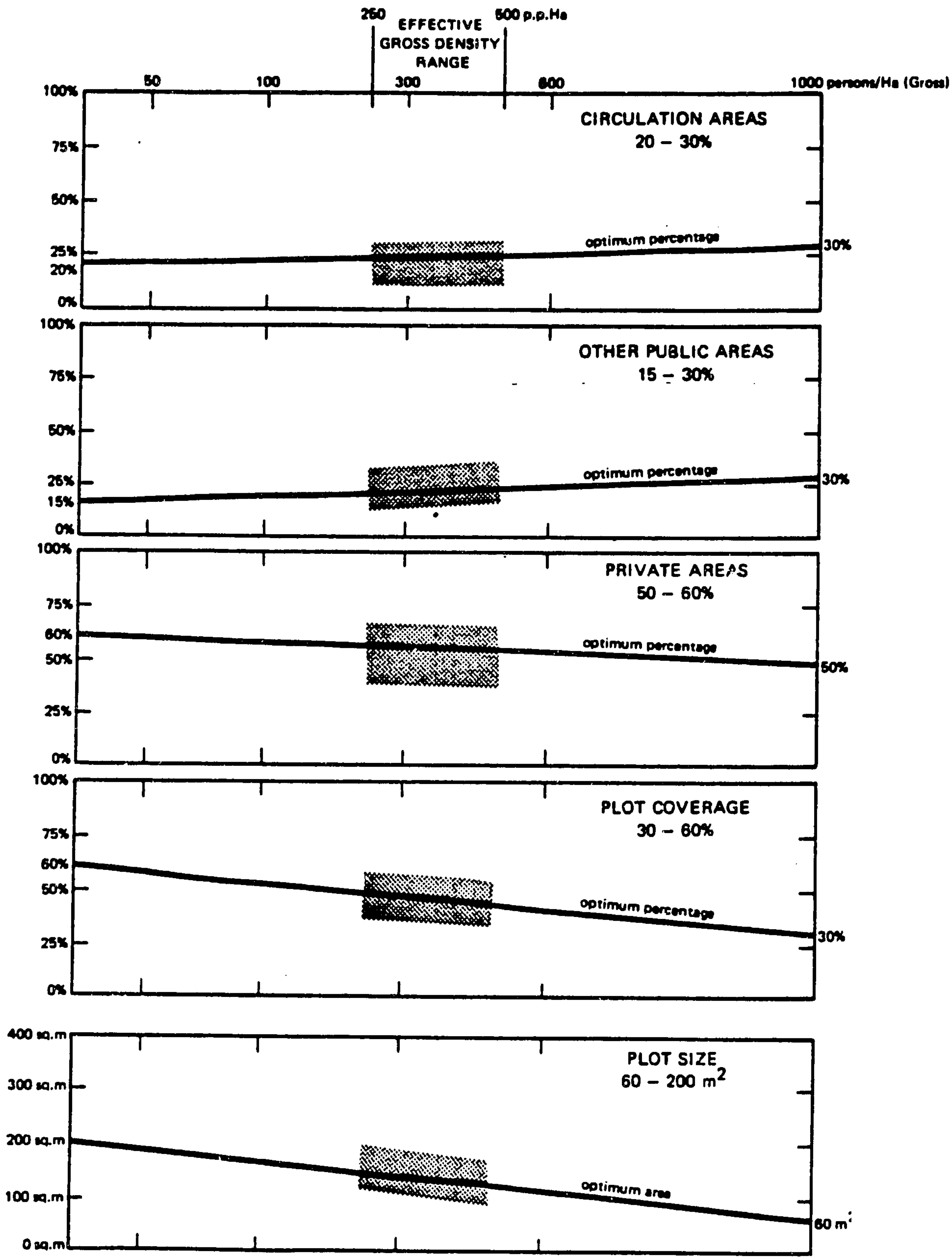
12. In the absence of realistic planning guidelines reflecting local conditions and needs, the physical form of residential areas in developing countries has generally been a function of imported, often grossly overstated norms and standards. These standards are especially unrealistic for site and services planning.

13. Distribution of Land Use Areas. 1/ The layout plan should consider provision of a balanced use of land for dwelling and related supportive functions, explicitly in the context of dynamic growth of the community. "Balanced" proportions of circulation, public and private areas can be determined on the basis of functional standards and target needs. The first three graphs in the Physical Layout Evaluation Chart summarize optimum ranges for land use areas.

14. Circulation areas. These are areas of land devoted to providing pedestrian and vehicular circulation: a road network for access, distribution and collection. Major circulation areas are usually publicly owned and therefore have rather limited private control over or responsibility for the costs of land acquisition, capital development and maintenance. The normal range for circulation areas in a balanced layout is 20% at lower densities to 30% at higher densities (the requirements of circulation areas increase with intensity of use). The CIRCULATION AREAS graph indicates a line of optimum percentage (20-30%) and a shaded box representing the range for optimum efficiency within an effective density range. Layouts above the line indicate excessive circulation meaning greater public responsibility and costs; layouts below the line indicate insufficient circulation.

1/ The discussion of Land Use Areas is adapted from "Residential Land Utilization, Case Study, Nairobi, Kenya" by G. Gattoni and P. Patel, Urban Settlement Design Program, M.I.T., 1973.

PHYSICAL LAYOUT EVALUATION CHART



15. Public areas are defined as areas within the residential layout reserved for the supporting community facilities and services, such as schools, health clinics, markets, etc. These public areas are also characterized by limited individual control and responsibility but are essential to residential development. The usual range of public areas in a balanced layout is 15% at lower densities to 30% at higher densities. (The requirements of public areas increase with intensity of use).

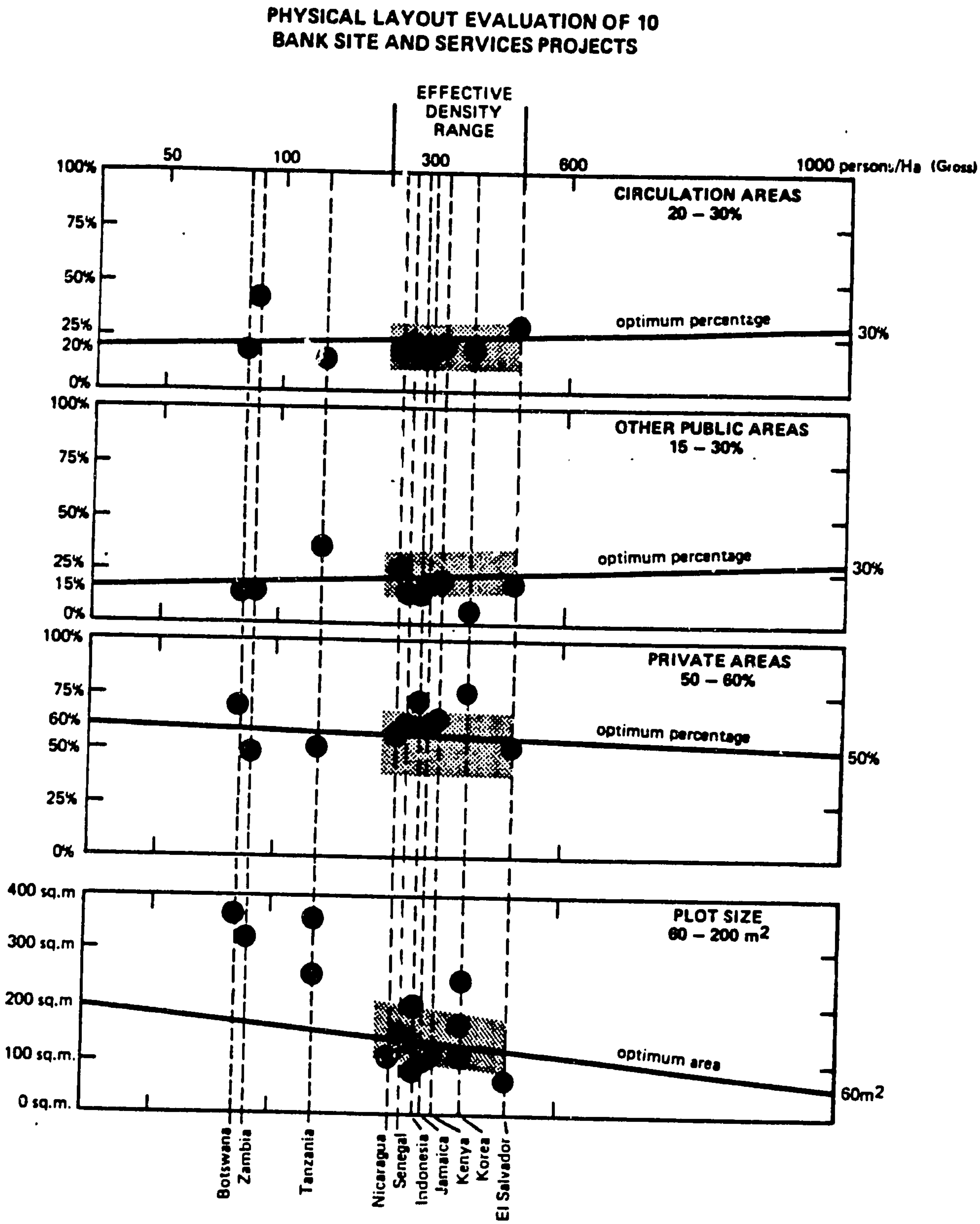
16. The PUBLIC AREAS graph indicates a line of optimum percentage (15-30%) and a shaded box representing the range for optimum efficiency within an effective density range. Layouts above the line indicate excessive public areas leading to greater public responsibility and costs and increased user services. Layouts below the line indicate insufficient public area in terms of minimum requirements.

17. Private areas. Areas defined by tenure and use to be of maximum individual control and responsibility. These areas generally provide the economic demand for the public land areas and therefore minimum cost requirements will usually imply the maximization of the private/public ratio of land use mix. The recommended range of private areas in a balanced layout is 60% at lower densities to 50% at higher densities (the percentage of private land decreases with intensity of use).

18. The PRIVATE AREAS graph indicates a line of optimum percentage (50-60%) and a shaded box representing the range of optimum efficiency within an effective density range. Layouts above the line indicate excessive private areas meaning lower public responsibility and cost (but more taxable land for support of public areas) and lower user costs (but at the expense of public facilities). Layouts below the line indicate insufficient private areas meaning greater public responsibility and costa and lower user control with higher supporting costs (also compromising user space requirements).

19. Plot Layout. The configuration and size of plots adopted in a layout will have a significant impact on the development costs of total scheme. Plot size and configuration, for example, determine the lengths and complexity of the infrastructure networks with resulting influences on unit costs per plot.

6a



PHYSICAL LAYOUT EVALUATION OF 10 BANK SITE AND SERVICES PROJECTS
EFFECTIVE DENSITY RANGE
50
100
300
600
1000 persons/Ha (Gross)
CIRCULATION AREAS 20 – 30%
100%
75%
50%
25%
20%
0%
optimum percentage
30%
OTHER PUBLIC AREAS 15 – 30%
15%
PRIVATE AREAS 50 – 60%
60%
50%
PLOT SIZE 60 – 200 m2
400 sq.m
300 sq.m
200 sq.m
100 sq.m.
0 sq.m.
optimum area
60m2
Botswana
Zambia
Tanzania
Nicaragua
Senegal
Indonesia
Jamaica
Kenya
Korea
El Salvador

20. Plot Size. The appropriate plot size in any scheme will provide adequate space to the user for his needs, while at the same time conserve land and minimize infrastructure network lengths. In the scanning survey of about 80 site and services projects in 27 developing countries, comprising 600,000 completed and 300,000 proposed plots, sizes ranged from 15 m^2 in Bombay to 850 m^2 in Khartoum with the weighted range falling between 60 m^2 - 200 m^2 (see Summary Chart, Annex A).

PLOT SIZES RECORDED IN A SCANNING SURVEY OF 80 PROPOSED AND COMPLETED SITE AND SERVICES PROJECTS IN 27 COUNTRIES

PLOT SIZE SQ.M.	% OF COMPLETED PLOTS	% OF PROPOSED PLOTS	% OF TOTAL	COUNTRIES
< 100	15	41	23	Colombia, El Salvador, Guinea, Jamica, India, Indonesia, Korea, Morocco, Pakistan
101–200	69	21	55	Colombia, Chile, Guinea, Indonesia, Iraq, Kenya, Nicaragua, Pakistan, Senegal, Zambia
201–300	8	14	8	Colombia, Kenya, Senegal, Tanzania
301–400	1	24	9	Botswana, Kenya, Zambia
> 400	7	0	5	Malawi, Sudan
	100	100	100	

World Bank – 8749

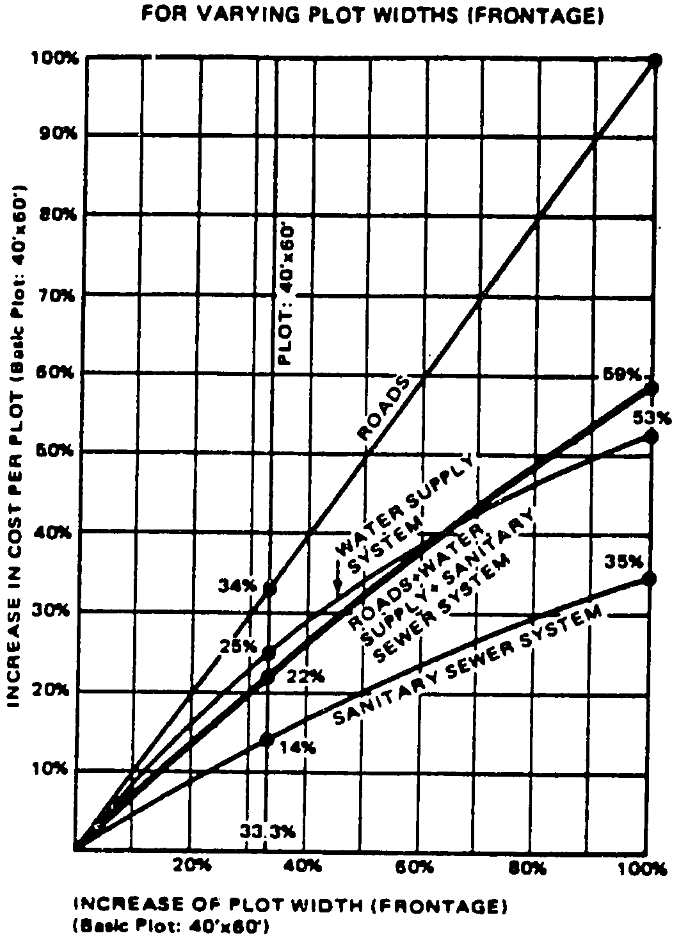
Another study done in 1964 1/ on plot sizes in 10 Latin American countries reports a range from 74 m^2 in Mexico to 254 m^2 in Venezuela with an average of 165 m^2. Thus there seems to be a tendency for the less urbanized countries to favor larger plot sizes - possibly owing to plentiful supply of land and rural preferences.

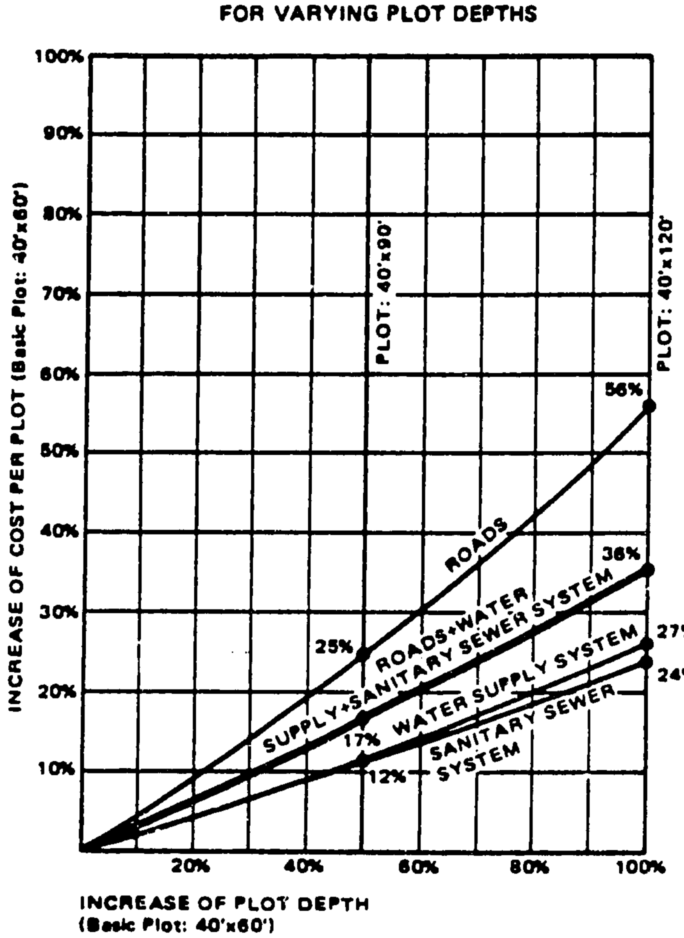
21. The range of plot sizes is from 200 m^2 at lower densities to 60 m^2 at higher densities. The larger size also meets requirements for pit latrines and septic tanks. The PLOT SIZE graph indicates a line of optimum area (60-200 m^2) and a shaded box representing the range for optimum efficiency within an effective density range. Three international agencies recommend minimum plot sizes as noted in the table on the opposite page.

1/ "Housing in Latin America", Research Report by M. Koth, Inter-American Program in Civil Engineering, M.I.T., 1964.

7a

VARIATIONS OF TOTAL LAND DEVELOPMENT COSTS PER PLOT





World Bank—8750

22. Plot Configuration. Plot dimensioning defines the access and utility frontage of each plot and is directly related to the block size, which in turn determines the infrastructure network length per plot. Square plots result in longer block perimeters than rectilinear plots of the same areas and therefore should be avoided. The narrower a plot gets, the more efficient are the utilities serving that lot assuming the narrower utility frontage. By taking the simple example of an estate laid out in its crudest form with all plots fronting the road, it is easy to see that for the same density, smaller frontages would reduce costs and the level of all other services that follow the road alignment. An analysis 1/ made in Zambia on the effect of plot size on infrastructure cost demonstrated that an increase in frontage is more crucial than an increase in total size: (see opposite page)

The recommended range for plot configurations is a ratio of 1:2 to 1:5. USAID recommends a minimum frontage of 7.5 m while UNRWA and OAS have specified 5 m.

RECOMMENDED MINIMUM PLOT WIDTHS (FRONTAGE)

AGENCY	MINIMUM WIDTH	DEPTH	CONFIGURATION
US Agency for International Development	7.5m	14m	1:2
UN Relief and Works Agency	5m	16.7m	1:3
Organization of American States	5m	8m	1:1.5

World Bank-8752

1/ "Land Development Cost Analysis, Lusaka SPAUR", Doxiadis Associates, 1969. The graphs of Variations of Total Land Development Costs per Plot are taken from this report.

RECORDED AND RECOMMENDED PLOT SIZES FOR SITE AND SERVICES PROJECTS

AGENCY/SOURCE	PLOT SIZE SQ.M.	CONFIGURATION WITH MINIMUM FRONTAGE	ASSUMED HOUSEHOLD SIZE	REMARKS
United Nations Relief and Works Agency - UNRWA	105	7.5m x 14m	5	Recommended Minimum Plot Size
US Agency for International Development USAID, 1966	100	6m x 16.7m	5	Recommended Minimum Plot Size
USAID Survey 11 Latin American Countries, 1966	204		5-6	Average Recorded (Range: 104-467 sq.m.)
Organization of American States OAS, 1968	4[illegible]	[illegible] x 8m	[illegible]	Recommended Minimum Plot Size
Scanning Survey 80 Projects 1973	60-200		5-8	Recorded Weighted Range (Range: 15-850 sq.m.)
Survey in 10 Latin American Countries, MIT 1964	165		5-6	Recorded Average (Range: 74-264 sq.m.)

World Bank-8751

CHARACTERISTICS OF THE WATER SUPPLY, SEWERAGE AND STORM DRAINAGE INFRASTRUCTURE

SYSTEM:	WATER SUPPLY	SEWER SYSTEM	STORM DRAINAGE
FUNCTION:	the supply of potable water for health, cleanliness and cooking; required for substaining life	the disposal of domestic waste in a sanitary and unobjectionable manner	prevention of flooding for protection of health and property
LAYOUT:	a closed grid network; not dependent on the terrain	a tree or branching system; dependent on topography; a sloped network	a tree or branching system dependent on topography; a sloped network
PIPE LOAD:	water only	floating suspended solids; 0.1% solids in domestic system; ½ pounds/person/day	floating suspended material 40% more putrescible matter than sewage
PIPE FLOW:	uniform steady pressure flow at the full section of the pipe; velocity of 2 fps minimum, 4 fps average	unsteady nonuniform gravity flow; may be a full section of pipe but usually at partial section; velocity of 2.5 fps to 15 fps	unsteady nonuniform gravity flow at full section at peaks, normally only partial; velocity of 3 fps minimum; 15 fps maximum
PIPE MATERIAL:	cast iron if over 12", spun iron most common; asbestos cement, concrete, cement lined steel (over 10"), plastic for service lines	house service line is cast iron; vitrified clay for small pipe; prefabricated concrete for large pipe; same as water if infiltration danger	same as sewer lines
LOCATION OF PIPE:	in streets or right-of way, 3 meters away and above sewer by 15 cm.	preferred in alleys; or center of street	in streets; opposite water lines
DESIGN CRITERIA:	economical flows dictate; acceptable friction losses with fire flows set sizes	hydraulic demands dictate; minimum velocity determines size and slope	hydraulic demands dictate minimum velocity sets pipe sizes and slope
DESIGN QUANTITIES:	50 to 150 gallons per person per day	70% to 90% of the domestic water consumption	quantity set by degree of tolerance to flooding

Source: R10

23. Density. Population density is a function of plot density and household size and it determines the intensity of use. The costs of providing infrastructure to a residential area are greatest at very high and very low densities. In determining an optimum effective range in a particular context, local factors such as traditional densities and life styles should be used as guidelines in conjunction with the broad ranges suggested here.

24. The "effective density range", employed in the Layout Evaluation Chart, is the gross population density range, derived from several sources and based on the needs and limited resources of developing countries. The recommended effective density range is from 250-500 persons per gross hectare; the higher figure assumes 2-4 storey dwellings in order to maximize land utility, while minimizing public investment costs per unit provided. The Layout Evaluation Chart is used to evaluate the 10 Bank site and services projects surveyed in detail (see Annex C).

25. Evaluation of Efficiency of Subdivision Layouts. A simple and useful method for the evaluation of urban layouts has been developed by Prof. H. Caminos in the Urban Settlement Design Program at M.I.T. 1/ The technique is based on a mathematical relation between infrastructure network lengths and the areas contained (or tangental). In its general form the R value, or index of efficiency between the lineal utilities and the lots, can be expressed as a ratio:

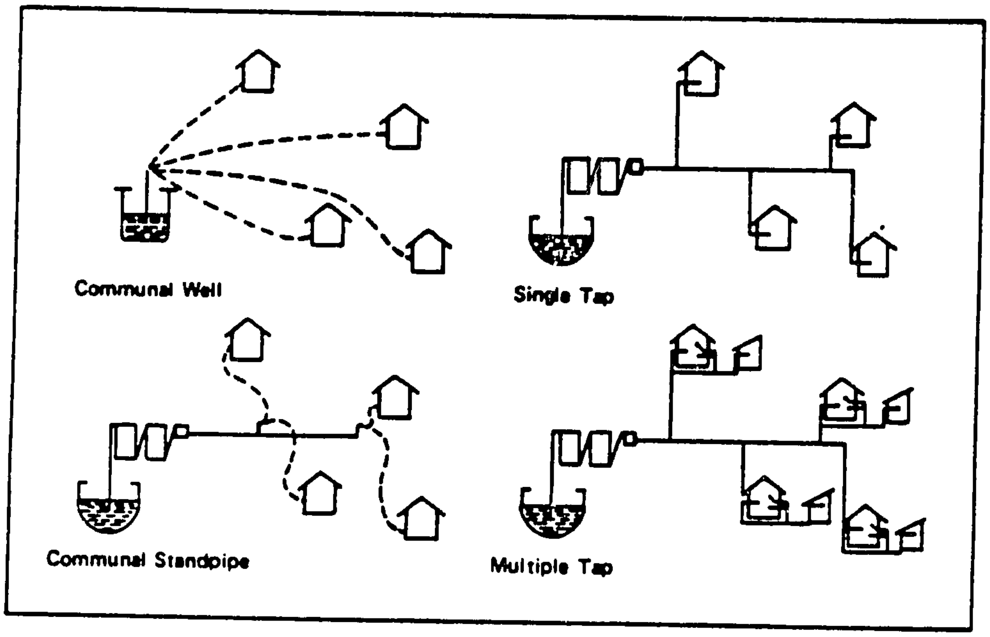
$$R = \frac{\text{Total Linear Service Distance (meters)}}{\text{Total Service Area (sq m)}}$$

26. It can be observed from this ratio that if the total lineal service distance is held constant, and the total service area associated with the lineal services is steadily increased, the result is a lower value of R. Therefore, lowering R values reflect an increase in the efficiency of lineal services to service areas. In short, more area more plots, more people, etc., can be served by a fixed lineal distance of utilities, and lower R values indicate higher plan efficiencies. To simplify the use of this technique, special tables have been prepared which perform the necessary arithmetic and allow for scanning of alternative possibilities.

1/ A detailed explanation of the method and its application can be found in "A Method for the Evaluation of Urban Layouts" by Prof. H. Caminos, Industrial Forum, Vol. 3, No. 2, December

9 a

LEVEL OF SUPPLY



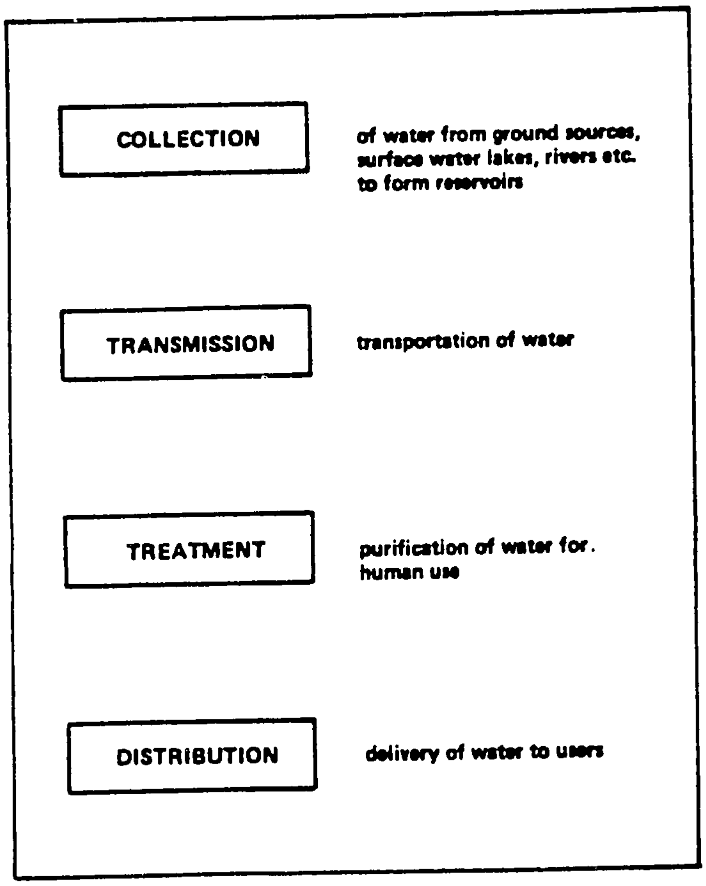
World Bank-8753

D. ON-SITE INFRASTRUCTURE: WATER SUPPLY

27. Water supply holds a strong and important position in infrastructure facilities and should receive high priority. Provision of an adequate supply of safe, potable water for drinking, cooking and sanitary purposes must be ensured within or at an economically minimum distance from all dwellings.

28. The functional components of a comprehensive urban water supply system comprise collection, transmission, treatment and distribution systems. The last of these is of the greatest relevance to on-site infrastructure development.

COMPONENTS OF THE WATER SUPPLY INFRASTRUCTURE



* Illustrative diagrams and some of the charts used in the on-site infrastructure sections are taken from "A PRIMER: URBAN RESIDENTIAL INFRASTRUCTURE NETWORKS", unpublished masters thesis by Reinhard Goethert, Urban Settlement Design Program, M.I.T., 1970. The 'primer' contains an excellent analysis of on-site infrastructure network.

10 a

PER CAPITA RESIDENTIAL WATER USE IN SELECTED AREAS

Country	Place	Estimated Daily Use per Capita in liters	Source	Year
Urban multiple taps or mixed use				
Developing nations	Several hundred	11-930	Dieterich and Henderson 1963, p. 28	
Costa Rica	2 metered cities	284-388	Wielers, Zobel, and Henderson 1959	1956
	7 unmetered cities	215		1959
	34 flat rate cities	444		
Ghana[a]	Accra. High grade housing	675	Tahal 1965	1965
	Medium grade housing	163		
	Low grade housing	34		
	Substandard housing	27		
	Tema. High grade	342		
	Medium grade	285		
	Low grade	108		
Greece		144	Panastasiou 1967	1965
India	Kalyani	113	Lee 1968	1964
	New Delhi	138		
Japan[b]	Osaka	520	Japan 1967	1966
	Yokohama	395		
	Tokyo	348		1966
	Kobe	328		1966
	Kyoto	317		1966
Kenya	Nairobi	90	City council report	1968
South Africa	Cape Town	144-63	Cluver n.d., p. 29	c.1963
	Johannesburg	158	Morris 1967	1965
	Queenstown	225		
	Pretoria	239		
	Durban	243		
Taiwan	Urban: pop. 50,000	245	Fung 1967	
Tanzania	Dar es Salaam (all supplies)	81	Tanganyika Ministry of Communications, Power, and Works 1964	1962
	Dodoma	66		
	Moshi	202		
Turkey	Greater Istanbul	108	Noyan and Senogulian 1967	1965
Uganda	Kampala	72-338	Scaff 1964, p. 180	
	All municipal supplies	202	Uganda Protectorate 1960/61	
U K	Bradford	544	Skeat 1961, p. 56	1958
	Tees Valley	126	ibid.	1958
	Birmingham	99	ibid., p. 69	1958
	Glasgow	212	ibid.	1959
	Liverpool	126	ibid.	1958
	London	162	ibid.	1959
U S	All cities	227	U.S. Senate 1961 7	1960
	Towson, Md. rental	190	Johns Hopkins Report 1:2-16	1959-62
	Residence value, $14,000	194		
	Residence value, $19,000	214		
	Residence value, $37,000	247		
Uruguay	Montevideo	176	Castagnino 1966	1964
	Punta del Este	447		
	All other towns	130-270		
Zambia	Mazabuka	27	G. Marais 1966 personal communication	
	Lusaka. Suburban African	13-50		
Single taps				
Guatemala	Single automatic tap systems	60	Arts 1967	1966
Paraguay	Asuncion pilot area single taps	28-49	Borjesson and Bobede 1964, p. 858	1964
Pakistan	Comilla pilot area single automatic taps	16	East Pakistan Water and Sewer Authority 1966	1966
Urban standpipes				
India	Calcutta standpipe or pump	30	Lee 1968	1964
Turkey	Greater Istanbul	15	Noyan and Senogullan 1967	1965
Uganda	Kampala	14	Scaff 1964, p. 32	
Venezuela		15	Dieterich and Henderson 1963, p. 28	
Rural				
Connected				
Republic of China	Rural area (with water systems)	50	Fung 1967	
West Germany	Rural systems	83	Schickhardt 1967	
Not connected				
Bolivia	Seven villages	10	Teller 1969	1968
Kenya	Zaina	7	Fenwick	
Nigeria	Anchau District	23-27	Nash 1948	1948
Sudan	Kordofan	9-16	FAO Land and Water Survey 1967, p. 2[illegible]	1967
Tanzania	26 villages in 10 districts	5-26	Warner 1969	1969

[a]Estimates of household use for accra were based on metered observations at six standpipes and five households for two months; Tema 282 housing units were studied for two weeks

[b]Includes industrial uses

Source. R17

29. For new development, the choice of supply method is generally between one of three alternatives, each with very different cost structures:

(a) Connection to an existing system;
(b) Development of a new system; and
(c) Reliance on individual systems.

REQUIRED COMPONENTS
WATER SUPPLY

	WATER SUPPLY SOURCE		
	EXISTING WATER SYSTEM	NEW SYSTEM	INDIVIDUAL SYSTEM
COLLECTION	not applicable	best source from rivers, lakes. well fields are more expensive	wells, cisterns
TRANSMISSION	(required if outside distribution area)	transmission lines should be minimized because of cost	not applicable
TREATMENT	not applicable	must meet U.S. public health standards	(sometimes chlorine treatment necessary)
DISTRIBUTION	connection of new system of mains and services to existing grid, might require pressure boost pumps	new distribution grid of mains and services must be laid	pumped flow to dwelling required
SCALE OF DEVELOPMENT	limited by city supply available; min. economical density 10/ha.	limited by water supply and amount invested; min. economical density 10 p/ha.	individual lots; less than 10 p/ha.
ADVANTAGES	lower costs, a proven reliable system	no dependence on city system if the supply is inadequate or faulty	an economical supply
DISADVANTAGES	if city supply is faulty, reliance on bad system	high first cost; duplication of city system	seasonal variation possible, danger of pollution, must tie-in with city

Source: P 10

30. The choice of distribution system has conventionally been between one of the following:

(a) Communal well;
(b) Communal standpipe;
(c) Single-tap connection to piped water supply; and
(d) Mutiple-tap connection to piped water supply.

11a

GENERALIZED ESTIMATES OF DOMESTIC WATER USE FOR DESIGN PURPOSES

Country	Place	Estimate Daily Use per Capita (liters)	Reference
Urban, multiple taps			
Developing countries	Multiple taps	120-240[a]	Dieterich and Henderson 1963, p. 28
	Private connections	250	Wagner and Lanoix 1959, p. 200
Guatemala	Guatemala City	243	Yoppe and Williamson 1967
India	Calcutta	225	Lee and Burton 1966
	Urban places of less than 10,000 without waterborne sewage	56	Langland 1962, p. 102
	Same with waterborne sewage	90-113	
Iran	Urban places	15-225	
	Greater Tehran	250	Dilmaghani 1967
Kenya	Nairobi	159	City Engineer 1968: personal communication
Peru	National water program	190	Escobar 1969
Rhodesia	Urban places: European	90-113	Langland 1962, p. 102
	African	9-15	
South Africa	Urban places, sewered	135[b]	Cluver, n.d., p. 29
	Urban places, not sewered	45	
Tanzania	Urban places: European	180	Tanzania, Ministry of Works: personal communication, 1965
	Asian	90	
	African	45	
Uganda	Urban places, institutions	180-203	Ministry of Public Works 1966
U.S.	Urban	380	Johns Hopkins, Report 11, p. 5
Venezuela	Urban places less than 20,000	200-400	Dieterich and Henderson 1963, p. 30
	Urban places 20,000-50,000	250-500	
	Urban places more than 50,000	300-600	
Single tap			
Developing countries		40-80	Dieterich and Henderson 1963, pp. 23,28
India	Calcutta	90	Lee and Burton 1966
Standpipe			
Developing countries		15	Wagner and Lanoix 1950, p. 209
Developing countries		20-40[c]	Dieterich and Henderson 1963, p. 28
Turkey	Greater Istanbul-public spigots, by year 2,000	1967 40	Noyan and Senogullari
Rural piped connections			
Guatemala	Rural communities	80	Ane 1967
Latin America	Rural places	100-125	M. Hollis: personal communication, 1965
U.K.	England and Wales (rural)	135	Skeat 1961, p. 49
	Scotland (rural)	180	Skeat 1961, p. 49
U.S.	Rural farmsteads with piped dwelling and barn	267	U.S. North Atlantic Regional Water Study 1968
	Indian or Alaskan native communities (with single tap only)	50	U.S. Public Health Survey, Div. of Indian Health 1967, p. 3
USSR	Urban and rural standard	30	
	Houses without bath facilities	125-160	USSR 1963, p. 96
	Houses with bath facilities	160-400	
Venezuela	Villages and towns	100-125	Hollis 1965
Standpipe			
Kenya	Rural places	20-40[d]	Water Development Dept. 1965
Latin America	Rural places	40	Hollis 1965
Tanzania	Rural areas	10	Gilman 1940
Tanzania	Rural areas	45	Holloway 1969

[a]Upper figure includes waste

[b]Includes industrial use

[c]Range is for metered and unmetered

[d]Includes livestock use. Taken from estimates for households, assuming five members each

Source: R17

31. Per Capita Water Consumption Standard. The quantity and quality of water to be supplied per capita is a principal cost determinant of the water supply system. The wide range of possible combinations of per capita water usage is indicated by a physiological minimum of 1 liter to over 200 liters per capita per day for multiple-tap supply systems. The consumption level depends on the standard of living, life styles, local conditions and level of charges. Thus a standard figure is difficult to develop.

The following table indicates a range of generalized estimates and recommended standards of domestic water use from several sources:

RECOMMENDED STANDARDS AND ESTIMATES FOR DAILY WATER USE PER CAPITA

TYPE OF DISTRIBUTION	DAILY USE PER CAPITA (LITERS)	REMARKS	REFERENCE
Communal Standpipe	20	Minimum Standard 100 persons/Standpipe Maximum distance: 200m	UNRWA 1957
	20-40*	Minimum Standard *100 persons/Standpipe Maximum distance: 100m	UNRWA 1957 WHO Dieterich and Henderson, 1963
	15	Generalized Estimate	Wagner and Lanoix, 1959
	100 180	Minimum Standard persons/Standpipe Maximum distance: 300m	CINVA CAS, 1968
Single Tap Connection	40-80*	Generalized Estimate	Dieterich and Henderson, 1963
	120-160*	Recommended Range	CINVA, OAS, 1968
	180	Minimum Standard	WHO; USAID
Multiple Tap Connection	180	Recommended Minimum	WHO
	120-240*	Generalized Estimate	Dieterich & Henderson, 1963

*upper figure includes waste

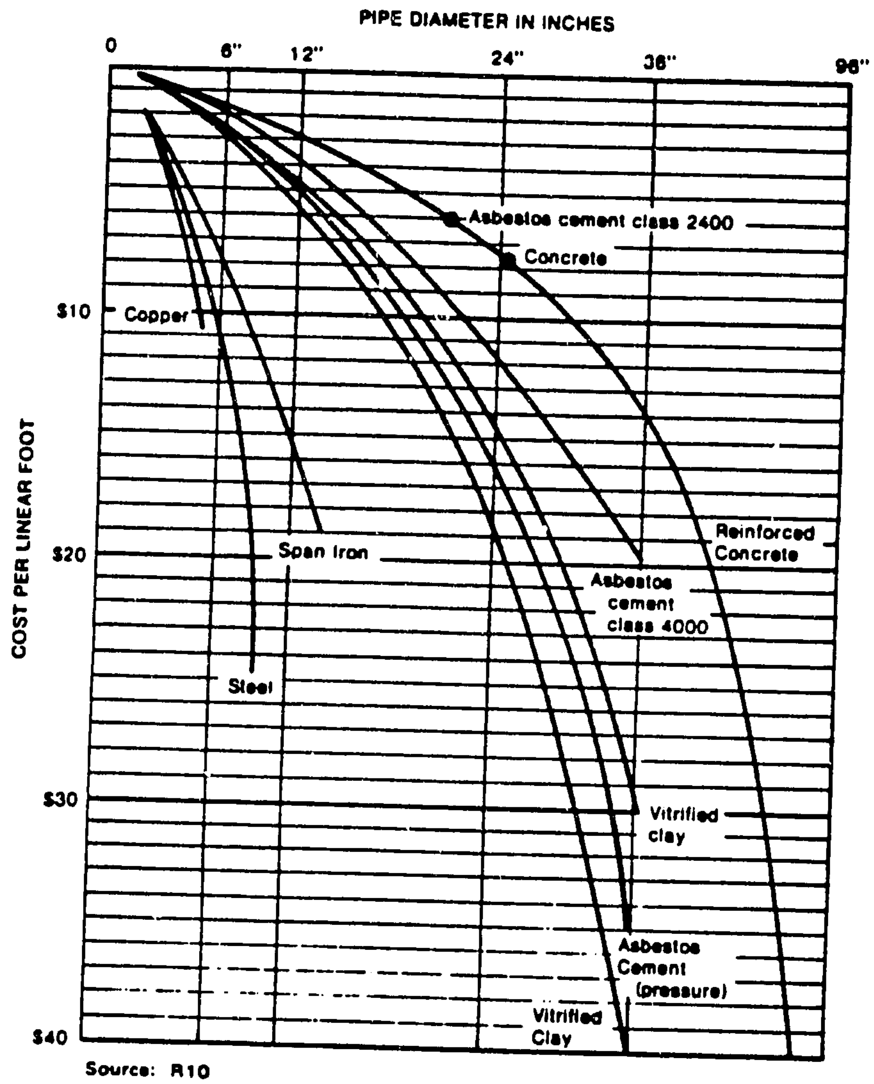
World Bank—8756

Consumption of carried water tends to be higher if the source is within 45 meters of the household, and then appears to remain constant over all the usual urban distances. One investigation in East Africa 1/ reports that low-income families take an average of 30 liters per capital daily if they are provided with a piped water supply but this figure falls to 15 liters if water has to be carried any distance from the house. The recommended minimum standards in the table are well above the figures found in studies of actual consumption. More realistic new per capita standards need to be established.

1/ "Drawers of Water: Domestic Water Use in East Africa", by E.F. White, D.J. Bradley and A.V. White, University of Chicago, 1972.

12a

COST OF PIPE PER LINEAR FOOT FOR DIFFERENT MATERIALS AND DIAMETER



Source: R10

12 b

BREAKDOWN OF CONSTRUCTION COST FOR DIFFERENT ROADS – NAIROBI, KENYA.

DESCRIPTION AND SPECIFICATION	COST PER LINEAR METER OF ROAD - IN US DOLLARS											
	Site Clearance	Excavation & Fill	Murram	Hardcore	Quarry Chips	Asphalt & Bitumen	Kerbs & Channels	Car Parks	Signs & Markings	Surface Water Drainage	Design & Supervision (10%)	TOTAL
COLLECTOR STREET												
I. 1/2" asphalt 2" bitumenmacadam 9" quarry chips 6" quarry waste 6" murram	0.7	14.3	6.7	3.8	11.6	19.6	10.4	4.9	3.6	17.8	9.2	101.6
II 1/2" asphalt 1" bitumen macadam 6" quarry chips 6" murram	0.7	11.0	6.7	-	7.7	12.5	10.4	4.9	3.5	17.8	7.4	81.6
SERVICE STREET												
I Sealed 12" hardcore; 2 coats sealed surface dressing	0.7	2.1	-	9.2	-	5.0	6.4	-	-	-	2.4	25.8
II. Unsealed - murram: 6" murram 6" hardcore	0.7	2.1	5.0	2.8	-	-	-	-	-	-	1.0	11.6
PEDESTRIAN PATH												
Murram Single seal	0.7	2.1	2.0	-	-	4.0	-	-	-	-	0.6	7.0

SOURCE: Extracted from Schedule of Rates, 1972 prepared by the City Engineer's Department, Nairobi City Council.

32. Initial Servicing Level. The initial level of servicing for a planned community is generally determined by users' economic capacity and willingness to pay or by prescribed minimum standards. In light of the inability of low-income families to pay even for minimal amount of water needed for subsistence, high initial levels of servicing--individual connections--would probably be out of the question.

33. One manual on the planning of site and services 1/ recommends the provision for ultimate individual services:

> "Regardless of the initial method of water distribution, the system itself should be laid out in anticipation of its eventual expansion to provide individual service to each plot. This means the easements required for servicing each plot should be established (the same holds true for the sewer system) and the water mains installed at a size sufficient to meet the ultimate needs of the project."

Another report, on infrastructure problems of developing countri... discusses the question of communal vs. individual service thus:

> "Standpipes or public fountains have much lower costs than normal piped water systems. This is due to the lower number of outlet facilities provided and to the fact that per capita demands from standpipe source are usually lower than the demand from house connections. Lower per capita consumption means smaller pipes can be used and less storage capacity is required..."
>
> "In addition, in the presence of capital constrain, the decision will have to be made whether it is more beneficial to supply some people with a lot of water from individual connections or whether to supply everybody with smaller gallonages of safe water from communal points."
>
> "At the present time, suggestions that public fountain or standpipe sources should be extended are not welcomed since:

1/ "Planning for Sites and Services Programs", by A.P. van Huyck, HUD, USAID, 1971.

2/ "Infrastructure Problems of the Cities of Developing Countries", Working Paper of the International Urbanization Survey, Ford Foundation, by Otto H. Koenigsberger, et. al., 1971.

(a) there is a feeling in the industry that water must be piped to the home before full health benefits are received; and

(b) many standpipe sources do not recover their operating costs."

"It has also been pointed out that, in situations of acute capital shortage, communal point systems may be the only ones that are able to ensure a chlorinated safe water supply to all the urban community. This view is taken by Carruthers, Lee and Burton. On the other hand, White and Bradley have maintained that the cost differential between providing water at a standpipe and at the home by a single connection system is minor, whereas the difference in benefits may be great. While such conflicting views exist, it is clearly desirable that more research is done to clarify the issue."

34. Pipe Size and Materials. In addition to the choice of supply level, it is necessary to pay attention to the more technical question of the location, type and size of pipes. Pipe is a major cost element of the water system. At present, the choice in developing countries of pipe materials in the larger sizes (4" and larger) lies between cast-iron and asbestos-cement pipe, with use of cast-iron pipe generally predominating. In the smaller sizes (¾" to 3"), galvanized steel pipe predominates with plastic pipe developing competitively. The use of plastic pipe is increasing because it has better hydraulic characteristics and is easy to handle and lay. A report 1/ prepared for AID emphasized the role of plastic pipe as follows:

"In the most common diameters pipe made of plastic is competitive in cost and performance, and in many circumstances costs less than pipe of other material. Plastic pressure pipe can be readily manufactured in developing countries with a minimum of hard-currency capital investment, skilled labor relative to other forms of pipe, and expenditure for imported materials, relative to production of other pipe."

1/ "Role of Plastic Pipe in Community Water Supplies in Developing Countries", by McJunkin and C. Pineo, USAID, 1969.

CAPITAL COST IN US$ PER CAPITA FOR WATER INSTALLATION AND COMPONENT WORKS IN SELECTED AREAS

Country	Date	Per Capita Cost of Construction (in dollars)
Class 2, group improvement, and Class 3, rural pipeline		
Kenya:		
225 rural health schemes—pumps and pipelines	1960-68	4
Zaina scheme—one pipeline	1967	11
Tanzania:		
Village wells—drilled and dug	1968	1-2
Water development schemes	1967-69	2-28
Public health center—drilled and dug wells	1968	0.50-1[a]
Uganda:		
Spring improvement	1968	1-6
Rural borehole projects	1968	9-14
Ghana:		
Village supplies	1960-68	3-9
Guatemala:		
Rural schemes, chiefly pipelines	1966	10-16
Lesotho:		
32 pipelines, reservoirs, and windmills	1969	.80
Pakistan:		
Rural water schemes	1965	2
Sudan:		
National rural supply	1959-64	2-60
Thailand:		
600 village supplies in northeast	1962	2
Class 4, municipal standpipe		
Uganda, Bugisu	1965	1
Ghana		
Village schemes	1960-68	5-43
Pakistan, East		
Selected villages	1965	7
Sudan:		
Village schemes (25% taps)	1960	15
Class 5, single tap		
Kenya, Karuri	1962	5
Pakistan, East Comilla	1967	10
Paraguay, Asuncion:		
Single taps	1962	5-7
Guatemala:		
3 towns	1966	16

Source: R17

35. Forecasting Water Demand. The simplest and most widely used method is to extrapolate the past growth in per capita consumption and the expected rate of growth of population, but the inadequacies of this "simple requirement technique" are pointed out in an IBRD Paper in these terms: 1/

"It is defective in that it leaves out of consideration various factors that affect the consumption of water besides the number of people to be served. In particular:

(a) it provides no indication of whether or not the demand for water of the existing population has been satisfactorily met, so that there is no way of judging whether the supply of water needs to be changed regarding existing demand;

(b) it does not account for increasing water demand per capita due to rises in per capita income;

(c) it does not account for changes in per capita consumption due to changes in the price of water; and

(d) it does not account for different levels of per capita consumption in different climatic, cultural and religious conditions.

Thus, the 'simple requirements' approach should ideally be complemented with various sorts of economic and non-economic factors in order to furnish an accurate forecast of the demand for water."

1/ "A Quantitative Analysis of Urban Water Demand in Developing Countries", by A. Meroz, Investment Planning Division, IBRD, 1968. The paper presents a methodology for estimating the effect of income, price and weather on the consumption of water and derives functional relationships between these factors and the demand for water which can be used for forecasting.

CAPITAL COST IN US$ PER CAPITA FOR WATER INSTALLATION AND COMPONENT WORKS IN SELECTED AREAS

Country	Date	Per Capita Cost of Construction (in dollars)
Class 2, group improvement, and Class 3, rural pipeline		
Kenya:		
225 rural health schemes—pumps and pipelines	1960-68	4
Zaina scheme—one pipeline	1967	11
Tanzania:		
Village wells—drilled and dug	1968	1-2
Water development schemes	1967-69	2-28
Public health center—drilled and dug wells	1968	0.50-1[a]
Uganda:		
Spring improvement	1968	1-6
Rural borehole projects	1966	9-14
Ghana:		
Village supplies	1960-68	3-9
Guatemala:		
Rural schemes, chiefly pipelines	1966	10-15
Lesotho:		
32 pipelines, reservoirs, and windmills	1969	.80
Pakistan:		
Rural water schemes	1965	2
Sudan:		
National rural supply	1959-64	2-60
Thailand:		
600 village supplies in northeast	1962	2
Class 4, municipal standpipe		
Uganda, Bugirisi	1966	7
Ghana:		
Village schemes	1960-68	5-43
Pakistan, East		
Selected villages	1965	7
Sudan:		
Village schemes (25% taps)	1960	15
Class 5, single tap		
Kenya, Karuri	1962	5
Pakistan, East Comilla	1967	10
Paraguay, Asuncion:		
Single taps	1962	5-7
Guatemala:		
3 towns	1966	15

Source: R17

36. Water Supply Cost Per Plot. The following table compares water supply costs and standards of service level in the survey of on-site infrastructure in site and services (see Annex B). As the table indicates, the average cost of providing water in the survey is about US$80 for individual connections and US$30-50 per plot for communal standpipes. On the average, water supply costs represented 20-30% of total on-site infrastructure costs per plot.

ON–SITE INFRASTRUCTURE COSTS PER PLOT: WATER SUPPLY

COUNTRY	SCANNING SURVEY CODE		NO. OF PLOTS (COST BASE)	PLOT SIZE SQ.M	LEVEL OF SERVICE	COST PER PLOT US$	% OF TOTAL URBANIZATION COST OF ON-SITE INFRASTRUCTURE 0 20 40 60 80 100%
NICARAGUA	1.1	P*	2,750	110	Individual connection; 85 1pd	80.0	
SENEGAL	2.1	P*	11,900	150	Communal standpipe; 1 per 100 Hshlds	10.4	
	2.2	P*	2,100	150	Individual connection	48.5	
	2.3	P*	1,600	200	Communal standpipe; 1 per 100 Hshlds	13.5	
INDONESIA	3.1	P*	12,866	80	Individual connection	33.8	
	3.2	P*	4,425	140	Individual connection	57.4	
	3.3	P*	23,600	110	Communal standpipe; 1 per 8 plots	30.0	
JAMAICA	4.1	P*	786	94	Individual connection	88.9	
	4.2	P*	786	94	Individual connection	88.9	
	4.3	P*	786	94	Individual connection	88.3	
BOTSWANA	5.1	P*	1,100	375	Communal standpipe; 1 per 20-25 plots	34.0	
	5.2	P*	306	375	Communal standpipe; 1 per 150m radius	38.0	
	5.3		–	–	Individual connection	108.0	
	5.4		–	–	Individual connection	108.0	
ZAMBIA	6.1	P*	7,600	210	Communal standpipe; 1 per 25 Hshlds	51.5	
	6.2	P*	1,200	324	Communal standpipe; 1 per 4 Hshlds	168.5	
	6.3	P*	1,200	324	Individual connection	171.0	
	6.4		1,084	324	Individual connection	127.7	
	6.5		868	324	Individual connection	96.6	
	6.6		1,977	186	Individual connection	52.2	
	6.7		114	324	Communal standpipe; 1 per 2-3 plots	53.8	
	6.8		868	324	Individual connection	57.8	
	6.9		868	370	Communal standpipe; 1 per 37 plots	37.1	
	6.10		717	370	Communal standpipe; 1 per 20 plots	53.5	
	6.11		307	370	Individual connection	53.9	
	6.12		278	370	Individual connection	50.4	
	6.13		100	370	Individual connection	45.1	
INDIA	7.1	P*	1,000	70	Individual connection; 200 1pd	158.0	
EL SALVADOR	8.1	P*	5,100	60	Individual connection	n.a.	
	8.2	P*	2,900	120	Individual connection	n.a.	
	8.3		508	60	Individual connection	32.6	
	8.4		235	60	n.a.		
	8.5		62	66	n.a.		
TANZANIA	9.1	P	5,370	265	Individual connection; 150 1pd	89.2	
	9.2	P	5,370	266	Communal standpipe; 1 per 10 plots	56.9	
	9.3	P	5,370	266	Communal standpipe; 1 per 50 plots	24.5	
	9.4	P	12,100	280	Communal standpipe; 1 per 60 plots	38.9	
	9.5	P	2,300	260	Communal standpipe; 1 per 60 plots	47.5	
	9.6	P	2,000	280	Communal standpipe; 1 per 60 plots	44.8	
	9.7	P*	8,050	280	Communal standpipe; 1 per 80 plots	39.5	
KENYA	10.1		600	128	Individual connection	57.1	
	10.2		375	128	Individual connection	28.6	
	10.3		104	128	Communal standpipe; 1 per 20 plots	14.3	
	10.4		723	187	Individual connection	54.0	
	10.5		100	326	Individual connection	34.1	
	10.6		110	188	Individual connection	67.0	
	10.7		42	298	Individual connection	36.0	
	10.8		94	242	Individual connection	42.6	
	10.9	P*	4,200	120	Individual connection	46.0	
COLOMBIA	11.1	P	3,500	80	Individual connection	107.5	
	11.2	P	3,500	80	Individual connection	107.5	
	11.3		2,800	140	n.a.		
	11.4		475	140	Individual connection	n.a.	
	11.5		757	140	Communal standpipe	n.a.	
CHILE	12.1		–	170	Individual connection	169.0	
ECUADOR	13.1		9,280	120	Communal standpipe	n.a.	
KOREA	14.1	P*	507	118	Individual connection	n.a	
	14.2	P*	145	185	Individual connection	n.a.	
	14.3	P*	73	248	Individual connection	n.a.	

CAPITAL COST IN US$ PER CAPITA FOR WATER INSTALLATION AND COMPONENT WORKS IN SELECTED AREAS (cont.)

Class 6, comprehensive urban systems—total cost

Country	Municipality	Date	Per Capita Cost of Construction: Total	Per Capita Cost of Construction: Mean
Kenya	Nairobi	1968	48	–
Tanzania	Dar es Salaam	1964	48	–
	Dodoma	1964	62	–
	Moshi	1964	13	–
Uganda	Kampala	1964	46-57	–
	Iganga	1960	11	–
	Kamuli	1960	3	–
	Tororo	1960	92	–
Argentina and Chile	Urban systems	1963	–	20
Ceylon	7 projects	1960	27-55	37
Costa Rica	19 small projects	1956	–	14
	22 mixed projects	1957	6-83	19
Ghana	Accra-Tema expansion	1965	60	–
Latin America	Selected projects	1962	15-90	50
Nigeria	National program	1960	–	.10
North Africa	Selected projects	1953	–	25
Paraguay	Asuncion	1962	43	–
United States	Design standards	1967	–	90-200
Venezuela	Selected projects	1965	–	35

Class 6, Comprehensive urban systems—breakdown by component costs

Country	Date	Supply Source	Treatment and Pumping	Distribution	Total	Mean
Brazil: 10 projects	1958-1961	1-20	1-2	4-20	6-28	16-20
India: 331 projects	1954-1960	0-9	1-7	3-5	4-11	9
Jamaica: program	1961	7	9	37	30-50[a]	40
United States: all	1956	3-85	8-60	110-206	–	275

[a] Materials only: no estimate of local labor.

SOURCES:

Aris 1968.
Borjesson and Bobeda 1964, pp. 853-82.
Diamant 1968.
Dieterich and Henderson 1963, p. 54.
Ferguson 1961
Gabaldon, Arnaldo 1965, pp. 394, 500-501.
Henderson 1961
Journal of the American Water Works Assoc., 48 (1966): 771-79, rough estimates.
Picton and Kollar 1962, pp. 2-5.
Scaff et al. 1964, pp. 56, 71-73.
Tahal 1965, II.
Tanganyika, Communications, Power and Works 1964.
Tanzania, Land Settlement and Water Development, *Annual Reports*.
Uganda, *Works for Progress* 1956.

Source: R17

16b

CHARACTERISTICS OF INDIVIDUAL SANITATION INSTALLATIONS

COMPONENT:	SEPTIC TANK	CESSPOOL	PRIVY
RESPONSIBILITY:	individual	individual	individual
CONTROL:	individual	individual	individual
CHARACTERISTICS:	requires drain field to take care of effluent	does not require drain field	consists of hole in ground
	system dependent on soil and geological conditions	store effluent in large fluid filled tank where liquid slowly seeps out	short term use only
			1.5 m. min. depth
	sized at 50/75 gpcd; 500 gallons minimum capacity; no storm flows allowed	highly dependent on soil and geological conditions	treat with lime and cover with 18" of soil after use
	drain field max. length of 100' on flat site; 6' spacing of lines; 4" tile for drain; 100' from water source		1 seat per 15 people on communal scale
	percolation of waste acts as treatment plant; tank stores solids		
	min. slope of 3/4" 100 feet of drains; if too steep; drains fail		
SCALE OF USE:	individual only; lots over 2 acres	individual only in both cases	
ADVANTAGES:		low cost	low cost, or no cost
DISADVANTAGES:	may not be used with wells; more expensive first costs than public system	may not be used with wells pollution and disease dangers; contaminates water supplies easily; more than septic tank	
	cannot expand easily		
	requires maintenance		

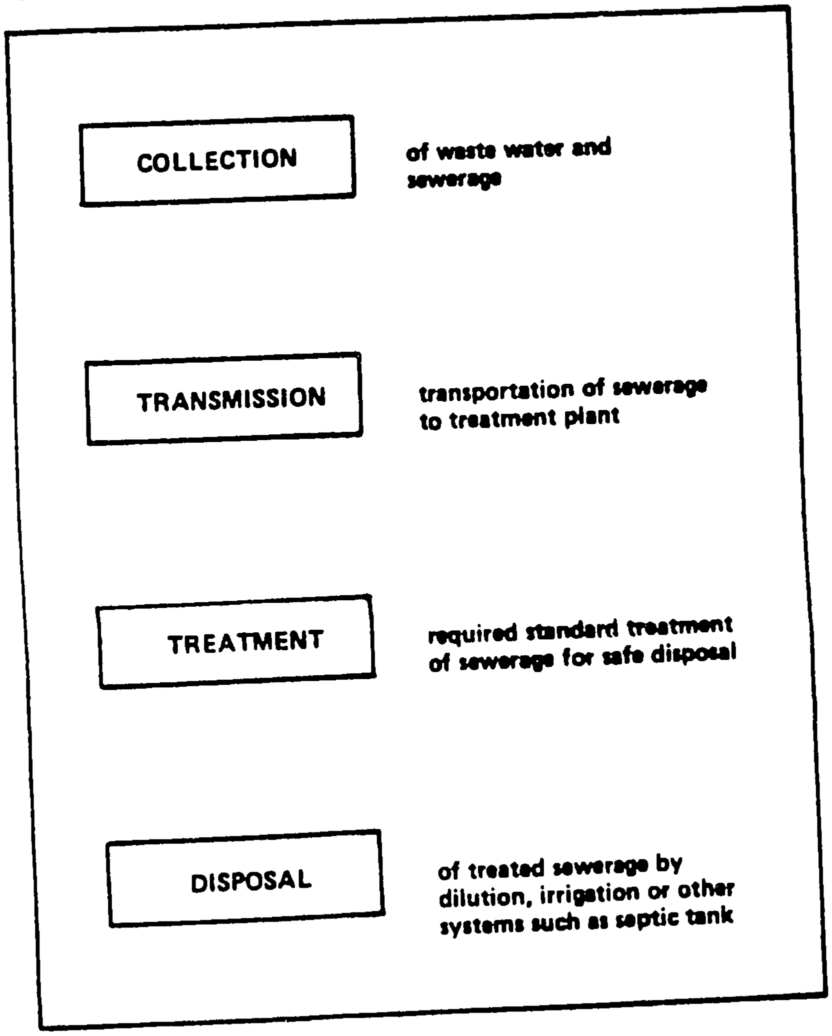
Source: R10

E. ON-SITE INFRASTRUCTURE: SEWERAGE

37. An adequate supply of potable water is fundamental to any housing development and along with it is the equally fundamental provision of an efficient and hygienic means of disposal of sewerage containing both human and household waste.

38. The <u>functional components</u> of a sewerage system comprise collection, treatment and a disposal system.

COMPONENTS OF THE SEWERAGE INFRASTRUCTURE



The choices available for new residential developments are many, but can be described within three general categories:

(a) Connection to an existing system;
(b) Development of new system on site; and
(c) Reliance on individual systems.

REQUIRED COMPONENTS
SEWERAGE

	TYPE OF SYSTEM		
	EXISTING SEWER SYSTEM	COMMUNAL SYSTEM	INDIVIDUAL SYSTEM
COLLECTION	connection of new system to existing city network	provision of pipe network and connection to private disposal	individual pipe service lines
TREATMENT	not required	complete plant of primary and secondary treatment lagoon may be used	not required
DISPOSAL	not required	dilution in water course, irrigation or lagoon must be provided	septic tank with drain field, or cesspool or privy must be provided
SCALE OF DEVELOPMENT	no limits if city pipe net able to handle additional capacity	usually more than 100 dwellings make communal systems economically competitive	large lot conditions of low density; generally greater than $1500m^2$; dependent on soil
ADVANTAGES	reliable system lower cost per unit; no treatment plant must be provided	no dependence on city system if inadequate	feasible alternative on small scale
DISADVANTAGES	may inherit bad system	high first costs; usually not well maintained; loss of investment if city expands	pollution dangers; loss of investment if city expands

Source: R10

Within these three categories, there is a wide variety of options depending on the level of service--from individual connections to waterborne sewerage to self-help communal pit latrines.

39. There are various types of sanitary installation: 1/

(a) Bucket or Pail Privies;
(b) Pit Privies, Borehole Privies;
(c) Compost Latrines;
(d) Aqua Privies;
(e) Septic Tank Privies; and
(f) Water Closet.

The selection of which type of installation is best suited to a particular situation must take into account the element of cost, although this is not the dominant factor. Density, local conditions, and life styles sometimes play a more important role. In all probability, though, waterborne sewerage systems will be beyond the economic capacity of many of the urban poor to pay.

40. The three types of installations which come closest to fulfilling the functional requirements within the economic possibilities of sites and services are the pit privy, the aqua privy and the septic tank privy. These three are described in a WHO Technical Report: 2/

"(1) Pit Privy: Pits are either hand-dug or machine bored; they may be open or have an appropriate seat installed and a structure erected over them. Their success, however, is dependent on favorable subsoil conditions. In hard and rocky soils they are costly and unsuitable, while in soft and sandy soils the pit walls may collapse, particularly with seasonal high water tables. When seepage from the pit is poor, the liquid accumulates and the useful life of the pit is reduced.

"The life of a pit latrine ranges from about 2½ years to 8 years, the average span being some 5 years; this implies that money and space must be provided for relocations in a housing scheme, if a waterborne system is not attainable during such a period. Furthermore, the minimum distance between the pit, the house to which it belongs, and the neighboring houses should be about 7 meters, which calls for extra land reservation.

1/ For detailed description, see "Excreta Disposal for Rural Areas and Small Communities", by E. Wagner and J. Lanoix, WHO, 1958.

2/ "Disposal of Community Waste Water", WHO Technical Report Series, No. 541, Geneva, 1974.

"Pit latrines do not handle the household wastewater, which needs separate disposal where piped water is provided, otherwise insanitary conditions prevail around the house and promote mosquito breeding. If open to daylight the pit itself may invite fly and mosquito breeding.

"(2) Aqua Privy: The aqua privy system provides treatment of a simple septic tank type, without the need for a flush system. The excreta are received directly through a chute into the tank below, where the organic solids undergo anaerobic decomposition. The chute must reach the liquid level to ensure the satisfactory functioning of the system and to prevent odour nuisance and mosquito breeding. Usually the water used for cleaning the chute is sufficient for the purpose.

"In principle the aqua privy provides an effective means of dealing with excreta. Anaerobic fermentation in the tank destroys much of the organic solids, and the small quantity of surplus liquid can usually be adequately disposed of in the soakaway. The system works satisfactorily irrespective of whether paper is used for personal hygiene or any other available material (such as sticks, stone, or corn cobs). These are retained in the tank and desludged periodically by vacuum tanker, the length of the interval between desludging operations depending on the size of the tank.

"In practice, however, failures occur because of the omission to add water to maintain the seal; the tanks eventually lose all liquid and become, in effect, pit latrines. The addition of water at intervals is a simple corrective, but needs personnel. Where the custom is to use water for personal hygiene the seal is automatically retained, the water use is small, and the aqua privy gives excellent service as an on-lot excreta disposal system. Failure to the soakaways due to impervious soils, clogging of porous soils with organic matter, or seasonal high water tables are possible disadvantages, but can be avoided by intelligent design and operation.

"As with the pit system the aqua privy system usually excludes the household sullage so as to minimize problems with soakaways.

CHARACTERISTICS OF THE SURFACE WATER DRAINAGE INFRASTRUCTURE

COMPONENT:	WALKWAYS	ROADWAYS	DITCHES
FUNCTION:	immediate control of water runoff, allowing dispersed runoff til need for pipes required		
RESPONSIBILITY:	developer is responsible for financing and installation		
CONTROL:	city controls and maintains all three components		
CHARACTERISTICS:	curbed sidewalk controle runoff into desired direction walkways are sloped to keep pedestrians dry but still allow water control	15-23 cm. curbs channel water to inlets and concentrate water into desired volume for given pipe diameter roads are crowned to keep water our of normal vehicular travel sections under normal runoff conditions since emergency vehicles normally have a higher body and larger tires, they may easily negotiate the streets when they are flooded	swallow ditches are standerd requirements (FHA-US) usually located on sides of streets to drain road bed
SCALE OF DEVELOPMENT	as needed	access to each DU	along roads

Source: R10

"(3) Septic Tank Privy: This is an improvement on the aqua privy, with the chute replaced by a regular waste closet or a hand-flush closet with a trap. The privy may be installed either on the septic tank itself, or located in the house and the discharge directed to the tank outside. Some septic tank systems are designed to deal only with latrine discharges, the treated effluent being led into soakaways, while the sullage is disposed of untreated in seepage pits. The more common system is to deal with both the sullage and the latrine discharges in the same tank, the effluent from the tank disposed of in a soakaway or by other means. Separation of the sullage from the latrine discharge is not to be recommended.

"Defective design of the tank may impair its efficient functioning; decomposition and settlement zones need attention in proper design; and access manholes should seal effectively, otherwise mosquito breeding may develop in the tank.

"The dominant source of trouble with the septic tank system is failure of the soakaway to deal with the volume of liquid, owing to organic clogging of the soil, high water tables, unsuitable soil conditions, and related factors. The effluent eventually stagnates on the surface or seeps into the storm drainage.

"Excavation of soakaways needs to be extensive if the soil is poor or impervious. In high-density areas it is not improbably that the excavation volume for soakaways will exceed the volume required for sewers."

41. Initial Servicing Level. Experience in all parts of the world indicates that, except in unusual circumstances, communal sanitary facilities are to be avoided. Communal facilities are notoriously difficult to maintain and are generally unpopular and ineffective solutions (people avoid using foul-smelling, dirty facilities). However, if circumstances dictate installation of public latrines as an initial measure, they should be designed to facilitate maintenance and water should be made available for use in keeping the latrines clean. Also, consideration should be given in the physical layout for the eventual installation of suitable individual installation.

42. <u>Sewerage Costs Per Plot</u>. The following table compares sewerage costs and standards of service level in the survey of on-site infrastructure in site and services (see Annex B). As the table indicates, the average cost of providing sewerage in the survey is about US$180 for waterborne systems, US$110 for aqua privies and US$20 per plot for pit latrines. On the average, sewerage costs represented 40-50% of total on-site infrastructure costs per plot.

ON-SITE INFRASTRUCTURE COSTS PER PLOT: SEWERAGE

COUNTRY	SCANNING SURVEY CODE		NO. OF PLOTS (COST BASE)	PLOT SIZE SQ.M	LEVEL OF SERVICE	COST PER PLOT US$	% OF TOTAL URBANIZATION COST OF ON-SITE INFRASTRUCTURE 0 20 40 60 80 100%
NICARAGUA	1.1	P*	2,750	110	Individual connection; waterborne	100.0	
SENEGAL	2.1	P*	11,800	180	Self-dug pit latrine on each plot	10.6	
	2.2	P*	2,100	180	Individual connection; septic tank	381.0	
	2.3	P*	1,800	300	Self-dug pit latrine on each plot	17.2	
INDONESIA	3.1	P*	12,8[illegible]	80	Individual connection; waterborne	180.4	
	3.2	P*	4,425	140	Individual connection; waterborne	283.2	
	3.3	P	23,600	110	Self-dug pit latrine on each plot	–	
JAMAICA	4.1	P*	785	94	Individual connection; waterborne	153.6	
	4.2	P*	786	94	Individual connection; waterborne	153.6	
	4.3	P*	786	94	Individual connection; waterborne	153.6	
BOTSWANA	5.1	P*	1,100	375	Individual aqua privy units	182.0	
	5.2	P*	306	375	Individual aqua privy units	92.0	
	5.3		–	–	Individual connection; waterborne	511.0	
	5.4		–	–	Individual connection; waterborne	504.0	
ZAMBIA	6.1	P*	7,800	210	Self-dug pit latrine on each plot	–	
	6.2	P*	1,200	324	Self-dug pit latrine on each plot	–	
	6.3	P*	1,200	324	Individual connection; waterborne	334.0	
	6.4		1,084	324	Individual Connection; waterborne	234.4	
	6.5		[illegible]	324	Individual Connection; waterborne	157.4	
	6.6		1,977	166	Individual Connection; waterborne	223.6	
	6.7		114	324	Self-dug pit latrine on each plot	–	
	6.8		858	324	Individual connection; waterborne	153.9	
	6.9		858	370	Self-dug pit latrine on each plot	–	
	6.10		717	370	Self-dug pit latrine on each plot	–	
	6.11		307	370	Individual connection; waterborne	159.2	
	6.12		278	370	Individual connection; waterborne	94.2	
	6.13		100	370	Individual connection; waterborne	111.2	
INDIA	7.1	P*	1,000	70	Individual connection; waterborne	227.5	
EL SALVADOR	8.1	P*	5,100	80	Individual connection; waterborne	n.a.	
	8.2	P*	2,400	120	Individual connection; waterborne	n.a.	
	8.3		508	80	Individual connection; waterborne	31.1	
	8.4		235	80	n.a.		
	8.5		82	66	n.a.		
TANZANIA	9.1	P	6,370	286	Individual connection; waterborne	171.4	
	9.2	P	6,370	286	Improved pit latrine on each plot	98.9	
	9.3	P	6,370	286	Communal pit latrine	14.3	
	9.4	P	12,100	280	Individual aqua privy units	119.0	
	9.5	P	2,300	280	Individual aqua privy units	130.9	
	9.6	P	2,000	280	Individual aqua privy units	137.2	
	9.7	P*	8,050	280	Individual aqua privy units	58.5	
KENYA	10.1		500	126	Individual connection; waterborne	142.9	
	10.2		375	126	Individual connection; waterborne	114.3	
	10.3		104	126	Communal; waterborne: 8 per 20 plots	57.1	
	10.4		723	187	Individual connection; waterborne	71.0	
	10.5		100	326	Individual connection; septic tank	180.0	
	10.6		110	188	Individual connection; waterborne	143.0	
	10.7		42	298	Individual connection; waterborne	84.0	
	10.8		94	242	Individual connection; oxidation pond	280.6	
	10.9	P*	4,200	120	Individual connection; waterborne	113.4	
COLUMBIA	11.1	P	3,500	80	Individual connection; waterborne	118.9	
	11.2	P	3,500	80	Individual connection; waterborne	118.9	
	11.3		2,800	140	n.a.		
	11.4		475	140	n.a.		
	11.5		757	140	n.a.		
CHILE	12.1		–	170	Individual connection; waterborne	140.0	
ECUADOR	13.1		9,280	120	Individual pit latrine	n.a.	
KOREA	14.1	P*	507	116	Individual connection; waterborne	n.a.	
	14.2	P*	146	166	Individual connection, waterborne	n.a.	
	14.3	P*	73	248	Individual connection, waterborne	n.a.	

World Bank—8830

F. ON-SITE INFRASTRUCTURE: ROADS & SURFACE DRAINAGE

43. The circulation network has already been mentioned as a critical element of the physical layout. A site should be adequately provided with external access linking it to the urban network and internal circulation for vehicular and pedestrian access to the users. The internal circulation also accommodates all the networks of on-site infrastructure and provides the physical framework around which the site is developed. Careful planning and economy in the circulation network will have a positive effect on all the other networks.

44. Internal Circulation. The internal circulation system is defined by a hierarchy of collector streets, service streets and pedestrian paths:

(a) Collector Street: Arterial roads connecting with or extending major circulation routes. Through traffic; bus routes; sidewalks. Vehicles dominate.

(b) Service Street: Local roads providing service access to individual dwellings. One-way or two-way traffic; parking space; sidewalks. Vehicles and pedestrians.

(c) Pedestrian Path: Paths providing pedestrians and bicycle access (as well as emergency vehicular access to areas and plots not fronting streets). Pedestrians dominate.

MINIMUM RIGHT-OF-WAY WIDTHS x

	MINIMUM RIGHT-OF-WAY WIDTH (M)	MAXIMUM LENGTH (M)
COLLECTOR STREET	18	-
SERVICE STREET	10	-
	10=	100=
PEDESTRIAN PATH	3	100-122+

x "Proposed Minimum Standards", USAID, 1966.
= Cul-de-sac.
+ Upper figure for path connecting two transverse streets.

45. Cost Components. Cost components of the roads and drainage network are strongly influenced by the type of usage (traffic system) and engineering practice and have many determinants. The principal cost components include:

- Right-of-way (% of land area);
- Earthwork and site preparation (excavation, removal of poor soil; addition of good soil, embankment, grading);
- Base Course (gravel, stone, brick and their compaction);
- Pavement or Surfacing (metalled surface - bituminous, concrete or macadam);
- Drainage and culverts;
- Maintenance (the upkeep of the road after construction.

Terrain, soil type and climate have a primary influence on earthworks and related components. But there is wide flexibility in the design and financing of roads, offering a major opportunity to save money; options should be evaluated in each case to determine the most appropriate level at the minimum cost.

46. Initial Servicing Level. Initially, the lowest possible standard should be installed. Paving should be avoided or kept to a minimum standard if climate requires it. Maintenance requirements should be considered when evaluating options. In the physical layout plan, land allocation to circulation should be sufficient to allow eventual upgrading to minimum standards in use locally.

47. Roads and Surface Drainage Costs. The following table compares roads and surface drainage costs and standards of service levels in the survey of on-site infrastructure in site and services (see Annex B). As the table indicates, the average cost of providing roads and surface drainage in the survey is about US$150 per plot for the higher standard (all roads surfaced), about US$100 per plot for the intermediate standard (main roads surfaced) and about US$25 per plot for the lower standard (all roads earth formed). On the average, roads and surface drainage costs represented 30-40% of total on-site infrastructure costs per plot.

ON–SITE INFRASTRUCTURE COSTS PER PLOT: ROADS & SURFACE DRAINAGE

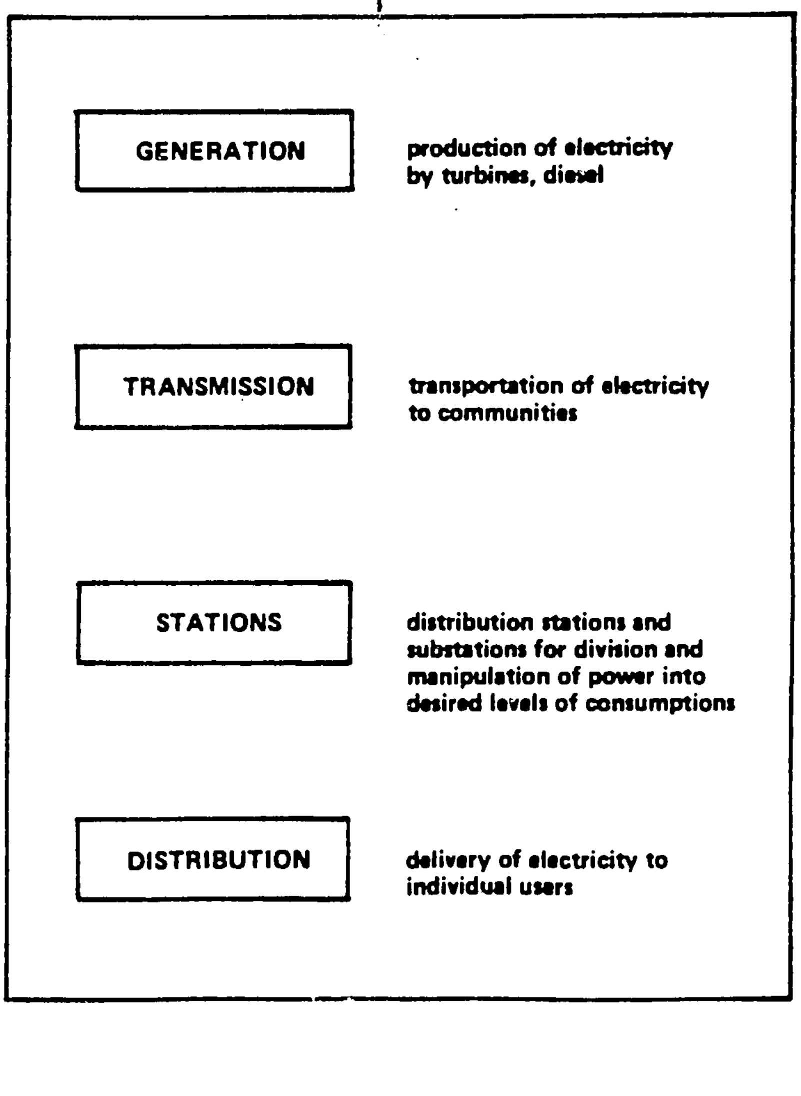
COUNTRY	SCANNING SURVEY CODE		NO. OF PLOTS (COST BASE)	PLOT SIZE SQ.M	LEVEL OF SERVICE	COST PER PLOT US$	% OF TOTAL URBANIZATION COST OF ON–SITE INFRASTRUCTURE 0 20 40 60 80 100%
NICARAGUA	1.1	P*	2,750	110	Main roads bitumenized; Piped drainage	135.0	
SENEGAL	2.5	P*	11,900	150	Main roads bitumenized; No drainage	20.6	
	2.2	P*	2,100	150	Main roads bitumenized; No drainage	20.6	
	2.3	P*	1,800	200	Main roads bitumenized; No drainage	30.2	
INDONESIA	3.1	P*	12,866	80	Surfaced roads; Stormwater drainage	164.0	
	3.2	P*	4,425	140	Surfaced roads; Stormwater drainage	287.0	
	3.3	P	23,800	110	Surfaced roads; earth ditches	81.7	
JAMAICA	4.1	P*	786	94	Surfaced roads; open channel drainage	196.0	
	4.2	P*	786	94	Surfaced roads; open channel drainage	196.0	
	4.3	P*	785	94	Surfaced roads; open channel drainage	196.0	
BOTSWANA	5.1	P*	1,100	375	Main roads gravel; Open 'V' channels	35.0	
	5.2	P*	306	375	All roads earth formed; Open channels	64.0	
	5.3		–	–	Main roads bitumenized; Piped drainage	142.0	
	5.4		–	–	All roads gravel; Open channels	77.0	
ZAMBIA	6.1	P*	7,800	210	Main roads bitumenized; Drainage	42.0	
	6.2	P*	1,200	324	Main roads bitumenized; Drainage	48.6	
	6.3	P*	1,200	324	Main roads bitumenized; Drainage	273.0	
	6.4		1,084	324	All roads gravel; Drainage	128.2	
	6.5		868	324	All roads gravel; Drainage	133.0	
	6.6		1,977	186	All roads gravel; Drainage	85.4	
	6.7		114	324	Some surfaced roads	44.7	
	6.8		858	324	Some surfaced roads	88.9	
	6.9		868	370	Some surfaced roads	47.0	
	6.10		717	370	Some surfaced roads	79.7	
	6.11		307	370	Some surfaced roads	79.1	
	6.12		278	370	Some surfaced roads	91.7	
	6.13		100	370	Some surfaced roads	80.1	
INDIA	7.1	P*	1,000	70	All roads gravel; Drainage	117.6	
EL SALVADOR	8.1	P*	6,100	80	All roads earth (compacted); Drainage	n.a.	
	8.2	P*	2,400	120	All roads earth (compacted); Drainage	n.a.	
	8.3		506	60	All roads earth; Drainage	10.8	
	8.4		236	80	Surfaced roads; Drainage	n.a.	
	8.5		62	66	Surfaced roads; Drainage	n.a.	
TANZANIA	9.1	P*	5,370	286	Main roads bitumenized; Earth ditches	131.4	
	9.2	P*	5,370	286	Main roads bitumenized; Earth ditches	103.2	
	9.3	P*	5,370	286	Main roads gravel; Earth ditches	56.1	
	9.4	P*	12,100	280	Surfaced roads; Piped drainage	124.0	
	9.5	P*	2,300	280	Surfaced roads; Piped drainage	103.4	
	9.6	P*	2,000	280	Surfaced roads; Piped drainage	91.4	
	9.7	P*	8,050	280	Surfaced roads; Drainage	127.0	
KENYA	10.1		500	128	Main roads bitumenized; Piped drainage	157.2	
	10.2		375	128	Main roads bitumenized; Drainage	71.5	
	10.3		104	128	Main roads bitumenized; Drainage	71.5	
	10.4		723	187	Main roads bitumenized; Drainage	54.0	
	10.5		100	326	Main roads bitumenized; Drainage	146.7	
	10.6		110	180	Main roads bitumenized; Open channels	21.0	
	10.7		42	298	Surfaced roads; Piped drainage	340.0	
	10.8		94	242	All roads earth; No drainage	16.0	
	10.9	P*	4,200	120	Surfaced roads; Drainage	129.0	
COLOMBIA	11.1	P	3,500	80	n.a.		
	11.2	P	3,500	80	n.a.		
	11.3		2,800	140	n.a.		
	11.4		475	140	n.a.		
	11.5		757	140	n.a.		
CHILE	12.1		–	170	Surfaced roads; Drainage	428.0	
ECUADOR	13.1		9,280	120	n.a.		
KOREA	14.1	P*	507	118	Surfaced roads; Drainage	n.a.	
	14.2	P*	146	186	Surfaced roads; Drainage	n.a.	
	14.3	P*	73	248	Surfaced roads; Drainage	n.a.	

World Bank–8831

G. ON-SITE INFRASTRUCTURE: SECURITY LIGHTING & ELECTRICITY

48. Of all the infrastructure components being considered in this survey, electricity is potentially the most capital intensive. Although not considered to be among the more basic needs, it is highly desirable to have at least some electricity available within the project for security lighting and small-scale industrial/commercial needs. For private connections, it is largely a question of users' priorities and economic capacity, which varies considerably. For example, in some countries--especially Latin American--priority for electricity is higher than the other utilities and users are willing to pay a relatively high proportion of their housing costs towards a private connection, whereas many low-income households in other countries prefer to use cheaper fuels. The electricity network comprises generation, transmission and distribution components.

COMPONENTS OF THE ELECTRICITY NETWORK



CHARACTERISTICS OF STREET LIGHTING

FUNCTION:	1. provides safety to pedestrians and drivers by increasing night visual distance 2 provides sense of security to inhabitant of dwellings
RESPONSIBILITY:	developer finances and installs
CONTROL.	city maintains and controls
CHARACTERISTICS:	on residential streets, 40-49 meters spacing with 6 to 7.5 m. height; located on alternate sides of the street for business streets, spacing is 21 to 37 meters with 9 meter height criteria of height to spacing is based on glare reduction and placement of light out of the vision range; a rough approximation is that spacing is 8 times the height; minimum height is 4.5 to 6.1 meters. intersections require street lights

Source: R10

49. <u>Initial Servicing Level.</u> The installation of electricity does not involve major works and can easily be made at any time; its staging does not affect the physical layout plan to the same extent as the other utilities. Economics permitting, initial servicing level should include security lighting in major community areas. This can later be extended into full street lighting. Subsequent provision for private connections is relatively simple and generally managed by local power companies.

50. Security Lighting and Electricity Costs. The following table compares security lighting and electricity costs and standards of service level in the survey of on-site infrastructure in site and services (see Annex B). As the table indicates, the average cost of providing security lighting and electricity in the survey is about US$60 per plot. On the average, security lighting and electricity costs represented 10-15% of total on-site infrastructure costs per plot.

ON-SITE INFRASTRUCTURE COSTS PER PLOT: STREET LIGHTING & ELECTRICITY

COUNTRY	SCANNING SURVEY CODE		NO. OF PLOTS (COST BASE)	PLOT SIZE SQ.M	LEVEL OF SERVICE	COST PER PLOT US$	% OF TOTAL URBANIZATION COST OF ON-SITE INFRASTRUCTURE 0 20 40 60 80 100%
NICARAGUA	1.1	P*	2,760	110	Street lighting; Individual electricity	28.0	
SENEGAL	2.1	P*	11,900	150	Street lighting	n.a.	
	2.2	P*	2,100	150	None; Power company to provide		
	2.3	P*	1,600	200	None	•	
INDONESIA	3.1	P*	12,868	80	None		
	3.2	P*	4,425	140	None		
	3.3	P	23,600	110	None		
JAMAICA	4.1	P*	785	94	Street lighting; Individual electricity		
	4.2	P*	785	94	Street lighting; Individual electricity		
	4.3	P*	785	94	Street lighting; Individual electricity		
BOTSWANA	5.1	P*	1,100	375	Street lighting	29.4	
	5.2	P*	306	375	None		
	5.3		–	–	Street lighting; Individual provision	98.0	
	5.4		–	–	Street lighting; Individual provision	98.0	
ZAMBIA	6.1	P*	7,600	210	Security lighting; 2 per Ha	9.7	
	6.2	P*	1,200	324	Security lighting; 2 per Ha	48.6	
	6.3	P*	1,200	324	Security lighting; 5 per Ha	46.0	
	6.4		1,084	324	None		
	6.5		868	324	None		
	6.6		1,977	165	None		
	6.7		114	324	None		
	6.8		868	324	None		
	6.9		858	370	None		
	6.10		717	370	None		
	6.11		307	370	None		
	6.12		278	370	None		
	6.13		100	370	None		
INDIA	7.1	P*	1,000	70	Street lighting; Low tension lines	63.1	
EL SALVADOR	8.1	P*	5,100	60	Street lighting; at 50m spacing	n.a.	
	8.2	P*	2,400	120	Street lighting; 50m spacing	n.a.	
	8.3		508	80	To be provided later		
	8.4		235	60	n.a.		
	8.5		62	68	n.a.		
TANZANIA	9.1	P	5,370	265	Security lighting; Individual provision	51.0	
	9.2	P	5,370	265	Security lighting	21.9	
	9.3	P	5,370	265	None		
	9.4	P	12,100	280	Street lighting; Individual provision	102.3	
	9.5	P	2,300	280	Street lighting; Individual provision	117.3	
	9.6	P	2,000	280	Street lighting; Individual provision	113.9	
	9.7	P*	8,050	280	Street lighting along main roads	18.0	
KENYA	10.1		500	128	Street lighting; Individual electricity	57.1	
	10.2		375	128	Security lighting	28.6	
	10.3		104	128	Security lighting	28.6	
	10.4		723	167	Security lighting	4.0	
	10.5		100	328	Street lighting	22.3	
	10.6		110	188	None		
	10.7		42	298	Street lighting; Individual provision	130.2	
	10.8		94	242	None		
	10.9	P*	4,200	120	Security lighting	14.0	
COLOMBIA	11.1	P	3,500	80	Street lighting; Individual provision	128.1	
	11.2	P	3,500	80	Street lighting; Individual provision	126.1	
	11.3		2,800	140	Street lighting; Individual provision	n.a.	
	11.4		475	140	Street lighting; Individual provision	n.a.	
	11.5		757	140	Street lighting; Individual provision	n.a.	
CHILE	12.1		–	170	Street lighting; Individual electricity	79.0	
ECUADOR	13.1		9,280	120	None		
KOREA	14.1	P*	507	118	Security lighting	n.a.	
	14.2	P*	145	188	Security lighting	n.a.	
	14.3	P*	73	248	Security lighting	n.a.	

World Bank—8832

REFERENCES

1 SITE AND SERVICES: THE EXPERIENCE AND POTENTIAL, W. Grindley and R. Merrill. Research Report, Urban Projects Department, I.B.R.D., May 1973.

2 PLANNING FOR SITES AND SERVICES, Alfred P. Van Huyck. Department of Housing and Urban Development, U.S.A.I.D., July 1971.

3 PROPOSED MINIMUM STANDARDS FOR PERMANENT LOW COST HOUSING AND FOR THE IMPROVEMENT OF EXISTING SUBSTANDARD AREAS, Office of Housing and Urban Development, U.S.A.I.D., May 1966.

4 PROPOSALS FOR THE CONVERSION OF REFUGEE CAMPS TO PERMANENT SETTLEMENTS, United Nations Works and Relief Agency, December 1957.

5 IMPROVEMENT OF SLUMS AND UNCONTROLLED SETTLEMENTS, Department of Economic and Social Affairs, United Nations, 1971.

6 URBANIZATION, Sector Working Paper, World Bank, June 1972.

7 MANUAL OF SELF-HELP HOUSING, United Nations, 1964.

8 MAN'S STRUGGLE FOR SHELTER IN AN URBANIZING WORLD, Charles Abrams, 1964.

9 SITE AND SERVICES: POLICY ISSUES, D. Haldane, Urban Projects Department, I.B.R.D., July 1973.

10 URBAN RESIDENTIAL INFRASTRUCTURE NETWORKS: A PRIMER, Reinhard Goethert, Urban Settlement Design Program, M.I.T., 1970.

11 INFRASTRUCTURE PROBLEMS OF THE CITIES OF DEVELOPING COUNTRIES, Otto Koenigsberger, et al., International Urbanization Survey Report, Ford Foundation, July 1971.

12 COSTS OF URBAN INFRASTRUCTURE FOR INDUSTRY AS RELATED TO CITY SIZE IN DEVELOPING COUNTRIES - INDIA CASE STUDY, Stanford Research Institute, 1968.

13 URBAN DWELLING ENVIRONMENTS, Horacio Caminos, John Turner and John Steffian, M.I.T., 1968.

14 A METHOD FOR THE EVALUATION OF URBAN LAYOUTS, Horacio Caminos, Industrial Forum Vol.3 No.2, December 1971.

15 THE GROWTH POLE SYSTEM, E. Popko and E. Kessler, Urban Settlement Design Program, M.I.T., 1971.

16 RESIDENTIAL LAND UTILIZATION: CASE STUDY, NAIROBI, KENYA, G.Gattoni and P. Patel, Urban Settlement Design Program, M.I.T., 1973.

17 DRAWERS OF WATER: DOMESTIC WATER USE IN EAST AFRICA, G.F. White, D.J. Bradley and A.V. White, 1972.

18 URBAN WATER SUPPLY CONDITIONS AND NEEDS IN 75 DEVELOPING COUNTRIES, B.H. Dietrich and J.M. Henderson, W.H.O., 1963.

19 WATER SUPPLY FOR RURAL AREAS AND SMALL COMMUNITIES, Edmund G. Wagner and J. Lanoix.

20 WATER SUPPLY PROBLEMS IN DEVELOPING COUNTRIES, H.R. Shipman, A.W.W.A.J., 1967.

21 INTERNATIONAL STANDARDS FOR DRINKING WATER, W.H.O.

22 A PRACTICAL HANDBOOK OF WATER SUPPLY, F. Dixey.

23 GUIDELINES AND CRITERIA FOR COMMUNITY WATER SUPPLIES IN THE DEVELOPING COUNTRIES, U.S. Public Health Service, 1969.

24 REPORT ON GLOBAL WATER SUPPLY PROGRAM COSTS IN DEVELOPING COUNTRIES 1961-1975, John M. Henderson, 1961.

25 WATER COSTS IN DEVELOPING COUNTRIES, Joseph Barnea, Development Digest, 1966.

26 A BIBLIOGRAPHY OF LOW-COST WATER TECHNOLOGIES, I.T.D.G., 1971

27 A QUANTITATIVE ANALYSIS OF URBAN WATER DEMAND IN DEVELOPING COUNTRIES, Avigdor Maroz, I.B.R.D., 1968.

28 EXCRETA DISPOSAL FOR RURAL AREAS AND SMALL COMMUNITIES, E. Wagner and J. Lanoix, W.H.O., 1958.

29 SEWERAGE AND SEWAGE TREATMENT, H.E. Babbitt, 1949.

30 LOW COST WASTE TREATMENT, C.P.H.E.R.I., edited by C.A. Sastry, 1972.

31 SEWAGE LAGOONS FOR DEVELOPING COUNTRIES, U.S.A.I.D., 1966.

32 SANITARY COLLECTION AND DISPOSAL OF ORGANIC WASTES, J.C. Wylie, 1959.

33 THE FUNDAMENTAL PRINCIPLES OF ROAD ENGINEERING, V.B. Priyani, 1966.

34 ECONOMICS OF DESIGN STANDARDS FOR LOW VOLUME RURAL ROADS, C.H Oglesby and M.J. Altenhofen, 1969.

35 COST ANALYSIS OF ELECTRICITY SUPPLY SYSTEMS FOR RURAL COMMUNITIES, Center for International Studies, M.I.T., 1963.

Sources of data used in the survey are noted in each survey.

SUMMARY CHARTS: SITE AND SERVICES SURVEY

1. Scanning Survey of Site and Services: Summary Chart
2. Data Matrix: Survey of On-site Infrastructure Costs per plot
3. On-site Infrastructure Cost per plot: Water Supply
4. On-site Infrastructure Cost per plot: Sewerage
5. On-site Infrastructure Cost per plot: Roads and Surface Drainage
6. On-site Infrastructure Cost per plot: Street Lighting and Electricity
7. Data Matrix: Survey of 10 Bank Site and Services Projects
8. Development Costs for Site and Services Plots in 10 Bank Projects

SCANNING SURVEY OF SITE AND SERVICES: Summary Chart

COUNTRY/CITY/PROJECT	(IBRD PROJECT) * (PROPOSED) P	YEAR	NO. OF PLOTS	PLOT SIZE m²	WATER	SEWERAGE	DEGREE OF SERVICES ○ COMMUNAL ● INDIVIDUAL	URBANIZATION COST PER PLOT US$	URBANIZATION COST PER SQ.M US$	GNP PER CAP US$
BOTSWANA										110
Francistown—FRTDP S&S Pts	P*	1973	1,100	375	○	●	1 st pipe/20-25 pts, aqua pvy, surfcd rds	280	0.7	
—FRTDP Trad Pts	P*	1973	305	375	○	●	1 st pipe/150m r, aqua pvy, rds	194	0.5	
BURMA										80
Rangoon Area		1961-63	40,000	280						
CAMEROON										180
Daula, Yaunde		1958	8,000		○	○		600	-	
COLOMBIA										340
Nationwide—ICT		1980-64	8,000	150 250	●	●	Indvdl electy, rds	380	1.5-2.5	
Barrios Jovenes—USAID/ICT	P	1973	3,500	80	●	●	Indvdl electy, rds (+ 10 sq m conc slab)	439	5.5	
Cali—La Floresta		1960	2,800	140	○	○	Water and letrines/75 hsehlds Indvdl electy	128	0.9	
—Aguablanca	*	1959	475	140	●	●	Indvdl electy, (+ 15 sq m conc slab)	523	3.7	
—La Fortaleza		1962	757	140	○	○	Indvdl electy	356	2.5	
CHILE										720
Nationwide—PAP Plan 1		1965-70		170	●	●	Pit latrine, indvdl electy, (+ temporary house)	415	2.4	
—PAP Plan 2		1965-70	181,208	170	●	●				
—CORVI, MINVU		1970-71	120,913	170	●	●	Surfcd rds, indvdl electy	898	5.3	
ECUADOR										290
Guayaquil—USAID-FCH	P	1970	9,280	127	○	●	Pit latrine, surfcd rds	200	1.6	
EL SALVADOR										300
San Salvador—FSDV		1969	1,220	87	●	●	Surfcd rds, (+ temporary house)	125	1.9	
Santa Telca		1972	508	60	●	●		75	1.3	
Agua Caliente		1971	62	66	●	●		152	2.3	
San Salvador—S&S	P*	1973	8,000	60 70	●	●		210	3.0-3.5	
GUINEA										120
Fria—Katourou I		1964-65	400	96	○	○				
—Katourou II		1965-67	636	96 126	○	○	1 water tap/60 persons, 1 Sanitary block/500 persons			
JAMAICA										670
Kingston, Spanish Town—S&S	P*	1973	1,656	94	●	●	Surfcd rds, st lghtng, indvdl electy	492	5.2	
INDIA										110
Bombay—Malwani Scheme	P	1970	50,000	15	○	○	St lghtng, surfcd rds			
Madras—Open Plot Scheme		1966	7,451	91	●	●	(+ 6mx9m mud building platform)	210	2.3	
New Delhi—Jhuggi Jhonpri			49,000	21	○	○	Water and letrine/5 hsehlds			
—Jhuggi Jhonpri			3,800	67	●	●				
Calcutta—S&S CMDA	P*	1973	1,000	70	●	●	Surfcd rds, st lghtng	610	8.7	
INDONESIA										80
Jakarta—Cenhkareng S&S	P*	1973	11,484	80 200	●	●	Surfcd rds	200	2.5	
—Klendar S&S	P*	1973	7,000	80 200	●	●	Septic tanks (1/4 plts), surfcd rds	180	2.4	
—Depok S&S	P*	1973	6,369	80 200	●	●	Septic tanks (1 per 4 pts), surfcd rds			
Surabaja—S&S	P*	1972	23,800	110	○	●	Water tap/6 pts, pit latrine, surfcd rds	112	1.0	
IRAQ										320
Baghdad, Basara		1960-70	100,000	160	●	●				

SCANNING SURVEY OF SITE AND SERVICES: Summary Chart (cont.)

COUNTRY/CITY/PROJECT	(IBRD PROJECT) * (PROPOSED) P	YEAR	NO. OF PLOTS	PLOT SIZE m²	WATER	SEWERAGE	DEGREE OF SERVICES (○ COMMUNAL, ● INDIVIDUAL)	URBANIZATION COST PER PLOT US$	URBANIZATION COST PER SQ.M US$	GNP PER CAP US$
KENYA										150
Nationwide—7 cities NDP	P	1965-70	25,000	210	○	●				
Nairobi—Mathare Core I		1970	500	126	●	●	Surfcd rds, st lghtng	414	3.3	
—Mathare S&S I		1970	375	126	●	●	Surfcd rds, st lghtng	243	1.9	
—Mathare Comm. S&S		1970	104	126	○	○	Water kiosk/20 plts, surfcd rds, public lghtng	172	1.4	
—Kariobangi S&S		1965	723	167	●	●	Surfcd rds, public lghtng	183	1.1	
—S&S Dandora IUP	P*	1973	5,000		●	●	Surfcd rds, st lghtng	500-600		
Mombasa—Kisauni		1971	100	326	●	●	Surfcd rds, st lghtng	383	1.2	
—Changamwe		1960	110	168	●	●	Surfcd rds	221	2.0	
Thika—Biafra Phase I		1971	42	298	●	●	Surfcd rds, st lghtng	589	2.0	
Karatina—S&S			94	242	●	●		318	1.3	
KOREA										250
Seoul—S&S Program	P	1969-72	40,000		○	○				
—Kwangju		1969	3,445	100	○	○	Wells, latrines, surfcd rds			
Pusan—Sao Dong		1968	3,200	50				290	5.8	
MALAWI										80
Nationwide—NDP		1972-7	25,000	500	○	●	Deep pit latrine (+ conc slab), dirt roads	210	0.5	
Blantyre—S&S		1971	7,500	530	○	●	Deep pit latrine (+ conc slab), dirt roads			
MOROCCO										230
Nationwide—Trame Sanitaire		1963	7,500	35	○	○	Public w.c.'s	41-81	1.2-1.7	
—Lot Evolutif		1963	8,250	64	●	●		91-131	1.4-2.1	
—Lot Economique		1963	2,500	64	●	●				
—S&S 221 Sites	P*	1965-70	39,000	64	●	●		125	2.0	
NICARAGUA										430
Managua—S&S	P*	1973	2,750	110	●	●	Surfcd rds, st lghtng, indvdl electy	402	3.7	
Masaya, Granada, Leon, Jinotepe	P*	1973	3,250	110	●	●	Surfcd rds, st lghtng, indvdl electy			
PAKISTAN										100
Lahore		1964	10,000	100	●	●				
Karachi		1959	2,000	9	●	●		180		
PANAMA										730
Panama City—3 sites		1968	1,500					338		
—USAID-IVU	P	1971-76	15,000					600		
SENEGAL										230
Dakar—Pikine Ancien		1952-58	15,000	219	○	○	1 water tap/100 hsehlds, surfcd rds	600	2.8	
—Pikine Extension		1967-70		150	○	○	1 water tap/100 hsehlds, surfcd rds			
—S&S Serviced Pts	P*	1973	11,900	150	○	●	1 water tap/100 hsehlds, pit latrine, surfcd rds, st lghtg	206	1.4	
—S&S Sanitary Core Pts	P*	1973	2,100	150	●	●	Septic tanks, surfcd rds	626	4.2	
Thies—S&S Serviced Pts	P*	1973	1,600	200	○	●	1 water tap/100 hsehlds, pit latrine, surfcd rds	74	0.4	
SUDAN										120
Nationwide, Khartoum		1961	13,000	850	●	●	Indvdl electy	172	0.2	

SCANNING SURVEY OF SITE AND SERVICES: Summary Chart (cont.)

COUNTRY/CITY/PROJECT (IBRD PROJECT) * (PROPOSED) P		YEAR	NO. OF PLOTS	PLOT SIZE m^2	WATER	SEWERAGE	DEGREE OF SERVICES O COMMUNAL ● INDIVIDUAL	URBANIZATION COST PER PLOT US$	URBANIZATION COST PER SQ.M US$	GNP PER CAP US$
TANZANIA										100
Nationwide–2nd NDP–NHC	P	1969-74	25,000							
Dar es Salaam–3 sites S&S	P*	1973	12,100	280	O	●	Water kiosk/50 pts, aqua pvy, surfcd rds, st lghtng	384	1.5	
Mwanza–S&S	P*	1973	2,300	260	O	●	Water kiosk/50 pts, aqua pvy, surfcd rds, st lghtng	399	1.5	
Mbeya–S&S	P*	1973	2,000	280	O	●	Water kiosk/50 pts, aqua pvy, surfcd rds, st lghtng	387	1.4	
THAILAND										250
Bangkok–3 sites		1960	4,450	73 146	●	●		95	1.3	
TUNISIA										250
Nationwide		1963	14,000					96		
TURKEY										310
Nationwide		1968-69	30,208							
VENEZUELA										980
Ciudad Guyana		1963-67	3,000		●	●	Indvdl electy, st lghtng, surfcd rds			
Nationwide–6 Regions S&S		1969	6,500		●	●	Indvdl electy, st lghtng, surfcd rds			
–4th NDP		1970-74	150,000		●	●	Indvdl electy, st lghtng, surfcd rds	535		
ZAMBIA										400
Nationwide–2nd NDP	P	1972-76	64,000	315	●	●	Surfcd rds, st lghtng	700	2.2	
Lusaka–Chunga		1971	1,084	324	●	●	Surfcd rds	488	1.5	
–Kaunda Sq II		1971	866	324	●	●	Surfcd rds	387	1.2	
–Kaunda Sq I		1970	1,977	165	●	●	Surfcd rds	368	2.2	
Kafue–Chawama		1969	114	324	O	●	Water tap/2-3 pts, pit latrine, surfcd rds	99	0.3	
Ndola–Pamodzi		1971	658	324	●	●	Surfcd rds	322	1.0	
–Kawama Stage I			858	370	O	●	1 st pipe/37 pts, pit latrine, surfcd rds	105	0.3	
–Kawama Stage III			717	370	O	●	1 st pipe/20 pts, pit latrine, surfcd rds	150	0.4	
–Luboto		1970	307	370	●	●	Surfcd rds	312	0.8	
–Luboto Extension		1970	278	370	●	●	Surfcd rds	255	0.7	
–Luboto Stage II		1967	100	370	●	●	Surfcd rds	247	0.7	
Lusaka–Serviced Plot Project	P*	1973	6,995	324	●	●	Surfcd rds, st lghtng	686	2.1	

NOTE: Urbanization cost includes capital cost of site preparation and on-site infrastructure provision (water, sewerage, surface drainage, roads and footways and electricity).
The costs are given in 1973 US$ equivalents.

SOURCES: *Botswana:* IBRD Appraisal Report on FRTDP, 1973; *Burma:* Report on the Union of Burma by S. Aung, UN, 1971; *Cameroon:* Self-help Housing in Africa by D. Henson, UN, 1963; *Colombia:* IBRD Research Report on Site and Services by W. Grindley and R. Merrill, 1973; *Chile:* IBRD R[illegible]h Report on Site and Services by W. Grindley and R. Merrill, 1973; *Ecuador:* HUD-FCH Report on Site and Services ar[illegible]lter Study by T. Callaway, 1970; *El Salvador:* FSDV Annual Report, 1970; IBRD Reports; *Guinea:* Article on Clearance of th[illegible] Area of Azio by A. Spire, 1970; *Jamaica:* IBRD Appraisal Report Drafts, 1973; *India:* Report on India's Urban Housing, 1965; [illegible]port on CMD Housing, 1967; UNCHBP Report on Preliminary Pilot Program Mission to India, 1970; IBRD Reports; *Indones*[illegible]ppraisal Reports, 1972, 1973; *Iraq:* UN Report on Financing of Housing and Related Community Facilities for Arab St[illegible]; *Kenya:* 2nd NDP, Kenya Government, 1965; Site and Services Survey by Housing Research and Development Unit, 1971; *Korea:* IBRD Research Report on Site and Services by W. Grindley and R. Merrill, 1973; *Malawi:* UN Report of Housing Finance Mission to Malawi, 1971; *Morocco:* UN Report on Financing of Housing and Related Community Facilities for Arab States, 1963; *Nicaragua:* IBRD Appraisal Report, 1973; *Pakistan:* IBRD Research Report on Site and Services by W. Grindley and R. Merrill, 1973; *Panama:* USAID Evaluation Report on Urban Improvement Loan, 1966; *Senegal:* IBRD Appraisal Report, 1972; *Sudan:* UN Report on Financing of Housing and Related Community Facilities for Arab States, 1963; *Tanzania:* 2nd NDP, Tanzania Government, 1966; IBRD Appraisal Report Drafts, 1973; *Thailand:* Low Cost Housing by J. Vichitranond, MIT, 1967; *Tunisia:* UN Report on Financing of Housing and Related Community Facilities for Arab States, 1963; *Turkey:* The Housing Situation and Government Policies in Turkey by M. Oleer, 1970; *Venezuela:* IBRD Research Report on Sites and Services by W. Grindley and R. Merrill, 1973; *Zambia:* Lusaka Site and Services Project–Application Report, Government of the Republic of Zambia, 1973 *GNP Figures:* World Bank Atlas, 1972.

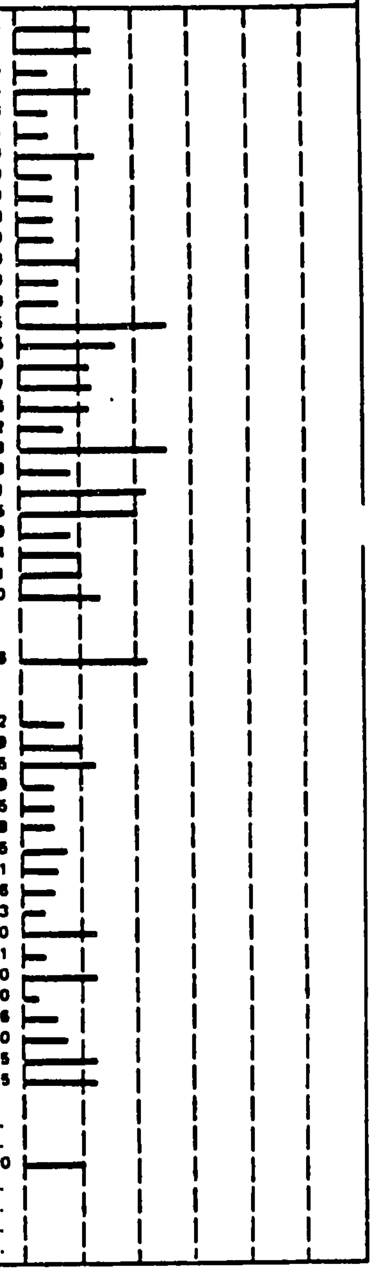
DATA MATRIX: SURVEY OF ON-SITE INFRASTRUCTURE COSTS PER PLOT

	COUNTRY/CITY/PROJECT	(IBRD PROJECT) * (PROPOSED) P	YEAR	NO. OF PLOTS (COST BASE)	PLOT SIZE SQ.M	URBANIZATION COST PER PLOT FOR ON–SITE INFRASTRUCTURE (EXCLUSIVE OF LAND, SITE PREPARATION AND CONTINGENCIES) TOTAL US $	WATER SUPPLY US $	WATER SUPPLY % OF TOTAL	SEWERAGE US $	SEWERAGE % OF TOTAL	ROADS & DRAINAGE US $	ROADS & DRAINAGE % OF TOTAL	STREET LGHTING & ELECTRICITY US $	STREET LGHTING & ELECTRICITY % OF TOTAL
1.0	NICARAGUA													
1.1	Managua – S&S	P*	1973	2,750	110	343.0	80.0	23.3	100.0	29.2	135.0	39.4	28.0	8.1
2.0	SENEGAL													
2.1	Dakar – Serviced Plot	P*	1973	11,900	150	41.6	10.4	25.0	10.6	25.5	20.6	49.5	–	–
2.2	Dakar – Sanitary Core	P*	1973	2,100	150	461.1	49.5	10.7	391.0	84.8	20.6	4.5	–	–
2.3	Thies – Serviced Plot	P*	1973	1,600	200	60.9	13.5	22.2	17.2	28.2	30.2	49.6	–	–
3.0	INDONESIA													
3.1	Jakarta – Type A	P*	1974	12,868	80	348.2	33.8	9.7	150.4	43.2	164.0	47.1	–	–
3.2	Jakarta – Type b	P*	1974	4,425	140	607.6	57.4	9.5	263.2	43.3	287.0	47.2	–	–
3.3	Surabaja	P	1972	23,600	110	111.7	30.0	26.9	–	–	81.7	73.1	–	–
4.0	JAMAICA													
4.1	Kingston – Marcus Garvey	P*	1974	785	94	438.5	88.9	20.3	153.6	35.0	196.0	44.7	–	–
5.0	BOTSWANA													
5.1	Francistown – S&S	P*	1974	1,100	375	280.4	34.0	12.1	182.0	64.9	35.0	12.5	29.4	10.5
5.2	Francistown – Tradit	P*	1974	305	375	184.0	38.0	19.6	92.0	47.4	64.0	33.0	–	–
5.3	Francistown – Estimates		1973	–	–	858.0	106.0	12.3	511.0	59.6	142.0	16.6	99.0	11.5
5.4	Francistown – Estimates		1973	–	–	785.0	106.0	13.5	504.0	64.2	77.0	9.8	98.0	12.5
6.0	ZAMBIA													
6.1	Lusaka – Overspill Plot	P*	1974	7,600	210	103.2	51.5	50.0	–	–	42.0	41.0	9.7	9.0
6.2	Lusaka – Basic Plot	P*	1974	1,200	324	460.1	168.5	36.6	–	–	243.0	52.8	48.6	10.6
6.3	Lusaka – Normal Plot	P*	1974	1,200	324	823.0	171.0	20.8	334.0	40.6	273.0	33.2	45.0	5.4
6.4	Lusaka – Chunga		1971	1,084	324	488.3	127.7	26.2	234.4	48.0	126.2	25.8	–	–
6.5	Lusaka – Kaunda Sq II		1971	888	324	387.0	96.6	25.0	157.4	40.8	133.0	34.2	–	–
6.6	Lusaka – Kaunda Sq I		1970	1,977	166	361.2	52.2	14.5	223.6	61.9	85.4	23.6	–	–
6.7	Kafue – Chawama		1969	114	324	98.5	53.8	54.6	–	–	44.7	45.4	–	–
6.8	Ndola – Pamodzi		1971	858	324	301.6	57.8	19.2	153.9	51.0	89.9	29.8	–	–
6.9	Ndola – Kawama St I		–	858	370	84.1	37.1	44.1	–	–	47.0	55.9	–	–
6.10	Ndola – Kawama St III		–	717	370	133.2	53.5	40.2	–	–	79.7	59.8	–	–
6.11	Ndola – Lubete		1970	307	370	292.2	53.9	18.4	159.2	54.5	79.1	27.1	–	–
6.12	Ndola – Lubete Extension		1970	278	370	236.3	50.4	21.3	94.2	39.9	91.7	38.8	–	–
6.13	Ndola – Lubete St II		1967	100	370	236.4	45.1	19.1	111.2	47.0	80.1	33.9	–	–
7.0	INDIA													
7.1	Calcutta – CMDA S&S	P*	1973	1,000	70	564.2	156.0	27.7	227.5	40.3	117.8	20.8	63.1	11.2
8.0	EL SALVADOR													
8.1	San Salvador	P*	1974	5,100	60	174.0								
8.2	Secondary Cities	P*	1974	2,900	120	348.0								
8.3	Santa Tecla		1972	508	60	74.5	32.6	43.8	31.1	41.8	10.8	14.4	–	–
8.5	Aqua Caliente		1971	82	66	152.0								
9.0	TANZANIA													
9.1	Dar-es-Salaam – Sinza-a	P	1973	5,370	265	422.9	69.2	16.4	171.4	40.5	131.4	31.0	51.0	12.1
9.2	Dar-es-Salaam – Sinza-b	P	1973	5,370	266	279.8	56.9	20.0	98.9	35.3	103.2	36.9	21.9	7.8
9.3	Dar-es-Salaam – Sinza-c	P	1973	5,370	265	95.2	24.7	26.0	14.3	15.0	56.1	59.0	–	–
9.4	Dar-es-Salaam – 3 Sites	P	1973	12,100	260	384.2	38.9	10.1	119.0	31.0	124.0	32.3	102.3	26.6
9.5	Mwanza – S&S	P	1973	2,300	260	399.1	47.5	11.9	130.9	32.8	103.4	26.0	117.3	29.3
9.6	Mbeya – S&S	P	1973	2,000	280	387.3	44.8	11.6	137.2	35.4	91.4	23.6	113.9	29.4
9.7	Dar-es-Salaam – Sinza	P*	1974	8,050	260	244.0	39.5	16.2	59.5	24.4	127.0	52.0	18.0	7.4
10.0	KENYA													
10.1	Nairobi – Mathare Core		1970	500	126	414.3	57.1	13.8	142.9	34.5	157.2	38.0	57.1	13.7
10.2	Nairobi – Mathare S&S I		1970	375	126	243.0	28.6	11.8	114.3	47.0	71.5	29.5	29.5	11.7
10.3	Nairobi – Mathare Com I		1970	104	126	171.5	14.3	8.3	57.1	33.3	71.5	41.7	28.6	16.7
10.4	Nairobi – Kariobangi S&S		1969	723	167	183.0	54.0	29.5	71.0	38.8	54.0	29.5	4.0	2.2
10.5	Mombasa – Kisauni		1971	100	326	383.1	34.1	8.9	180.0	47.0	146.7	38.6	22.3	5.6
10.6	Mombasa – Changamwe		1960	110	188	221.0	57.0	25.8	143.0	64.7	21.0	9.5	–	–
10.7	Thika – Bafra S&S		1971	42	298	589.2	35.0	5.9	84.0	14.3	340.0	57.7	130.2	22.1
10.8	Karatina – S&S			94	242	318.2	42.6	13.4	260.6	81.9	15.0	4.7	–	–
10.9	Nairobi-Dandora	P*	1974	4,200	120	303.0	46.0	15.2	113.4	37.4	129.6	42.8	14.0	4.6
11.0	COLOMBIA													
11.1	Barrios Jovenes – ICT	P	1973	3,500	80	439.0	107.5	24.5	118.9	27.1	86.5	19.7	126.1	28.7
11.3	La Floresta		1960	2,800	140	126.0								
11.4	Aguablanca		1959	475	140	523.0								
11.5	La Fortaleza		1962	757	140	366.0								
12.0	CHILE													
12.1	Santiago – CORVI Estimates		1971	–	170	816.0	169.0	20.7	140.0	17.5	428.0	52.4	79.0	9.4
13.0	ECUADOR													
13.1	Guayaquil – USAID Study	P	1970	9,280	120	200.0								
14.0	KOREA													
14.1	Gwangju – a	P*	1974	507	116									
14.2	Gwangju – b	P*	1974	145	165									
14.3	Gwangju – c	P*	1974	73	248									

World Bank—8834

ON-SITE INFRASTRUCTURE COSTS PER PLOT: WATER SUPPLY

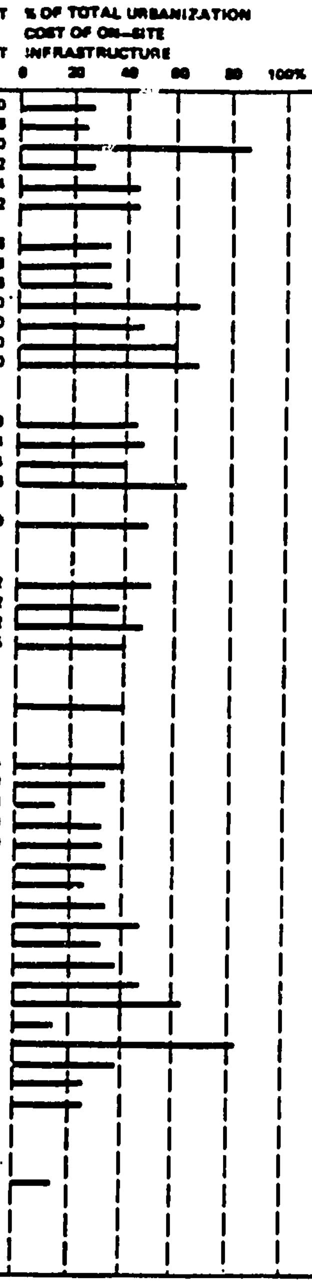
COUNTRY	SCANNING SURVEY CODE		NO.OF PLOTS (COST BASE)	PLOT SIZE SQ.M	LEVEL OF SERVICE	COST PER PLOT US$
NICARAGUA	1.1	P*	2,750	110	Individual connection; 55 1pd	80.0
SENEGAL	2.1	P*	11,800	150	Communal standpipe; 1 per 100 Hsehlds	10.4
	2.2	P*	2,100	150	Individual connection	49.5
	2.3	P*	1,800	200	Communal standpipe; 1 per 100 Hsehlds	13.5
INDONESIA	3.1	P*	12,868	80	Individual connection	33.8
	3.2	P*	4,425	140	Individual connection	57.4
	3.3	P*	23,800	110	Communal standpipe; 1 per 6 plots	30.0
JAMAICA	4.1	P*	785	94	Individual connection	88.9
	4.2	P*	785	94	Individual connection	89.9
	4.3	P*	785	94	Individual connection	88.3
BOTSWANA	5.1	P*	1,100	375	Communal standpipe; 1 per 20-25 plots	34.0
	5.2	P*	305	375	Communal standpipe; 1 per 150m radius	38.0
	5.3		–	–	Individual connection	106.0
	5.4		–	–	Individual connection	108.0
ZAMBIA	6.1	P*	7,800	210	Communal standpipe; 1 per 25 Hsehlds	51.5
	6.2	P*	1,200	324	Communal standpipe; 1 per 4 Hsehlds	188.5
	6.3	P*	1,200	324	Individual connection	171.0
	6.4		1,084	324	Individual connection	127.7
	6.5		868	324	Individual connection	96.6
	6.6		1,877	166	Individual connection	52.2
	6.7		114	324	Communal standpipe; 1 per 2-3 plots	53.8
	6.8		858	324	Individual connection	57.8
	6.9		858	370	Communal standpipe; 1 per 37 plots	37.1
	6.10		717	370	Communal standpipe; 1 per 20 plots	53.5
	6.11		307	370	Individual connection	53.9
	6.12		278	370	Individual connection	50.4
	6.13		100	370	Individual connection	46.1
INDIA	7.1	P*	1,000	70	Individual connection; 200 1pd	186.0
EL SALVADOR	8.1	P*	5,100	60	Individual connection	n.a.
	8.2	P*	2,900	120	Individual connection	n.a.
	8.3		508	60	Individual connection	32.6
	8.4		235	80	n.a.	
	8.5		62	86	n.a.	
TANZANIA	9.1	P	5,370	265	Individual connection; 150 1pd	89.2
	9.2	P	5,370	265	Communal standpipe; 1 per 10 plots	56.9
	9.3	P	5,370	265	Communal standpipe; 1 per 50 plots	24.5
	9.4	P	12,100	280	Communal standpipe; 1 per 50 plots	38.9
	9.5	P	2,300	280	Communal standpipe; 1 per 50 plots	47.5
	9.6	P	2,000	280	Communal standpipe; 1 per 50 plots	44.8
	9.7	P*	8,050	280	Communal standpipe; 1 per 50 plots	38.5
KENYA	10.1		500	126	Individual connection	57.1
	10.2		375	126	Individual connection	28.6
	10.3		104	126	Communal standpipe; 1 per 20 plots	14.3
	10.4		723	167	Individual connection	84.0
	10.5		100	326	Individual connection	34.1
	10.6		110	188	Individual connection	57.0
	10.7		42	298	Individual connection	36.0
	10.8		94	242	Individual connection	42.6
	10.9	P*	4,200	120	Individual connection	48.0
COLOMBIA	11.1	P	3,500	80	Individual connection	107.5
	11.2	P	3,500	80	Individual connection	107.5
	11.3		2,800	140	n.a.	
	11.4		475	140	Individual connection	n.a.
	11.5		757	140	Communal standpipe	n.a.
CHILE	12.1		–	170	Individual connection	189.0
ECUADOR	13.1		9,780	120	Communal standpipe	n.a.
KOREA	14.1	P*	707	116	Individual connection	n.a.
	14.2	P*	145	165	Individual connection	n.a.
	14.3	P*	73	248	Individual connection	n.a.



World Bank–8833

ON–SITE INFRASTRUCTURE COSTS PER PLOT: SEWERAGE

COUNTRY	SCANNING SURVEY CODE		NO. OF PLOTS (COST BASE)	PLOT SIZE SQ.M	LEVEL OF SERVICE	COST PER PLOT US$
NICARAGUA	1.1	P*	2,750	110	Individual connection; waterborne	100.0
SENEGAL	2.1	P*	11,900	150	Self-dug pit latrine on each plot	10.6
	2.2	P*	2,100	150	Individual connection; septic tank	301.0
	2.3	P*	1,600	200	Self-dug pit latrine on each plot	17.2
INDONESIA	3.1	P*	12,886	80	Individual connection; waterborne	180.4
	3.2	P*	4,425	140	Individual connection; waterborne	263.2
	3.3	P	23,600	110	Self-dug pit latrine on each plot	–
JAMAICA	4.1	P*	786	94	Individual connection; waterborne	153.6
	4.2	P*	785	94	Individual connection; waterborne	153.6
	4.3	P*	786	94	Individual connection; waterborne	153.6
BOTSWANA	5.1	P*	1,100	375	Individual aqua privy units	182.0
	5.2	P*	306	375	Individual aqua privy units	92.0
	5.3		–	–	Individual connection; waterborne	611.0
	5.4		–	–	Individual connection; waterborne	504.0
ZAMBIA	6.1	P*	7,600	210	*Self-dug pit latrine on each plot	–
	6.2	P*	1,200	324	Self-dug pit latrine on each plot	–
	6.3	P*	1,200	324	Individual connection; waterborne	334.0
	6.4		1,084	324	Individual Connection; waterborne	234.4
	6.5		568	324	Individual Connection; waterborne	157.4
	6.6		1,977	186	Individual Connection; waterborne	223.6
	6.7		114	324	Self-dug pit latrine on each plot	–
	6.8		858	324	Individual connection; waterborne	153.9
	6.9		858	370	Self-dug pit latrine on each plot	–
	6.10		717	370	Self-dug pit latrine on each plot	–
	6.11		307	370	Individual connection; waterborne	188.2
	6.12		278	370	Individual connection; waterborne	94.2
	6.13		100	370	Individual connection; waterborne	111.2
INDIA	7.1	P*	1,000	70	Individual connection; waterborne	227.5
EL SALVADOR	8.1	P*	5,100	60	Individual connection; waterborne	n.a.
	8.2	P*	2,400	120	Individual connection; waterborne	n.a.
	8.3		508	60	Individual connection; waterborne	31.1
	8.4		235	60	n.a.	
	8.5		62	66	n.a.	
TANZANIA	9.1	P	5,370	265	Individual connection; waterborne	171.4
	9.2	P	5,370	265	Improved pit latrine on each plot	98.9
	9.3	P	5,370	265	Communal pit latrine	14.3
	9.4	P	12,100	280	Individual aqua privy units	119.0
	9.5	P	2,300	280	Individual aqua privy units	130.9
	9.6	P	2,000	260	Individual aqua privy units	137.2
	9.7	P*	8,050	280	Individual aqua privy units	98.5
KENYA	10.1		500	126	Individual connection; waterborne	142.9
	10.2		375	126	Individual connection; waterborne	114.3
	10.3		104	126	Communal; waterborne; 6 per 20 plots	67.1
	10.4		723	167	Individual connection; waterborne	71.0
	10.5		100	328	Individual connection; septic tank	180.0
	10.6		110	180	Individual connection; waterborne	143.0
	10.7		42	298	Individual connection; waterborne	84.0
	10.8		94	242	Individual connection; oxidation pond	280.6
	10.9	P*	4,200	120	Individual connection; waterborne	113.4
COLUMBIA	11.1	P	3,500	80	Individual connection; waterborne	118.9
	11.2	P	3,600	80	Individual connection; waterborne	118.9
	11.3		2,800	140	n.a.	
	11.4		475	140	n.a.	
	11.5		787	140	n.a.	
CHILE	12.1		–	170	Individual connection; waterborne	140.0
ECUADOR	13.1		9,280	120	Individual pit latrine	n.a.
KOREA	14.1	P*	507	116	Individual connection; waterborne	n.a.
	14.2	P*	145	186	Individual connection; waterborne	n.a.
	14.3	P*	73	248	Individual connection; waterborne	n.a.



World Bank–8830

ON–SITE INFRASTRUCTURE COSTS PER PLOT: ROADS & SURFACE DRAINAGE

COUNTRY	SCANNING SURVEY CODE		NO. OF PLOTS (COST BASE)	PLOT SIZE SQ.M	LEVEL OF SERVICE	COST PER PLOT US$	% OF TOTAL URBANIZATION COST OF ON–SITE INFRASTRUCTURE 0 20 40 60 80 100%
NICARAGUA	1.1	P*	2,750	110	Main roads bitumenized; Piped drainage	136.0	
SENEGAL	2.5	P*	11,900	150	Main roads bitumenized; No drainage	20.6	
	2.2	P*	2,100	150	Main roads bitumenized; No drainage	20.6	
	2.3	P*	1,800	200	Main roads bitumenized; No drainage	30.2	
INDONESIA	3.1	P*	12,866	80	Surfaced roads; Stormwater drainage	164.0	
	3.2	P*	4,425	140	Surfaced roads; Stormwater drainage	287.0	
	3.3	P	23,800	110	Surfaced roads; earth ditches	81.7	
JAMAICA	4.1	P*	785	94	Surfaced roads; open channel drainage	196.0	
	4.2	P*	785	94	Surfaced roads; open channel drainage	196.0	
	4.3	P*	785	94	Surfaced roads; open channel drainage	196.0	
BOTSWANA	5.1	P*	1,100	375	Main roads gravel, Open "V" channels	36.0	
	5.2	P*	306	375	All roads earth formed; Open channels	64.0	
	5.3		–	–	Main roads bitumenized; Piped drainage	142.0	
	5.4		–	–	All roads gravel; Open channels	77.0	
ZAMBIA	6.1	P*	7,800	210	Main roads bitumenized; Drainage	42.0	
	6.2	P*	1,200	324	Main roads bitumenized; Drainage	48.6	
	6.3	P*	1,200	324	Main roads bitumenized; Drainage	273.0	
	6.4		1,084	324	All roads gravel; Drainage	126.2	
	6.5		868	324	All roads gravel; Drainage	133.0	
	6.5		1,977	165	All roads gravel; Drainage	85.4	
	6.7		114	324	Some surfaced roads	44.7	
	6.8		858	324	Some surfaced roads	89.9	
	6.9		858	370	Some surfaced roads	47.0	
	6.10		717	370	Some surfaced roads	79.7	
	6.11		307	370	Some surfaced roads	79.1	
	6.12		278	370	Some surfaced roads	91.7	
	6.13		100	370	Some surfaced roads	80.1	
INDIA	7.1	P*	1,000	70	All roads gravel; Drainage	117.6	
EL SALVADOR	8.1	P*	5,100	80	All roads earth (compacted); Drainage	n.a.	
	8.2	P*	2,400	120	All roads earth (compacted); Drainage	n.a.	
	8.3		608	60	All roads earth; Drainage	10.8	
	8.4		236	60	Surfaced roads; Drainage	n.a.	
	8.5		62	66	Surfaced roads; Drainage	n.a.	
TANZANIA	9.1	P*	5,370	265	Main roads bitumenized; Earth ditches	131.4	
	9.2	P*	5,370	265	Main roads bitumenized; Earth ditches	103.2	
	9.3	P*	5,370	265	Main roads gravel; Earth ditches	56.1	
	9.4	P*	12,100	280	Surfaced roads; Piped drainage	124.0	
	9.5	P*	2,300	280	Surfaced roads; Piped drainage	103.4	
	9.6	P*	2,000	280	Surfaced roads; Piped drainage	91.4	
	9.7	P*	8,050	280	Surfaced roads; Drainage	127.0	
KENYA	10.1		500	126	Main roads bitumenized; Piped drainage	157.2	
	10.2		375	126	Main roads bitumenized; Drainage	71.5	
	10.3		104	126	Main roads bitumenized; Drainage	71.5	
	10.4		723	167	Main roads bitumenized; Drainage	54.0	
	10.5		100	326	Main roads bitumenized; Drainage	148.7	
	10.6		110	188	Main roads bitumenized; Open channels	21.0	
	10.7		42	298	Surfaced roads; Piped drainage	340.0	
	10.8		94	242	All roads earth; No drainage	15.0	
	10.9	P*	4,200	120	Surfaced roads; Drainage	129.0	
COLOMBIA	11.1	P	3,500	80	n.a.		
	11.2	P	3,500	80	n.a.		
	11.3		2,800	140	n.a.		
	11.4		475	140	n.a.		
	11.5		757	140	n.a.		
CHILE	12.1		–	170	Surfaced roads; Drainage	428.0	
ECUADOR	13.1		9,280	120	n.a.		
KOREA	14.1	P*	507	116	Surfaced roads; Drainage	n.a.	
	14.2	P*	145	185	Surfaced roads; Drainage	n.a.	
	14.3	P*	73	248	Surfaced roads; Drainage	n.a.	

World Bank–8831

ON–SITE INFRASTRUCTURE COSTS PER PLOT: STREET LIGHTING & ELECTRICITY

COUNTRY	SCANNING SURVEY CODE	NO.OF PLOTS (COST BASE)	PLOT SIZE SQ.M	LEVEL OF SERVICE	COST PER PLOT US$	% OF TOTAL URBANIZATION COST OF ON–SITE INFRASTRUCTURE 0 20 40 60 80 100%
NICARAGUA	1.1 P*	2,750	110	Street lighting; Individual electricity	28.0	
SENEGAL	2.1 P*	11,900	160	Street lighting	n.a.	
	2.2 P*	2,100	150	None; Power company to provide		
	2.3 P*	1,600	200	None		
INDONESIA	3.1 P*	12,866	80	None		
	3.2 P*	4,425	140	None		
	3.3 P	23,600	110	None		
JAMAICA	4.1 P*	78[illegible]	94	Street lighting; Individual electricity		
	4.2 P*	785	94	Street lighting; Individual electricity		
	4.3 P*	786	94	Street lighting; Individual electricity		
BOTSWANA	5.1 P*	1,100	375	Street lighting	29.4	
	5.2 P*	305	375	None		
	5.3	–	–	Street lighting; Individual provision	98.0	
	5.4	–	–	Street lighting; Individual provision	98.0	
ZAMBIA	6.1 P*	7,600	210	Security lighting; 2 per Ha	9.7	
	6.2 P*	1,200	324	Security lighting; 2 per Ha	48.6	
	6.3 P*	1,200	324	Security lighting; 5 per Ha	46.0	
	6.4	1,084	324	None		
	6.5	868	324	None		
	6.6	1,977	166	None		
	6.7	114	324	None		
	6.8	858	324	None		
	6.9	858	370	None		
	6.10	717	370	None		
	6.11	307	370	None		
	6.12	278	370	None		
	6.13	100	370	None		
INDIA	7.1 P*	1,000	70	Street lighting; Low tension lines	63.1	
EL SALVADOR	8.1 P*	5,100	60	Street lighting; at 50m spacing	n.a.	
	8.2 P*	2,400	120	Street lighting; 50m spacing	n.a.	
	8.3	508	60	To be provided later		
	8.4	235	60	n.a.		
	8.5	62	86	n.a.		
TANZANIA	9.1 P	5,370	265	Security lighting; Individual provision	51.0	
	9.2 P	5,370	265	Security lighting	21.9	
	9.3 P	5,370	265	None		
	9.4 P	12,100	280	Street lighting; Individual provision	102.3	
	9.5 P	2,300	280	Street lighting; Individual provision	117.3	
	9.6 P	2,000	280	Street lighting; Individual provision	113.9	
	9.7 P*	8,050	280	Street lighting along main roads	18.0	
KENYA	10.1	500	128	Street lighting; Individual electricity	67.1	
	10.2	375	128	Security lighting	28.6	
	10.3	104	126	Security lighting	28.6	
	10.4	723	167	Security lighting	4.0	
	10.5	100	326	Street lighting	22.3	
	10.6	110	188	None		
	10.7	42	298	Street lighting; Individual provision	130.2	
	10.8	94	242	None		
	10.9 P*	4,200	120	Security lighting	14.0	
COLOMBIA	11.1 P	3,500	80	Street lighting; Individual provision	126.1	
	11.2 P	3,500	80	Street lighting; Individual provision	126.1	
	11.3	2,800	140	Street lighting; Individual provision	n.a.	
	11.4	475	140	Street lighting; Individual provision	n.a.	
	11.5	767	140	Street lighting; Individual provision	n.a.	
CHILE	12.1	–	170	Street lighting; Individual electricity	78.0	
ECUADOR	13.1	9,280	120	None		
KOREA	14.1 P*	507	116	Security lighting	n.a.	
	14.2 P*	145	165	Security lighting	n.a.	
	14.3 P*	73	248	Security lighting	n.a.	

World Bank–0832

DATA MATRIX: SURVEY OF 10 BANK SITE & SERVICES PROJECTS

[illegible]

DEVELOPMENT COSTS FOR SITE & SERVICES PLOTS IN 10 BANK PROJECTS (in US$ per Plot)*

COUNTRY/ YEAR OF ESTIMATES/ TYPICAL PLOT	1 ON-SITE INFRASTRUCTURE									4 PLOT DEVELOPMENT						
COST COMPONENTS	1a WATER	1b SEWERAGE	1c ROADS AND DRAINAGE	1d SECURITY LIGHTING & ELECTRICITY	1 TOTAL ON-SITE INFRASTRUCTURE SUB-TOTAL (1)	2 SITE PREPARATION Survey & Earth Works	SUB-TOTAL (2) 1+2	3 LAND Cost charged to Individual Plots	SUB-TOTAL (3) 1+2+3	4a BUILT DWELLING/ PARTIAL DWELLING	4b BUILT SANITARY CORE	4c MATERIALS LOAN FOR DWELLING CONSTRUCTION	4 TOTAL PLOT DEVELOPMENT	SUB-TOTAL (4) 1+2+3+4	5 SUPERVISION & ENGINEERING	TOTAL 1+2+3+4+5
1.0 NICARAGUA – 1973																
1.1 110 sq.m. plot in Managua, individual services, completed 20 sq.m. dwelling.	80.0	100.0	135.0	28.0	343.0	59.0	402.0	200.0	602.0	836.0	–	–	836.0	1438.0	110.0	1548.0
1.2 110 sq.m. plot in Managua; individual services; built sanitary core; materials loan	80.0	100.0	135.0	28.0	343.0	59.0	402.0	200.0	602.0	–	233.0	350.0	583.0	1196.0	110.0	1306.0
2.0 SENEGAL – 1972																
2.1 150 sq.m. plot in Dakar; Communal water and individual pit latrine.	10.4	13.3	20.6	–	44.3	164.4	208.7	–	208.7	–	–	–	–	208.7	27.1	235.8
2.2 150 sq.m. plot in Dakar; individual services; built Sanitary core.	49.5	391.0	20.6	–	461.1	164.4	625.5	–	625.5	–	29.3	–	29.3	654.8	64.0	718.8
2.3 200 sq.m. plot in Thies communal water and individual pit latrine.	13.5	21.9	30.2	–	65.6	13.0	78.6	–	78.6	–	–	–	–	78.6	10.0	88.6
3.0 INDONESIA – 1974																
3.1 80 sq.m. plot in Cengkareng; individual services; 20 sq.m. core house including sanitary unit.	38.8	150.4	164.0	–	353.2	8.8	362.0	152.8	514.8	323.0	–	–	323.0	837.8	24.8	862.6
3.2 140 sq.m. plot in Cengkareng; individual services; 20 sq.m. core house including sanitary unit.	57.4	263.2	287.0	–	607.6	15.4	623.0	257.4	880.4	540.0	–	–	540.4	1430.4	43.4	1473.8
4.0 JAMAICA – 1974																
4.1 94 sq.m. plot in Marcus Garvey; individual services, Materials loan.	88.9	153.6	196.0	–	438.5	224.1	662.6	–	662.6	–	–	682.0	682.0	1344.6	–	1344.6
4.2 94 sq.m. plot in Marcus Garvey; individual services; built sanitary core; Materials loan	88.9	153.6	196.0	–	438.5	224.1	662.6	–	662.6	–	418.0	539.0	957.0	1619.6	–	1619.6
4.3 94 sq.m. plot in Marcus Garvey; individual services; built dwelling; materials loan.	88.9	153.6	196.0	–	438.5	224.1	662.6	–	662.6	1100.0	–	275.0	1375.0	2037.6	–	2037.6
5.0 BOTSWANA – 1973																
5.1 375 sq.m. plot in Francistown; communal water and individual aqua privy; materials loan.	34.0	182.0	36.0	28.4	280.4	–	280.4	–	280.4	–	–	374.0	374.0	654.4	20.0	674.4
5.2 375 sq.m. plot in Francistown; communal water and individual aqua privy; 'traditional area'.	38.0	92.0	64.0	–	194.0	–	194.4	–	194.4	–	–	–	–	194.0	13.0	207.0
6.0 ZAMBIA – 1974																
6.1 210 sq.m. plot in Lusaka; communal water and individual pit latrine; materials loan.	51.5	–	42.0	9.7	103.2	–	103.2	–	103.2	–	–	401.5	401.5	504.7	15.0	519.7
6.2 324 sq.m. plot in Lusaka; communal water and individual pit latrine; materials loan	168.5	–	243.0	48.6	460.1	–	460.1	–	460.1	–	–	401.5	401.5	861.6	61.6	923.2
6.3 324 sq.m. plot in Lusaka; individual services materials loan	171.0	334.0	273.0	45.0	823.0	–	823.0	–	823.0	–	–	817.0	817.0	1640.0	107.0	1747.0
8.0 EL SALVADOR – 1974																
8.1 60 sq.m. plot in San Salvador, individual services, built sanitary core; materials loan	–	–	–	–	174.0	–	174.0	180.0	354.0	–	146.0	422.0	568.0	922.0	165.0	1087.0
8.2 120 sq.m. plot in the Secondary Cities; individual services; built sanitary core; materials loan	–	–	–	–	348.0	–	348.0	360.0	708.0	–	146.0	422.0	568.0	1276.0	330.0	1606.0
9.0 TANZANIA – 1974																
9.7 280 sq.m. plot in Sinza, Dar-es-Salaam communal water and individual aqua privy; materials loan.	39.5	58.5	127.0	19.0	244.0	–	244.0	–	244.0	–	–	700.0	700.0	944.0	–	944.0
10.0 KENYA – 1974																
10.0 120 sq.m. plot in Dandora Nairobi: individual services; built sanitary core; materials loan	46.0	113.4	129.6	14.0	303.0	54.6	357.6	–	357.6	–	210.0	436.0	646.0	1003.6	143.3	1146.9
14.0 KOREA – 1974																
14.1 116 sq.m. plot in Gwangju; individual services; materials loan.																
14.2 186 sq.m. plot in Gwangju, individual services, materials loan																
14.3 248 sq.m. plot in Gwangju, individual services; materials loan.																

*NOTES

- Development costs attributable to residential users excluding contingencies, interest during construction, off-site infrastructure and community facilities.
- Detailed descriptions of standards and level of services, plot development etc. are documented in the Surveys in Annexes B and C.
- Land costs per plot were not available except for Nicaragua, Indonesia and El Salvador

World Bank –8836

COMPARISON OF DEVELOPMENT COSTS FOR SITE & SERVICES PLOTS IN 10 BANK PROJECTS. (US$ PER PLOT).*

	COUNTRY/ YEAR	SURVEY NO.	TYPICAL PLOT	SUB-TOTAL (i) ON-SITE INFRASTRUCTURE	SUB-TOTAL (ii) (i) + SITE PREPARATION	SUB-TOTAL (iii) (ii) + LAND	SUB-TOTAL (iv) (iii) + PLOT DEVELOPMENT	TOTAL (iv) + SUPERVISION & ENGINEERING	TOTAL DEVELOPMENT COST PER CAPITA (Assuming 6 persons per household)
1.0	NICARAGUA 1973	1.1	110 sq.m. plot in Managua	343.0	402.0	602.0	1438.0	1548.0	258
		1.2	110 sq.m. plot in Managua	343.0	402.0	602.0	1195.0	1306.0	217
2.0	SENEGAL 1972	2.1	150 sq.m. plot in Dakar	44.3	208.7	208.7	208.7	235.8	39
		2.2	150 sq.m. plot(in Dakar	461.1	625.5	625.5	654.8	719.8	120
		2.3	200 sq.m. plot in Thies	65.6	78.6	78.6	78.6	98.6	16
3.0	INDONESIA 1974	3.1	80 sq.m. plot in Cengkareng	363.2	382.0	514.8	837.8	862.6	144
		3.2	140 sq.m. plot in Cengkareng	607.6	623.0	890.4	1430.4	1473.8	246
4.0	JAMAICA 1974	4.1	94 sq.m. plot in Marcus Garvey	438.5	662.6	662.6	1344.6	1344.6	224
		4.2	94 sq.m. plot in Marcus Garvey	438.5	662.6	662.6	1519.6	1519.6	253
		4.3	94 sq.m. plot in Marcus Garvey	438.5	662.2	662.6	2037.6	2037.6	340
5.0	BOTSWANA 1973	5.1	375 sq.m. plot in Francistown	280.4	280.4	280.4	654.4	674.4	112
		5.2	375 sq.m. plot in Francistown	194.0	194.0	194.0	194.0	207.0	35
6.0	ZAMBIA 1974	6.1	210 sq.m. plot in Lusaka	103.2	103.2	103.2	504.7	519.7	87
		6.2	324 sq.m. plot in Lusaka	460.1	460.1	460.1	861.6	923.2	154
		6.3	324 sq.m. plot in Lusaka	823.0	823.0	823.0	1640.0	1747.0	291
8.0	EL SALVADOR 1974	8.1	60 sq.m. plot in San Salvador	174.0	174.0	364.0	922.0	1087.0	181
		8.2	120 sq.m. plot in Secondary Cities	348.0	348.0	708.0	1276.0	1606.0	268
9.0	TANZANIA 1974	9.7	280 sq.m. plot in Sinza, Dar.	244.0	244.0	244.0	944.0	944.0	157
10.0	KENYA 1974	10.9	120 sq.m. plot in Dandora, Nbi.	303.0	357.6	357.6	1002.6	1145.9	191
14.0	KOREA 1974	14.1	118 sq.m. plot in Gwangju						
		14.2	165 sq.m. plot in Gwangju						
		14.3	248 sq.m. plot in Gwangju						

* NOTES:

- Development costs attributable to residential users excluding contingencies, interest during construction, off-site infrastructure and community facilities.
- Detailed descriptions of Standards and level of services, plot development etc. are documented in the surveys in Annexes B and C.
- 2.1, 2.3, 5.1, 5.2, 6.1, 6.2, and 9.7 have communal water and pit latrines/aqua privies; the rest have individual services.
- Total development cost per plot represents the cost of developing the plot with services and providing for shelter appropriate for the needs of at least one household.
- Land costs per plot were not available except for Nicaragua, Indonesia and El Salvador.

World Bank—8837

COMPARISON OF DEVELOPMENT COSTS FOR SITE & SERVICES PLOTS IN 10 BANK PROJECTS – ADJUSTED TO A PER CAPITA GNP OF US$200.*

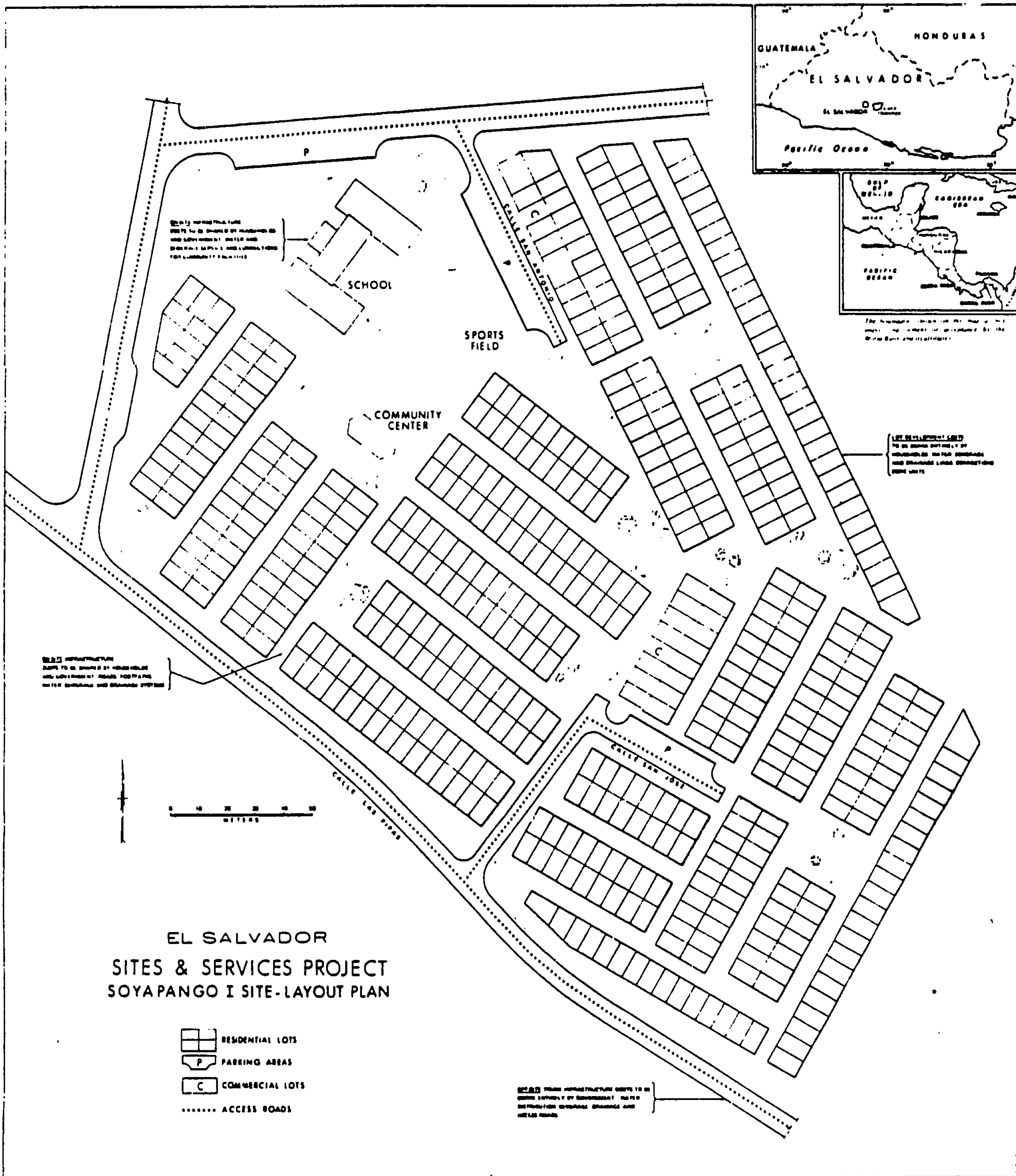
(US$ per Plot)

	COUNTRY/ YEAR	SURVEY NO.	TYPICAL PLOT	SUB-TOTAL (i) ON-SITE INFRASTRUCTURE	SUB-TOTAL (ii) (i) + SITE PREPARATION	SUB-TOTAL (iii) (ii) + LAND	SUB – TOTAL (iv) (iii) + PLOT DEVELOPMENT	SUB-TOTAL (v) (iv) + SUPERVISION & ENGINEERING	TOTAL DEVELOPMENT COST PER CAPITA (Assuming 6 persons per household)
1.0	NICARAGUA 1973	1.1	110 sq.m. plot in Managua	151	177	265	633	681	114
		1.2	110 sq.m. plot in Managua	151	177	265	526	574	96
2.0	SENEGAL 1972	2.1	150 sq.m. plot in Dakar	36	167	167	167	189	32
		2.2	150 sq.m. plot in Dakar	369	500	500	524	576	96
		2.3	200 sq.m. plot in Thies	63	63	63	63	71	12
3.0	INDONESIA 1974	3.1	80 sq.m. plot in Cengkareng	883	905	1287	2095	2157	360
		3.2	140 sq.m. plot in Cengkareng	1519	1568	2226	3678	3685	614
4.0	JAMAICA 1974	4.1	94 sq.m. plot in Marcus Garvey	123	186	186	377	377	63
		4.2	94 sq.m. plot in Marcus Garvey	123	186	186	426	426	71
		4.3	94 sq.m. plot in Marcus Garvey	123	186	186	571	571	95
5.0	BOTSWANA 1973	5.1	375 sq.m. plot in Francistown	361	361	361	818	843	141
		5.2	375 sq.m. plot in Francistown	243	243	243	243	258	4J
6.0	ZAMBIA 1974	6.1	210 sq.m. plot in Lusaka	56	56	56	288	275	48
		6.2	324 sq.m. plot in Lusaka	244	244	244	457	489	82
		6.3	324 sq.m. plot in Lusaka	436	436	436	869	926	164
8.0	EL SALVADOR 1974	8.1	60 sq.m. plot in San Salvador	110	110	223	581	686	114
		8.2	120 sq.m. plot in Secondary Cities	219	219	446	804	1012	169
9.0	TANZANIA 1974	9.7	260 sq.m. plot in Sinza, Dar.	444	444	444	1718	1718	286
10.0	KENYA 1974	10.9	120 sq.m. plot in Dandora, Nbi.	379	447	447	1253	1432	239
14.0	KOREA 1974	14.1	116 sq.m. plot in Gwangju						
		14.2	165 sq.m. plot in Gwangju						
		14.3	248 sq.m. plot in Gwangju						

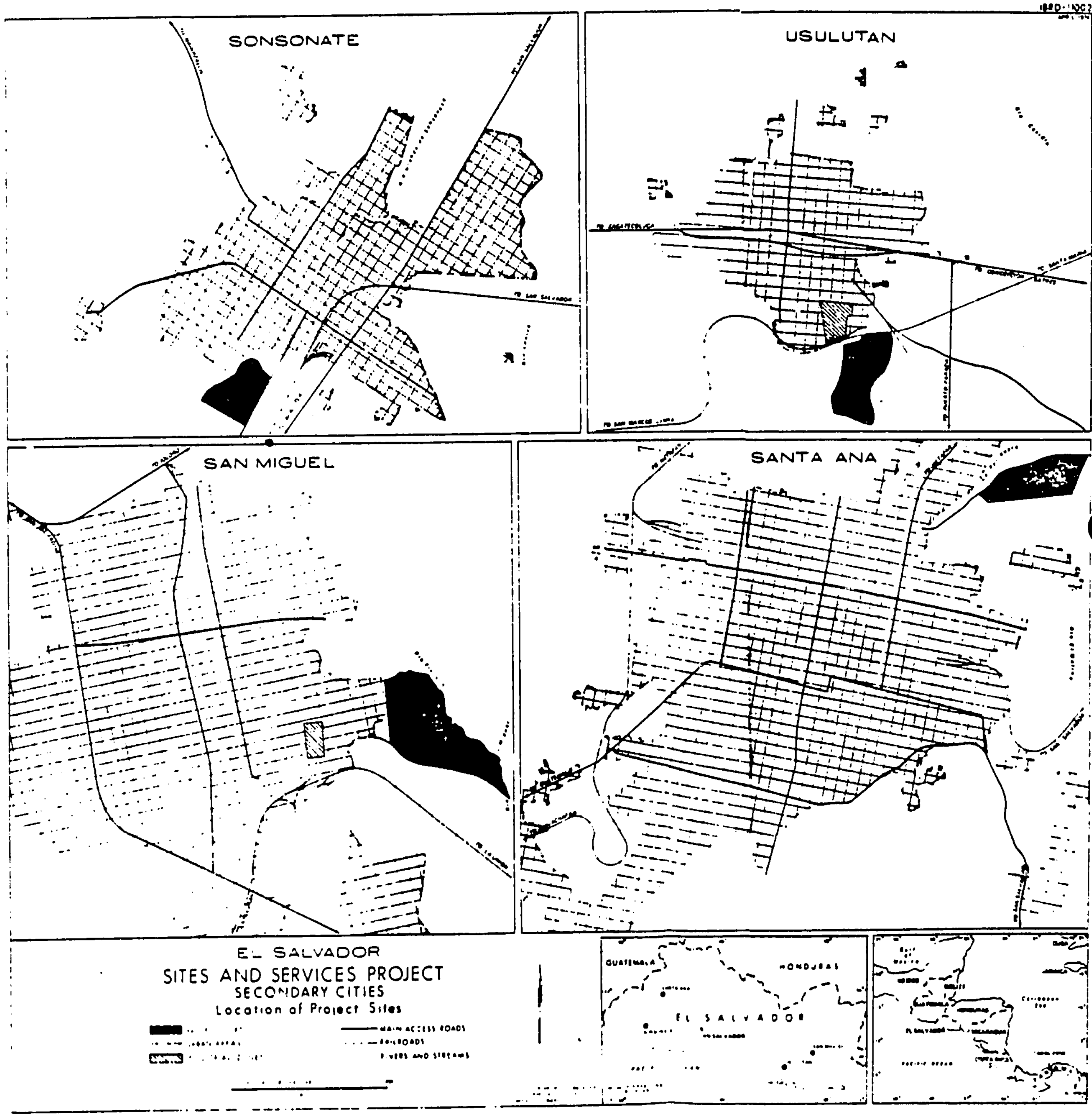
*NOTES:

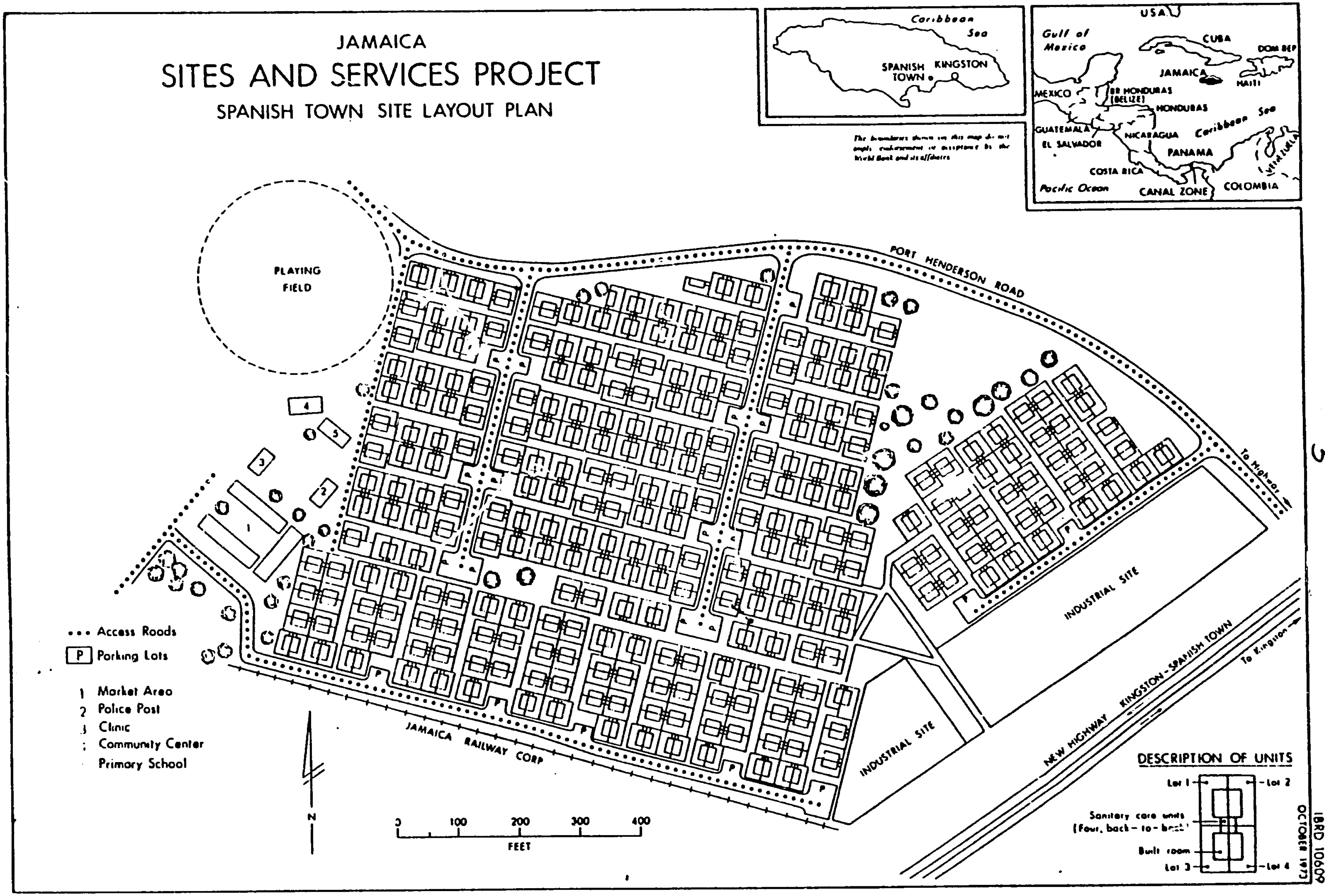
- Derived by the following adjustment factors: Nicaragua 200/450 = 0.44; Senegal 200/250 = 0.80; Indonesia 200/80 = 2.5; Jamaica 200/720 = 0.28, Botswana 200/160 = 1.25; Zambia 200/380 = 0.53; El salvador 200/320 = 0.63; Tanzania 200/110 = 1.82; Kenya 200/160 = 1.25 and Korea 200/290 = 0.69.

World Bank—8638

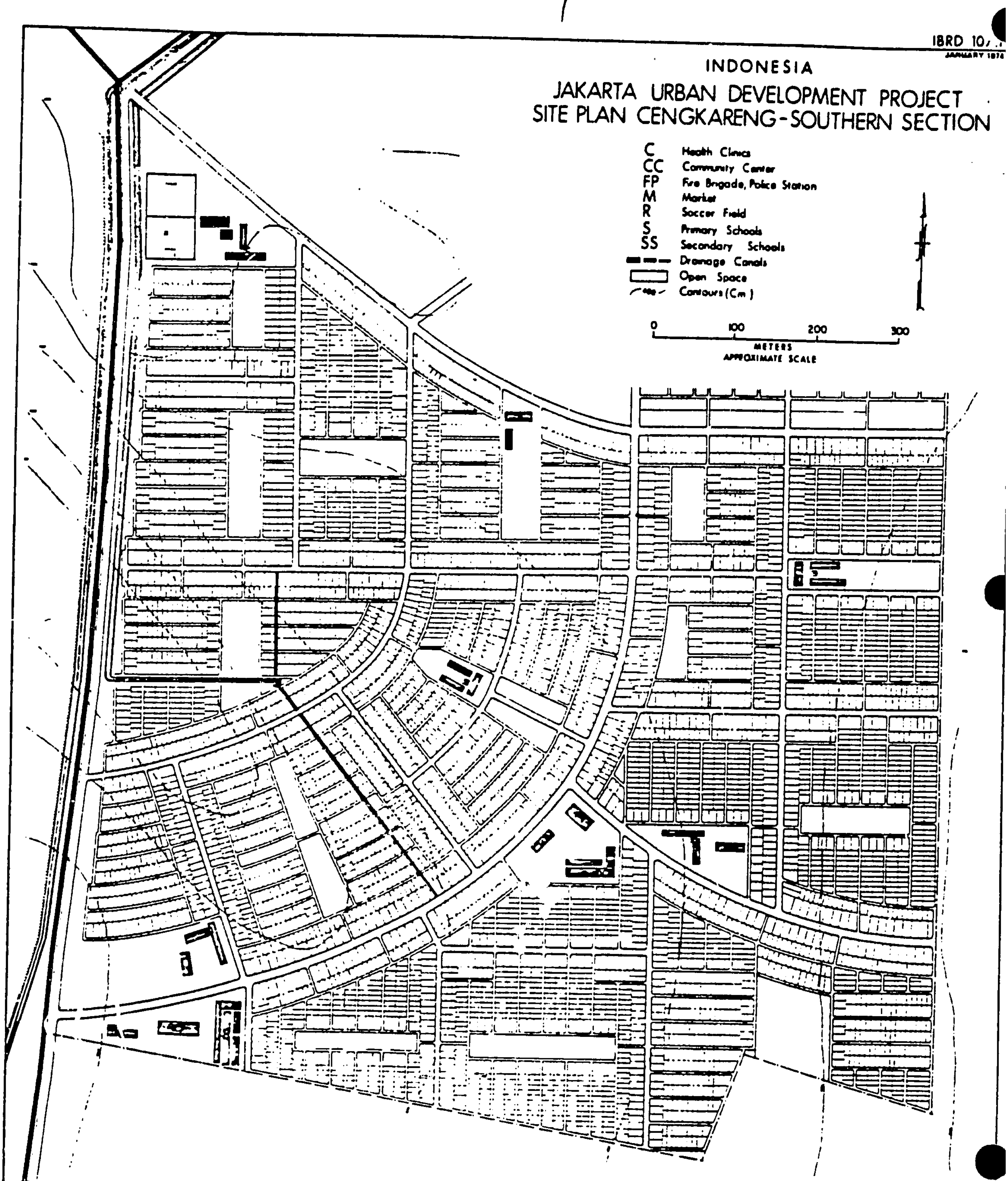

GUATEMALA
HONDURAS
EL SALVADOR
Pacific Ocean
P
SCHOOL
CALLE SAN ANTONIO
SPORTS FIELD
C
COMMUNITY CENTER
CALLE SAN JOSE
0 10 20 30 40 50
METERS
EL SALVADOR
SITES & SERVICES PROJECT
SOYAPANGO I SITE-LAYOUT PLAN
RESIDENTIAL LOTS
PARKING AREAS
COMMERCIAL LOTS
ACCESS ROADS
IBRD 10903

2

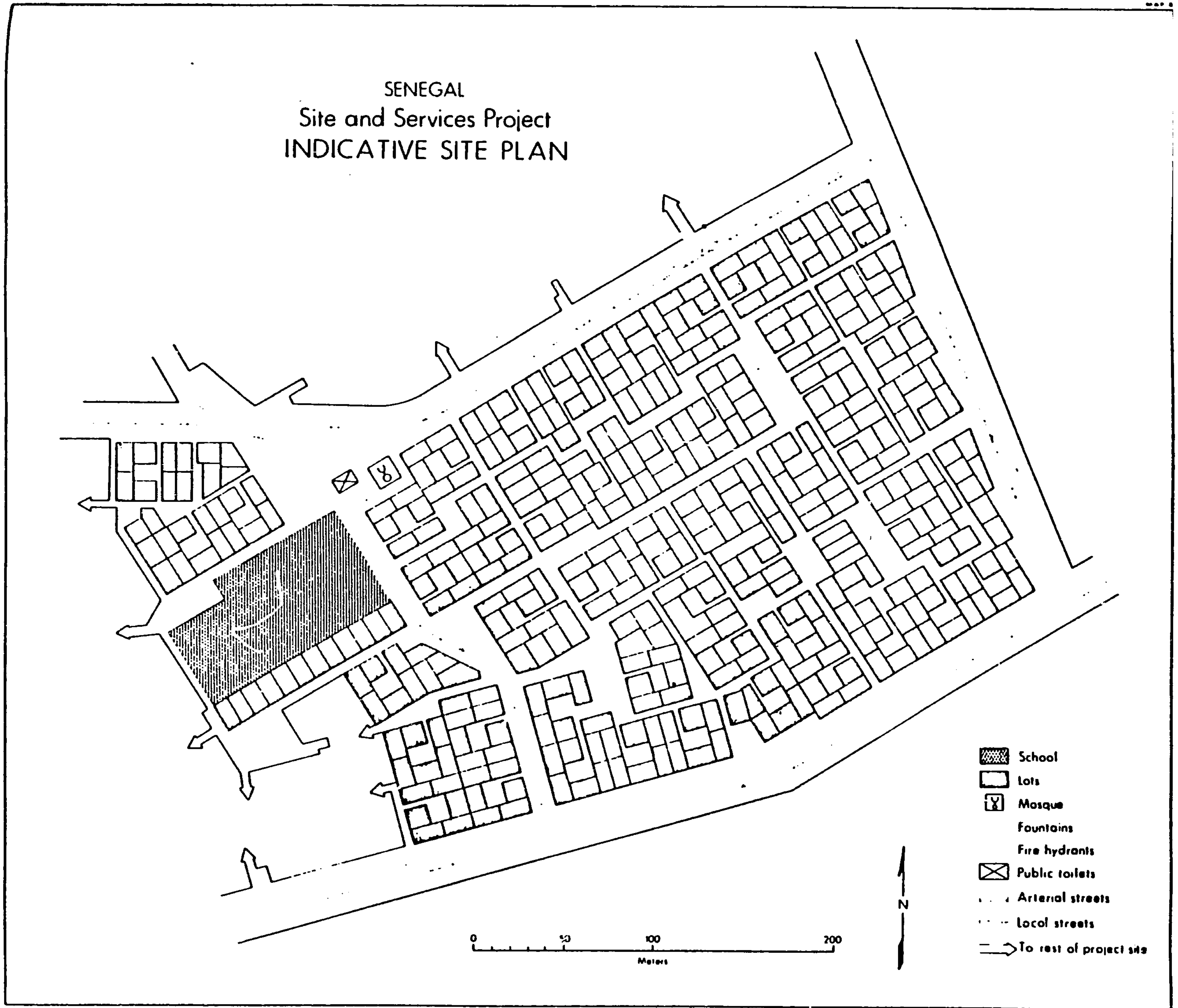

SONSONATE
USULUTAN
SAN MIGUEL
SANTA ANA
EL SALVADOR
SITES AND SERVICES PROJECT
SECONDARY CITIES
Location of Project Sites
MAIN ACCESS ROADS
RAILROADS
RIVERS AND STREAMS
GUATEMALA
HONDURAS
E L S A L V A D O R

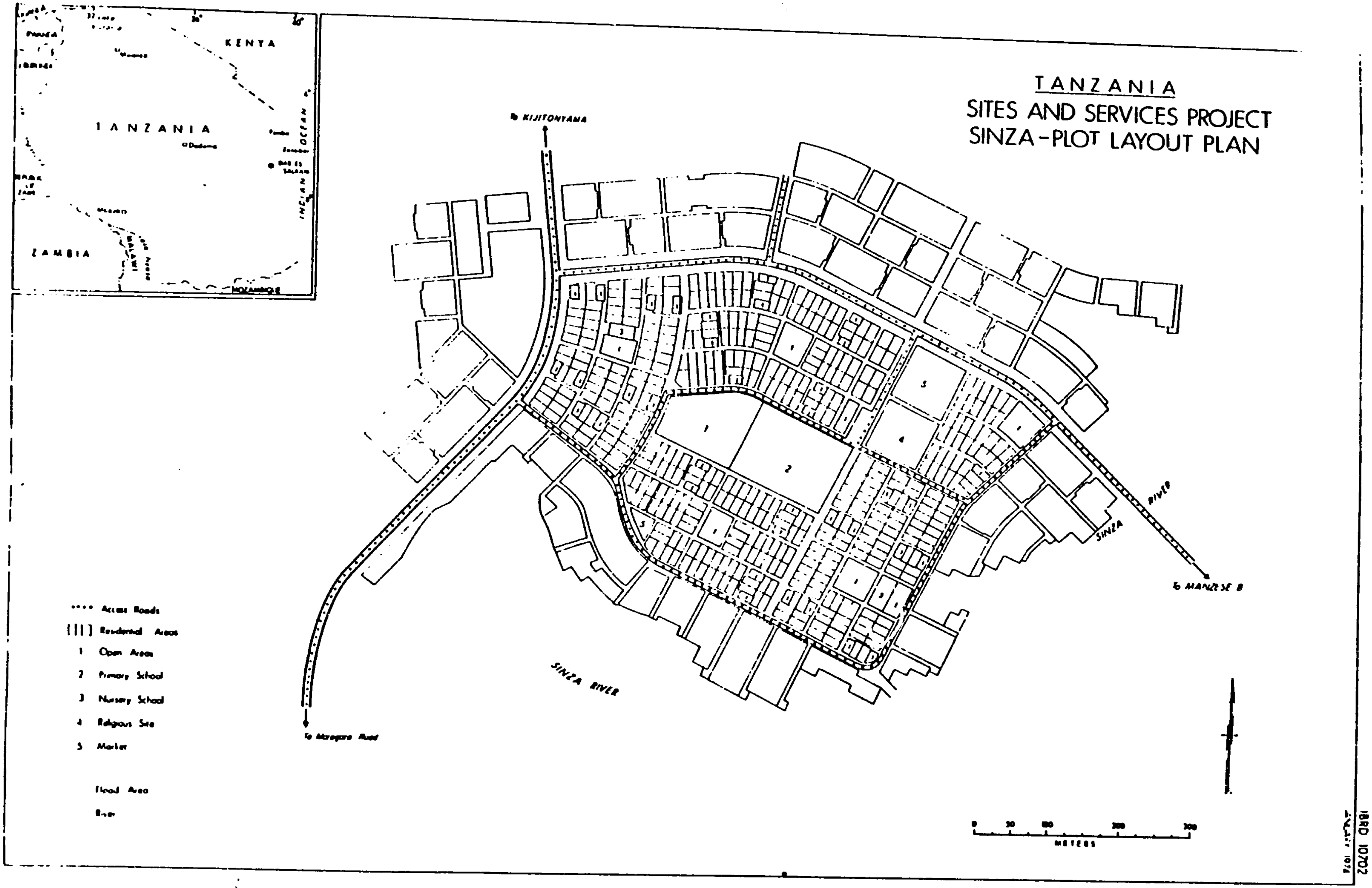

JAMAICA
SITES AND SERVICES PROJECT
SPANISH TOWN SITE LAYOUT PLAN
Caribbean Sea
SPANISH TOWN
KINGSTON
USA
Gulf of Mexico
CUBA
DOM REP
JAMAICA
HAITI
MEXICO
BR HONDURAS (BELIZE)
HONDURAS
GUATEMALA
EL SALVADOR
NICARAGUA
Caribbean Sea
PANAMA
COSTA RICA
Pacific Ocean
CANAL ZONE
COLOMBIA
VENEZUELA
PLAYING FIELD
PORT HENDERSON ROAD
To Highway
INDUSTRIAL SITE
INDUSTRIAL SITE
NEW HIGHWAY KINGSTON - SPANISH TOWN
To Kingston
JAMAICA RAILWAY CORP
Access Roads
P Parking Lots
1 Market Area
2 Police Post
3 Clinic
Community Center
Primary School
N
0 100 200 300 400
FEET
DESCRIPTION OF UNITS
Lot 1
Lot 2
Sanitary core units (Four, back-to-back)
Built room
Lot 3
Lot 4
IBRD 10609
OCTOBER 1973
3

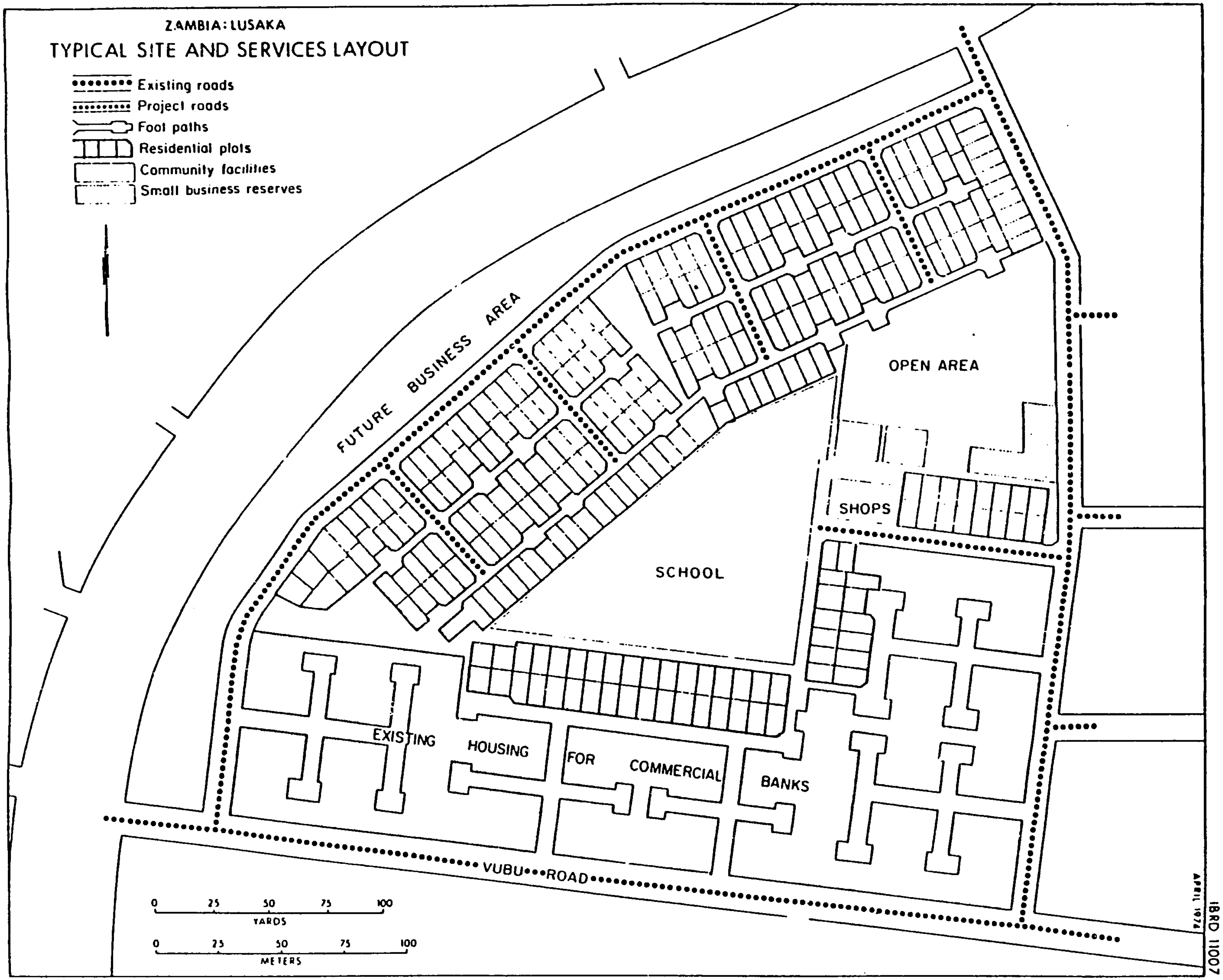
4



IBRD 10..
JANUARY 1974
INDONESIA
JAKARTA URBAN DEVELOPMENT PROJECT
SITE PLAN CENGKARENG-SOUTHERN SECTION
C Health Clinics
CC Community Center
FP Fire Brigade, Police Station
M Market
R Soccer Field
S Primary Schools
SS Secondary Schools
Drainage Canals
Open Space
Contours (Cm)
0
100
200
300
METERS
APPROXIMATE SCALE


SENEGAL
Site and Services Project
INDICATIVE SITE PLAN
School
Lots
Mosque
Fountains
Fire hydrants
Public toilets
Arterial streets
Local streets
To rest of project site
0
50
100
200
Meters
N
FEBRUARY 1972
IBRD 1851


TANZANIA
SITES AND SERVICES PROJECT
SINZA-PLOT LAYOUT PLAN
To KIJITONYAMA
To Morogoro Road
To MANZESE B
SINZA RIVER
SINZA RIVER
KENYA
TANZANIA
ZAMBIA
INDIAN OCEAN
Dodoma
DAR ES SALAAM
MOZAMBIQUE
Access Roads
Residential Areas
1 Open Areas
2 Primary School
3 Nursery School
4 Religious Site
5 Market
Flood Area
River
0 50 100 200 300
METERS
IBRD 10702



ZAMBIA: LUSAKA
TYPICAL SITE AND SERVICES LAYOUT
Existing roads
Project roads
Foot paths
Residential plots
Community facilities
Small business reserves
FUTURE BUSINESS AREA
OPEN AREA
SHOPS
SCHOOL
EXISTING HOUSING FOR COMMERCIAL BANKS
VUBU ROAD
0 25 50 75 100
YARDS
0 25 50 75 100
METERS
APRIL 1974
IBRD 11007

Office of Housing
Agency for International Development

SHELTER
TRAINING
WORKSHOP

November 5-30, 1979

SUPPLEMENTARY REFERENCE MATERIAL

ON

SITES AND SERVICES

SITE LAYOUT AND INFRASTRUCTURE

(To accompany packet for Sites and Services Session Code 37.P)

Additional Reference Material on Sites and Services Site Layout and Infrastructure

These supplementary materials are provided for reference. They include:

Reproductions of selections from Horacio Caminos' and Reinhard Goethert's Urbanization Primer. There are a glossary and bibliography relating to urbanization in developing countries. Sections on design criteria and site analysis are presented here, not as a model for project planning to follow, but rather as examples of an effort to analyze design issues systematically. Close scrutiny of every project element for ways to simplify, reduce, substitute, eliminate or privide in incremental stages over time is important to the process of developing affordable shelter.

April and May 1979 numbers of The Urban Edge which address the subjects of planning infrastructure to serve the urban poor in developing countries, and innovations in construction technology applicable in projects for the urban poor.

Portions of Alternative Sanitation Technologies for Urban Areas in Africa, a 1979 study which addresses this most critical aspect of urban projects.

The following material comes from a 1976 study prepared by Horacio Caminos and Reinhard Goethert as a reference work for World Bank staff involved in sites and services projects. Title of the study is:

<u>Urbanization Primer</u>.

It represents an effort to analyze systematically the relative efficiency of different site layouts. Examples presented here are schematic, and, as indicated on page 105, they bear no relation to any specific sites or settings or populations. For this reason, they are more useful for the general principles they illustrate than as a point of departure for project design.

The chapter on site analysis indicates how special characteristics such as climate or topography, site location or service requirements bear on sites and services project design. It goes without saying that the relative importance of these factors varies from one situation to another. They are included here as a sort of checklist.

GLOSSARY

The glossary contains terms used in the text whether they are or not marked with an asterisk.

The criteria for the preparation of the definitions have been as follows:

* *FIRST PREFERENCE: definitions from* Webster's Third New International Dictionary, *(Merriam-Webster, 1971.)*
* *SECOND PREFERENCE: definitions from technical dictionaries, text books, or reference manuals.*
* *THIRD PREFERENCE: definitions from the Urban Settlement Design Program (U.S.D.P.) Files. They are used when existing sources were not quite appropriate/satisfactory.*

Words added for specificity and to focus on a particular context are indicated by square brackets. Sources of definitions are indicated in parentheses. (See also BIBLIOGRAPHY).

ACCESSES. The pedestrian/vehicular linkages from/to the site to/from existing or planned approaches [urban streets, limited-access highways, public transportation systems, and other systems such as: waterways, airlines, etc.]. (U.S.D.P.)

ACTUAL LAND COST. "[The cost of land is] set solely by the level of demand. The price of land is not a function of any cost conditions; it is set by the users themselves in competition." (Turner, 1971)

AD VALOREM (TAX). A tax based on a property's value; the value taxed by local governments is not always or even usually the market value, but only a valuation for tax purposes. (U.S.D.P.)

[AIRPORT] DISTURBANCE. The act or process of destroying the rest, tranquility, or settled state of [the site by the annoyance of airport noise, vibration, hazards, etc.]. (Merriam-Webster, 1971)

AIRPORT ZONING RESTRICTIONS. The regulation of the height or type of structures in the path of moving aircraft. (Abrams, 1971)

ALL WEATHER (SURFACE COURSE). A temporary surface (such as layered oil, gravel) constructed over the base so that hard surfacing can be easily accomplished at a later date. (U.S.D.P.)

ALTERNATING CURRENT (A.C.). (An electric) current that reverses its direction of flow at regular intervals. (ROTC ST 45-7, 1953)

AMENITY. Something that conduces to physical or material comfort or convenience, or which contributes satisfaction rather than money income to its owner. (Merriam-Webster, 1971)

AMPERE (amp). A measure of the rate of flow of electricity. It is somewhat comparable to the rate of flow of water (quantity/time). A steady current produced by one volt applied across a resistance of one ohm. (ROTC ST 45-7, 1953)

APARTMENT. *See* **DWELLING UNIT TYPE.**

APPRAISAL. An estimate and opinion of value, especially by one fitted to judge. (Merriam-Webster, 1971)

APPROACHES. The main routes external to the site (pedestrian/vehicular) by which the site can be reached from other parts of the urban context. (U.S.D.P.)

AQUA PRIVY. An excreta disposal system that consists of a watertight tank with a constant water level. Excrement and urine undergo anaerobic decomposition and the liquids in the tank overflow into soakage or leaching pits to be absorbed by the soil. Initial cost is high, but operating costs are low; however, the tank has to be emptied of the digested sludge at infrequent intervals and the liquid pollutes the soil. This kind of system requires high soil absorption capacity, and large lots for adequate distance between adjacent systems. (U.S.D.P.)

ARTISAN-BUILT. *See* **DWELLING BUILDER.**

ASSESSED VALUE. A valuation placed upon property by a public officer or board as a basis for taxation. (Keyes, 1971)

ASSESSMENT. The value of property for the purpose of levying a tax or the amount of the tax levied. (Keyes, 1971)

BACKFILL. Earth or other material used to replace material removed during construction, such as in culvert, sewer, and pipeline trenches and behind bridge abutments and retaining walls or between an old structure and a new lining. (DePina, 1972)

BARRIER. [A boundary] (as a topographic feature or a physical or psychological quality) that tends to separate or restrict the free movement [to and from the site]. (Merriam-Webster, 1971)

BETTERMENT (TAX). A tax on the increment in value accruing to an owner because of development and improvement work carried out by local authorities. (U.S.D.P.)

BINDER COURSE. A transitional layer of bituminous paving between the crushed stone base and the surface course [to increase bond between base and surface course]. (DePina, 1972)

BITUMINOUS. A coating of or containing bitumen; as asphalt or tar. (DePina, 1972)

BITUMINOUS BASE COURSE. A paving base consisting of coarse aggregate treated with hot asphalt cement. (U.S.D.P.)

BITUMINOUS WEARING TREATMENT. A wearing surface composed of single or multiple layers of aggregate bonded to the primed base or road surface by hot bituminous material. (Edwards, 1961)

BLOCK. A portion of land bounded and served by lines of public streets. (U.S.D.P.)

BOUNDARY. Something [a line or area] that fixes or indicates a limit or extent [of the site]. (Merriam-Webster, 1971)

BUILDING CODE. A body of legislative regulations or by-laws that provide minimum standards to safeguard life or limb, health, property, and public welfare by quality of materials, use and occupancy, location and maintenance of all buildings and structures within the city, and certain equipment specifically regulated therein. (BOCA, 1967)

BUILDING DRAIN. Lowest horizontal piping of the building drainage system receiving discharge from soil, waste, and other drainage pipes. It is connected to the building sewer. (ROTC ST 45-7, 1953)

BUILDING MAIN. Water-supply pipe and fittings from the water main or other source of supply to the first branch of the water-distribution system of a building. (ROTC ST 45-7, 1953)

CAPITAL COSTS. *See* **COSTS OF URBANIZATION**

CENTER. *See* **DWELLING LOCATION**

CESSPOOL. An underground catch basin that is used where there is no sewer and into which household sewage or other liquid waste is drained to permit leaching of the liquid into the surrounding soil. (Merriam-Webster, 1971)

CIRCULATION. System(s) of movement/passage of people, goods from place to place; streets, walkways, parking areas. (U.S.D.P.)

CLAY. A lusterless colloidal substance, plastic when moist (crystalline grains less than 0.002mm in diameter). (U.S.D.

CLEANOUT. A plug or similar fitting to permit access to traps or sewer lines. Cleanouts are usually used at turns and other points of collection. (ROTC ST 45-7, 1953)

CLIMATE. The average condition of the weather at a particular place over a period of years as exhibited by temperature, wind, precipitation, sun energy, humidity, etc. (Merriam-Webster, 1971)

COLLECTION SYSTEM. The system of pipes in a sewage network, comprised of house service, collection lines, manholes, laterals, mains. (U.S.D.P.)

COLLEGES/UNIVERSITIES. *See* **SCHOOL.**

COMBINED SEWER. A sewer that carries both storm water and sanitary or industrial wastes. (DePina, 1972)

COMMUNITY. The people living in a particular place or region and usually linked by common interests: the region itself; any population cluster. (U.S.D.P.)

COMMUNITY FACILITIES/SERVICES. Facilities/services used in common by a number of people, including schools, health, recreation, police, fire, public transportation, community center, etc. (U.S.D.P.)

COMMUNITY RECREATION FACILITIES. Facilities for activities voluntarily undertaken for pleasure, fun, relaxation, exercise, self-expression, or release from boredom, worry, or tension. (U.S.D.P.)

COMPONENT. A constituent part of the utility network. (U.S.D.P.)

CONCRETE PAVING (PORTLAND CEMENT). A paving slab consisting of water, aggregate and cement in the required proportions, reinforced with a steel mesh. (U.S.D.P.)

CONDOMINIUM. A system of direct ownership of a single unit in a multi-unit whole. The individual owns the unit in much the same manner as if it were a single family dwelling: he holds direct legal title to the unit and a proportionate interest in the common land and areas. Two types of condominiums are recognized: *HORIZONTAL:* detached, semi-detached, row/grouped dwelling types; *VERTICAL:* walk-up, high-rise dwelling types. (U.S.D.P.)

CONDUCTORS. Materials which allow current to flow such as aluminum, copper, iron. (ROTC ST 45-7, 1953)

CONDUIT. A pipe or other opening, buried or above ground, for conveying hydraulic traffic, pipelines, cables, or other utilities. (DePina, 1972)

CONSERVATION EASEMENT. An easement acquired by the public and designed to open privately owned lands for recreational purposes or to restrict the use of private land in order to preserve open space and protect certain natural resources. (U.S.D.P.)

CONSTRUCTION BORING. A subsurface boring done at the planned location of all infrastructure and building footings and roadway subbases for design of foundation systems. (U.S.D.P.)

CONVEYANCE. The transfer of ownership [of land]. (Merriam-Webster, 1971)

CORPORATION COCK/CORPORATION STOP. A water or gas cock by means of which utility-company employees connect or disconnect service lines to a consumer. (Merriam-Webster, 1971)

COSTS OF URBANIZATION. Include the following: *CAPITAL:* cost of land and infrastructure; *OPERATING:* cost of administration, maintenance, etc.; *DIRECT:* include capital and operating costs; *INDIRECT:* include environmental and personal effects. (U.S.D.P.)

COURSE. A horizontal layer forming one of series [as of concrete or asphalt in road making]. (Merriam-Webster, 1971)

CURRENT (*See:* **ALTERNATING CURRENT, DIRECT CURRENT**). An electric current is a movement of positive or negative electric particles (as electrons) accompanied by such observable effects as the production of heat, of a magnetic field, or of chemical transformation. (Merriam-Webster, 1971)

CYCLE. One complete performance of a vibration, electric oscillation, current alternation, or other periodic process. (Merriam-Webster, 1971)

DAM. A barrier preventing the flow of water; a barrier . . . built across a watercourse to confine and keep back flowing water. (Merriam-Webster, 1971)

DEPRECIATION ACCELERATION (TAX). A tax incentive designed to encourage new construction by allowing a faster write-off during the early life of a building. (U.S.D.P.)

DESIGN. 1) The arrangement of elements that make up a work of art, a machine or other man-made object. 2) The process of selecting the means and contriving the elements, steps, and procedures for producing what will adequately satisfy some need. (Merriam-Webster, 1971)

DETACHED DWELLING. An individual dwelling unit, separated from others (U.S.D.P.)

DEVELOPMENT. Gradual advance or growth through progressive changes; a developed tract of land. (U.S.D.P.)

DEVELOPMENT SIZE. There are two general ranges of size: *LARGE:* may be independent communities requiring their own utilities, services, and community facilities; *SMALL:* generally are part of an adjacent urbanization and can use its supporting utilities, services, and community facilities. (U.S.D.P.)

DIRECT COSTS. *See* **COSTS OF URBANIZATION.**

DIRECT CURRENT (D.C.) (An electric current that) flows continuously in one direction. (ROTC ST 45-7, 1953)

DISCHARGE (Q). Flow from a culvert, sewer, channel, etc. (DePina, 1972)

DISTANCE. The degree or amount of separation between two points [the site and each other element of the urban context] measured along the shortest path adjoining them [paths of travel]. (Merriam-Webster, 1971)

DISTRIBUTION (STATION). The part of an electric supply system between bulk power sources (as generating stations or transformation station tapped from transmission lines) and the consumers' service switches. (Merriam-Webster, 1971)

DISTURBED SOIL. Soil that has been disturbed by an artificial process, such as excavation, transportation, and compaction in fill. (U.S.D.P.)

DRAINAGE. Interception and removal of groundwater or surface water, by artificial or natural means. (DePina, 1972)

DUST/DIRT. Fine dry pulverized particles of earth, grit, refuse, waste, litter, etc. (Merriam-Webster, 1971)

DWELLING. The general, global designation of a building/shelter in which people live. A dwelling contains one or more "dwelling units." (U.S.D.P.)

DWELLING BUILDER. Four groups are considered: *SELF-HELP-BUILT:* where the dwelling unit is directly built by the user or occupant; *ARTISAN–BUILT:* where the dwelling unit is totally or partially built by a skilled craftsman hired by the user or occupant; payments can be monetary or an exchange of services; *SMALL-CONTRACTOR-BUILT:* where the dwelling unit is totally built by a small organization hired by the user, occupant, or developer; "small" contractor being defined by the scale of oper ations, financially and materially; the scale being limited to the construction of single dwelling units or single complexes; *LARGE-CONTRACTOR-BUILT:* where the dwelling unit is totally built by a large organization hired by a developer; "large" contractor being defined by the scale of operations, financially and materially; the scale reflects a more comprehensive and larger size of operations encompassing the building of large quantities of similar units, or a singularly large complex. (U.S.D.P.)

DWELLING DENSITY. The number of dwellings, dwelling units, people or families per unit [hectare]. Gross density is the density of an overall area (e.g., including lots, streets). Net density is the density of selected, discrete portions of an area (e.g., including only lots). (U.S.D.P.)

DWELLING DEVELOPER. Three sectors are considered in the supply of dwellings: *POPULAR SECTOR:* the marginal sector with limited or no access to the formal financial, administrative, legal, technical institutions involved in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the Popular Sector generally for "self use" and sometimes for profit. *PUBLIC SECTOR:* the government or non profit organizations involved in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the Public Sector for service (non profit or subsidized housing). *PRIVATE SECTOR:* the individuals, groups or societies, who have access to the formal financial, administrative, legal, technical institutions in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the Private Sector for profit. (U.S.D.P.)

DWELLING DEVELOPMENT MODE. Two modes are considered: *PROGRESSIVE:* the construction of the dwelling and the development of the local infrastructure to modern standards by stages, often starting with provisional structures and undeveloped land. This essentially traditional procedure is generally practiced by squatters with de facto security of tenure and an adequate building site. *INSTANT:* the formal development procedure in which all structures and services are completed before occupation. (U.S.D.P)

DWELLING FLOORS. The following numbers are considered: *ONE:* single-story; generally associated with detached, semidetached and row/group dwelling types. *TWO:* double-story; generally associated with detached, semi-detached and row/group dwelling types. *THREE OR MORE:* generally associated with walk-up and high-rise dwelling types. (U.S.D.P.)

DWELLING GROUP. The context of the dwelling in its immediate surroundings. (U.S.D.P.)

DWELLING/LAND SYSTEM. A distinct dwelling environment/ housing situation characterized by its users as well as by its physical environment. (U.S.D.P.)

DWELLING LOCATION. Three sectors are considered in single- or multi center urban areas. Sectors are identified by position as well as by the density of buildings as follows: *CENTER:* the area recognized as the business center of the city, generally the most densely built-up sector; *INNER RING:* the area located between the city center and the urban periphery, generally a densely built-up sector; *PERIPHERY:* the area located between the inner ring and the rural areas, generally a scatteredly built-up sector. (U.S.D.P.)

DWELLING PHYSICAL STATE. A qualitative evaluation of the physical condition of the dwelling types: room, apartment, house; the shanty unit is not evaluated. *BAD:* generally poor state of structural stability, weather protection, and maintenance. *FAIR:* generally acceptable state of structural stability, weather protection, and maintenance with some deviation. *GOOD:* generally acceptable state of structural stability, weather protection, and maintenance without deviation. (U.S.D.P.)

DWELLING TYPE. The physical arrangement of the dwelling unit: *DETACHED:* individual dwelling unit, separated from others. *SEMIDETACHED:* two dwelling units sharing a common wall (duplex). *ROW/GROUPED:* dwelling units grouped together linearly or in clusters. *WALK-UP:* dwelling units grouped in two to five stories with stairs for vertical circulation. *HIGH-RISE:* dwelling units grouped in five or more stories with stairs and lifts for vertical circulation. (U.S.D.P.)

DWELLING UNIT. A self-contained unit in a dwelling for an individual, a family, or a group. (U.S.D.P.)

DWELLING UNIT AREA. The dwelling unit area (m^2) is the built-up, covered area of a dwelling unit. (U.S.D.P.)

DWELLING UNIT COST. The initial amount of money paid for the dwelling unit or the present monetary equivalent for replacing the dwelling unit. (U.S.D.P.)

DWELLING UNIT TYPE. Four types of dwelling units are considered: *ROOM:* A SINGLE SPACE usually bounded by partitions and specifically used for living; for example, a living room, a dining room, a bedroom, but not a bath/toilet, kitchen, laundry, or storage room. SEVERAL ROOM UNITS are contained in a building/shelter and share the use of the parcel of land on which they are built (open spaces) as well as common facilities (circulation, toilets, kitchens). *APARTMENT:* A MULTIPLE SPACE (room/set of rooms with bath, kitchen, etc.) SEVERAL APARTMENT UNITS are contained in a building and share the use of the parcel of land on which they are built (open spaces) as well as some common facilities (circulation). *HOUSE:* A MULTIPLE SPACE (room/set of rooms with or without bath, kitchen, etc.) ONE HOUSE UNIT is contained in a building/shelter and has the private use of the parcel of land on which it is built (open spaces) as well as the facilities available. *SHANTY:* A SINGLE [illegible] MULTIPLE SPACE (small, crudely built). ONE SHANTY UNIT is contained in a shelter and shares with other shanties the use of the parcel of land on which they are built (open spaces). (U.S.D.P.)

DWELLING UTILIZATION. The utilization indicates the type of use with respect to the number of inhabitants/families. *SINGLE:* an individual or family inhabiting a dwelling. *MULTIPLE:* a group of individuals or families inhabiting a dwelling. (U.S.D.P.)

EASEMENT. Servitude: a right in respect of an object (as land owned by one person) in virtue of which the object [land] is subject to a specified use or enjoyment by another person or for the benefit of another thing. (Merriam-Webster, 1971)

EFFICIENCY. Capacity to produce desired results with a minimum expenditure of energy, time, money or materials. (Merriam-Webster, 1971)

EFFLUENT. Outflow or discharge from a sewer or sewage treatment equipment. (DePina, 1972)

ELECTRIC FEEDER. That part of the electric distribution system between the transformer and the service drop or drops. (HUD, Mobile Court Guide, 1970)

ELECTRIC SERVICE DROP. That part of the electric distribution system from a feeder to the user's service equipment serving one or more lots. (HUD, Mobile Court Guide, 1970)

ELECTRIC TRANSFORMER. A device which changes the magnitude of alternating voltages and currents; generally from distribution voltages to user voltages; a distribution component that converts power to usable voltage. (TM 5 765 Army, 1970; U.S.D.P.)

ELECTRICAL CIRCUIT. A closed, complete electrical path with various connected loads. Circuits may either be "parallel" (voltage constant for all connected [illegible]) or eries (voltage divided among connected oads). Parallel circuits are fixtures wired ndependent of each other, which are used in nearly all building wiring. (U.S.D.P.; ROTC ST 45-7, 1953)

ELECTRICAL FREQUENCY. The number of times an alternating electric current changes direction in a given period of time. Measured in cycles per second: hertz (Hz). (ROTC ST 45-7, 1953)

ELECTRICAL GROUND. The electrical connection with the earth or other ground. (Merriam-Webster, 1971)

ELECTRICAL NETWORK COMPONENTS. It is composed of the following: *GENERATION:* provides electricity; *TRANSMISSION:* transports energy to user groups; *DISTRIBUTION STATION:* divides power among main user groups; *SUBSTATION:* manipulates power into useful energy levels for consumption; *DISTRIBUTION NETWORKS:* provides electrical service to user. (U.S.D.P.)

ELECTRICAL PHASE. May be either a single-phase circuit (for small electrical devices) or a three-phase circuit (for heavy equipment, large electrical devices). In single-phase, only one current is flowing through the circuit, with the voltage dropping to zero twice in each cycle. In three-phase, current flows through the circuit continuously, with the power never dropping to zero. (U.S.D.P.)

ELECTRICAL POWER. The source or means of supplying energy for use; measured in watts. (U.S.D.P.)

ELECTRICAL WIRING SYSTEMS. May either be single-phase or three-phase. *SINGLE-PHASE:* 2 hot wires with 1 neutral wire; *THREE-PHASE:* 3 hot wires with 1 neutral wire. (ROTC ST 45-7, 1953)

EMBANKMENT (or FILL). A bank of earth, rock, or other material constructed above the natural ground surface. (DePina, 1972)

EROSION. The general process whereby materials of the earth's crust are worn away and removed by natural agencies including weathering, solution, corrosion, and transportation; specifically land destruction and simultaneous removal of particles (as of soil) by running water, waves and currents, moving ice, or wind. (Merriam- Webster, 1971)

EXCRETA. Waste matter eliminated from the body. (U.S.D.P.)

EXISTING STRUCTURE. Something constructed or built (on the site). (U.S.D.P.)

EXPLORATORY BORING. Initial subsurface investigations (borings) done on a grid superimposed on the areas of interest and on areas indicated as limited/restricted/hazardous in the initial survey. (U.S.D.P.)

EXTERIOR CIRCULATION/ACCESSES (SITE PLANNING). The existing and proposed circulation system/accesses outside but affecting the site. These include limited access highways as well as meshing access to the surrounding area. Exterior circulation/accesses are generally given conditions. (U.S.D.P.)

FAUCET (also TAP). A fixture for drawing liquid from a pipe, cask, or other vessel. (Merriam-Webster, 1971)

FINANCING. The process of raising or providing funds. *SELF-FINANCED:* provided by own funds; *PRIVATE/PUBLIC FINANCED:* provided by loan; *PUBLIC SUBSIDIZED:* provided by grant or aid. (U.S.D.P.)

FIRE/EXPLOSION HAZARDS. Danger: the state of being exposed to harm; liable to injury, pain, or loss from fire/explosion [at or near the site]. (Merriam-Webster, 1971)

FIRE FLOW. The quantity (in time) of water available for fire-protection purposes in excess of that required for other purposes. (Meriam-Webster, 1971)

FIRE HYDRANT. A water tap to which fire hoses are connected in order to smother fires. (U.S.D.P.)

FIRE PROTECTION. Measures and practices for preventing or reducing injury and loss of life or property by fire. (Merriam-Webster, 1971)

FLEXIBLE PAVEMENT. A pavement structure which maintains intimate contact with and distributes loads to the subgrade and depends upon aggregate interlock, particle friction, and cohesion for stability. (DePina, 1972)

FLOODING. A rising and overflowing of a body of water that covers land not usually under water. (U.S.D.P.)

FLOODWAY FRINGE. The floodplain area landward of the natural floodway which would be innundated by low-velocity flood waters. (U.D.S.P.)

FLOW METER. A device to measure the flow of water. (U.S.D.P.)

FLUSH TANK TOILET. Toilet with storage tank of water used for flushing bowl. (U.S.D.P.)

FLUSH VALVE TOILET. Toilet with self-closing valve which supplies water directly from pipe. It requires adequate pressure for proper functioning. (U.S.D.P.)

FOOTCANDLE. A unit of illuminance on a surface that is everywhere one foot from a uniform point source of light of one candle and equal to one lumen per square foot. (Merriam-Webster, 1971)

FUMES. Gaseous emissions that are usually odorous and sometimes noxious. (Merriam-Webster, 1971)

GAS. A system for supplying natural gas, manufactured gas, or liquefied petroleum gas to the site and individual users. (U.S.D.P.)

GOVERNMENT/MUNICIPAL REGULATIONS. In urban areas, the development of the physical environment is a process usually controlled by a government/municipality through all or some of the following regulations: Master Plan, Zoning Ordinance, Subdivision Regulations, Building Code (U.S.D.P.)

GATE VALVES. The valves used for controlling the flow of water. (U.S.D.P.)

GRADE. Profile of the center of a roadway, or the invert of a culvert or sewer. (DePina, 1972)

GRAVEL BASE. A paving base consisting of gravel and filler constructed on a prepared subgrade. (U.S.D.P.)

GRAVEL SURFACE ON ASPHALT. A paving surface consisting of coarse and fine aggregates applied in a manner similar to gravel base. (U.S.D.P.)

GRID BLOCKS. The block determined by a convenient public circulation and not by dimensions of lots. In grid blocks some lots have indirect access to public streets. (U.S.D.P.)

GRIDIRON BLOCKS. The blocks determined by the dimensions of the lots. In gridiron blocks all the lots have direct access to public streets. (U.S.D.P.)

GRID LAYOUTS. The urban layouts with grid blocks. (U.S.D.P.)

GRIDIRON LAYOUTS. The urban layouts with gridiron blocks. (U.S.D.P.)

GROUPED. *See* **DWELLING TYPE.**

HEAD (Static). The height of water above any plane or point of reference. Head in feet = (lb/sq. in. x 144)/(Density in lb/cu. ft.) For water at 68°F. (DePina, 1972)

HIGH-RISE. Dwelling units grouped in five or more stories with stairs and elevators for vertical circulation. (U.S.D.P.)

HIGH SCHOOL (JUNIOR, SENIOR). *See* SCHOOL.

HIGH TENSION CABLE. [Cable] having high potential or voltage. (Merriam-Webster, 1971)

HOT WIRE. Wire carrying voltage between itself and a ground. (ROTC ST 45-7, 1953)

HOURDI. A hollow tile used in masonry construction for walls or slabs. (U.S.D.P.)

HOUSE. *See* DWELLING UNIT TYPE.

HYDRANT. A discharge pipe with valve and spout at which water may be drawn from the mains of waterworks. (Merriam-Webster, 1971)

HYDRAULICS. That branch of science or engineering that deals with water or other fluid in motion. (DePina, 1972)

ILLEGAL. That which is contrary to or violating a rule or regulation or something having the force of law. (Merriam-Webster, 1971)

INCOME. The amount (measured in money) of gains from capital or labor. The amount of such gain received by a family per year may be used as an indicator of income groups. (U.S.D.P.)

INCOME GROUPS. A group of people or families within the same range of incomes. (U.S.D.P.)

INCREMENT (TAX). A special tax on the increased value of land, which is due to no labor/expenditure by the owner, but rather to natural causes such as the increase of population, general progress of society, etc. (U.S.D.P.)

INDIRECT COST. *See* COST OF URBANIZATION.

INFRASTRUCTURE. The underlying foundation or basic framework for utilities and services: streets, sewage; water network; storm drainage, electrical network; gas network; telephone network; public transportation; police and fire protection; refuse collection, health, schools, playgrounds, parks, open spaces. (U.S.D.P.)

INLET (CURB, CHANNEL). A device to collect surface runoff from streets and discharge it into pipes and basic storm drainage network. (U.S.D.P.)

INNER RING. *See* DWELLING LOCATION.

INSTANT DEVELOPMENT. *See* DWELLING DEVELOPMENT MODE.

INSULATOR. A material or body that is a poor conductor of electricity, heat, or sound. (Merriam-Webster, 1971)

INTERIOR CIRCULATION NETWORK (SITE PLANNING). The pedestrian/vehicular circulation system inside the site. It should be designed based upon the exterior circulation/accesses and land development requirements. (U.S.D.P.)

INTERVAL. A space of time [or distance] between the recurrences of similar conditions or states. (Merriam-Webster, 1971)

KILOWATT (kw). (1000 watts) A convenient manner of expressing large wattages. Kilowatt hours (kwh) measure the total quantity of energy consumed in a given time. One kwh represents the use of an average of 1 kilowatt of electrical energy for a period of 1 hour. (ROTC ST 45-7, 1953)

KINDERGARTEN. *See* SCHOOL.

KVA (KILO-VOLT-AMPERES). An electrical unit representing 1000 volts-amperes. (U.S.D.P.)

LAMPHOLE. A vertical pipe or shaft leading from the surface of the ground to a sewer, for admitting light for purposes of inspection. (U.S.D.P.)

LAND COST. Price: the amount of money given or set as the amount to be given as a consideration for the sale of a specific thing [the site]. (Merriam-Webster, 1971)

LAND DEVELOPMENT COSTS. The costs of making raw land ready for development through the provision of utilities, services, accesses, etc. (U.S.D.P.)

LAND LEASE. The renting of land for a term of years for an agreed sum; leases of land may run as long as 99 years. (U.S.D.P.)

LAND-MARKET VALUE. Refers to: 1) the present monetary equivalent to replace the land; 2) the present tax-based value of the land; or 3) the present commercial market value of the land. (U.S.D.P.)

LAND OWNERSHIP. The exclusive right of control and possession of a parcel of land. (U.S.D.P.)

LAND SUBDIVISION. The division of the land in blocks, lots and laying out streets. (U.S.D.P.)

LAND TENANCY. The temporary holding or mode of holding a parcel of land of another. (U.S.D.P.)

LAND TENURE. *See* TENURE.

LAND UTILIZATION. A qualification of the land around a dwelling in relation to user, physical controls and responsibility. *PUBLIC* (streets, walkways, open spaces): user —anyone/unlimited; physical controls —minimum; responsibility —public sector. *SEMIPUBLIC* (open spaces, playgrounds, schools): user —limited group of people; physical controls —partial or complete; responsibility —public sector and user. *PRIVATE* (dwellings, lots): user —owner or tenant or squatter; physical controls—complete; responsibility —user. *SEMI-PRIVATE* (cluster courts): user —group of owners and/or tenants; physical controls —partial or complete; responsibility —user. (U.S.D.P.)

LAND UTILIZATION: PHYSICAL CONTROLS. The physical/ legal means or methods of directing, regulating, and coordinating the use and maintenance of land by the owners/users. (U.S.D.P.)

LAND UTILIZATION: RESPONSIBILITY. The quality/state of being morally /legally responsible for the use and maintenance of land by the owners/users. (U.S.D.P.)

LAND UTILIZATION: USER(S). The people or the group of people who ordinarily and directly use a piece of land and the facilities it contains. (U.S.D.P.)

LARGE CONTRACTOR BUILT. *See* DWELLING BUILDER.

LATERAL SEWER. A collector pipe receiving sewage from building connection only. (U.S.D.P.)

LATRINE. A receptacle (as a pit in the earth or a water closet) for use in defecation and urination or a room (as in a barracks or hospital) or enclosure (as in a camp) containing such a receptacle. (Merriam-Webster, 1971)

LAYOUT. The plan or design or arrangement of something that is laid out. (Merriam-Webster, 1971)

LEVELS OF SERVICES. Two levels are considered: *MINIMUM*, acceptable or possible levels below the standard; *STANDARD*: levels set up and established by authority, custom, or general consent, as a model, example or rule for the measure of quantity, weight, extent, value or quality. (U.S.D.P.)

LIFT PUMP. A collection system component that forces sewage to a higher elevation to avoid deep pipe networks. (U.S.D.P.)

LOCALITY. A relatively self-contained residential area/community/neighborhood/settlement within an urban area which may contain one or more dwelling/land systems. (U.S.D.P.)

LOCALITY SEGMENT. A 400m x 400m area taken from and representing the residential character and layout of a locality. (U.S.D.P.)

LOCATION. Situation: the way in which something [the site] is placed in relation to its surroundings [the urban context]. (Merriam-Webster, 1971)

LOT. A measured parcel of land having fixed boundaries and access to public circulation. (U.S.D.P.)

LOT CLUSTER. A group of lots (owned individually) around a semipublic common court (owned in condominium). (U.S.D.P.)

LOT COVERAGE. The ratio of building area to the total lot area. (U.S.D.P.)

LOT PROPORTION. The ratio of lot width to lot depth. (U.S.D.P.)

LOW TENSION CABLE. [Cable] having low potential or voltage. (Merriam-Webster, 1971)

LUMINAIRE. In Highway lighting, a complete lighting device consisting of a light source, plus a globe, reflector, refractor, housing and such support as is integral with the housing. (DePina, 1972)

MANHOLE. An access hole sized for a man to enter, particularly in sewer and storm drainage pipe systems for cleaning, maintenance and inspection. (U.S.D.P.)

MASTER PLAN. A comprehensive, long range plan intended to guide the growth and development of a city, town, or region, expressing official contemplations on the course its transportation, housing, and community facilities should take, and making proposals for industrial settlement, commerce, population distribution, and other aspects of growth and development. It is usually accompanied by drawings, explanatory data, and a prefatory *apologia* explaining its limitations. Few aspects of the city-planning process have aroused more controversy than the master plan. Conceptions of what it should be run the gamut from the futurama down to the simple zoning scheme. No master plan can be fulfilled specification by specification in the face of the ever-recurring changes caused by industrialization, population shift, traffic increase, suburbanization, and periodic political undulations. (Abrams, 1972)

MATRIX (OF BASIC REFERENCE MODELS). A set of models of urban layouts arranged in rows and columns. (U.S.D.P.)

MEDIAN BARRIER. A double-faced guard rail in the median or island dividing two adjacent roadways. (DePina, 1972)

MESHING BOUNDARIES. Characterized by continuing, homogeneous land uses or topography, expressed as *LINES:* property lines, political or municipal divisions, main streets, etc.; *AREAS:* similar residential uses, compatible uses (as parks with residential). (U.S.D.P.)

METER. An instrument for measuring and recording the amount of something (as water, gas, electricity) that flows. (Merriam-Webster, 1971)

MICROCLIMATE. The local climate of a given site or habitat varying in size from a tiny crevice to a large land area but being usually characterized by considerable uniformity of climate. (Merriam-Webster, 1971)

MODE OF TRAVEL. Manner of moving from one place (the site) to another (other parts of the urban context). (U.S.D.P.)

MODEL (OF URBAN LAYOUT). A representation of an urban residential area illustrating circulation, land utilization, land subdivision, and utility network of a specific layout and lot. (U.S.D.P.)

MUTUAL OWNERSHIP. Private land ownership shared by two or more persons and their heir under mutual agreement. (U.S.D.P.)

NATURAL FEATURES. Prominent objects in or produced by nature. (U.S.D.P.)

NATURAL UNDISTURBED SOIL. Soil that has not been disturbed by artificial process. Although natural, such soils depend greatly on local conditions, environment, and past geological history of the formations. (U.S.D.P.)

NEIGHBORHOOD. A section lived in by neighbors and having distinguishing characteristics. (U.S.D.P.)

NETWORK EFFICIENCY (LAYOUT EFFICIENCY). The ratio of the length of the network to the area(s) contained within; or tangent to it. (U.S.D.P.)

NEUTRAL WIRE. The wire in a three-wire distribution system usually required to be grounded for safety of both linemen and householders. (Merriam-Webster, 1971)

NOISE. Any sound [affecting the site] that is undesired [such as that produced by: traffic, airports, industry, etc.] (Merriam-Webster, 1971)

ODOR. A quality of something that affects the sense of smell. (Merriam-Webster, 1971)

OHMS (electrical). The unit of resistance to the flow of electricity. The higher the number of ohms, the greater the resistance. When resistance is constant, amperage (and wattage) are in direct proportion to voltage. Resistance varies inversely with the cross-sectional area of the wire. Ohms = volts/amperes. R = E/I. The practical mks unit of electrical resistance that is equal to the resistance of a circuit in which a potential difference of one volt produces a current of one ampere or to the resistance in which one watt of power is dissipated when one ampere flows through it and that is taken as standard in the U.S. (U.S.D.P.; ROTC ST 45-7, 1951. Merriam-Webster, 1971)

OPERATION COST. *See* COSTS OF URBANIZATION.

OPTIMIZE/OPTIMALIZE. To bring to a peak of economic efficiency, specially by the use of precise analytical methods (Merriam-Webster, 1971)

ORGANIC SOILS. Soils composed mostly of plant material. (U.S.D.P.)

OXIDATION POND (LAGOON). A method of sewage treatment using action of bacteria and algae to digest/decompose wastes. (U.S.D.P.)

PARKS. *See* RECREATION FACILITIES.

PERCENT RENT/MORTGAGE. The fraction of income allocated for dwelling rental or dwelling mortgage payments; expressed as a percentage of total family income (U.S.D.P.)

PERIPHERY. *See* DWELLING LOCATION.

PIRATE TAXI. A taxi cab that illegally carries paying passengers over a regular route according to a flexible schedule. (U.S.D.P.)

PIT PRIVY/LATRINE. A simple hole in the ground, usually hand-dug, covered with a slab and protective superstructure; for disposal of human excreta. (U.S.D.P.)

PLANNING. The establishment of goals, policies, and procedures for a social or economic unit, i.e. city. (U.S.D.P.)

PLAY FIELDS. *See* RECREATION FACILITIES.

PLAY GROUNDS. *See* RECREATION FACILITIES.

PLAY
CILIT

PLOT.
having
circulat

POLE.
which s
thing is

POLICI
body of
a goverr
peace ar
vention
Webster,

POPUL.
DEVEL

POPULA
tween the
area. It is
can be: G
of land
public fa
cludes onl
include la

POSITIO
tually occu
(Merriam-

PRE-SCH

PRIMARY
SCHOOL.

PRIMER.
specific sub

PRIVATE
absolute ter
ers withou

PRIVATE/
FINANCIN

PRIVATE
DEVELOPE

PLAY LOTS. *See* RECREATION FACILITIES.

PLOT/LOT. A measured parcel of land having fixed boundaries and access to public circulation. (U.S.D.P.)

POLE. An upright column to the top of which something is affixed or by which something is supported. (Merriam-Webster, 1971)

POLICE PROTECTION. Police force: a body of trained men and women entrusted by a government with the maintenance of public peace and order, enforcement of laws, prevention and detection of crime. (Merriam-Webster, 1971)

POPULAR SECTOR. *See* DWELLING DEVELOPER.

POPULATION DENSITY. The ratio between the population of a given area and the area. It is expressed in people per hectare. It can be: *GROSS DENSITY:* includes any kind of land utilization, residential, circulation, public facilities, etc. *NET DENSITY:* includes only the residential land and does not include land for other uses. (U.S.D.P.)

POSITION. The point or area in space actually occupied by a physical object [the site]. (Merriam-Webster, 1971)

PRE-SCHOOL. *See* SCHOOL.

PRIMARY/ELEMENTARY SCHOOL. *See* SCHOOL.

PRIMER. A small introductory book on a specific subject. (U.S.D.P.)

PRIVATE LAND OWNERSHIP. The absolute tenure of land to a person and his heirs without restriction of time. (U.S.D.P.)

PRIVATE/PUBLIC FINANCED. *See* FINANCING.

PRIVATE SECTOR. *See* DWELLING DEVELOPER.

PRIVY. A small, often detached building having a bench with one or more round or oval holes through which the user may defacate or urinate (as into a pit or tub) and ordinarily lacking any means of automatic discharge of the matter deposited. (Merriam-Webster, 1971)

PROGRESSIVE. *See* DWELLING DEVELOPMENT MODE.

PROJECT. A plan undertaken; a specific plan or design. (U.S.D.P.)

PUBLIC CIRCULATION. The circulation network which is owned, controlled, and maintained by public agencies and is accessible to all members of a community. (U.S.D.P.)

PUBLIC FACILITIES. Facilities such as schools, playgrounds, parks, other facilities accessible to all members of a community which are owned, controlled, and maintained by public agencies. (U.S.D.P.)

PUBLIC SECTOR. *See* DWELLING DEVELOPER.

PUBLIC SERVICE AND COMMUNITY FACILITIES. Includes: public transportation, police protection, fire protection, refuse collection, health facilities, schools, and playgrounds, recreation and open spaces, other community facilities, business, commercial, small industries, markets. (U.S.D.P.)

PUBLIC SUBSIDIZED. *See* FINANCING.

PUBLIC SYSTEM (general). A system which is owned and operated by a local governmental authority or by an established public utility company which is controlled and regulated by a governmental authority. (HUD/AID, Minimum Standards, 1966)

PUBLIC UTILITIES. Includes: water supply, sanitary sewerage, storm drainage, electricity, street lighting, telephone, circulation networks. (U.S.D.P.)

PUMP. A device or machine that raises, transfers, or compresses fluids or that attenuates gases especially by suction or pressure or both. (Merriam-Webster, 1971)

RECREATION FACILITIES. Outdoors facilities provided for recreation and for different age groups as follows: *playlots,* ages 2-7; *playgrounds,* ages 6-16; *playfields,* ages 12-20; *parks,* all ages. (U.S.D.P.)

REFUSE COLLECTION. The service for collection and disposal of all the solid wastes from a community. (U.S.D.P.)

RESERVOIR. Large-scale storage of water; also functions to control fluctuations in supply and pressure. (U.S.D.P.)

RESIDENTIAL AREA. An area containing the basic needs/requirements for daily life activities: housing, education, recreation, shopping, work. (U.S.D.P.)

RESISTANCE. The opposition to electrical flow. (Resistance increases as the length of wires is increased and decreases as the cross-sectional area of wires is increased). (ROTC ST 45-7, 1953)

RESTRICTIVE ZONE. *See* FLOODWAY FRINGE.

RIGHT-OF-WAY. A legal right of passage over another person's ground [land], the area or way over which a right-of-way exists such as: a path or thoroughfare which one may lawfully use, the strip of land devoted to or over which is built a public road, the land occupied by a railroad, the land used by a public utility. Rights-of-way may be shared (as streets; pedestrians and automobiles) or exclusive (as rapid transit routes; subways, railroads, etc.) (Merriam-Webster, 1971; U.S.D.P.)

ROADWAY (HIGHWAY). The portion of a highway included between the outside lines of gutter or side ditches, including all slopes, ditches, channels, and appurtenances necessary to proper drainage, protection, and [illegible] (DePina, 1972)

ROOM. *See* DWELLING UNIT TYPE.

ROW/GROUPED HOUSING. Dwelling units grouped together linearly or in clusters. (U.S.D.P.)

RUNOFF. That part of precipitation carried off from the area upon which it falls. (DePina, 1972)

RUNOFF-RAINFALL RATIO. The percentage (ratio) of storm-water runoff that is not reduced by evaporation, depression storage, surface wetting, and percolation; with increased rainfall duration, runoff-rainfall ratios rise increasing runoff flow. (U.S.D.P.)

SAND. Loose, distinguishable grains of quartz/feldspar, mica (ranging from 2mm to 0.02mm in diameter). (U.S.D.P.)

SANITARY SEWERAGE. The system of artificial, usually subterranean conduits, to carry off sewage composed of: *excreta:* waste matter eliminated from the human body; *domestic wastes:* used water from a home/community containing 0.1% total solids; and some *industrial wastes,* but not water from ground, surface, or storm. (U.S.D.P.)

SCHOOL. An organized institution of education for different age groups as follows: *pre-schools* (kindergarten), ages 2-7; *primary and elementary schools,* ages 6-16; *secondary schools* (junior senior high), ages 12-20; *colleges* and *universities,* ages 18-up. (U.S.D.P.)

SECONDARY SCHOOL. *See* SCHOOL.

SELF-FINANCED. *See* FINANCING.

SELF-HELP-BUILT. *See* DWELLING BUILDER.

SEMIDETACHED DWELLING. Two dwelling units sharing a common wall (duplex). (U.S.D.P.)

SEPTIC TANK. A tank in which the organic solid matter of continuously flowing sewage is deposited and retained u[illegible] has been disintegrated by anaerobic bacteria. (Merriam-Webster, 1971)

SERIES CIRCUIT. Fixtures connected in a circuit by a single wire. When one fixture is out, the circuit is broken. Fixtures with different amperages cannot be used efficiently in the same circuit. (ROTC ST 45-7, 1953)

SERVICE CONNECTION (SEWAGE). The pipes and fittings that connects the individual lots, cluster of lots, or communal's sewage systems with the basic network. (U.S.D.P.)

SERVICE CONNECTION (WATER). The pipe and fittings that connects the street distribution pipe to the individual lots or cluster of lots' plumbing system or storage tank. (U.S.D.P.)

SERVICE DROP. The electrical connection between the secondary low tension network and the individual lots or cluster of lots' electric system. (U.S.D.P.)

SERVITUDE. *See* **EASEMENT.**

SETTLEMENT. Occupation by settlers to establish a residence or colony. (U.S.D.P.)

SEWAGE. The effluent in a sewer network. (U.S.D.P.)

SEWER. The conduit in a subterranean network used to carry off water and waste matter. (U.S.D.P.)

SEWER BUILDING CONNECTION. The pipe connecting the dwelling with the sewer network. (U.S.D.P.)

SEWERAGE. Sewerage system: the system of sewers in a city, town or locality. (Merriam-Webster, 1971)

SHAPE. Form/configuration of the site surface as defined by its perimeter/boundaries. (U.S.D.P.)

SHANTY. *See* **DWELLING UNIT TYPE.**

SHOPPING. (Facilities for) searching for, inspecting, or buying available goods or services. (U.S.D.P.)

SILT. Loose, unconsolidated sedimentary rock particles (ranging from 0.02mm to 0.002mm in diameter). (U.S.D.P.)

SINGLE. *See* **DWELLING UTILIZATION.**

SITE. Land (that could be) made suitable for building purposes by dividing into lots, laying out streets and providing facilities. (Merriam-Webster, 1971)

SITE AREAS. Two types are considered: *GROSS AREA:* includes the whole site or the bounded piece of ground. *USABLE AREA:* includes only the portion of the site that can be fully utilized for buildings, streets, playgrounds, recreation facilities, gardens, or other structures. (U.S.D.P.)

SITE AND SERVICES. The subdivision of urban land and the provision of services for residential use and complementary commercial use. Site and services projects are aimed to improve the housing conditions for the low income groups of the population by providing: *a) SITE:* the access to a piece of land where people can build their own dwellings; *b) SERVICES:* the opportunity of access to employment, utilities, services and community facilities, financing and communications. (U.S.D.P.)

SIZE. Physical magnitude or extent (of the site), relative or proportionate dimensions (of the site). (Merriam-Webster, 1971)

SLOPE. Degree or extent of deviation [illegible] the land surface) from the horizontal. (Merriam-Webster, 1971)

SMALL CONTRACTOR BUILT. *See* **DWELLING BUILDER.**

SMOKE. The gaseous products of burning carbonaceous materials made visible by the presence of carbon particles. (Merriam-Webster, 1971)

SOAKING PIT. Also referred as leeching or seepage pits, are used for the disposal of settled sewage where the soil is suitable and a public water supply is used. (Salvato, 1958)

SOIL. Soil structure: the arrangement of soil particles in various aggregates differing in shape, size, stability, and degree of adhesion to one another. (Merriam-Webster, 1971)

SOIL INVESTIGATION. It is the process to find the soil structure and other characteristics. It may include the following stages: initial soil survey, exploratory boring, construction boring. (U.S.D.P.)

SOIL PIPE. The pipe in a dwelling which carries the pipe discharge from water closets. (U.S.D.P.)

SOIL SURVEY (INITIAL). An on-site examination of surface soil conditions and reference to a GENERAL SOIL MAP. It is used to reveal obvious limitations/restrictions/hazards for early planning consideration. (U.S.D.P.)

STACK. The vertical pipe in a dwelling of the soil-, waste-, or vent-pipe systems. (ROTC ST 45-7, 1953)

STANDARD. 1) Something that is established by authority, custom, or general consent as a model or example to be followed. 2) Something that is set up and established by authority as a rule for the measure of quantity, weight, extent, value or quality. (Merriam-Webster, 1971)

STANDPIPE. A pipe riser with tap used as a source of water for domestic purposes. (HUD/AID, Minimum Standards, 1966)

STORM DRAINAGE. Storm sewer: a sewer (system) designed to carry water [illegible] except sewage (exclusively storm water, [illegible] face runoff, or street wash). (Merriam-Webster, 1971)

STREET LIGHTING. Illumination to [illegible] prove vision at night for security and for the extension of actvities. (U.S.D.P.)

SUBDIVISION REGULATIONS. Regulations governing the development of [illegible] land for residential or other purposes. They prescribe standards for the street improvements, lot sizes and layouts, procedures for dedicating private land for public purposes and other requirements. Procedures are also given for filing maps; for receiving the approval of the public engineer, planning commission, and other departments. (Abrams, 1972)

SUBGRADE. The layer of natural soil or fill (compacted soil) upon which the pavement structure including curbs is constructed. (DePina, 1972)

SUBMAIN or BRANCH SEWER. A collector pipe receiving sewage from lateral sewer only. (U.S.D.P.)

SUBSISTENCE INCOME. The minimum amount of money required for the purchase of food and fuel for an average family to survive. (U.S.D.P.)

SULLAGE. Drainage or refuse [illegible] from a house, farmyard, or street. (Merriam-Webster, 1971)

TAP (also FAUCET). A fixture for drawing a liquid from a pipe, cask, or other vessel. (Merriam-Webster, 1971)

TAX EXEMPTION. A grant by a government of immunity from taxes; (a ten year tax exemption on new housing in New York stimulated new construction in the 1920's, [illegible] its housing shortage, Turkey granted a [illegible] year tax exemption on new buildings. (Abrams, 1966)

TAX INCENTIVE. Favorable tax treatment to induce the beneficiary to do something he would not otherwise be likely to do. (U.S.D.P.)

TAX STRUCTURE/TAXATION. The method by which a nation (state, municipality) implements decisions to transfer resources from the private sector to the public sector. (U.S.D.P.)

TELEPHONE. An electrical voice communication network interconnecting all subscribing individuals and transmitting over wires or by other electronic means. (U.S.D.P.)

TENURE. The act, right, manner or term of holding land property. Two situations of tenure of the dwelling unit and/or the lot/land are considered: *LEGAL:* having formal status derived from law; *EXTRALEGAL:* not regulated or sanctioned by law. Four types of tenure are considered: *RENTAL:* where the users pay a fee (daily, weekly, monthly) for the use of the dwelling unit and/or the lot/land; *LEASE:* where the users pay a fee for long-term use (generally for a year) for a dwelling unit and/or the lot/land from the owner (an individual, a public agency, or a private organization); *OWNERSHIP:* where the users hold in freehold the dwelling unit and/or the lot/land which the unit occupies; *EMPLOYER-PROVIDED:* where the users are provided a dwelling unit by an employer in exchange for services, e.g., domestic live-in servants. (U.S.D.P.)

TITLE. The instrument (as a deed) that constitutes a legally just cause of exclusive possession (of land, dwellings, or both). (Merriam-Webster, 1971)

TOILET. A fixture for defecation and urination, esp. water closet. (8th Collegiate Webster, 1973)

TOPOGRAPHY. The configuration of a [land] surface including its relief and the position of its natural and man-made features. (Merriam-Webster, 1971)

TRANSFORMER. A device employing the principle of mutual induction to convert variations of current in a primary circuit into variations of voltage and current in a secondary circuit and typically consisting of two separate coils usually with different numbers of turns on the same closed laminated iron core. (Merriam-Webster, 1971)

TRANSPORTATION. Means of conveyance or travel from one place [the site] to another [other parts of the urban context]. (Merriam-Webster, 1971)

TRAP. A fitting that provides a water seal to prevent sewer gases and odors being discharged through fixtures. (ROTC ST 45-7, 1953)

TREATMENT WORKS. Filtration plant, reservoirs, and all other construction required for the treatment of a water supply. (ROTC ST 45-7, 1953)

UNIT. A determinate quantity adopted as a standard of measurement for other quantities of the same kind. (Merriam-Webster, 1971)

URBAN. Of, relating to, characteristic of, or taking place in a city. Constituting or including and centered in a city. (Merriam-Webster, 1971)

URBAN TRANSPORTATION. Means of conveyance of passengers or goods from one place to another along ways, routes of circulation in a metropolitan context. (U.S.D.P.)

URBANIZATION. The quality or state of being or becoming urbanized; to cause to take on urban characteristics. (U.S.D.P.)

USE TAX. The tax on land aimed primarily at enforcing its use or improvement. (U.S.D.P.)

USER INCOME GROUPS. Based upon the subsistence (minimum wage) income per year, five income groups are distinguished: *VERY LOW (below subsistence level):* the income group with no household income available for housing, services, or transportation; *LOW (1 x subsistence level):* the income group that can afford no or very limited subsidized housing; *MODERATE (3 x subsistence level):* the income group that can afford limited housing and rent only with government assistance; *HIGH (5 x subsistence level):* the income group that can afford housing without subsidy, by cash purchase, through mortgage payments, or by rent; *VERY HIGH (10 x subsistence level):* the income group that represents the most economically mobile sector of the population. (Turner, 1971)

USUFRUCT. The right to profit from a parcel of land or control of a parcel of land without becoming the owner or formal lessee; legal possession by decree without charge. (U.S.D.P.)

UTILITIES. Include: water supply, sanitary sewerage, storm drainage, electricity, street lighting, gas, telephone. (U.S.D.P.)

UTILITY/SERVICE. The organization and/or infrastructure for meeting the general need (as for water supply, wastewater removal, electricity, etc.) in the public interest. (U.S.D.P.)

VALVE. A water supply distribution component which interrupts the supply for maintenance purposes. (U.S.D.P.)

VENT. A pipe opening to the atmosphere, which provides ventilation for a drainage system and prevents trap siphonage or back pressure. (ROTC ST 45-7, 1953)

VIBRATION. A quivering or trembling motion [such as that produced by: heavy traffic, industry, aircraft, etc.]. (Merriam-Webster, 1971)

VIEWS. That which is revealed to the vision or can be seen [from the site]. (Merriam-Webster, 1971)

VOLT. A measure of the "pressure" of electricity, much the same as pounds per square inch measure water pressure, and indicating the capacity of a given current to pass through electrical resistance. (ROTC ST 45-7, 1953)

WALK-UP. Dwelling units grouped in two to five stories with stairs for vertical circulation. (U.S.D.P.)

WASTE PIPE. A pipe [in a dwelling] which carries water from wash basins, sinks, and similar fixtures. (ROTC ST 45-7, 1953)

WATER SUPPLY. Source, means, or process of supplying water, (as for a community) usually involving reservoirs, pipelines, and often the watershed from which the water is ultimately drawn. (Merriam-Webster, 1971)

WATERSHED. The catchment area or drainage basin from which the waters of a stream or stream system are drawn. (Merriam-Webster, 1971)

WATERWORKS. The whole system of reservoirs, channels, mains, and pumping and purifying equipment by which a water supply is obtained and distributed to consumers. (Merriam-Webster, 1971)

WATT (w). A measure of the power of the flow of energy through a circuit. Wattage is the product of volts times amperes. Both watts and horsepower denote the rate of work being done. 746w = 1HP. (ROTC ST 45-7, 1953)

ZONING ORDINANCE. The demarcation of a city by ordinance into zones (areas/districts) and the establishment of regulations to govern the use of land and the location, bulk, height, shape, use, population density, and coverage of structures within each zone. (U.S.D.P.)

BIBLIOGRAPHY

The corresponding topic in the Primer is indicated following each entry.

Abrams, Charles. **THE LANGUAGE OF CITIES.** Viking Press, New York, N.Y., 1971. *Definitions, glossary.*

_______. **MAN'S STRUGGLE FOR SHELTER IN AN URBANIZING WORLD.** M.I.T. Press, Cambridge, Mass., 1966. *General references.*

Adams, Thomas. **(THE) DESIGN OF RESIDENTIAL AREAS: BASIC CONSIDERATIONS, PRINCIPLES, AND METHODS.** Harvard University Press, Cambridge, Mass., 1934. *Design Criteria.*

Agency for International Development (AID). **PROPOSED MINIMUM STANDARDS.** Ideas and Methods, Exchange no. 64, 602.2 Housing Codes and Standards, Department of Housing and Urban Development, Washington, D.C., 1966. *Urbanization standards.*

Alvarez Martinez, Felix. **PRESUPUESTOS PARA LA CONSTRUCCION.** Monografias sobre construccion y arquitectura, Ediciones CEAC, Barcelona, 1971. *Cost studies.*

American Law Institute (ALI). **A MODEL LAND DEVELOPMENT CODE.** American Law Institute, Philadelphia, Penn., 1968. *Land development.*

Annez, Philippe. **FORMULATION AND SIMULATION OF A GROWTH STRATEGY FOR THE DEVELOPMENT OF FINCA LA MARINA IN SAN JUAN, PUERTO RICO.** M. Arch. Thesis, Urban Settlement Design in Developing Countries, M.I.T., Cambridge, Mass., 1971. *Land development.*

American Society of Planning Officials (ASPO). **SOIL SURVEYS AND LAND USE PLANNING.** Soil Science Society of America, 1966. *Soil, topography, and natural features.*

Aronin, Jeffrey Ellis. **CLIMATE AND ARCHITECTURE.** Reinhold Publishing Co., New York, N.Y., 1953. *Climate.*

Babbit, Harold E.; Doland, James J.; Cleasby, John L. **WATER SUPPLY ENGINEERING.** McGraw-Hill Book Co., New York, N.Y., 1967. *Water supply.*

Baity, H.G. **COMMUNITY WATER SUPPLY IN THE DEVELOPING COUNTRIES.** In "Water Development in Less Developed Countries." Transactions of an International Conference, Berlin, 17-21 May 1963, Duncker & Humbolt, Berlin, 1963. *Water supply.*

Baldwin, John. **GUIDE FOR SURVEY-EVALUATION OF URBAN DWELLING ENVIRONMENTS.** M. Arch. Thesis, Urban Settlement Design in Developing Countries, M.I.T., Cambridge, Mass., 1974. *Project assessment.*

Bartelli, L.J. **ENGINEERING SOIL CLASSIFICATION FOR RESIDENTIAL DEVELOPMENT.** Soil Science Society of America, 1966. *Soil.*

Bartholomew, Harland. **LAND USES IN AMERICAN CITIES.** Harvard Press, Cambridge, Mass., 1955. *Land utilization.*

Bazant, Jan; Cortez, Jose L.; Dávila, Ramiro; Espinosa, Enrique. **URBAN DWELLING ENVIRONMENTS: MEXICO CITY.** M. Arch. Thesis, Urban Settlement Design in Developing Countries, M.I.T., Cambridge, Mass., 1974. *Case Studies.*

Beeman, William J. **THE PROPERTY TAX AND THE SPATIAL PATTERN OF GROWTH WITHIN URBAN AREAS.** Research Monograph no. 16, Urban Land Institute, 1969. *Land development.*

Berry, Donald S.; Blomme, George W.; Shuldiner, Paul W.; Jones, John H. **THE TECHNOLOGY OF URBAN TRANSPORTATION.** Northwestern University Press, Evanston, Ill., 1963. *Public transportation.*

Beyer, Glenn H. **LAND SPECULATION: SOME CAUSES AND SOLUTIONS.** Mimeographed, Urban Renewal and Housing Administration, San Juan, P.R., undated. *Land costs dnd speculation.*

Borgstrom, Georg. **TOO MANY.** Collier Books, New York, N.Y., 1971. *Population density.*

_______. **THE HUNGRY PLANET.** Collier Books, New York, N.Y., 1967. *General references.*

Building Officials Conference of America, Inc. (BOCA). **THE BOCA BASIC BUILDING CODE/1970.** Building Officials and Code Administrators International, Inc., Chicago, Ill., 1969. *Building code.*

Callender, John Hancock, ed. **TIME-SAVER STANDARDS: A HANDBOOK OF ARCHITECTURAL DESIGN.** 4th edition, McGraw-Hill Book Co., Inc., New York, N.Y., 1966. *Design handbook.*

Caminos, Horacio. **A METHOD FOR THE EVALUATION OF URBAN LAYOUTS.** *Industrial Forum*, vol. 3, no. 2, December 1971. *Circulation system.*

Caminos, Horacio; Goethert, Reinhard. **HOUSING OPTIONS FOR THE $1000 TO $3000 LOW INCOME SECTOR.** Mimeographed, Urban Settlement Design in Developing Countries, M.I.T., Cambridge, Mass., 1970. *Housing policies.*

_______. **LA MARINA: A NEW TOWN IN TOWN.** Limited edition, Urban Settlement Design in Developing Countries, M.I.T., Cambridge, Mass., 1971. *Urbanization project.*

_______. **EVALUATION OF A SITE AND SERVICES PROJECT: DAKAR, SENEGAL.** Mimeographed, Urban Settlement Design in Developing Countries, M.I.T., Cambridge, Mass., 1972. *Project assessment*

_______. **URBANIZATION PRIMER.** Course notes, Urban Settlement Design in Developing Countries, Cambridge, Mass., Fall 1974. *Urbanization standards.*

Caminos, Horacio; Goethert, Reinhard; Take, Omar. **MKALLES HOUSING PROJECT: BEIRUT, LEBANON.** Limited edition, Urban Settlement Design in Developing Countries, M.I.T., Cambridge, Mass., 1974. *Housing project.*

Centro Interamericano de Vivienda y Planeamiento (CINVA). **PROPUESTA SOBRE NORMAS MINIMAS DE URBANIZACION.** Centro Interamericano de Vivienda y Planeamiento, Bogotá, 1968. *Urbanization standards.*

Committee on Solid Wastes (CSW), American Public Works Association. **REFUSE COLLECTION PRACTICE.** Public Administration Service, Chicago, Ill., 1965. *Refuse collection.*

XVI° Congreso Internacional de Planificacion y de la Habitacion. **GLOSARIO INTERNACIONAL DE TERMINOS TECNICOS DE PLANIFICACION Y DE LA HABITACION (International Glossary of Technical Terms Used in Housing and Town Planning).** Ramos Arizpe no. 1, México, D.F., undated. *Definitions, glossary.*

DeChiara, Joseph; Koppelman, Lee. **PLANNING DESIGN CRITERIA.** Van Nostrand Reinhold Co. (Pratt Institute), *General references.*

DePina, Edward and others, ed. **DODGE ESTIMATING GUIDE FOR PUBLIC WORKS CONSTRUCTION.** McGraw-Hill Information Systems Company, New York, N.Y., 1972. *Cost studies, definitions, glossary.*

Dietrich, Bernd H. **URBAN WATER SUPPLY CONDITIONS AND NEEDS IN SEVENTY-FIVE DEVELOPING COUNTRIES.** World Health Organization, Geneva, 1963. *Water supply.*

Dodge Building Cost Services. **1975 DODGE MANUAL FOR BUILDING CONSTRUCTION PRICING AND SCHEDULING.** Annual Edition no. 10, McGraw-Hill Information Systems Company and Wood & Tower Inc., New York, N.Y., 1975. *Cost studies.*

Dougal, Merwin D. and others. **FLOOD PLAIN MANAGEMENT: IOWA'S EXPERIENCE.** Iowa State University Press, Ames, Ia., 1969. *Flooding.*

Edwards, H. Griffith. **SPECIFICATIONS.** 2nd edition, D. Van Nostrand Company, Inc., Princeton, N.J., 1961. *Utilities specifications.*

Ehrlich, Paul and Anne. **POPULATION RESOURCES ENVIRONMENT.** W.H. Freeman Co., San Francisco, Cal., 1970. *General references.*

Eichler, Kaplan. **THE COMMUNITY BUILDERS.** University of California Press, Berkeley, Cal., 1967. *General references.*

Englehardt, N.L. **THE SCHOOL NEIGHBORHOOD NUCLEUS.** *Architectural Forum,* October 1943. *Community facilities.*

Estado Libre Asociado de Puerto Rico (ELAPR). **REGLAMENTO DE ZONIFICACION.** Reglamento de Planificación no. 4, Oficina del Gobernador, San Juan, P.R., 1969. *Zoning ordinance.*

Experimental Building Station Bulletin Number 3. **CLIMATE AND HOUSE DESIGN.** Australia, 1964. *Climate.*

Fair, Gordon M.; Geyer, John C.; Okun, Alexander. **WATER AND WASTE-WATER ENGINEERING.** Volumes 1 and 2. John Wiley and Sons, New York, 1966. *Water supply, sewage disposal.*

Federal Housing Administration (FHA). **ENGINEERING SOIL CLASSIFICATION FOR RESIDENTIAL DEVELOPMENTS.** Washington, D.C., 1961. *Soil.*

Gaffney, Mason. **LAND AS AN ELEMENT OF HOUSING COSTS: THE EFFECTS OF PUBLIC POLICIES AND PRACTICES. THE EFFECTS OF HOUSING DEMAND.** Institute of Defense Analyses, Arlington, Va., 1968. *Land costs.*

Gallion, Arthur B.; Eisner, Simon. **THE URBAN PATTERN.** D. Van Nostrand Co., Princeton, N.J., 1963. *General references.*

Gattoni, George; Patel, Praful. **RESIDENTIAL LAND UTILIZATION, CASE STUDY: NAIROBI, KENYA.** M. Arch. Thesis, Urban Settlement Design in Developing Countries, M.I.T., Cambridge, Mass., 1973. *Case studies.*

Goethert, Reinhard. **URBAN RESIDENTIAL INFRASTRUCTURE NETWORKS.** M. Arch. Thesis, Urban Settlement Design in Developing Countries, M.I.T., Cambridge, Mass., 1970. *Utilities.*

Housing and Home Finance Agency. (HHFA). **SUGGESTED LAND SUBDIVISION REGULATIONS.** Washington, D.C., 1962. *Subdivision regulations.*

Howard, John T. **COMPONENTS OF THE URBAN ENVIRONMENT.** Course 11.11, M.I.T., Cambridge, Mass., Classnotes Fall/Spring, 1968. *General references.*

Ingenieursbureau Dwars, Heederik en Verhey B.V. **THE PLANNING OF SITES AND SERVICES.** Prepared by T.J. Segaar, Overseas Projects Department, File no. 4-5354-0200, Amersfoort, June 1974. *Site and services projects.*

Institute of Transportation and Traffic Engineering (ITTE). **NEW AND NOVEL TRANSPORTATION SYSTEMS.** University of California, Berkeley, Cal., 1970. *Public transportation.*

Instituto de Crédito Territorial. **ESTUDIO DE NORMAS MINIMAS DE URBANIZACION, SERVICIOS PUBLICOS Y SERVICIOS COMUNITARIOS.** Bogotá, 1972. *Urbanization standards.*

International Bank for Reconstruction and Development (World Bank). **SITES AND SERVICES PROJECTS.** Transportation and Urban Projects Department, Washington, D.C., April 11, 1974. *Site and services projects.*

_______. **SITE AND SERVICES PROJECTS: SURVEY AND ANALYSIS OF URBANIZATION STANDARDS AND ON-SITE INFRASTRUCTURE.** Divisional paper-preliminary draft, prepared by Praful Patel, Transportation and Urban Projects Department, Washington, D.C., August 1974. *Sites and services projects.*

_______. **URBANIZATION.** Sector Working Paper, Washington, D.C., June 1972. *General references.*

_______. **WATER SUPPLY AND SEWERAGE.** Sector Working Paper, Washington, D.C., October 1971. *Water supply.*

International Conference of Building Officials (ICBO). **UNIFORM BUILDING CODE.** International Conference of Building Officials, Pasadena, Cal., 1967. *Building code.*

James, Charles S. **POLICE AND FIRE INTEGRATION IN THE SMALL CITY.** Public Administration Service, Chicago, Ill., 1955. *Community services.*

Kessler, Earl; Popko, Edward S. **THE GROWTH POLE SYSTEM: AN ALTERNATIVE PROGRAM FOR LOW INCOME HOUSING IN COLOMBIA, SOUTH AMERICA.** M. Arch. Thesis, Urban Settlement Design in Developing Countries, M.I.T., Cambridge, Mass., 1971. *Case studies.*

Keyes, Langley. **HOUSING PROBLEMS.** Course 11.20, M.I.T., Cambridge, Mass., Classnotes 1972. *Glossary.*

McHarg, Ian. **DESIGN WITH NATURE.** Natural History Press, Garden City, N.Y., 1969. *Topography, natural features.*

Means Company, Robert Snow. **BUILDING CONSTRUCTION COST DATA 1975.** Robert S. Godfrey, ed., 33rd Annual Edition, Duxbury, Mass., 1974. *Cost studies.*

Meyer, J.R.; Kain, J.F.; Wohl, M. **THE URBAN TRANSPORTATION PROBLEM.** Harvard University Press, Cambridge, Mass., 1965. *Public transportation.*

Minchin, Leslie T. **THE GAS INDUSTRY: TODAY AND TOMORROW.** George C. Harrap and Co., London, 1966. *Gas.*

Minimum Cost Housing Group, The. **STOP THE FIVE GALLON FLUSH: A SURVEY OF ALTERNATIVE WASTE DISPOSAL.** Minimum Cost Housing Studies, McGill University, Montreal, 1973. *Sewage disposal.*

Ministerio de Obras Públicas Venezuela. **CODIGO ELECTRICO NACIONAL 1971.** Comité de Electricidad "CODELECTRA," Caracas, 1971. *Electricity.*

Murphy, Francis. **REGULATING FLOODPLAIN DEVELOPMENT.** University of Chicago Press, Chicago, Ill., 1958. *Flooding.*

National Aeronautics and Space Administration (NASA). **FACILITIES ENGINEERING HANDBOOK.** NHB 7320.1A, Washington, D.C., 1974. *General references.*

National Association of Home Builders (NAHB). **LAND DEVELOPMENT MAN-**

UAI.. Washington, 1969. *Land develop- ment.*

National Board of Fire Underwriters (NBFU). **FIRE DEPARTMENT STATIONS —PLANNING THE LOCATION.** Special Interest Bulletin no. 176, New York, N.Y., February 1963. *Community services.*

_______. **STANDARD SCHEDULE FOR GRADING CITIES AND TOWNS OF THE UNITED STATES: NEW YORK, CHICAGO, SAN FRANCISCO,** 1956. *Community services.*

_______. **NATIONAL BUILDING CODE.** New York, N.Y., 1955. *Building code.*

National Research Council (NAE-NAS). **POLICIES FOR SOLID WASTE MANAGEMENT.** U.S. Public Health Service Publication no. 2018, Washington, D.C., 1940. *Sewage disposal.*

Neufert, Ernst. **ARTE DE PROYECTAR EN ARQUITECTURA.** Editorial Gustavo Gili, Barcelona, 1964. *Design handbook.*

Olson, Charles E. **COST CONSIDERATIONS FOR EFFICIENT ELECTRICITY SUPPLY.** The Institute of Public Utilities, Graduate School of Business Administration, Michigan State University, East Lansing, Mich., 1970. *Electricity.*

Owen, Wilfred. **THE ACCESSIBLE CITY.** The Brookings Institution, Washington, D.C., 1972. *Public transportation.*

_______. **THE METROPOLITAN TRANSPORTATION PROBLEM.** The Brookings Institution, Washington, D.C., 1966. *Public transportation.*

Parker, George. **PHYSICAL GUIDELINES FOR POPULAR URBAN SETTLEMENTS IN DEVELOPING COUNTRIES.** M. Arch. Thesis, Urban Settlement Design in Developing Countries, M.I.T., Cambridge, Mass., 1970. *Urbanization standards.*

Planning Board, The. **ZONING BY-LAWS, TOWN OF WATERTOWN, MASSACHUSETTS, 1971.** *Zoning ordinance.*

Pickard, Jerome P. **TAXATION AND LAND USE IN METROPOLITAN AND URBAN AMERICA.** Research Monograph no. 12, Urban Land Institute, 1966. *Physical-economic issues.*

Powell, Charles A. **PRINCIPLES OF ELECTRIC UTILITY ENGINEERING.** M.I.T. Press, Cambridge, Mass., 1955. *Electricity.*

Rams, Edwin M. **CITY LAND VALUES.** Academy Publishing Co., Worthington, O., 1963. *Land costs.*

Ramsey, Charles G.; Sleeper, Harold R. **ARCHITECTURAL GRAPHIC STANDARDS, 6th edition.** Harold D. Hauf, Chairman, Editorial Advisory Committee; Joseph N. Boaz, Editor, The American Institute of Architects; John Wiley & Sons, Inc., New York, N.Y., 1970. *Design Handbook.*

Ratcliff, Richard. **URBAN LAND ECONOMICS.** McGraw-Hill Co., New York, N.Y., 1949. *Land costs.*

Real Estate Research Corporation. **THE COSTS OF SPRAWL: ENVIRONMENTAL AND ECONOMIC COSTS OF ALTERNATIVE RESIDENTIAL DEVELOPMENT PATTERNS AT THE URBAN FRINGE.** Volume 1, Executive Summary; Volume 2, Detailed Cost Analysis; Volume 3, Literature Review and Bibliography. Prepared for the Council on Environmental Quality, the Department of Housing and Urban Development, and the Environmental Protection Agency, Government Printing Office, Washington, D.C., April,1974. *Cost studies.*

Richards, Brian. **NEW MOVEMENT IN CITIES.** Studio Vista Limited, London, 1966. *Public transportation.*

Ritter, Paul. **PLANNING FOR MAN AND MOTOR.** Macmillan Co., New York, N.Y., 1964. *Circulation system.*

Salvato, Joseph A. **ENVIRONMENTAL SANITATION.** John Wiley and Sons, New York, N.Y., 1958. *Water supply, sewage disposal.*

Seelye, Elwyn E. **DATA BOOK FOR CIVIL ENGINEERS.** Volume 1, Design, 3rd edition. John Wiley and Sons, Inc., New York, N.Y., 1960. *Design Handbook.*

_______. **DATA BOOK FOR CIVIL ENGINEERS.** Volume 2, Specifications and Costs, 3rd edition. John Wiley and Sons, Inc., New York, N.Y., 1957. *Utilites specifications and costs.*

Smerk, George M. **URBAN TRANSPORTATION —THE FEDERAL ROLE.** Indiana University Press, Bloomington, Ind., 1965. *Public transportation.*

Solomon, Richard J.; Silien, Joseph S.; Holden, William H.T. **MODES OF TRANSPORTATION.** American Society of Civil Engineers, New York, N.Y., 1968. *Public transportation.*

Street and Highway Lighting Committee (SHLC). **STREET LIGHTING MANUAL.** Edison Electric Institute, New York, N.Y., 1969. *Street Lighting.*

Tokman, K. Bulent. **URBAN DWELLING ENVIRONMENTS: ANKARA, TURKEY.** M. Arch. Thesis, Urban Settlement Design in Developing Countries, M.I.T., Cambridge, Mass., 1975. *Case studies.*

Turner, John. **NOTES FOR A HOUSING POLICY WITH SPECIAL REFERENCE TO LOW INCOME HOUSING SYSTEMS IN METROPOLITAN MEXICO.** Mimeographed, M.I.T., Cambridge, Mass., 1971. *Housing policies.*

United Nations, Department of Economic and Social Affairs. **SELF- HELP PRACTICES IN HOUSING: SELECTED CASE STUDIES.** United Nations Publication, New York, N.Y., 1973. *Case studies.*

U.S. Bureau of the Census. **GOVERNMENT FINANCES IN 1970-71.** U.S. Department of Commerce Publication, Washington, D.C., 1972. *General references.*

U.S. Department of the Army. **FM 5-34: ENGINEER FIELD DATA.** Headquarters, Washington, D.C., 1969. *Utility data.*

_______. **ROTC ST 45-7: CONSTRUCTION, UTILITIES AND JOB MANAGEMENT (Engineer School ROTC Special Text).** The Engineer School, Fort Belvoir, Va., 1953. *Utility data.*

_______. **TM 5-813-5: WATER SUPPLY, WATER-DISTRIBUTION SYSTEMS.** Headquarters, Washington, D.C., August 1965. *Water supply.*

_______. **TM 5-700: FIELD WATER SUPPLY.** Headquarters, Washington, D.C., July 1967. *Water supply.*

_______. **TM 5-765: ELECTRIC POWER TRANSMISSION AND DISTRIBUTION.** Headquarters, Washington, D.C., June 1970. *Electricity.*

_______. **TM 5-680E: ELECTRICAL FACILITIES EXTERIOR LIGHTING REPAIRS AND UTILITIES.** United States Government Printing Office, Washington, D.C., December 1947. *Electricity/Street lighting.*

U.S. Department of the Army; U.S. Department of the Air Force. **TM 5-813-1, AFM 88-10, CHAPTER 1: WATER SUPPLY GENERAL CONSIDERATIONS.** Washington, D.C., 15 July 1966. *Water supply.*

_______. **TM 5-882-6, AFM 88-\ CHAPTER 1: RIGID PAVEMENTS FOR ROADS, STREETS, WALKS AND OTHER STORAGE AREAS.** Washington, D.C., April 1969. *Circulation/Storm drainage.*

U.S. Department of Health, Education, and Welfare (HEW). **MANUAL OF SEPTIC-TANK PRACTICE.** Public Health Service Publication no. 526, Washington, D.C., 1960. *Sewer disposal.*

U.S. Department of Housing and Urban Development (HUD). **MINIMUM DESIGN STANDARDS FOR COMMUNITY SEWERAGE SYSTEMS: A HUD GUIDE.** Washington, D.C., May 1968. *Sewer disposal.*

_______. **PROPOSED MINIMUM STANDARDS FOR PERMANENT LOW- COST HOUSING AND FOR THE IMPROVEMENT OF EXISTING SUBSTANDARD AREAS.** Prepared for the Agency for International Development, Ideas and Methods, Exchange no. 64, Washington, D.C., May 1966. *Urbanization standards.*

_______. **MOBILE COURT DEVELOPMENT GUIDE.** Washington, D.C., January 1970. *Utility data.*

_______. **MINIMUM PROPERTY STANDARDS FOR MULTIFAMILY HOUSING** Federal Housing Administration, Washington, D.C., February 1971. *Urbanization standards.*

_______. **MINIMUM PROPERTY STANDARDS FOR ONE AND TWO LIVING UNITS.** Federal Housing Administration (FHA), U.S. Government Printing Office, Washington, D.C., 1968. *Urbanization standards.*

University of Chicago. **A MANUAL OF STYLE FOR AUTHORS, EDITORS, AND COPYWRITERS, 12th edition.** The University of Chicago Press, 1969. *General references.*

Urban Land Institute (ULI). **NEW ENGINEERING CONCEPTS IN COMMUNITY DEVELOPMENT.** Technical Bulletin no 59, Washington, D.C., 1967. *Sewer disposal, storm drainage.*

_______. **COMMUNITY BUILDERS HANDBOOK.** Washington, D.C., 1968. *General references.*

Urban Settlement Design Program. **INTERIM URBANIZATION PROJECT DANDORA.** Limited edition, Urban Settlement Design in Developing Countries, M.I.T., Cambridge, Mass., 1973. *Site and services project.*

_______. **SURVEYS. URBAN SERVICES: USER/DWELLING, SUPPLIER/NETWORK.** Limited edition, Urban Settlement Design in Developing Countries, M.I.T., Cambridge, Mass., 1975. *Utilities surveys.*

Urquhart, Leonard C. **CIVIL ENGINEERING HANDBOOK, 4th edition.** McGraw Hill Book Co., Inc., New York, N.Y., 1959. *Water supply, sewage disposal.*

Vennard, Edwin. **GOVERNMENT IN THE POWER BUSINESS.** McGraw-Hill Book Co., Inc., New York, N.Y., 1968. *General references.*

Wagner, E.G.; Lanoix, J.N. **WATER SUPPLY FOR RURAL AREAS AND SMALL COMMUNITIES.** World Health Organization (W.H.O.), Geneva, 1959. *Water supply.*

_______. **EXCRETA DISPOSAL FOR RURAL AREAS AND SMALL COMMUNITIES.** World Health Organization (W.H.O.), Geneva, 1958. *Sewage disposal.*

WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY OF THE ENGLISH LANGUAGE (A Merriam-Webster). Unabridged. G. & C. Merriam Company, Springfield, Mass., 1971. *Definitions, glossary.*

Wild, S.A. **FOREST SOILS.** Ronald Press, New York, N.Y., 1958. *Soil.*

World Health Organization (W.H.O.) **COMMUNITY WATER SUPPLY.** Technical Report Series, no. 420, Geneva, 1969. *Water supply.*

_______. **DISPOSAL OF COMMUNITY WASTEWATER.** Technical Report Series, no. 541, Geneva, 1974. *Sewage disposal.*

PUBLIC STREETS. *(opposite page)* Taipei, Taiwan. A narrow street of multiple use: children playing, people shopping, laundry drying. Vehicular traffic is minimum. Dwellings cover entirely the private land and therefore the streets are the only areas available for outdoor activities. *(See Street Mode I, pages 28-29-87). (left)* Nairobi, Kenya. Public housing in Kariobangi South. A service alley at the rear of the row of dwellings. The alley is too narrow for garbage truck collection or for children playing. Note the utilities: electric conduits, electricity and water meters, sewer access and vents, roof drain pipes, open gutter, the N.C.C. trash bins. The service alley is really a garbage dump, when not the stage for more serious offenses. *(See lot accesses, page 96). (Photos: C.T. Hsu, 1975; P. Patel, 1972).*

3.0 design criteria

INTRODUCTION. This section is concerned with the design of site and services and similar projects. It provides a reference for the preparation of projects and cost estimates for urban settlements in the process of planning, as well as for existing settlements in the process of being upgraded. It also provides a reference in the preparation of policies and programs. The main body of this section is a matrix for site and services projects with models of urban layouts. The matrix includes: a) Elementary physical *MODELS* of circulation, land utilization and land subdivision. They cover basic urban residential configurations which are the products of two variables: lots and layouts of blocks. b) The *UTILITIES* for the models (water supply, sewage disposal, circulation/storm drainage, electricity/street lighting), covering: objectives, minimum and standard levels of services, design, specifications and cost analysis. c) Studies of *COSTS*, including: guidelines for evaluation of costs; illustration of cost implications; supporting and reference cost data.

3.1 THE SITE AND SERVICES CONCEPT

DEFINITIONS. *SITE AND SERVICES* is a term that covers the subdivision of urban land and the provision of services for residential use and complementary commercial use. Site and services projects are aimed to improve the housing conditions for the low income groups of the population by providing: a) *SITE:* availability of a piece of land on which people can build their own dwellings; b) *SERVICES:* availability of employment, utilities, services and community facilities, financing and communications as follows: *employment:* existing and newly created job opportunities; *public utilities:* water supply and sewage disposal, street paving and storm drainage, electricity and street lighting, refuse collection; *services and community facilities:* health, educational, recreational and cultural; *finances:* housing bank, credit and loan associations; *communications:* public transportation, public telephone, public mail service. Site and services projects recognize the principle that security of tenure is one of the main conditions for social and economic upward mobility for people without wealth, goods, or any other form of capital.

Site and services projects are not, by any means, limited to prototypes; on the contrary, they have innumerable variations: they can be of any size in terms of population or site extent; they can be developed in any convenient location; they can provide different levels and types of services; they can also include different kinds of housing programs; they can imply different degrees of government and community participation; they are not necessarily the concern of only one particular agency as is the case with all the utilities. Despite the wide variety of options, common positive traits can be recognized when:

a) The type and level of site and services is based on the needs of the people for whom the project is intended and is adjusted to their capacity to pay.

b) The users accept different levels of services and different stages of development.

c) Most of the housing is built through self-help or aided self-help programs.

d) Loans at low interest rates are made available for the purchase of land and dwelling construction.

e) Cooperatives of users are created with the following responsibilities: to collect housing loan payments; to organize a savings system that will allow uninterrupted dwelling development; to organize the implementation of services and community facilities in cooperation with the public housing agencies.

f) The land is sold only by public housing agencies in order to avoid speculation by individual as well as private organizations, which is a common abuse in urban settlements of this nature.

g) Social, educational, health, employment community programs are provided as an integral part of the site and services package.

SIZE AND POPULATION. Size and population are critical factors in urbanization. It goes without saying that they are also critical in site and services projects. The direct consequence is that variations in size and population affect percentages of different land utilization (*See: SIZE, SHAPE, page 62.*) But, most important, in addition to these variations, other more significant changes take place.

Larger sizes or larger populations imply in general a larger variety of population in terms of incomes, ages, household composition, education, skills, cultures, aspirations, ambitions, etc. This variety is directly reflected in the physical environment, particularly in the demand for different types of dwelling groups, dwelling units, different sizes of lots.

There is abundant documented evidence to support the observation that when this variety is not recognized in the projects, the immediate effects in the community are negative. It is also demonstrated that, eventually, people will modify unsatisfactory dwellings and lots to provide for the variety needed, putting a great strain on their limited resources and money. Unfortunately, these efforts will not achieve the same degree of success that would have resulted if these needs had been anticipated. As a consequence, the critical issue in large site and services projects is to provide a variety of lot options or, better yet, flexible urban layouts with built-in capacity to accommodate changes.

3.2 THE MODELS

DEFINITIONS. The models developed are primarily physical models of a residential area and contemplate the basic needs/requirements for daily life activities. They can accommodate dwellings, a primary school, playgrounds, shops, markets, small industries and other sources of employment, and community services. All of these elements are located within walking distance, because it is assumed that none of the members of a family will depend on automobiles for everyday activities like going to work or to school, or to any other place for recreation, leisure, shopping, or even small errands. It is assumed, for instance, that the configuration of all the social, economic, and physical systems will permit food and other goods to be purchased several times a day, in small quantities for immediate needs, from a corner store. The size, population, circulation, land utilization, and urban layout of the models should be adequate to make an environment suitable for the community; "community" being the people living in a particular place or region and usually linked by common interests. The context of the model is: urban areas, developing countries, low-income people, site and service projects. Other characteristics are described in the sections that follow. Despite these specific limits, the models can be applied to different cases of urban settlements. Similarly, they are confined to basic questions to permit the introduction of local variables in any specific context.

The models are represented in schematic form, indicating property lines and the different land utilization. They show layouts of public streets, blocks with lots, and blocks with semipublic land. Each model contains, in addition, the layout of the utilities, water supply, sewage disposal, circulation and storm drainage, electricity and street lighting. The utilities include brief specifications, a bill of quantities and a cost analysis. Other basic assumptions for the models are the following: (*See: SITE ANALYSIS, page 59, for additional references, when not otherwise indicated.*)

•**LOCATION, APPROACHES, ACCESSES, TRANSPORTATION.** Regarding the site for the models, the following assumptions have been made: a) Sources of employment exist within walking and bicycling distances; b) The site can be approached from a main route or avenue; c) The site either has direct access to some form of public transportation or extension of such transportation is feasible along one side of the site's perimeter; d) It is also feasible to extend to the site the existing urban utilities networks: water supply, streets, storm drainage, electricity, street lighting, refuse collection, and sewage disposal (the last desirable but not essential); e) Community services as education, health, social, etc., are also accessible; f) The utilization of the site is compatible with urban patterns of land use, population densities, income groups, land values.

•**SHAPE.** The models are square because this is more convenient than other shapes. It provides a more neutral, general, uniform symmetric condition for land utilization, land subdivision, and circulation.

•**SIZE.** The proper size is within a well-restricted range, since the elements contained in it should be within walking distance in order to allow travel several times a day by different members of a family. This simple notion results in dimensions that are then conditioned by local characteristics: culture, income, topography, climate, etc., but that ordinarily vary only within restricted limits. This has been verified by personal experience and case studies in different urban areas. However, for a better overview in the selection, smaller as well as larger dimensions were analyzed. These sizes are listed in the table with notes (*See: Figure 1, page 106.*) As a reference, the areas of some projects designed by the Urban Settlement group have been included. The size selected is 400m x 400m (measured between the centerline of perimeter streets), which meets the specific requirements.

•**BOUNDARIES.** It is assumed that the boundaries of the site are defined by perimeter streets and adjacent areas as follows: One side will be a "barrier" boundary characterized by a main through street and a sharp change in the land use of the adjacent area. Three sides will be a "meshing" boundary, characterized by secondary through streets and continuous, homogeneous topography and land uses, of similar residential or other compatible uses within the adjacent area.

•**TOPOGRAPHY.** The site is assumed to be flat.

•**SOIL.** It is assumed to be normal, with acceptable characteristics for the subbase of streets, foundations of buildings and sewage disposal as well as drainage.

•**CLIMATE.** It is assumed to be temperate. For practical reasons, North can be assumed at the top of the plans.

•It is assumed that the site is not negatively affected by: *VIEWS, FLOODING, DUST/DIRT, SMOKE, FUMES, ODORS, NOISES, VIBRATIONS, FIRE/EXPLOSION HAZARDS, AIRPORT DIS-*

TURBANCES, ZONING RESTRICTIONS, EXISTING STRUCTURES, EASEMENTS, RIGHTS-OF-WAY.

•**TENURE.** It is assumed that the legal tenure of the land is clearly determined and in one parcel to permit and facilitate the development.

•**POPULATION DENSITY.** (*See page 84.*) The range of net population densities will vary from 200 to 600 people per hectare. This is a reasonable range for site and services projects, which can be accommodated in the following physical structures: rooms in tenements (1 or 2 stories), row/group dwellings (1 or 2 stories), walk-up apartments (1, 2, 3 or 4 stories). For the 16Ha, the initial working estimate of the population is:

NET DENSITY	*RESIDENTIAL LAND*		*TOTAL POPULATION*
200 people/Ha	69%	11.47Ha	2,294 persons
600 people/Ha	59%	9.42Ha	5,652 persons

The net density refers only to the residential land, excluding land for circulation and public facilities. The area available for residential land decreases with the increase in density from 11.47Ha to 9.42Ha. A greater density demands more semipublic land for schools and other communal facilities. This land is subtracted from the residential land. The population will be sufficient to support the elements listed in the definition of the model, which include a primary school and playground, or a semipublic open area reserved for community uses.

•**CIRCULATION SYSTEM.** (*See page 86.*) In the models, the following modes of circulation were considered:

MODE I	user:	Pedestrians	ROW 10m
MODE II	users:	Pedestrians (dominating) and Vehicles	ROW 10m
MODE III	users:	Vehicles and Pedestrians (undefined pattern)	ROW 20m
MODE IV	users:	Vehicles (dominating) and Pedestrians	ROW 40m

(See: Table of Circulation Modes, Users, and Road Characteristics, page 87.) ROW: Right-of-way.

The boundaries/perimeter of the models are Modes III/IV, serving local and through traffic. The interior of the models has Modes I/II, serving only the local traffic within the model. This configuration will contribute to the physical and functional definition of the community environment. All land for circulation is public.

The models developed include two gridiron layouts and three grids. (*See: URBAN LAYOUTS, page 90.*) The gridirons have only lines of circulation and therefore this cannot be minimized. The grids combine lines of circulation and lines of access and therefore allow the minimization of public circulation.

•**LAND UTILIZATION.** (*See page 92.*) Private and semiprivate land are distinguished in plans, but are grouped together in tables and graphs. All this land is primarily residential but contains dwellings as well as shops and small industries. This is the common practice in urban areas, where shops and small industries include dwellings, particularly when all kinds of small businesses are run on a family basis. It serves no purpose to indicate specific commercial areas because they can be located anywhere and combined with dwellings.

•**LAND SUBDIVISION.** (*See page 96.*)

•**LAND DEVELOPMENT.** (*See page 98.*)

•**BASIC AND PHYSICAL-ECONOMIC DIAGRAMS.** (*See page 100.*)

SIZES *m x m*		*Hectares*	*NOTES*
100 x 100	=	1	These small sizes cannot include some of the community elements that are directly and daily related with the dwelling.
200 x 200	=	4	
300 x 300	=	9	
MKALLES PROJECT		13.3	These sizes permit the identification of the community with the site. They also include the elements mentioned in the definition of the model within distances that can be comfortably covered by walking
400 x 400	=	16	
500 x 500	=	25	
600 x 600	=	36	These large sizes are still within reasonable walking distances. But they also begin to include other elements not necessarily related to the basic community life and activities; for example, secondary schools, parks, large playgrounds, etc. In addition, the larger the site, the more the particular features of the environment make each case unique and therefore not prototypical,: topography, boundaries, soil, existing structures, etc.
700 x 700	=	49	
800 x 800	=	64	
900 x 900	=	81	
1000 x 1000	=	100	
RUARAKA PROJECT		117.8	
1500 x 1500	=	225	
LA MARINA PROJECT		232	
DANDORA PROJECT		310	
200 x 200	=	400	

Figure 1: **TABLE OF MODEL SIZES ANALYZED.**

3.3 THE MATRIX

The preceding specifications and ranges are illustrated with a matrix containing *BASIC REFERENCE MODELS* representing elementary physical models of circulation, land utilization and land subdivision; covering typical layouts, common lot areas and proportions; and provided with infrastructure at minimum and standard levels.

The models typify basic urban residential configurations which are the products of two variables: lots and layout of blocks. The lots include a range of areas ($20m^2$ to $400m^2$) and proportions (1:1 to 1:4).

The layouts include the basic types of blocks: *Gridiron and Grid*. The matrix has 400 models numerically developed by computer and tabulated. (*See page 114.*) Only 20 of these models have their layouts designed. (*See: Figure 1, page 109.*)

The designed models comprise a sequence of layouts, starting from gridiron and being successively modified by inputs affecting the different types of land utilization. Each layout is evaluated and identified with a specific issue of land utilization. The following is a description of the layouts and how they were evolved:

•1. GRIDIRON, representing **GEOMETRIC FORM** of subdivision. Characteristic: the layout is determined by the manner in which access is provided to a given type of lots. Accesses are minimized by providing only one side for access. This requirement implies side-by-side and back-to-back lots. The depth of blocks is a fixed dimension determined by the depth of two lots. The length of blocks is a variable dimension determined by the selected distance for circulation intervals. (*See: CIRCULATION SYSTEM, page 86; LAND SUBDIVISION, page 96.*) Block lengths run perpendicular to the main street, which is at the top of the models.

•2. **GRIDIRON,** incorporating **SEMIPUBLIC LAND.** Characteristic: the layout makes room for land of semipublic utilization. Part of the private and public land is transferred to semipublic use for schools, playgrounds, community facilities, etc. Area of land required is determined by population. (*See: SIZE, page 62; POPULATION DENSITY, page 84; LAND UTILIZATION, page 92.*) The area should be constant for all the models. However, since this area should be defined within the given street layout, it was necessary to make adjustments in order to fit the layout, and consequently there are small differences between the semipublic areas of different sets of models. All the semipublic land is in one parcel or block in order to reduce circulation lengths; it has been located in the center of the model in order to be easily accessible from all the lots; its proportion has been determined by the minimum block length of 80m. But this simple configuration does not need to be followed in other cases. Semipublic areas can also be divided into several smaller parcels, which may increase circulation lengths and costs.

•3. **GRID,** minimizing **PUBLIC LAND.** Characteristic: the layout cuts down public circulation areas. In order to minimize public land for circulation, public streets are limited to a basic circulation grid (range: 80m to 200m). Access to lots is provided through semiprivate spaces owned in condominium. (*See: CIRCULATION SYSTEM, page 86; LAND SUBDIVISION, page 96.*) All this land subtracted from the streets is gained for private or semiprivate use. It represents, approximately, a gain of 10% of the total area of a model (16Ha). (*See Figure 1, pages 110-111.*) In addition to this procedure, another approach would be to reduce public land by reducing the width of streets. But this latter procedure is not applied here, in order to preserve the dimensional consistency of the models.

•4. **GRID,** differentiating **PRIVATE LAND** Characteristic: the layout provides flexibility in lot subdivision. The different demands for land in terms of potential, costs, utilization, and lot sizes is recognized by providing different options fronting on the principal streets (Modes III and IV). (*See: BASIC AND PHYSICAL-ECONOMIC DIAGRAMS, page 100.*) These areas are left white in the plans, indicating that they can be subdivided in lots of different sizes. On two streets (Modes III and IV), lots are deeper, but in the case of the other two lateral streets (Mode III), lots maintain their original depth because this option is more convenient than to abandon the dimensional consistency of the models. Furthermore, they do not alter quantities and costs of the components of the basic networks of utilities. However, variations in lot depths and widths are fully illustrated in a demonstrative model. (*See: DEMONSTRATIVE MODEL, page 26.*)

•5. **GRID,** expanding **SEMIPRIVATE LAND.** Characteristic: the layout provides adequate land for semiprivate utilization. The semiprivate land (access to lots), until this moment, was maintained at 10m wide, which is the width used for all interior streets. But when the land became semiprivate, the function of circulation became secondary in relation to other uses. It is then opportune to expand the land in order to make it adequate for these other uses — children's playground, limited parking, social activities, drying the wash, or even drying seeds on the ground — as is commonly done everywhere that such spaces exist. The required land is taken from the private area of each lot and transferred to the semiprivate area owned in condominium. This change does not affect quantities and percentages, since private and semiprivate land are considered together. (*See: LAND SUBDIVISION, page 96; DEMONSTRATIVE MODEL, page 26; LAND UTILIZATION, page 92.*)

The matrix with the 20 models is shown in the opposite page. The land utilization ratings for the 20 models are shown in the table below.

Land utilization is rated as follows: *SEMIPUBLIC LAND:* unprovided/provided; *PUBLIC LAND:* wasteful/efficient; *PRIVATE LAND:* inflexible/flexible; *SEMIPRIVATE LAND:* inadequate/adequate. Only the negative ratings are specified in the table. The positive ratings are indicated by OK.

Of the 20 models, 4 (20%) represent cases without semipublic land, 8 (40%), cases of waste in public land; 8 (40%), cases of inflexible private land; 16 (80%), cases of insufficient or no semiprivate land; 4 (20%), cases of all positive ratings. In all cases the infrastructure of the model represents the optimum design for the particular model, independent of its intrinsic qualities. The ratings result from the land utilization areas and circulation lengths. (*See pages 110-111.*)

Tables for the determination of models for other lot dimensions are included. (*See page 114.*) Larger-scale plans of layouts for each lot type and comments on efficiency will be found in the Appendix. (*See pages 166-173.*)

LAND UTILIZATION RATINGS

LOT TYPES Area (m^2) / Dimensions ($m \times m$)	Land Utilization	*GRIDIRON BLOCKS* 1 Represents Geometric Form	*GRIDIRON BLOCKS* 2 Incorporates Semipublic Land	*GRID BLOCKS* 3 Minimizes Public Land	*GRID BLOCKS* 4 Differentiates Private Land	*GRID BLOCKS* 5 Expands Semiprivate Land
100 / 10.00x10.00	Semipublic	Unprovided	OK	OK	OK	OK
	Public	Wasteful	Wasteful	OK	OK	OK
	Private	Inflexible	Inflexible	Inflexible	OK	OK
	Semiprivate	Inadequate	Inadequate	Inadequate	Inadequate	OK
100 / 6.03x16.66	Semipublic	Unprovided	OK	OK	OK	OK
	Public	Wasteful	Wasteful	OK	OK	OK
	Private	Inflexible	Inflexible	Inflexible	OK	OK
	Semiprivate	Inadequate	Inadequate	Inadequate	Inadequate	OK
203 / 14.00x14.50	Semipublic	Unprovided	OK	OK	OK	OK
	Public	Wasteful	Wasteful	OK	OK	OK
	Private	Inflexible	Inflexible	Inflexible	OK	OK
	Semiprivate	Inadequate	Inadequate	Inadequate	Inadequate	OK
200 / 8.75x22.85	Semipublic	Unprovided	OK	OK	OK	OK
	Public	Wasteful	Wasteful	OK	OK	OK
	Private	Inflexible	Inflexible	Inflexible	OK	OK
	Semiprivate	Inadequate	Inadequate	Inadequate	Inadequate	OK

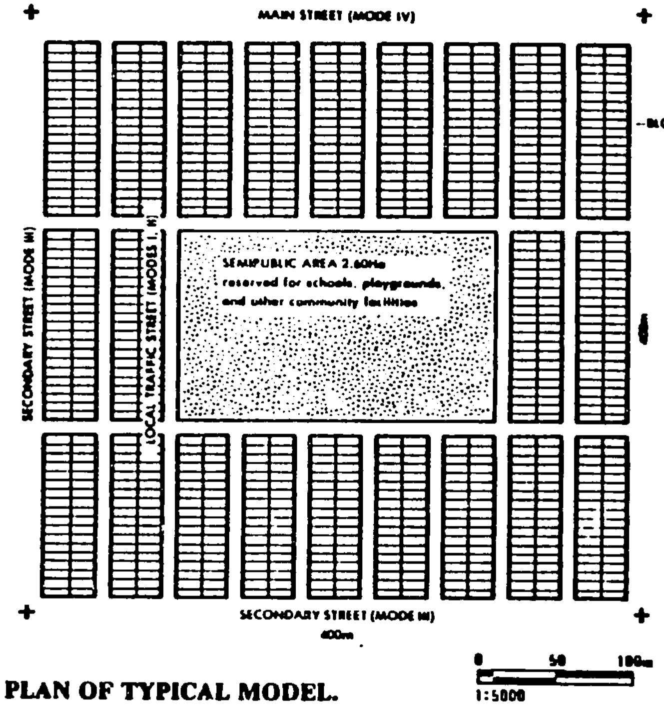
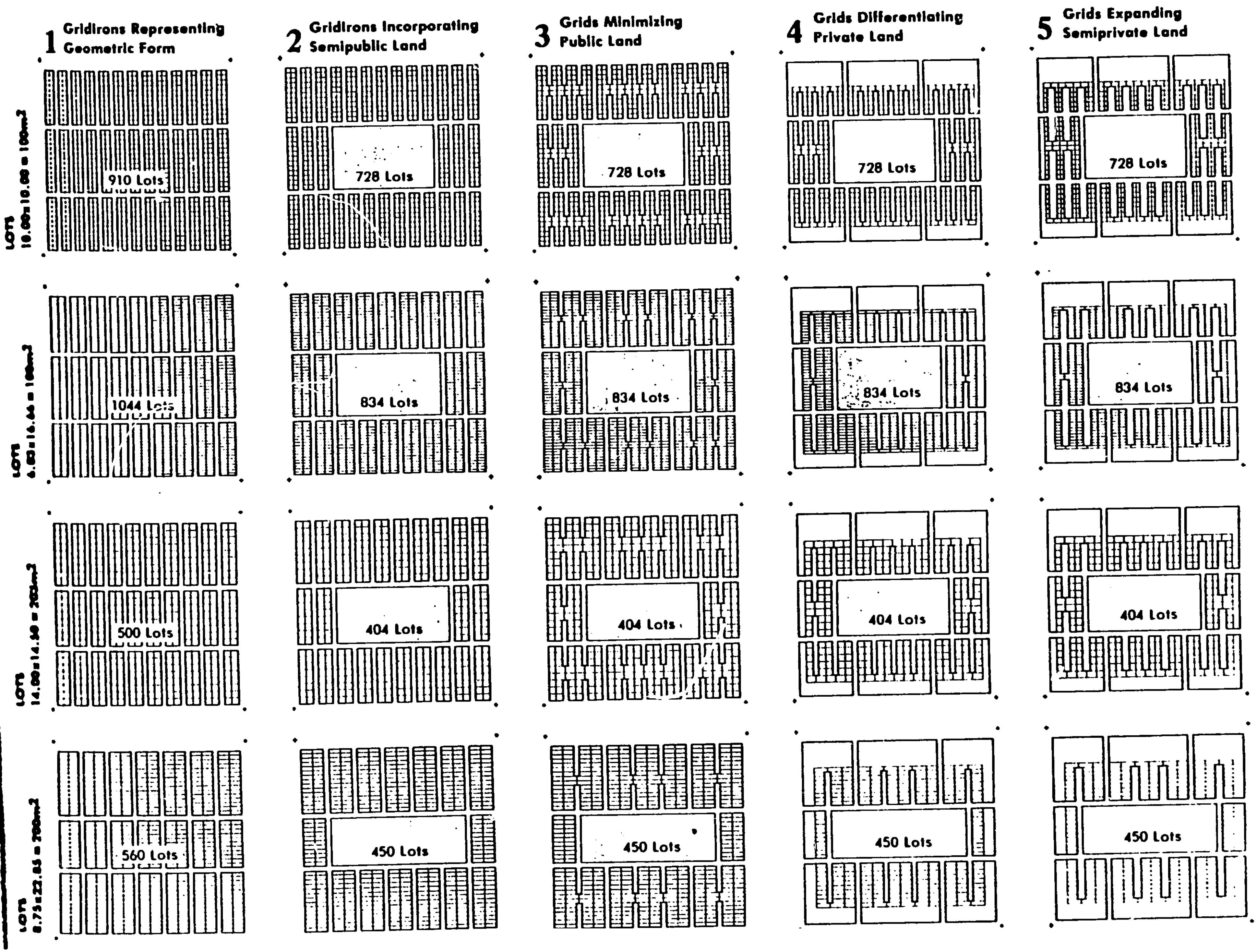


***Figure 1:* PLAN OF TYPICAL MODEL.**

***Figure 1* (*opposite page*): MATRIX OF 20 BASIC REFERENCE MODELS.** They are arranged as follows: horizontally, the four types of lots; vertically, the five layouts. Each model (400m x 400m) shows blocks, circulation, and semipublic area. Scale 1/10,000.


1 Gridirons Representing Geometric Form
2 Gridirons Incorporating Semipublic Land
3 Grids Minimizing Public Land
4 Grids Differentiating Private Land
5 Grids Expanding Semiprivate Land
910 Lots
728 Lots
728 Lots
728 Lots
728 Lots
1044 Lots
834 Lots
834 Lots
834 Lots
834 Lots
500 Lots
404 Lots
404 Lots
404 Lots
404 Lots
560 Lots
450 Lots
450 Lots
450 Lots
450 Lots

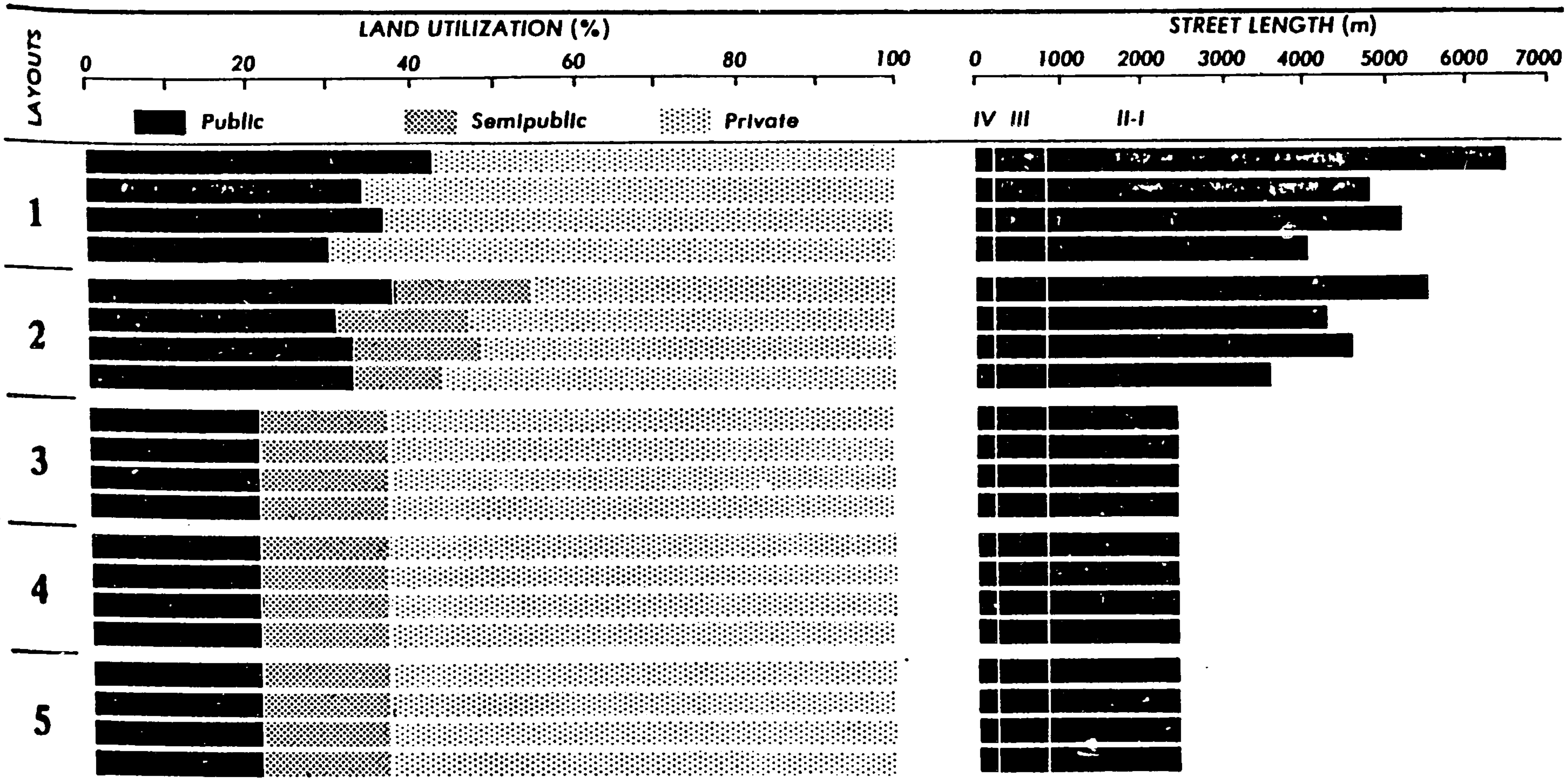
LAYOUTS	LOTS AREA m²		No.	LAND UTILIZATION Public Has	%	Semipublic Has	%	Private Has	%	STREETS Areas(Has) I-II	III-IV	Length (m) I-II	III	IV	UNIT LENGTH Total	m/Ha
1	100	□	910	6.90	43.13	—	—	9.10	56.87	4.96	1.94	5600	600	200	6400	400
	100	▭	1044	5.50	34.38	—	—	10.50	65.62	3.66	1.94	4000	600	200	4800	300
	203	□	500	5.85	36.56	—	—	10.15	63.44	3.91	1.94	4400	600	200	5200	[illegible]
	200	▭	560	4.80	30.00	—	—	11.20	70.00	2.86	1.94	3200	600	200	4000	250
2	100	□	728	6.12	38.25	2.60	16.25	7.28	45.50	4.18	1.94	4760	600	200	5560	347
	100	▭	834	4.99	31.21	2.62	16.37	8.39	52.42	3.05	1.94	3453	600	200	4253	265
	203	□	404	5.29	33.06	2.51	15.69	8.20	51.25	3.35	1.94	3790	600	200	4590	286
	200	▭	450	[illegible]	27.63	2.58	16.12	9.00	56.25	2.98	1.94	[illegible]	[illegible]	200	3575	223
3	100	□	728	3.40	21.25	2.60	16.25	10.00	62.50	1.46	1.94	1600	600	200	2400	150
	100	▭	834	3.40	21.25	2.62	16.37	9.98	62.38	1.46	1.94	1600	600	200	2400	150
	203	□	404	3.40	21.25	2.51	15.69	10.09	63.06	1.46	1.94	1600	600	200	2400	150
	200	▭	450	3.40	21.25	2.58	16.12	10.02	62.63	1.46	1.94	1600	600	200	2400	150
4	100	□	728	3.40	21.25	2.50	16.25	10.00	62.50	1.46	1.94	1600	600	200	2400	150
	100	▭	834	3.40	21.25	2.62	16.37	9.98	62.38	1.46	1.94	1600	600	200	2400	150
	203	□	404	3.40	21.25	2.51	15.69	10.09	63.06	1.46	1.94	1600	600	200	2400	150
	200	▭	450	3.40	21.25	2.58	16.12	10.02	62.63	1.46	1.94	1600	600	200	2400	150
5	100	□	728	3.40	21.25	2.60	16.25	10.00	62.50	1.46	1.94	1600	600	200	2400	150
	100	▭	834	3.40	21.25	2.62	16.37	9.98	62.30	1.46	1.94	1600	600	200	3400	150
	203	□	404	3.40	21.25	2.51	15.69	10.09	63.06	1.46	1.94	1600	600	200	2400	150
	200	▭	450	3.40	21.25	2.58	16.12	10.02	62.63	1.46	1.94	1600	600	200	2400	150

Figure 1 (above): **TABLE OF LOTS AND LAYOUTS,** with land utilization areas and percentages, and circulation lengths. Layouts: **1 GRIDIRON REPRESENTING GEOMETRIC FORM; 2 GRIDIRON INCORPORATING SEMIPUBLIC LAND; 3 GRIDIRON MINIMIZING PUBLIC LAND; 4 GRID DIFFERENTIATING PRIVATE LAND; 5 GRID EXPANDING SEMIPRIVATE LAND.** Circulation modes: **I and II, INTERNAL STREETS: III and IV, PERIMETER STREETS.**

Figure [illegible] (opposite page): CHART of the preceding table. Layouts and Circulation Modes are the same as in the table.

LAND UTILIZATION AND LAND CIRCULATION. The accompanying table and graph show areas of land utilization and lengths of circulation for the 20 models.

There is no semipublic land in the gridiron representing geometric form. The other layouts include a constant semipublic area of approximately 16%. The areas of public and private land are inversely related: the increase or decrease of one results in a loss or gain in the other.



The layouts with less private land (45.50%) and consequently more public land are the gridiron layouts 1 and 2. The gridirons also have the larger circulation lengths (6400-5560m), with a unit circulation length of 400-347m/Ha. The length of the streets on the perimeter is constant in all the layouts; therefore, the variations in circulation lengths result from the interior streets. The layouts with more private land (63.06%) and consequently less public land (21.25%) are the grid layouts 3, 4 and 5. The grids also have the shorter circulation lengths (2400m) with a unit circulation length of 150m/Ha. The street lengths are also constant in all the grid layouts because they are independent of the lot dimensions. The percentages of private and public land are constant. The small disparities in the table arise from the semipublic areas, which are similar but not exactly equal. There is a great difference between the layouts of efficient land utilization and those that are wasteful. The figures in the table show that the wasteful layouts have 28% less private land, but 205% more public land, 231% more in public street lengths.

3.4 MODELS FOR ANY LOTS

Layouts for only two lot areas are shown in the urbanization models of the study ($100m^2$ and $200m^2$, for both square and rectangular proportions). To provide data for other lot areas and lot proportions, a computer program was developed which determines other models with their corresponding land utilization areas and percentages. When given any lot area, lot proportion, and layout type, the program would determine the exact layout with corresponding numerical outputs of selected parameters that will permit drawing a plan of the layout.

•*INPUT VARIABLES. Lot area:* $20m^2$ to $400m^2$, or other; *Lot proportions:* 1:1 (square) to 1:4, or other; *Layout types:* gridiron incorporating semipublic land, or other.

•*OUTPUT VARIABLES. Lot area:* actual area adjusted to fit layout (numerical); *Lot dimensions:* actual lot size based on adjusted area (numerical); *Land subdivision:* a) number of lots, number of blocks, dimensions of semipublic area, area and percentage of land utilization, street lengths (numerical). b) plan of layout, may be drawn from data.

•*ADDITIONAL OUTPUTS WHICH CAN BE DEVELOPED.* Quantities of utility components, for water supply, sewage disposal, circulation, storm drainage, electricity, street lighting, for any model (numerical). *Total model costs:* Unit costs could be assigned to components and resultant total costs could be derived, for any model (numerical).

•*CONSTRAINTS OF COMPUTER MODEL.* Layouts derived through the computer correspond to all requirements of the 20 developed models: All layouts are 400m x 400m; all interior streets are 10m in width; the main street along one side is 20m (to centerline); the other peripheral streets are 10m (to centerline); the semipublic area varies from 2.50 to 2.62Ha with a dimension between 80m and 140m on its short side.

The results of the program are tabulated in the accompanying TABLE OF BASIC MODEL LAYOUTS (*See pages 114-115.*) Significant facts from the table are illustrated in two graphs. (*See opposite page.*) These graphs are plotted using the unit circulation lengths and the percentages of land for private and semiprivate utilization of the different layouts given in the table.

COMMENTS ON THE GRAPHS. In examining the graphs, the following should be noted: a) All layouts represented are gridiron; b) Lots are indicated with squares and circles. The gaps in the graphs occur because certain lot dimensions are not given by the tables. c) In site and services projects the lot sizes generally provided are as follows: 20 to $80m^2$ less frequently; 100 to $200m^2$ most frequently; 220 to $300m^2$ less frequently; 320 to $400m^2$ least frequently.

The graph of unit lengths indicates:

•The square lots (1:1) have a trend curve with the highest unit circulation lengths. This unit length decreases with the size of the lot but rapidly stabilizes between 234-248m/Ha after lots are larger than $340m^2$.

•The rectangular lots of narrow proportions (1:4) have a trend curve with lower unit circulation lengths. This unit length decreases with the size of the lots, but rapidly stabilizes between 166-184m/Ha after lots are larger than $320m^2$.

The graph of private, semiprivate land indicates:

•The square lots (1:1) have a trend curve with the lowest percentages of private land. This percentage increases with the size of the lots but rapidly becomes stationary between 54-55% after lots are larger than 340m.

•The rectangular lots of narrow proportions (1:4) have a trend curve with higher percentages of private land. This percentage increases with the size of the lots, but rapidly becomes stationary between 60-61% when lots are larger than $260m^2$.

Conclusions can be summarized as follows:

•The square (1:1) or approximately square lots are never adequate, because they always result in a poor unit circulation length, as well as a poor percentage of land for private utilization, when lots are $200m^2$ or smaller.

•The rectangular lots (1:4) provide a better unit circulation length, as well as a better percentage of land for private utilization. Yet, unit circulation lengths cannot be better than 204m/Ha, nor percentages of private land better than 58%, when lots are $200m^2$ or smaller and the layouts are gridiron.

As shown in the graphs, all gridiron layouts in fact provide poor indices: unit circulation lengths and percentages of private land

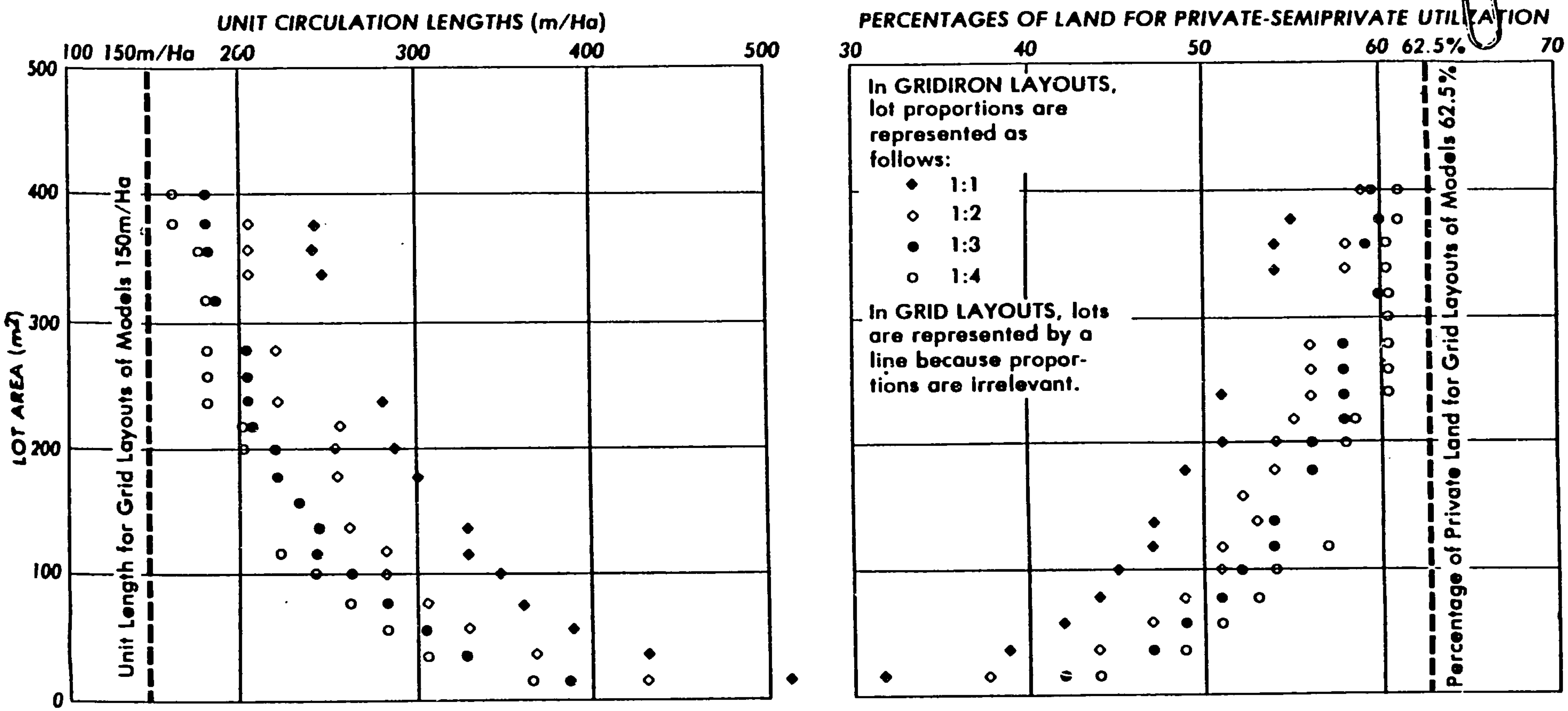


Figure 1: **GRAPHS OF UNIT CIRCULATION LENGTHS AND PERCENTAGES OF LAND FOR PRIVATE-SEMIPRIVATE UTILIZATION.** Values taken from tables in figure 1, pages 114-115. For: lot areas $20m^2$ — $400m^2$; lot proportions 1:1 to 1:4; layouts incorporating 2.50Ha — 2.61Ha (16%) of semipublic land.

be improved because circulation depends on lot dimensions. In grid layouts, unit circulation lengths and percentages of private land can be improved because the circulation is independent of lot dimensions, as has been mentioned. Indices for models of grid layouts are represented in the graphs by vertical broken lines: unit circulation lengths of 150m/Ha; percentages of private land of 62.5%.

Figure 1 (pages 114-115): **TABLE OF BASIC MODEL LAYOUTS.** The tables determine land subdivision (lots, semipublic land) and land utilization percentages for lot areas from $20m^2$ to $400m^2$, for lot proportions from 1:1 (square) to 1:4, and for the gridiron layout incorporating semipublic land. The other 4 layouts can be easily derived from the numerical values given in the table. These numerical values can be used to draw layouts. The areas of land utilization are the direct result of the given layout and do not represent optimum indices.

INPUT AREA m^2	RATIO W/D	ADJUST AREA m^2	LOT DEPTH m	LOT WIDTH m	VERT LOTS N°	BLOCKS N°	TOTAL LOTS N°	TOTAL AREAS IN Ha WITH %						CIRCULATION UNIT LENGTH m/Ha	SEMIPUBLIC AREA	
								PRIVATE		PUBLIC		SEMIPUBLIC			VERTICAL DIST m	HORIZ DIST m
								Ha	%	Ha	%	Ha	%			
20	1/1	20.00	4.29	4.67	75	21	2534	5.07	31.67	8.39	52.46	2.54	15.87	512	130.67	194.29
20	1/2	20.04	6.47	3.10	113	17	3068	6.15	38.43	7.23	45.22	2.62	16.35	428	133.19	196.47
20	1/3	20.00	8.00	2.50	140	15	3372	6.74	42.15	6.68	41.75	2.58	16.10	388	115.00	224.00
20	1/4	20.03	8.93	2.24	156	14	3504	7.02	43.87	6.40	40.01	2.58	16.12	368	121.15	212.86
40	1/1	39.73	6.47	6.14	57	17	1560	6.20	38.74	7.27	45.43	2.53	15.83	431	128.95	196.47
40	1/2	40.06	8.93	4.49	78	14	1752	7.02	43.87	6.40	40.01	2.58	16.12	368	121.15	212.86
40	1/3	40.18	11.25	3.57	98	12	1884	7.57	47.31	5.85	36.58	2.58	16.10	328	139.29	185.00
40	1/4	40.13	12.73	3.15	111	11	1966	7.89	49.31	5.56	34.73	2.55	15.96	306	107.21	238.18
60	1/1	59.57	8.00	7.45	47	15	1140	6.79	42.45	6.71	41.91	2.50	15.64	389	111.70	224.00
60	1/2	59.66	11.25	5.30	66	12	1272	7.59	47.43	5.86	36.63	2.55	15.94	329	137.88	185.00
60	1/3	60.20	12.73	4.73	74	11	1306	7.86	49.14	5.55	34.57	2.59	16.19	305	108.78	238.18
60	1/4	59.71	14.50	4.12	85	10	1364	8.14	50.90	5.27	32.96	2.58	16.14	286	115.29	224.00
80	1/1	80.13	8.93	8.97	39	14	876	7.02	43.87	6.36	39.76	2.62	16.37	363	80.77	324.29
80	1/2	79.55	12.73	6.25	55	11	994	7.91	49.42	5.56	34.77	2.53	15.82	306	106.25	238.18
80	1/3	80.56	14.50	5.56	63	10	1008	8.12	50.75	5.27	32.92	2.61	16.33	285	116.67	224.00
80	1/4	79.91	16.67	4.79	73	9	1054	8.42	52.64	5.00	31.26	2.58	16.10	266	124.66	206.67
100	1/1	100.00	10.00	10.00	35	13	728	7.28	45.50	6.12	38.25	2.60	16.25	348	130.00	200.00
100	1/2	99.51	14.50	6.86	51	10	816	8.12	50.75	5.27	32.92	2.61	16.33	285	116.67	224.00
100	1/3	100.57	16.67	6.03	58	9	834	8.39	52.42	4.99	31.21	2.62	16.37	266	126.72	206.67
100	1/4	99.72	19.38	5.15	68	8	872	8.70	54.35	4.73	29.58	2.57	16.07	247	138.97	185.00
120	1/1	119.32	11.25	10.61	33	12	636	7.59	47.43	5.86	36.63	2.55	15.94	329	137.88	185.00
120	1/2	120.83	14.50	8.33	42	10	672	8.12	50.75	5.27	32.92	2.61	16.33	285	116.67	224.00
120	1/3	118.97	19.38	6.14	57	8	732	8.71	54.43	4.69	29.31	2.60	16.26	243	92.11	282.50
120	1/4	119.40	22.86	5.22	67	7	758	9.05	56.57	4.42	27.65	2.53	15.78	224	94.03	268.57
140	1/1	140.63	11.25	12.50	28	12	540	7.59	47.46	5.86	36.64	2.54	15.90	329	137.50	185.00
140	1/2	138.89	16.67	8.33	42	9	606	8.42	52.60	5.00	31.25	2.58	16.15	266	125.00	206.67
140	1/3	141.28	19.38	7.29	48	8	616	8.70	54.39	4.73	29.59	2.56	16.02	247	138.54	185.00
140	1/4	140.35	22.86	6.14	57	7		SEMI-PUBLIC SOLUTION NOT POSSIBLE								
160	1/1	159.09	12.73	12.50	28	11		SEMI-PUBLIC SOLUTION NOT POSSIBLE								
160	1/2	162.04	16.67	9.72	36	9	518	8.39	52.46	4.99	31.22	2.61	16.33	266	126.39	206.67
160	1/3	160.00	22.86	7.00	50	7		SEMI-PUBLIC SOLUTION NOT POSSIBLE								
160	1/4	160.42	27.50	5.83	60	6		SEMI-PUBLIC SOLUTION NOT POSSIBLE								
180	1/1	178.18	12.73	14.00	25	11	442	7.88	49.22	5.53	34.55	2.60	16.23	303	84.00	309.0
180	1/2	178.45	19.38	9.21	38	8	488	8.71	54.43	4.74	29.60	2.56	15.97	247	138.16	185.0
180	1/3	181.82	22.86	7.95	44	7	496	9.02	56.36	4.42	27.61	2.56	16.02	224	95.45	268.5
180	1/4	181.60	27.50	6.60	53	6		SEMI-PUBLIC SOLUTION NOT POSSIBLE								
200	1/1	203.00	14.50	14.00	25	10	404	8.20	51.26	5.29	33.06	2.51	15.68	287	112.00	224.0
200	1/2	199.45	19.38	10.29	34	8	436	8.70	54.35	4.69	29.29	2.62	16.36	243	92.65	282.5
200	1/3	200.00	22.86	8.75	40	7	450	9.00	56.25	4.42	27.59	2.58	16.16	223	96.25	268.5
200	1/4	200.52	27.50	7.29	48	6		9.30	58.15	4.14	25.90	2.55	15.95	204	102.08	250.0

INPUT AREA m^2	RATIO W/D	ADJUST AREA m^2	LOT DEPTH m	LOT WIDTH m	VERT LOTS N°	BLOCKS N°	TOTAL LOTS N°	TOTAL AREAS IN Ha WITH % PRIVATE Ha	%	PUBLIC Ha	%	SEMIPUBLIC Ha	%	CIRCULATION UNIT LENGTH m/Ha	SEMIPUBLIC AREA VERTICAL DIST m	HORIZ DIST m
220	1/1	220.65	14.50	15.22	23	10		SEMI-PUBLIC SOLUTION NOT POSSIBLE								
220	1/2	218.75	19.38	11.29	31	8	400	8.75	54.69	4.74	29.65	2.51	15.67	248	135.48	185.00
220	1/3	218.75	27.50	7.95	44	6	424	9.27	57.97	4.14	25.87	2.59	16.16	204	103.41	250.00
220	1/4	218.75	27.50	7.95	44	6	424	9.27	57.97	4.14	25.87	2.59	16.16	204	103.41	250.00
240	1/1	241.67	14.50	16.67	21	10	336	8.12	50.75	5.27	32.92	2.61	16.33	285	116.67	224.00
240	1/2	242.42	22.86	10.61	33	7	372	9.02	56.36	4.42	27.61	2.56	16.02	224	95.45	268.57
240	1/3	240.63	27.50	8.75	40	6		SEMI-PUBLIC SOLUTION NOT POSSIBLE								
240	1/4	238.00	34.00	7.00	50	5	404	9.62	60.09	3.88	24.23	2.51	15.68	185	112.00	224.00
260	1/1	265.15	16.67	15.91	22	9		SEMI-PUBLIC SOLUTION NOT POSSIBLE								
260	1/2	258.06	22.86	11.29	31	7		SEMI-PUBLIC SOLUTION NOT POSSIBLE								
260	1/3	260.14	27.50	9.46	37	6	356	9.26	57.88	4.14	25.86	2.60	16.26	204	104.05	250.00
260	1/4	258.70	34.00	7.61	46	5	370	9.57	59.82	3.87	24.20	2.56	15.98	184	114.13	224.00
280	1/1	277.78	16.67	16.67	21	9		SEMI-PUBLIC SOLUTION NOT POSSIBLE							-	
280	1/2	275.86	22.86	12.07	29	7	326	8.99	56.21	4.41	27.59	2.59	16.21	223	96.55	268.57
280	1/3	283.09	27.50	10.29	34	6	328	9.29	58.03	4.14	25.88	2.57	16.08	204	102.94	250.00
280	1/4	276.74	34.00	8.14	43	5	346	9.58	59.85	3.87	24.20	2.55	15.95	185	113.95	224.00
300	1/1	307.02	16.67	18.42	19	9		SEMI-PUBLIC SOLUTION NOT POSSIBLE								
300	1/2	296.30	22.86	12.96	27	7		SEMI-PUBLIC SOLUTION NOT POSSIBLE								
300	1/3	300.78	27.50	10.94	32	6		SEMI-PUBLIC SOLUTION NOT POSSIBLE								
300	1/4	297.50	34.00	8.75	40	5	322	9.58	59.87	3.87	24.20	2.55	15.92	185	113.75	224.00
320	1/1	324.07	16.67	19.44	18	9		SEMI-PUBLIC SOLUTION NOT POSSIBLE								
320	1/2	320.83	27.50	11.67	30	6		SEMI-PUBLIC SOLUTION NOT POSSIBLE								
320	1/3	321.67	34.00	9.46	37	5	298	9.58	59.90	3.87	24.21	2.54	15.89	185	113.51	224.00
320	1/4	321.67	34.00	9.46	37	5	298	9.58	59.90	3.87	24.21	2.54	15.89	185	113.51	224.00
340	1/1	339.06	19.38	17.50	20	8	256	8.68	54.25	4.73	29.56	2.59	16.19	247	140.00	185.00
340	1/2	343.75	27.50	12.50	28	6	272	9.35	58.44	4.15	25.94	2.50	15.63	204	100.00	250.00
340	1/3	340.00	34.00	10.00	35	5		SEMI-PUBLIC SOLUTION NOT POSSIBLE								
340	1/4	340.00	34.00	10.00	35	5		SEMI-PUBLIC SOLUTION NOT POSSIBLE								
360	1/1	356.91	19.38	18.42	19	8	244	8.71	54.43	4.69	29.31	2.60	16.26	243	92.11	282.50
360	1/2	356.48	27.50	12.96	27	6	260	9.27	57.93	4.14	25.87	2.59	16.20	204	103.70	250.00
360	1/3	360.61	34.00	10.61	33	5	264	9.52	59.50	3.87	24.17	2.61	16.33	184	116.67	224.00
360	1/4	360.61	34.00	10.61	33	5	264	9.52	59.50	3.87	24.17	2.61	16.33	184	116.67	224.00
380	1/1	376.74	19.38	19.44	18	8	232	8.74	54.63	4.74	29.64	2.52	15.74	248	136.11	185.00
380	1/2	385.00	27.50	14.00	25	6		SEMI-PUBLIC SOLUTION NOT POSSIBLE								
380	1/3	383.87	34.00	11.29	31	5	250	9.60	59.98	3.87	24.21	2.53	15.81	185	112.90	224.00
380	1/4	382.81	43.75	8.75	40	4	256	9.80	61.25	3.61	22.56	2.59	16.19	166	140.00	185.00
400	1/1	398.90	19.36	20.59	17	8		SEMI-PUBLIC SOLUTION NOT POSSIBLE								
400	1/2	401.04	27.50	14.58	24	6	232	9.30	58.15	4.14	25.90	2.55	15.95	204	102.08	250.00
400	1/3	396.57	34.00	11.67	30	5	240	9.52	59.59	3.87	24.17	2.61	16.33	184	116.67	224.00
400	1/4	402.96	43.75	9.21	38	4	244	9.83	61.45	3.61	22.57	2.56	15.97	163	138.16	185.00

3.5 UTILITIES, SERVICES, COMMUNITY FACILITIES

CONTENT AND APPROACH. Urban areas are served by different systems of networks. The models are particularly concerned with the systems of land utilization and infrastructure, which are physical in nature, more permanent and less flexible, and represent capital costs. Therefore, the models include the study of only the following: *Land:* private and semiprivate land for dwellings, shops, small industries; public land for circulation; semipublic land for schools, playgrounds and other communal facilities. *Infrastructure/utilities:* water supply; sewage disposal; circulation and storm drainage; electricity and street lighting. The models do not include the study of the following: *Utilities:* gas, telephone. *Services, facilities:* public transportation, police protection, fire protection, refuse collection, health, schools, kindergartens, playgrounds, recreation, parks, open spaces, other community facilities.

The study of each utility for the models covers: definition of objectives, requirements for minimum and standard levels of services, basic data, basic calculations, basic criteria, design sketches, quantity of components, cost analysis, costs per model, relative/comparative costs per lot and per hectare. The design of utilities does not include: site exploration, clearing and preparation (borings, clearing, core drilling, demolition, disposal, dump charges, moving buildings, site removal, etc.); temporary constructions (barricades, fences, offices, roads, sidewalks, winter protection, etc.). It should be made clear that the study of utilities is schematic because the purpose and extent of this work is not to provide a set of designs and specifications for construction but rather to offer a set of guidelines for preliminary estimates and evaluations.

The networks of utilities are limited to the area of the model only. It is assumed that urban utilities are available within its boundaries (with the exception of sewage disposal in the case of aqua privies or septic tanks). Any data, input, capital costs beyond that are not part of this study. For reasons of design, construction, service, maintenance and administration, some utilities should be considered together, as is clearly the case with circulation/storm drainage; electricity/street lighting. But for the same reasons, the other pair of utilities, water supply and sewage disposal, although interdependent in many ways, must be considered separately. Water supply services are always provided in one way or another. Sewage disposal is less often provided, and if it is, it can combine many types and stages of development. In reality, water supply comes first and sewage disposal perhaps may never come. It is thus more practical to consider them separately.

For the reasons discussed further on (*See page 147*), two distinctive parts are recognized in the utilities: *BASIC NETWORK* (for all the utilities) includes all the primary distribution or collection system; occupies generally publicly owned land, with few exceptions as in easements. *FACILITIES/SERVICE CONNECTIONS* (for water supply, sewage disposal, electricity) include service drops, connections, meters, privies, septic tanks, aqua privies; occupy mostly privately owned land.

OBJECTIVES AND LEVELS. Levels of services are hard to evaluate and cannot be measured with the same units. In some cases quantities are the main indicators, but quantities are not absolutes and only represent ranges that can be very wide; moreover, they are not the only indicators to be considered. Quantities or numbers are essential gauges, provided that they are supported by sensible judgment and criteria in the definition of needs, objectives, and levels. This is not the case most of the time. It has become normal professional practice to deal with situations not as realities but as abstractions. As a result, very soon people and needs are symbols, numbers are the living creatures, and foolishness is in the making. Typical examples are found in the design of streets in the urban areas of developing countries where the levels adopted for traveled ways provide for a high volume of traffic, heavy loads and high speeds, when the existing vehicles are a few old automobiles or trucks and streets are mostly used by pedestrians and children playing hopscotch. Similarly, storm drainage may have been designed for runoff levels corresponding to copious rains, lasting only a few hours, that may occur only seldom over a very long period of time. In addition, following the same criteria, the use of inlets and underground pipes as secondary collectors is not minimized in favor of the streets as primary collectors, thus not only considerably raising the cost of construction but also multiplying the problems of maintenance.

Levels of services have been defined as follows: *Minimum levels* are acceptable or possible levels below the standard. *Standard levels* are levels set up and established by authority, custom or general consent, as a model, example or rule for the measure of quantity, weight, extent, value or quality.

In the models, the levels were limited to one specific minimum level and one specific standard level for each utility. They are thoroughly described in the opening paragraphs of the discussion of each utility. They are not intended as measures of "excellence," because, as is obvious, levels of services change from country to country, depending on culture, customs, living standards, physical limitations, etc. For each particular project, the proper levels should be determined. A limiting condition established for the utilities was that of progressive development, recognizing that achieving standard levels should not require an entirely new development but rather should be the result of upgrading minimum levels, using existing elements. However, to facilitate the comparison of design layouts, quantities of components and costs per model, each level is presented as complete in itself; that is, differences between levels should be found by subtraction.

PRACTICAL GUIDELINES. This study of utilities does not cover specific aspects such as maintenance and operation, but the reductions of costs in these areas are implicit in the design. The layout of utilities is optimized for each model independent of its intrinsic qualities. Some of the practical guidelines for the layouts are given in the following checklist:

- a) Objectives and levels should be determined by a careful examination of the problem and not by a routine application of existing procedures. This is illustrated in the preceding example of streets and storm drainage.
- b) Quantities of components should be minimized by a good, competent layout. This also is apparent in the preceding example, when in providing storm drainage, unnecessary underground pipes and inlets are installed instead of adopting the more economical and practical solution of maximizing the street as a primary collector.
- c) The number of different sizes of the same type of components should be kept to a minimum by judiciously grouping dimensional requirements and not specifying every size indicated in the tables of the handbook or catalog. This is a common fault, resulting from lack of experience, plain incompetence or the mindless, bureaucratic application of established procedures. It is repeatedly found in the selection of the components of utilities, where too many different pipe diameters (for water supply, sewage disposal and storm drainage) or different types/capacities of transformers (for electrical systems) are employed. This procedure is uneconomical and impractical not only for construction, which is a transitory stage, but also for maintenance and operation, which must be provided forever. But, in all instances, there are local conditions that should be considered: the availability on the market of limited types/dimensions and also the availability of imported components, tools, equipment, usually emanating from European countries or the U.S.A., that are not always interchangeable because of different gauges and dimensional norms.
- d) The different basic networks should be channeled or confined to a few main public streets and not dispersed at random in many public lines of circulation. This is also a common deficiency and probably results from emphasis on only one factor, distribution of services, with little attention paid to others no less important: location for easy identification of lines and access for easy servicing. These two conditions cannot be underrated in the light of plain practicality. Problems of identification commonly result from lack of coordination between the agencies responsible for the different utilities; incomplete plans or late filing; last-minute changes in original plans, made in the field, that afterwards are never properly recorded and filed. Because of such blunders, whatever goes underground may become forgotten and difficult to find. Confining the basic networks to fewer major streets will narrow down the field and thus facilitate locating lines and allow better control of interruptions of services, leaks or losses. In the case of servicing, the fact is that dispersion and difficult accesses result in longer, winding itineraries that take a longer time to cover than direct routes. All this can hinder the regular as well as the emergency servicing of inlets, hydrants, valves, manholes of all types, electricity lines, transformers, etc.

There are still many other practical means, not included here, that are addressed more specifically to the different type of utility. But all these preventive measures can be summarized in two words: good design.

3.6 WATER SUPPLY

OBJECTIVES. The primary purpose is to provide the community with an adequate supply of safe, potable water for drinking, cooking, personal hygiene, and sanitary purposes. The supply of water is from a distribution network connected to the urban area water grids. Other sources which do not satisfy practical or health criteria are not considered: individual and communal wells and truck delivery of water. Design criteria and requirements for minimum and standard levels of service are outlined below:

MINIMUM LEVEL	STANDARD LEVEL
Limited supply of water is provided within the dwelling or at a maximum of 100m from individual dwellings.	Full supply of water is provided within the dwelling or cluster.

ALTERNATIVE A: All distribution mains and lines on public land.

INDIVIDUAL FACILITIES

No provision.	Provided in each lot or cluster: a service connection. The following improvements are anticipated by the user in each lot: w.c., bath/shower tap, kitchen tap, bathroom tap, laundry tap. Roof tanks for one day's supply are anticipated/recommended if there may be low pressure and volume during the day. Metered service is optional. *Above facilities only or combined with:*

COMMUNAL FACILITIES

They depend on cultural acceptance. Each facility includes: w.c.'s (if required), showers, lavatories, laundries, and water taps in same facility to encourage.

ALTERNATIVE B: Distribution lines on private land affected by easements. (See: WATER SUPPLY AND SEWAGE DISPOSAL, EASEMENTS; page 130.)

INDIVIDUAL FACILITIES

The following is provided at the back of each lot: a shelter of 6m^2 including toilet/kitchen core with water taps and drain for w.c., lavatory/laundry, shower, kitchen sink. Roof tanks for one day's supply are recommended if there may be low pressure and volume during the day. Metered service is optional.

Limited supply	Full supply In addition, increased demand is anticipated through higher consumption and/or more fixtures installed by the user in each lot.

BASIC DATA. The following data were used for the models: a) Plan of layout to be served (400m x 400m = 16Ha). b) Maximum expected average density of 600 people/Ha. c) Total design population based on density; the equivalent population of the semipublic area was included to provide for schools or other public facilities. d) An urban water supply main was assumed to be located along the main (Mode IV) street, with sufficient pressure and quantity of water to supply the models. e) Water consumption per person per day was assumed to be 120 liters. f) The peak hourly demand was assumed to be 2 times greater than the average demand. For isolated projects this factor should be increased to 3-5. g) The minimum residual pressure was assumed to be 10m of head (15 psi); 25m of head (35 psi) is desirable at the fire hydrant locations for proper functioning when there are no pumper trucks. h) The pipes were limited to 3 sizes: 2" (min.), 4", and 6". i) Acceptable head losses from friction were assumed to be 10m of head per 1000m length for 6" pipe, 24m of head per 1000m length for 4" pipe. j) A minimum pressure of 25m (35 psi) is assumed for the urban water supply network. k) Extra flow capacity for fires was not considered.

The following basic reference data were not necessary for the calculation and design of the water supply network, but should be considered in a project: a) Quantity and pressure of water availabl[illegible]diability of services; insufficient/limited supply of water would limit/dictate the levels of service and alternatives. b) Topography of site; large changes in elevation may require pumps or elevated storage tanks to supply sufficient pressure. c) Soil and water analysis; the chemical action of the soil and water will in part determine the selection of the pipe material. d) Weather conditions, particularly data on frost and its depth of penetration. e) Local availability of pipe sizes and material.

BASIC CALCULATIONS. The water supply network was designed for the full development of the models. A tentative layout was established following minimum standards. Calculations have been made to verify that the layouts do not have excessive head losses (pressure losses from friction) with the design flows and pipe sizes specified.

TENTATIVE PIPE LAYOUT. 6" primary distribution lines were connected to the assumed urban network and on the perimeter of the model, providing water to secondary distribution lines and to adjacent lots; 4" secondary distribution lines were located passing through the interior and on the perimeter without primary distribution lines, providing water to the block distribution lines and to adjacent lots; 2" block distribution lines were located in each remaining interior block, providing water to lots. The maximum length before interconnection with another pipe was 183m for 2" pipe and 610m for 4" pipe.

CALCULATION FOR HEAD LOSSES. The networks were calculated assuming a one-way, dead-end layout with the consideration that all the water needed for a particular layout would be used at the last pipe at the minimum pressure selected. The total head loss for the model at the worst condition was determined using the Hazen-Williams formula:

$$\text{Velocity (V)} = 0.55\ C\ D^{2.63}\ H^{0.54}$$

$$\text{Flow (Qm)} = 0.279\ C\ D^{2.63}\ H^{0.54}$$

where: V = velocity of flow in feet/second

C = roughness coefficient of 100

H = head loss in feet per foot length

Qm = flow in millions of gallons/day

A nomograph relating flow, diameter of pipe, head loss and velocity was used to simplify calculations.

An example of the procedure is illustrated as follows for the 6.03m x 16.66m = 100m² lot, layout 2.

•*Average water demand for model:* (figures for population are based on the initial working estimates of maximum density and land utilization areas assumed for the models, *see: THE MODELS, page 105*) total population x consumption per person = 7188 x 120 = 9.98 liters/second.

•*Design water demand for model:* average demand x peak demand factor = 9.98 x 2 = 19.96 liters/second.

•*Total head loss:* the calculations were as follows:

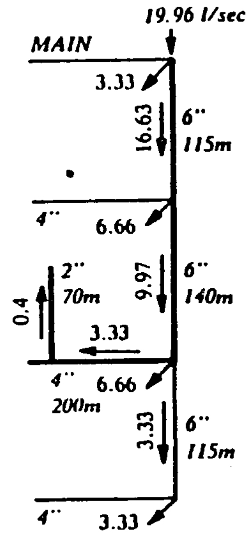


Figure 1: **SCHEMATIC FLOW DIAGRAM OF CRITICAL SECTION.**

PIPE *in*	*LENGTH* *m*	*FLOW* *l/sec*	*UNIT HEAD LOSS* *m per 1000m*	*TOTAL HEAD LOSS* *m*	*VELOCITY* *m/sec*
6"	115	16.63	9.5	1.16	0.91
6"	140	9.97	4.0	0.54	0.56
4"	200	3.30	3.5	0.70	0.41
2"	70	0.40	—	—	—

The total head loss under the worst conditions is 2.4m. An additional residual pressure of 10m (15psi) in the interior of the model would mean that approximately 12.4m would be required at the street main for proper functioning of the network. This is well within the requirements. The desirable head loss per 1000m of pipe is below the specified 10m for the 6" pipe and 24m for the 4" pipe.

BASIC CRITERIA. *LAYOUT.* The distribution network has been designed as a gridiron system, with no dead ends. A dead-end system would have a negligible effect on the cost, without the better flow characteristics and the elimination of stagnant water that the gridiron provides. At the minimum level, dead ends are connected to communal facilities, but the concentrated demand at the pipe terminals eliminates water stagnation problems. The network was designed so that no redundancy of components or pipes would be necessary if upgraded to the standard level. The pipes, valves and fire hydrants on the perimeter of the model were considered to be shared with the adjacent layouts. The assumed urban distribution pipe in the main (Mode

IV) street was not included in the costs of the model. Primary distribution pipes were located on the perimeter of the models as an extension of an assumed urban water supply network. These pipes logically follow the main circulation street, which would be built/developed first. Also, their larger capacity would be able to serve higher densities of population in the areas of commercial potential and higher land values. (*See: BASIC AND PHYSICAL-ECONOMIC DIAGRAMS, page 100.*) The primary distribution pipes were located in public areas (streets) to facilitate access for maintenance and installation. Only 2" block distribution lines were located on private land, at the back of the lots in the easement alternative.

PIPES. The sizes selected are listed in the Basic Calculations. Choice of materials would be dictated by local availability, bylaws, cost, and the chemical composition of the soil and water. Galvanized, cast-iron, or asbestos-cement pipes are the most commonly used. Cement-lined cast-iron pipes (as commonly used in the U.S.A.) have been specified for the models.

VALVES. Gate valves to shut off the water supply for maintenance are relatively expensive and require periodic, although infrequent, use, to prevent them from becoming "frozen" and useless. Therefore, valves have been minimized and are located so that the interior of the model would be without water should maintenance be required: 3 valves on the intersections of the pipes at the four corners of the model, 1 valve on each pipe leading into the model. An acceptable maximum walking distance of 200m in emergencies would be required for people to have access to water from taps on the perimeter streets if the interior flow was interrupted. A valve was located at each fire hydrant. Check valves and air valves have not been included in the models.

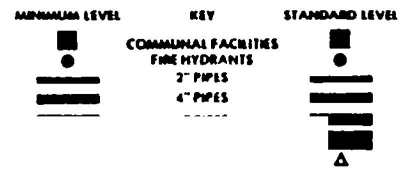
FIRE HYDRANTS. Only limited hydrant coverage was provided in the models. At the minimum level, hydrants were provided only along the main (Mode IV) street at an approximate spacing of 100m on both sides of the street at intersections. The communal facilities provide a limited water source for the remainder of the model. At the standard level, hydrants were provided on the perimeter of the model on opposite sides of the street, at a maximum spacing of 200m. Two hydrants were located in the interior of the model. Hydrant locations were limited to 4" pipes or greater for adequate flow.

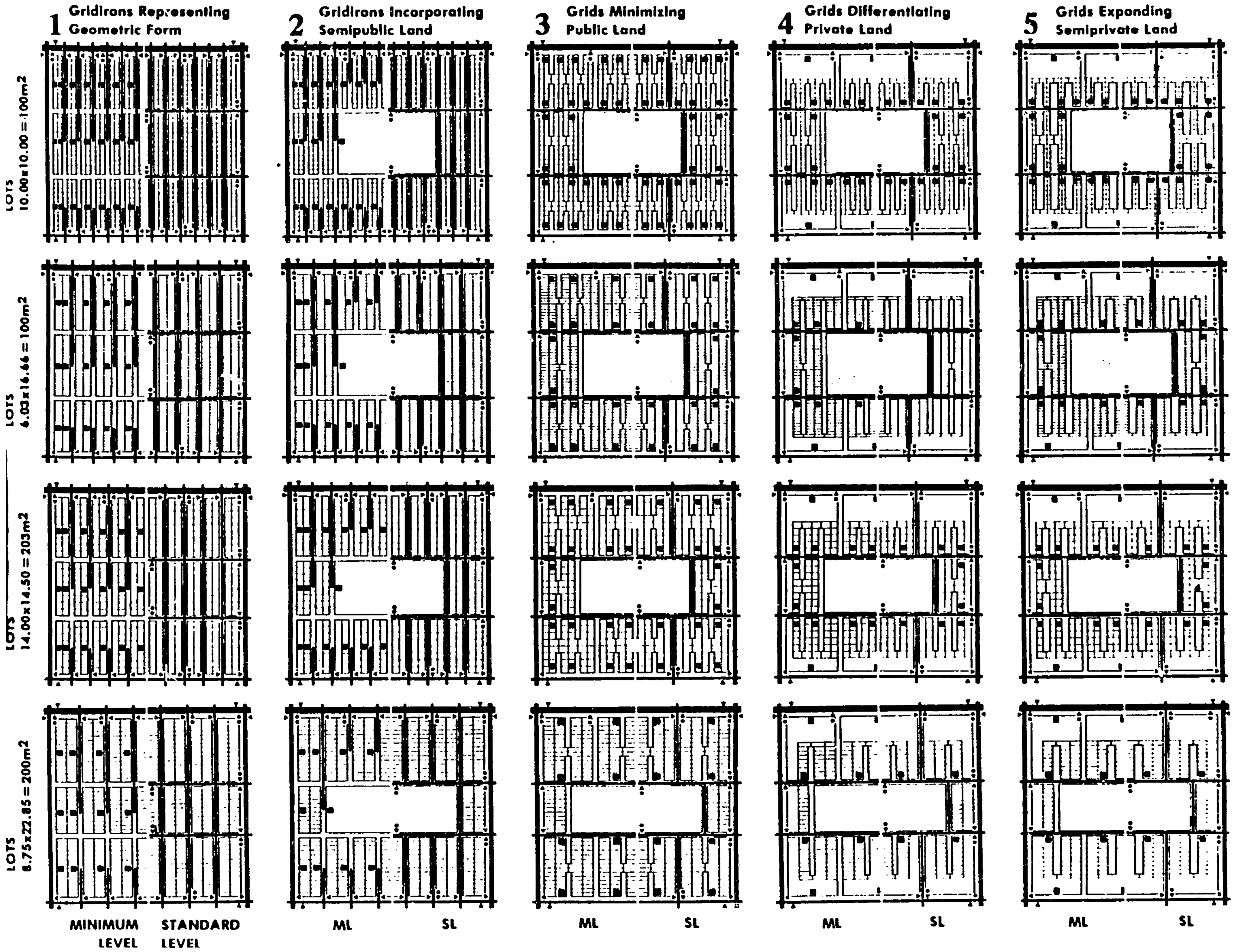
METE. Meters serve to determine an equitable water charge based on usage; moreover, they indirectly control the water consumption. The cost of the meter itself and the operating costs of meter reading, billing, and maintenance are substantial, but the absence of meters can result in from 2 to 4 times greater consumption, as demonstrated by cases in Latin America and the U.S.A. The model costs include meters with all individual service connections and a meter with each service connection for the communal facility. The use costs in the latter case may be divided equally among the families served. A flat rate may be equitably applied if roof tanks are used in situations of low pressure.

SERVICE CONNECTIONS. 3/4" pipes were used to supply water to individual lots, 1" pipes to communal facilities. The length of the service line was considered to be an average of 5m, from the centerline of the street to the lot line.

ROOF TANKS. Water storage tanks of 1000 liters per family should be considered in the design of a project in areas of low pressure or intermittent flow. Storage tanks may also be installed in the communal facilities. The models do not include roof tanks in the costs.

***Figure 1** (opposite page):* **WATER SUPPLY LAYOUTS FOR THE 20 REFERENCE MODELS. They are arranged as follows: horizontally, the four types of lots; vertically, the five layouts. Each plan is divided to show minimum and standard levels of service. Scale 1/10,000.**




1 Gridirons Representing Geometric Form
2 Gridirons Incorporating Semipublic Land
3 Grids Minimizing Public Land
4 Grids Differentiating Private Land
5 Grids Expanding Semiprivate Land
LOTS 10.00x10.00 = 100m2
LOTS 6.03x16.66 = 100m2
LOTS 14.00x14.50 = 203m2
LOTS 8.75x22.85 = 200m2
MINIMUM LEVEL
STANDARD LEVEL
ML
SL
ML
SL
ML
SL
ML
SL

LAYOUTS	LOTS		BASIC NETWORK: PIPES (m) 2"		4"		6"		Main	VALVES (N°) 2"		4"		6"	FACILITIES: FIRE HYDRANTS (N°)		SERVICE CONNECTIONS (N°) Individual	Communal		BASIC NETWORK COST/HECTARE $/Ha	
	AREA m²	No.	ML	SL	ML	SL	ML	SL	ML-SL	ML	SL	ML	SL	ML-SL	ML	SL	SL	ML	SL	ML	SL
1	100	910	3240	4800	200	1000	400	400	200	24	24	3.5	12.5	2	3	6	910	42	—	3381	5528
	100	1044	2179	3200	200	1000	400	400	200	16	16	3.5	12.5	2	3	8	1044	30	—	2563	4330
	203	500	2502	3600	200	1000	400	400	200	18	18	3.5	12.5	2	3	8	500	33	—	2809	4629
	200	560	1684	2400	200	1000	400	400	200	12	12	3.5	12.5	2	3	8	560	24	—	2180	3731
2	100	728	2460	3960	200	1000	400	400	200	24	24	3.5	12.5	2	3	8	728	36	—	2832	4936
	100	834	1656	2653	200	1000	400	400	200	16	16	3.5	12.5	2	3	8	834	26	—	2195	3944
	203	404	1857	2990	200	1000	400	400	200	18	18	3.5	12.5	2	3	8	404	28	—	2354	4199
	200	450	1189	1975	200	1000	400	400	200	12	12	3.5	12.5	2	3	8	450	20	—	1831	3431
3	100	728	—	800	1000	1000	400	400	200	—	4	7.5	12.5	2	3	8	184	48	48	1655	2533
	100	834	—	800	1000	1000	400	400	200	—	4	7.5	12.5	2	3	8	306	28	28	1655	2533
	203	404	—	800	1000	1000	400	400	200	—	4	7.5	12.5	2	3	8	134	32	32	1655	2533
	200	450	—	800	1000	1000	400	400	200	—	4	7.5	12.5	2	3	8	218	16	16	1655	2533
4	100	728	—	800	1000	1000	400	400	200	—	4	7.5	12.5	2	3	8	344	34	28	1655	2533
	100	834	—	800	1000	1000	400	400	200	—	4	7.5	12.5	2	3	8	462	22	16	1655	2533
	203	404	—	800	1000	1000	400	400	200	—	4	7.5	12.5	2	3	8	218	24	18	1655	2533
	200	450	—	800	1000	1000	400	400	200	—	4	7.5	12.5	2	3	8	298	14	8	1655	2533
5	100	728	—	800	1000	1000	400	400	200	—	4	7.5	12.5	2	3	8	344	34	28	1655	2533
	100	834	—	800	1000	1000	400	400	200	—	4	7.5	12.5	2	3	8	462	22	16	1655	2533
	203	404	—	800	1000	1000	400	400	200	—	4	7.5	12.5	2	3	8	218	24	18	1655	2533
	200	450	—	800	1000	1000	400	400	200	—	4	7.5	12.5	2	3	8	298	14	8	1655	2533

ML: Minimum level; SL: Standard level

Figure 1: **WATER SUPPLY: TABLE OF QUANTITIES OF COMPONENTS AND COSTS/HECTARE OF BASIC NETWORK FOR EACH MODEL.**

The table and chart on these pages illustrate the quantities of components for each of the 20 layouts at the two levels of service. The quantities have been used for the calculation of costs; the costs/hectare of the basic network has been included in the table for reference. The comparative chart shows very clearly the direct relationships between urban layouts (*See page 109*), layouts of utilities (*See page 121*), and quantities of components (*this page*). Also note that the quantity of components is considerably less for the grid layouts.

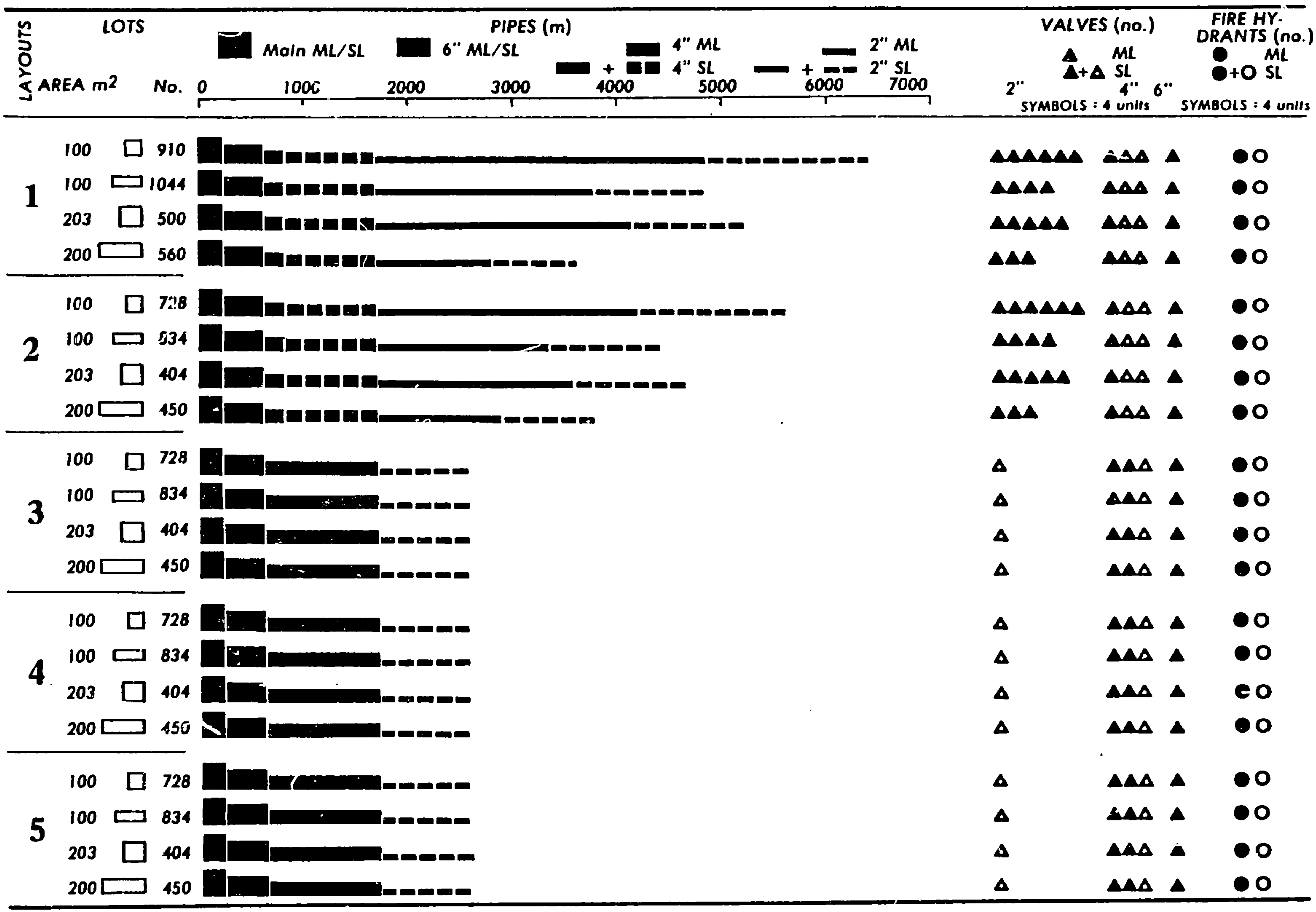


Figure 1: **WATER SUPPLY: COMPARATIVE CHART OF THE PRECEDING TABLE.**

ML: Minimum level; SL: Standard level.

3.7 SEWAGE DISPOSAL

OBJECTIVES. The primary objective is the disposal of human waste for prevention of pollution, disease, and contamination of drinking water. Design criteria and requirements for minimum and standard levels of service are outlined below:

MINIMUM LEVEL	STANDARD LEVEL
Disposal is provided within the dwelling or at a maximum distance of 100m from individual dwelling.	Disposal is provided within the dwelling or cluster.

ALTERNATIVE A: All collectors in public land.

INDIVIDUAL FACILITIES

MINIMUM LEVEL	STANDARD LEVEL
Provided in all lots.	Provided in cluster lots.

ON-LOT DISPOSAL: Includes pit latrines. It depends on the soil conditions. It includes in each lot a pit latrine dug by individual or provided. A suitable protective structure should be provided by user.

Improvements provided in all lots or other than cluster lots: *ON-LOT DISPOSAL:* Includes aqua privy or septic tank; or *WATERBORNE NETWORK DISPOSAL:* Includes service connection. Waste demands anticipated for each lot: w.c., bathroom/shower drain, kitchen sink drain, laundry drain.

MINIMUM LEVEL	STANDARD LEVEL
Above facilities combined with:	*Above facilities only or combined with:*

COMMUNAL FACILITIES

ON SITE DISPOSAL: Includes aqua privy or septic tank complete with drain field, soaking pit, etc., or *WATERBORNE NETWORK DISPOSAL:* Includes service connections. They depend on cultural acceptance and soil conditions for site disposal. They contemplate: w.c.'s, water taps, showers, lav[illegible]ies and laundry tubs in same facility to encourage use.

ALTERNATIVE B: Some collectors in private land affected by easements (See: WATER SUPPLY AND SEWAGE DISPOSAL, EASEMENTS; page 130.)

INDIVIDUAL FACILITIES

WATERBORNE NETWORK DISPOSAL: Includes service connections. The following is provided at the back of each lot: a shelter of $6m^2$ including toilet/kitchen core with water taps and rains for w.c.'s, lavatory, shower, kitchen sink.

In addition, increased flow is anticipated through higher consumption and/or additional fixtures installed by the user in each lot.

BASIC DATA. The following data were used for the models for the waterborne sewage disposal network: a) Plan of layout to be served and size of area to be drained (400m x 400m = 16Ha). b) Area of lots, number of lots. c) Maximum expected average density of 600 people/Ha. d) Total design population based on density; the equivalent population of the semipublic area is included to provide for schools or other public facilities. e) An urban sewage disposal main collector pipe is assumed to be along the main (Mode IV) street, with sufficient capacity to accept the additional flows from the model. f) The sewage disposal network is not interconnected with the storm drainage network. g) The average sewage flow is considered to be 100% of the complement of the water supply (120 liters per person per day). h) The peak hourly flow is assumed to be 2.5 times greater than the average flow. i) The sewage network is designed for full section flow. j) The minimum velocity to retard settling of sediment was assumed to be 0.6m/second (2 feet/second) but may go as low as 0.45m/second (1.5 feet/second). k) The minimum pipe slopes assumed are: 6": 0.65m/100m; 8": 0.40m/100m; 12": 0.22m/100m. l) Additional flow from storm drainage due to illegal connections was assumed for 3% of the lots (each lot = $100m^2$), resulting in a flow of 0.56 liters/second/Ha. m) Additional flow from infiltration of groundwater into the pipes was assumed to be 100,000 liters/day/Km of pipe.

The following basic reference data were not necessary for the calculation and design of the sewage disposal network but should be considered in a project: a) Actual available capacity and depth of urban network collector pipe. b) Topography of site; the pipe layout would be dictated by the natural drainage pattern of the site. c) Height of groundwater table and permeability characteristics of soil; infiltration of groundwater would alter accordingly. d) Soil chemical analysis; the chemical action of the soil would help to determine the selection of the pipe material. e) Local high-water marks to determine the susceptibility of the site to flooding. f) Weather conditions, particularly data on frost and its depth of penetration. g) Local availability of pipe sizes and materials. e) Local code restrictions.

BASIC CALCULATIONS. The waterborne sewage disposal system was designed for the maximum expected demand, with a gravity-flow network of full-section flow. The design flow for the pipes was the total of: a) 100% of the complement of the water supply flow multiplied by a peak flow factor of 2.5; b) additional flow from groundwater infiltration; c) additional flow from illegal storm drainage connections.

•*Total water supply flow* = 7188 (5652 persons in private area + 1536 equivalent persons in semipublic area) x 120 liters/day = 9.98 liters/second. (Figures for population based on initial working estimate of maximum density and areas assumed for models, *see: THE MODELS, page 105.*)

•*Peak flow per hectare* = total water flow x peak flow factor = 9.98 x 2.5/16 = 1.56 liters/second.

•*Infiltration per hectare* (total pipe length assumed as 5Km; 100,000 liters/day per kilometer assumed infiltration rate) = 0.36 liters/second.

•*Illegal connection flow per hectare* (3% of total lots with assumed rainfall of 250 liters/second per hectare) = 0.03 x 250 x 1198 x 10^{-3}/16 = 0.56 liters/second.

•*Design flow per hectare* = peak flow per hectare + infiltration per hectare + illegal connection flow per hectare = 1.56 + 0.36 + 0.56 = 2.48 liters/second.

Based upon the Manning formula, a nomograph was used to relate the slope of the sewer, diameter of pipe, discharge of pipe and velocity.

Manning formula:

$$V = \frac{1.49 \times r^{2/3} \times s^{1/2}}{n}$$

where:

V = velocity of flow in feet/second
n = coefficient of roughness 0.013
r = hydraulic radius in feet
s = slope of pipe

PIPE	*SLOPE*	*CAPACITY*	*VELOCITY*
6"	0.0065	12 liters/second	0.68m/second
8"	0.0040	20 liters/second	0.64m/second
12"	0.0022	40 liters/second	0.57m/second

The maximum area which each pipe can serve and the area it serves in the model was determined as follows:

PIPE	*CAPACITY/ FLOW PER Ha.*	=	*MAXIMUM AREA*	*MAXIMUM AREA IN MODEL*
6"	12/2.48		4.84Ha	50m x 150m = 7500m^2 (0.75Ha)
8"	20/2.48		8.06Ha	180m x 280m = 50400m^2 (5.00Ha)
12"	40/2.48		16.13Ha	400m x 400m = 160000m^2 (16.00Ha)

It may be seen that the minimum pipe diameters and not the capacity requirements dictate the choice of the 6" pipe.

In the design of a project, an additional calculation would be made for a sewer flowing partially full in order to determine if the velocity requirements are satisfied. The pipe slopes would be adjusted as needed.

BASIC CRITERIA. *LAYOUT.* The sewage flow is collected on the perimeter of the model for connection to an assumed urban network. The larger capacity of these pipes would be able to serve the higher densities of population in the areas of commercial potential and higher land values. (*See: BASIC AND PHYSICAL-ECONOMIC DIAGRAMS, page 100.*) The primary collection lines were located in public areas (streets) to facilitate access for maintenance and installation. Only 6" lateral collectors were located on private land at the back of the lots in the easement alternative. The network was designed so that there would be minimal redundancy in components or pipes if upgraded to the standard level. A limited number of manholes at dead ends serving communal facilities at the minimum level in layouts 1 and 2 would be redundant if upgraded to the standard level. The pipes and manholes on the perimeter of the model were considered to be shared with the adjacent layouts. The assumed urban collector pipe and its appurtenances in the main (Mode IV) street are not included in the costs of the model.

PIPES. The sizes selected are listed in the Basic Calculations. Choice of materials would be dictated by local availability, bylaws, cost, and chemical characteristics of the soil. Vitrified-clay, asbestos-cement, and concrete pipe are the most common pipes used. Cast-iron pipes would be used if extra strength is required. Concrete pipes were specified in the costs of the model.

MANHOLES. For cleaning and maintenance purposes, manholes were located at all intersections, at all turns, at dead ends and at other points to anticipate future expansion. Spacing of manholes was approximately 100-120m for smaller diameter pipes and up to 150m for larger-diameter pipes.

SERVICE CONNECTIONS. 4" pipes were used for connections to individual lots, and 6" pipes for communal facilities. The length of the service line was considered to be an average of 10m from the centerline of the street to an assumed point in the lot.

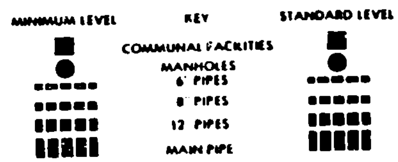
SEPTIC TANK AND AQUA PRIVY ALTERNATIVES. Both septic tanks and aqua privy are provided as alternatives in the models when an urban waterborne sewage disposal network is not available for connection. Both alternatives are considered permanent fixtures, even at the standard level of service. (They both function on the same principles: excreta are deposited in a sealed tank of water where the sludge undergoes anaerobic decomposition; excess liquid from flushing or cleaning passes into an underground drainage field where it leaches into the ground. The septic tank relies on a flush toilet to transport the excreta into the tank; in the aqua privy the excreta are deposited directly into the tank with minimal water for cleaning purposes.)

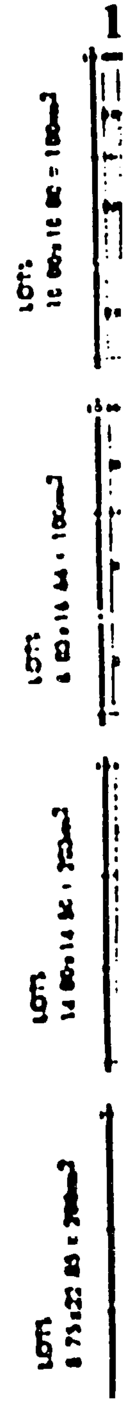
Both alternatives are only feasible with acceptable soil absorption characteristics and where there is no danger of ground pollution. Both require larger lot sizes in order to be provided.

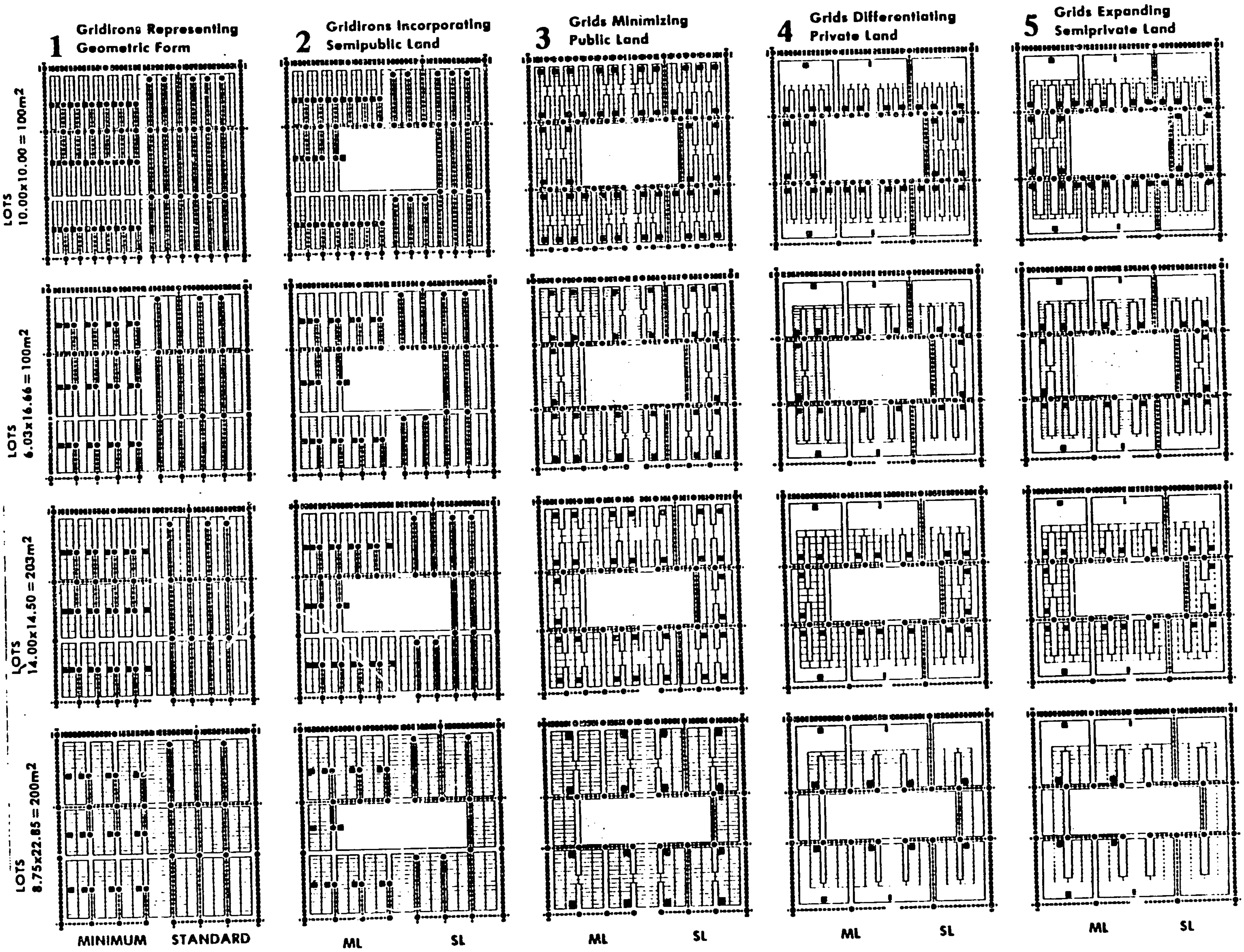
The septic tank was sized following standard design procedures: for an individual family, minimum tank size 500 gallons, as prescribed by the World Health Organization (W.H.O.); communal facilities were designe[illegible] a maximum of 200 people with a design flow of 120 liters per person per day. The aqua privy followed W.H.O. empirical design criteria: the individual family tank was $1m^3$, the communal facility for a maximum of 200 people followed W.H.O. criteria of 4 cubic feet per person for tank sizing. Both alternatives have drain fields for disposal of effluent assuming a good percolation rate of 2.5cm water drop in 5 minutes is the standard absorption test. The aqua privy included an additional 10 liters per person per day in the drain field for other waste water.

The septic tanks require large drain fields which are difficult to justify with small $100m^2$ lots, but in the $200m^2$ they would be acceptable (15m total length for drain field). The aqua privy would be acceptable in smaller lots if the soil absorption characteristics were good (5.4m total drain field length). Communal facilities with septic tanks would require careful consideration for location of the drain field in the design of a project (total drain field length for septic tank: 238m, for aqua privy: 60m).

***Figure 1** (opposite page):* **SEWAGE DISPOSAL LAYOUTS FOR THE 20 REFERENCE MODELS.** They are arranged as follows: horizontally, the four types of lots; vertically, the five layouts. Each plan is divided to show minimum and standard levels of service. Scale 1/10,000.






1 Gridirons Representing Geometric Form
2 Gridirons Incorporating Semipublic Land
3 Grids Minimizing Public Land
4 Grids Differentiating Private Land
5 Grids Expanding Semiprivate Land
LOTS 10.00x10.00 = 100m2
LOTS 6.03x16.66 = 100m2
LOTS 14.00x14.50 = 203m2
LOTS 8.75x22.85 = 200m2
MINIMUM LEVEL
STANDARD LEVEL
ML
SL
ML
SL
ML
SL
ML
SL

LAYOUTS	LOTS AREA m²	LOTS No.	BASIC NETWORK PIPES (m) 6" ML	6" SL	8" ML	8" SL	12" ML	12" SL	Main ML-SL	MANHOLES (N°) ML	MANHOLES (N°) SL	FACILITIES SERVICE CONNECTIONS (N°) Individual SL	Communal ML	Communal SL	BASIC NETWORK COST/HECTARE $/Ha ML	$/Ha SL
1	100	910	2370	4500	555	555	400	400	200	56.5	42.5	910	42	—	3913	4929
	100	1044	1590	2992	535	535	400	400	200	38.5	28.5	1044	30	—	2891	3538
	203	500	1785	3362	542	542	400	400	200	43.0	32.0	500	33	—	3148	3882
	200	560	1200	2258	516	516	400	400	200	29.5	21.5	560	24	—	2373	2849
2	100	728	1950	3570	555	555	400	400	200	50.5	42.5	728	36	—	3472	4317
	100	834	1316	2430	535	535	400	400	200	34.5	28.5	834	26	—	2601	3168
	203	404	1480	2657	542	542	400	400	200	38.0	32.0	404	28	—	2810	3419
	200	450	988	1778	516	516	400	400	200	25.5	21.5	450	20	—	2124	2533
3	100	728	—	800	925	925	400	400	200	32.5	32.5	184	48	48	1961	2487
	100	834	—	800	891	891	400	400	200	22.5	22.5	306	28	28	1661	2187
	203	404	—	800	903	903	400	400	200	25.0	25.0	134	32	32	1739	2265
	200	450	—	800	861	861	400	400	200	17.5	17.5	218	16	16	1502	2028
4	100	728	—	800	933	930	400	400	200	27.5	27.5	344	34	28	1827	2353
	100	834	—	800	907	907	400	400	200	19.5	19.5	462	22	16	1590	2116
	203	404	—	800	908	908	400	400	200	21.5	21.5	218	24	18	1646	2172
	200	450	—	800	880	880	400	400	200	15.5	15.5	298	14	8	1461	1987
5	100	728	—	800	930	930	400	400	200	27.5	27.5	344	34	28	1827	2353
	100	834	—	800	907	907	400	400	200	19.5	19.5	462	22	16	1590	2116
	203	404	—	800	908	908	400	400	200	21.5	21.5	218	24	18	1646	2172
	200	450	—	800	880	880	400	400	200	15.5	15.5	298	14	8	1461	1987

ML: Minimum level; SL: Standard level.

Figure 1: **SEWAGE DISPOSAL: TABLE OF QUANTITIES OF COMPONENTS AND COSTS/HECTARE OF BASIC NETWORK FOR EACH MODEL.**

The table and chart on these pages illustrate the quantities of components for each of the 20 layouts at the two levels of service. The quantities have been used for the calculation of costs; the costs/hectare of the basic network have been included in the table for reference. The comparative chart shows very clearly the direct relationships between urban layouts (*See page 109*), layouts of utilities (*See page 127*), and quantities of components (*this page*). Also note that the quantity ... considerably less for the grid layouts.

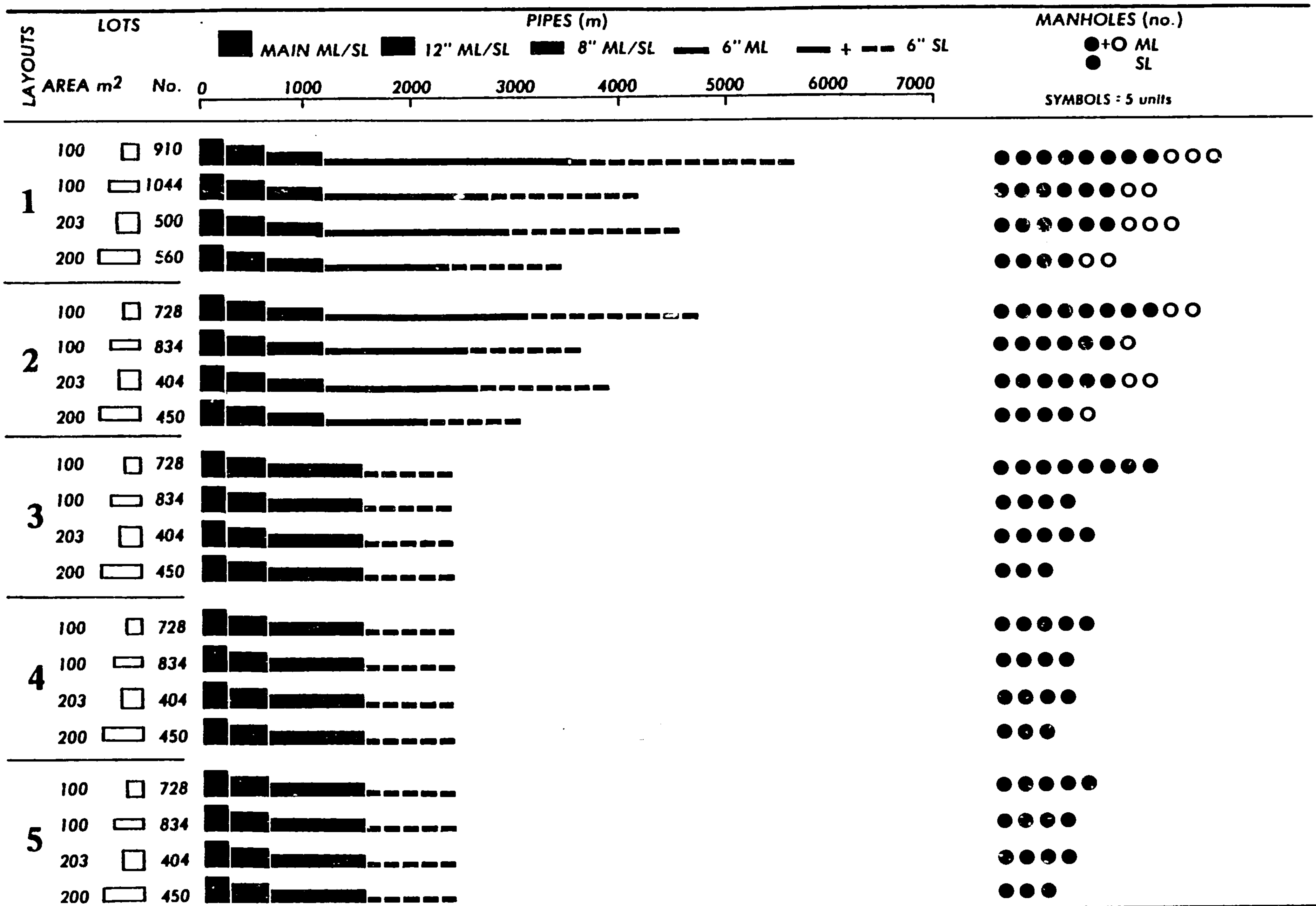


Figure 1: SEWAGE DISPOSAL: COMPARATIVE CHART OF THE PRECEDING TABLE.

ML: Minimum level; SL: Standard level.

3.8 WATER SUPPLY AND SEWAGE DISPOSAL (EASEMENTS)

DEFINITION. *EASEMENTS, Servitudes:* (*) rights in respect of an object (as land owned by one person) in virtue of which the object [land] is subject to a specified use or enjoyment by another person or for the benefit of another thing. An easement may be "an acquired right of use, interest, or privilege (short of ownership) in lands owned by another, such as an easement of light, of building support, or of right-of-way. . . . They may be permanent or limited in time dependent upon the easement agreement." (*From: Abrams, 1972.*) *Right-of-way:* (*) a legal right of passage over another person's ground [land]; the area or way over which a right-of-way exists, such as: a path or throughfare which one may lawfully use, the strip of land devoted to or over which is built a public road, the land occupied by a railroad, the land used by a public utility.

The models include easements as an alternative in water supply and sewage disposal.

The only difference between minimum and standard levels is limited supply versus full supply of water. The basic networks and service connections remain the same. They are represented in the plans as follows: left portion for water supply; right portion for sewage disposal.

The purpose of easements, at least in theory, is to reduce costs of service connections, by running lines of water and sewage in the back of the lots and installing the sanitary services along these lines, thus serving from 2 to 4 lots and saving lengths of service connections. The length of the basic network remains the same as in the waterborne system. The disadvantages of the easements are the following: a) They require the "instant" construction of the sanitary services for each lot, in order to control proper installation. This means a higher initial investment in water and sewage disposal. b) Lines are on private land, creating difficulty of access for repairs, control and routine inspections by the public agency. In some cases, to improve this condition, a narrow strip of land in the back of the lots is made public, but this creates other problems of maintenance. c) By placing the services in a fixed point on the lot, it impairs its flexibility of use. d) Foundations, footings, or other construction may damage the network.

Design provisions are outlined below. (*See: WATER SUPPLY and SEWAGE DISPOSAL, pages 118, 124, for design criteria and requirements.*)

MINIMUM LEVEL	**STANDARD LEVEL**

WATER SUPPLY. Distribution lines are on private land affected by easements. (ALTERNATIVE B)

INDIVIDUAL FACILITIES

The following is provided at the back of each lot: a shelter of $6m^2$ including toilet/kitchen core with water taps and drains for w.c., lavatory/laundry, shower, kitchen sink. Roof tanks for one day's supply are recommended if there may be low pressure and volume during the day. (Metered service is optional.)

MINIMUM LEVEL	STANDARD LEVEL
Limited supply.	Full supply. In addition, increased demand is anticipated through higher consumption and/or more fixtures installed by the user in each lot.

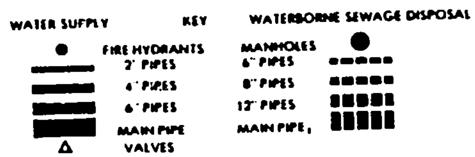
SEWAGE DISPOSAL. Some collectors are on private land affected by easements. (ALTERNATIVE B)

INDIVIDUAL FACILITIES

Waterborne disposal: *Service connections.* The following is provided at the back of each lot: a shelter of $6m^2$ including toilet/kitchen core with water taps and drains for w.c., lavatory/laundry, shower, kitchen sink.

MINIMUM LEVEL	STANDARD LEVEL
	In addition, increased flow is anticipated through higher consumption and/or additional fixtures installed by the user in each lot.

Figure 1 (opposite page): **WATER SUPPLY AND SEWAGE DISPOSAL (EASEMENTS) LAYOUTS FOR THE 20 REFERENCE MODELS.** They are arranged as follows: horizontally, the four types of lots; vertically, the five layouts. Each plan is divided to show water supply and sewage disposal. Scale 1/10,000.



LOTS 10.00x10.00=100m2

LOTS 6.03x16.66=100m2

LOTS

LOTS

' and
d re-

ease-

uding
ndry,
ded if
ice is

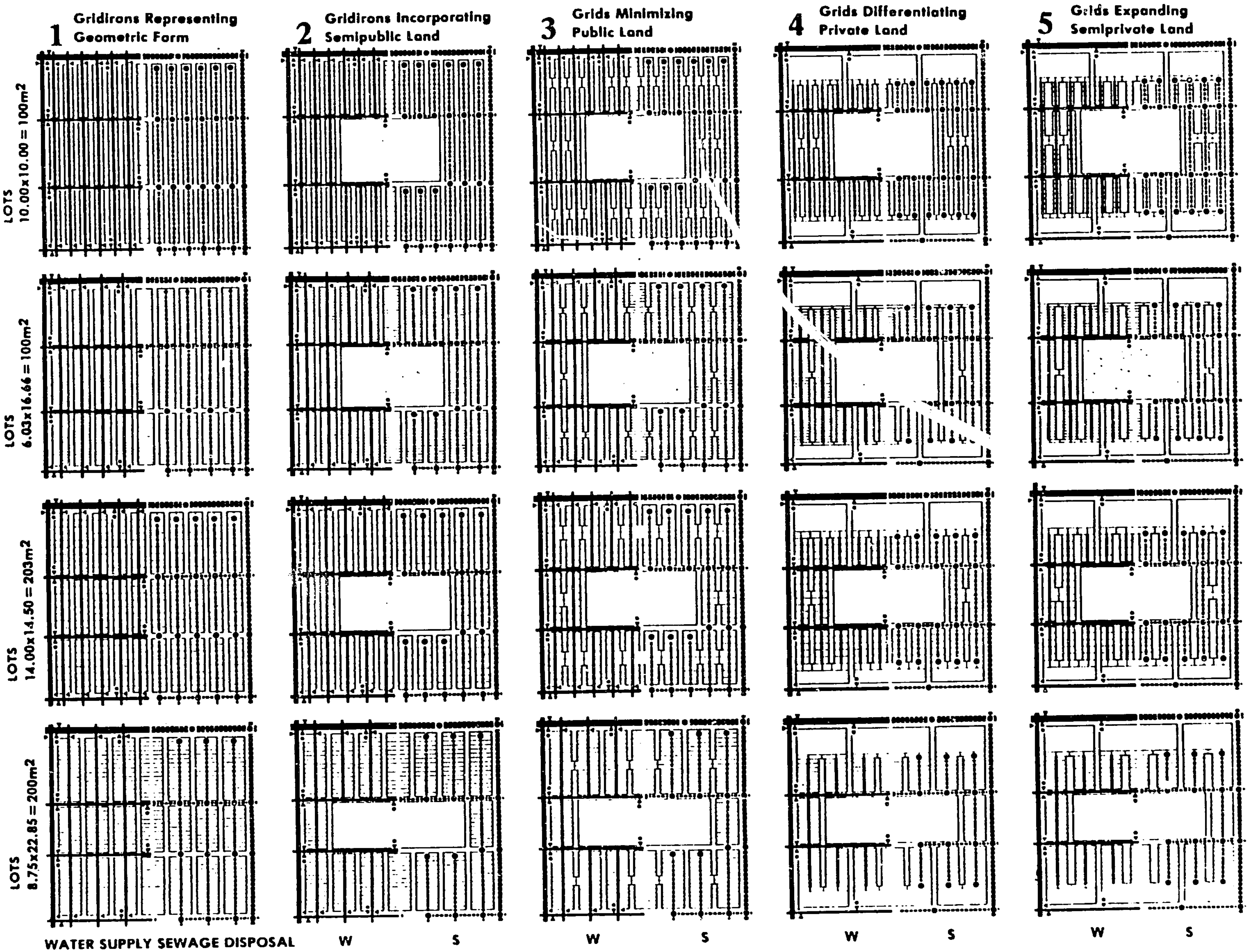
eased
rough
more
er in

ease-

it the
water

anti-
ump-
s in-

ASE-
ged as
lan is



LAYOUTS	LOTS AREA m²	LOTS No.	BASIC NETWORK WATER PIPES (m) 2" ML-SL	4" ML-SL	6" ML-SL	Main ML-SL	WATER VALVES (N°) 2" ML-SL	4" ML-SL	6" ML-SL	FIRE HYDRANTS (N°) ML-SL	SEWER PIPES 6" ML-SL	8" ML-SL	12" ML-SL	Main ML-SL	MANHOLES (N°) ML-SL	FACILITIES SER. CON. Ind. ML-SL	BASIC NETWORK COST/HECTARE $/Ha WATER SUPPLY ML-SL	SEWAGE DISPOSAL ML-SL
1	100	910	5200	1000	400	200	26	12.5	2	8	4810	555	400	200	48.0	910	5827	5284
	100	1044	3600	1000	400	200	18	12.5	2	8	3366	535	400	200	34.0	1044	4629	3935
	203	500	4000	1000	400	200	20	12.5	2	8	3660	542	400	200	37.5	500	4929	4230
	200	560	2800	1000	400	200	14	12.5	2	8	2599	516	400	200	27.0	560	4030	3224
2	100	728	4220	1000	400	200	26	12.5	2	8	3725	555	400	200	48.0	728	5136	4570
	100	834	2916	1000	400	200	18	12.5	2	8	2626	535	400	200	34.0	834	4147	3448
	203	404	3268	1000	400	200	20	12.5	2	8	2814	542	400	200	37.5	404	4413	3673
	200	450	2269	1000	400	200	14	12.5	2	8	2122	516	400	200	27.0	450	3656	2911
3	100	728	4220	1000	400	200	26	12.5	2	8	3725	555	400	200	48.0	728	5136	4570
	100	834	2916	1000	400	200	18	12.5	2	8	2626	535	400	200	34.0	834	4147	3448
	203	404	3268	1000	400	200	20	12.5	2	8	2814	542	400	200	37.5	404	4413	3673
	200	450	2269	1000	400	200	14	12.5	2	8	2122	516	400	200	27.0	450	3656	2911
4	100	728	2530	1000	400	200	—	12.5	2	8	2530	900	400	200	52.0	728	3717	4143
	100	834	1830	1000	400	200	—	12.5	2	8	1830	907	400	200	39.5	834	3224	3344
	203	404	1848	1000	400	200	—	12.5	2	8	1848	908	400	200	43.5	404	3237	3466
	200	450	1324	1000	400	200	—	12.5	2	8	1325	866	400	200	31.5	450	2867	2762
5	100	728	2530	1000	400	200	—	12.5	2	8	2530	900	400	200	52.0	728	3717	4143
	100	834	1830	1000	400	200	—	12.5	2	8	1830	907	400	200	39.5	834	3224	3344
	203	404	1848	1000	400	200	—	12.5	2	8	1848	908	400	200	43.5	404	3237	3466
	200	450	1324	1000	400	200	—	12.5	2	8	1325	866	400	200	31.5	450	2867	2762

ML: Minimum level; SL: Standard level

Figure 1: **WATER SUPPLY AND SEWAGE DISPOSAL (EASEMENTS): TABLE OF QUANTITIES OF COMPONENTS AND COSTS/HECTARE OF BASIC NETWORK FOR EACH MODEL.**

The table and chart of these pages illustrate the quantities of components for each of the 20 layouts at the two levels of service. The quantities have been used for the calculation of costs; the costs per hectare of the basic network have been included in the table for reference. The comparative chart shows very clearly the direct relationships between urban layouts (*See page 109*), layouts of utilities (*See page 131*), and quantities of components (*this page*). Also note that the quantity of components is considerably less for the grid layouts.

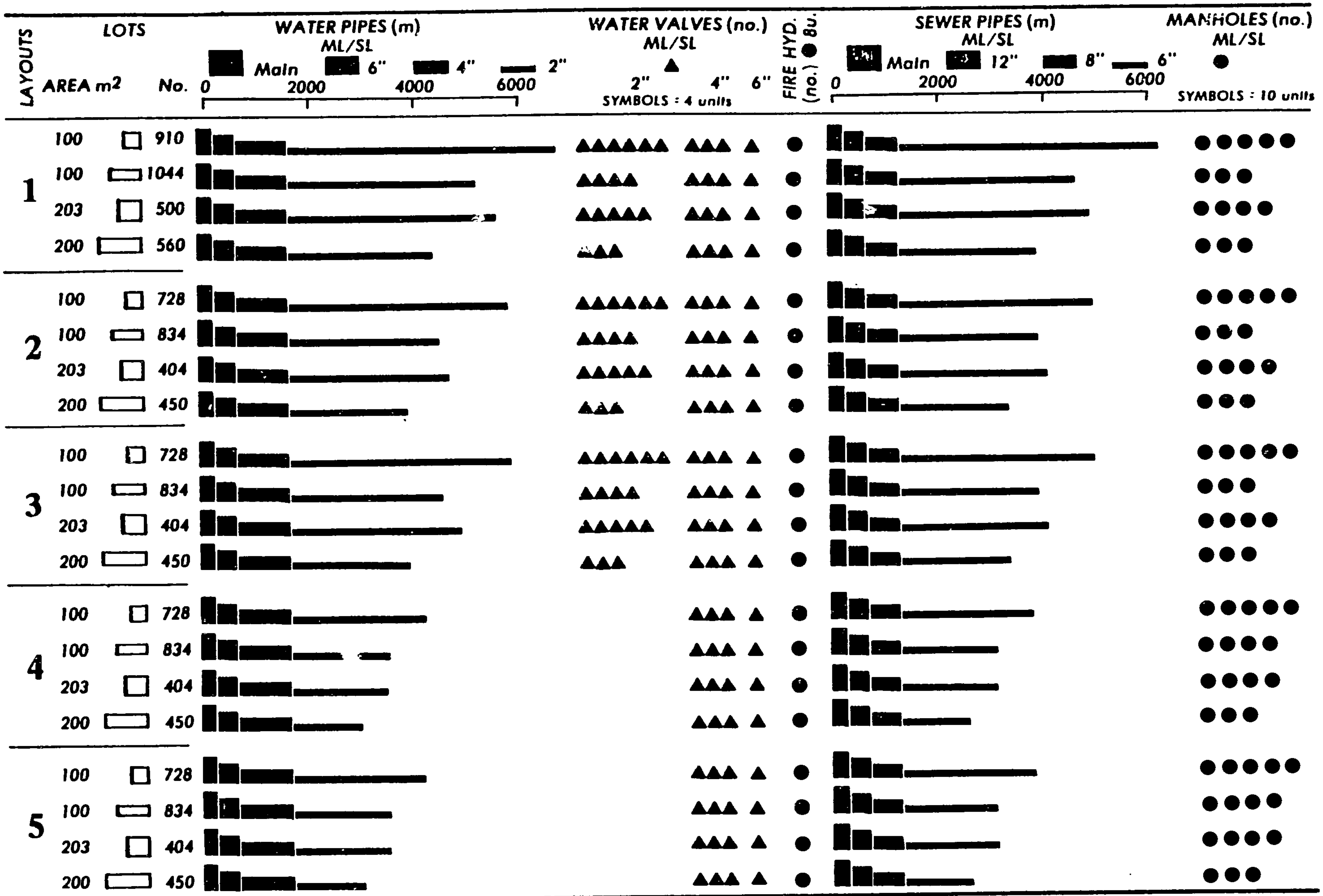


Figure 1: **WATER SUPPLY AND SEWAGE DISPOSAL (EASEMENTS): COMPARATIVE CHART OF THE PRECEDING TABLE.**

ML: Minimum level; SL: Standard level.

3.9 CIRCULATION AND STORM DRAINAGE

CIRCULATION OBJECTIVES. Streets should provide adequate and safe means of vehicular and pedestrian circulation, drainage of storm water, tree planting space, and where necessary, on-street parking of vehicles (*From: AID Proposed Minimum Standards, 1966*). Design criteria and requirements for two levels are outlined below. Right-of-way will be the same for any level.

MINIMUM LEVEL
Consists in the basic treatment of the soil to provide a wearing surface for circulation and drainage; to minimize erosion, dust, mud, maintenance. When possible, this treatment will provide a subgrade for future surfacing or paving.

STANDARD LEVEL
Consists in the improvement of the minimum level to the level established by local codes in terms of traffic load and bearing capacity.

(*See Figure 1: STREET SECTIONS, page 136.*)

INTERIOR STREETS (MODES I AND II)

Components: Traveled way, shallow ditches, sidewalks. *Types of work:* Compacted subgrade, earth or single-course construction.

Components: Traveled way, curb-gutters, sidewalks. *Types of work:* Compacted subgrade, base course, surface course (all-weather).

PERIMETER STREETS (MODE III)

Components: Traveled way, deep or shallow ditches, culverts, sidewalks, planting areas. *Types of work:* Compacted subgrade, base course, surface course (all-weather).

Components: Traveled way, curb-gutters, sidewalks, planting areas. *Types of work:* Compacted subgrade, base course, surface course (hard).

PERIMETER STREETS (MODE IV)

Components: Traveled way, deep and shallow ditches, culverts, sidewalks, planting areas. *Types of work:* Compacted subgrade, base course, surface course (all-wea[illegible]

Components: Traveled way, curb-gutters, sidewalks, parking, planting areas. *Types of work:* Compacted subgrade, base course, surface course (hard).

STORM DRAINAGE OBJECTIVES. The primary purpose is the removal of storm-water runoff to prevent flooding. Flooding results in high material damage, washing away streets, sidewalks, undermining building footings and threatening water supplies by infiltration and contamination. The primary drainage interceptors for abutting properties are the streets. The flow concentration collectors are ditches and pipes. Design criteria and requirements for two levels are outlined below.

MINIMUM LEVEL
It is basically a system of deep and shallow ditches.

STANDARD LEVEL
It is basically a system of gutters and underground pipes.

INTERIOR STREETS (MODES I AND II)

Contain primary drainage interceptors: shallow ditches.

Contain primary drainage interceptors: curb-gutter.

PERIMETER STREETS (MODES III and IV)

Contain primary drainage interceptors as above and the flow concentration collectors: shallow and deep ditches (earth-formed or lined), culverts.

Contain primary drainage interceptors as above and the flow concentration collectors: underground pipes, manholes, street inlets.

BASIC DATA. The following data were used for the models: a) Plan of layout to be served and size of area to be drained (400m x 400m = 16Ha). b) Assumed traffic loads: Streets I and II; average light traffic (local residential streets, parking lots and driveways for passenger cars). Streets III and IV; intermediate traffic (feeder streets, parking lots and driveways for trucks, commercial light traffic). Another category may be considered for Street IV; heavy traffic (truck freight terminals, manufacturing plants, commercial, heavy traffic). In all cases it was assumed that a good to excellent subgrade existed. c) Average rainfall intensity for Boston (50-year storm) i = 2" (0.05m)/hour; for Caracas i = 2.8" (0.072m)/hour. d) Coefficient of runoff for residential blocks, multifamily attached or detached dwellings 60%. e) Assumed urban network connections: main drainage along Street IV. f) Storm drainage network is not connected with the sewage disposal network. g) Street signs and traffic lights are not included in the models but should be considered separately in a project.

Due to the nature of this work, the following basic reference data were not necessary here but should be considered in a project: 1) Topographic maps, showing natural drainage lines. 2) Soil profile, showing the elevation of the groundwater table; horizontal and vertical occurrence and extent of all soil types and their drainage characteristics. 3) Temperature and frost data, particularly depth of frost penetration. 4) Other factors, such as snow and ice, which may require special consideration in drainage plans and construction. 5) Careful inquiries and check of local high-water marks to determine the susceptibility of the site to flooding. 6) Functions and traffic loads of existing and proposed streets.

BASIC CALCULATIONS. *Circulation.* The pavements were designed for the assumed traffic loads listed above and using characteristics, thickness and specifications indicated in handbooks. (*From: SPECIFICATIONS, H. Griffith-Edwards, Princeton, N.J., 1961.*) (*See Figure 1, STREET SECTIONS, page 136.*)

Storm drainage. Capacity design: Q = c i a, where Q = runoff of area to be drained (m^3/second), c = coefficient of runoff 0.60, i = average rainfall intensity per hectare:

For BOSTON: $i = \dfrac{0.05m \times 10000m^2}{3600 \text{ seconds}} = 0.014m^3/\text{second}$

For CARACAS: $i = \dfrac{0.072m \times 10000m^2}{3600 \text{ seconds}} = 0.20m^3/\text{second}$

a = area to be drained 16Ha:

For BOSTON: $Q = 0.60 \times 0.14 \times 16 = 1.34m^3/\text{second}$

For CARACAS: $Q = 0.60 \times 0.20 \times 16 = 1.92m^3/\text{second}$

Traveled way drainage capacity should be sufficient to keep the water running along the ditches or curb-gutters and not overflowing onto the sidewalks. Traveled ways: 6m wide; curb-gutters: 0.15m high; slope towards center of section: 2%; slope of the street: 0.3% minimum.

Capacity: Q = $0.59m^3$/second (from tables). Interior Streets I and II are the primary collectors draining a maximum of 1/6 of 16Ha. Runoff:

For BOSTON: $\dfrac{1.34}{6} = 0.22m^3/\text{second}$

For CARACAS: $\dfrac{1.92}{6} = 0.32m^3/\text{second}$

All values are below the street drainage capacity of $0.59m^3$/second.

Pipes diameters: according to plan layouts (*See page 137.*) pipes take respectively 3/3, 2/3, and 1/3 of Q for the total area. Diameters are determined by using a diagram for the solution of the Manning formula with: slope of pipes: 0.0015; n = Manning roughness coefficient 0.013.

For BOSTON: $\frac{3}{3} \times (1.34m^3/\text{second})$; diameter = 48"

$\frac{2}{3} \times (1.34m^3/\text{second})$; diameter = 42"

$\frac{1}{3} \times (1.34m^3/\text{second})$; diameter = 30"

For CARACAS: $\frac{3}{3} \times (1.92m^3/\text{second})$; diameter = 52"

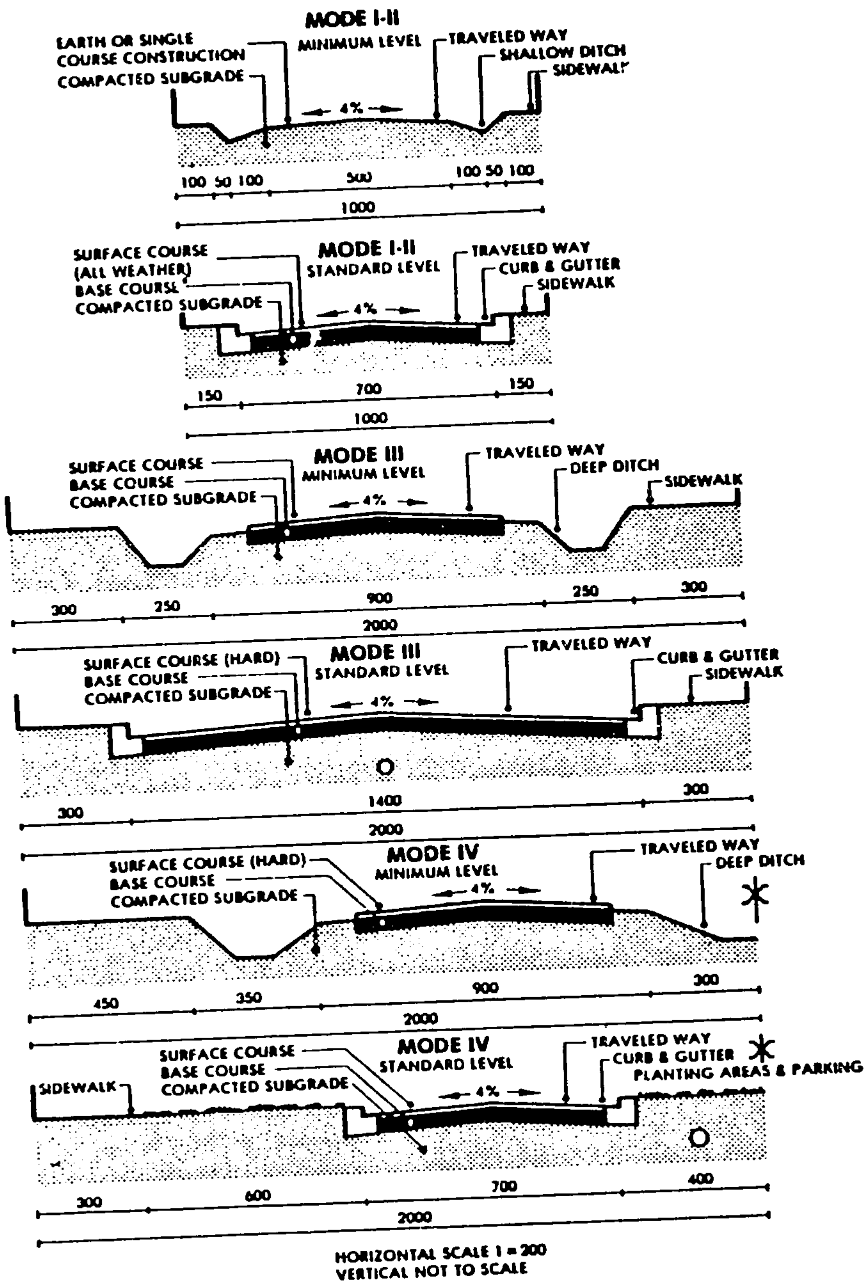
$\frac{2}{3} \times (1.92m^3/\text{second})$; diameter = 48"

$\frac{1}{3} \times (1.92m^3/\text{second})$; diameter = 36"

BASIC CRITERIA. *LAYOUT. Circulation.* The models include gridiron layouts where the lengths of streets cannot be minimized and grid layouts where the lengths have been minimized. (*See: CIRCULATION SYSTEM, page 86.*) *Storm drainage.* All primary rainfall collectors are maximized, in this case: interior Streets I and II with shallow ditches at minimum level and curb gutters at standard levels. All secondary rainfall collectors are minimized, in this case, perimeter streets III-IV with deep ditches at minimum levels and underground pipes at standard levels.

INTERIOR STREETS I AND II. Width: 10m. Utilization: circulation as well as other community activities. At the minimum level, for practical and economic reasons, the whole street will have the same pavement. It will be a continuous surface with shallow depressions or ditches, which have the function not only of channelizing rain water but also of serving the few automobiles or other vehicles. At the standard level the pavement can be improved and curb gutters provided. But since they are generally expensive, they may be eliminated if shallow ditches continue to be adequate.

PERIMETER STREETS III AND IV. Width: 20m-40m. Utilization: predominantly circulation. At the minimum level, for practical and economic reasons, the traveled way has shoulders at both sides that can be used by pedestrians, since the sidewalks are not paved at



Fi[illegible]: STREET SECTIONS. Dimensions are in centimeters.

this level. At the standard level, deep ditches are replaced by underground pipes and curb gutters provided. Since the use of perimeter streets is shared with the adjacent area, the costs of the streets are computed as one half.

MANHOLES. Location is at all intersections, at all turns, at approximately 100m intervals for cleaning purposes, at dead ends. The cost of the manholes on the perimeter is also shared with the adjacent areas.

PIPES. Sizes have been indicated previously. Choices of materials are dictated by economy, availability and required bylaws. Models specify precast reinforced concrete.

INLETS. Surface runoff enters from street gutters to inlets. Their size, number and placement governs the degree of freedom from flooding of traffic ways and pedestrian crossings. Models include only curb inlets 24" x 25", but other types may be used. Their number should be minimized and they preferably should discharge directly into manholes to permit inspection and cleaning.

SHALLOW DITCHES. They are designed in the models as an integral part of the paving surface and without sharp angles. This design offers economy in construction, and easy maintenance, and also facilitates the utilization of the street by the people for different activities.

DEEP DITCHES. They provide the most inexpensive secondary collectors of rainwatér, but they require constant maintenance. Models include the trapezoidal type, wide and with gentle slope to facilitate cleaning and minimize accidents; but local conditions of soil, rainfall, topography, etc., will dictate the convenient type.

MAINTENANCE. A critical factor in circulation/storm drainage systems is maintenance in terms of periodic repairs and constant cleaning. Both should be considered from the outset of any project as part of the design determinants.

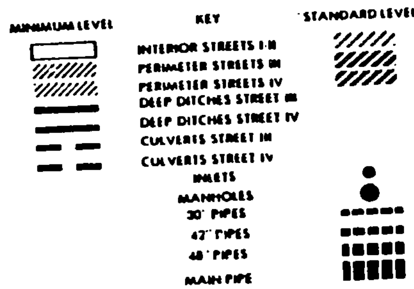


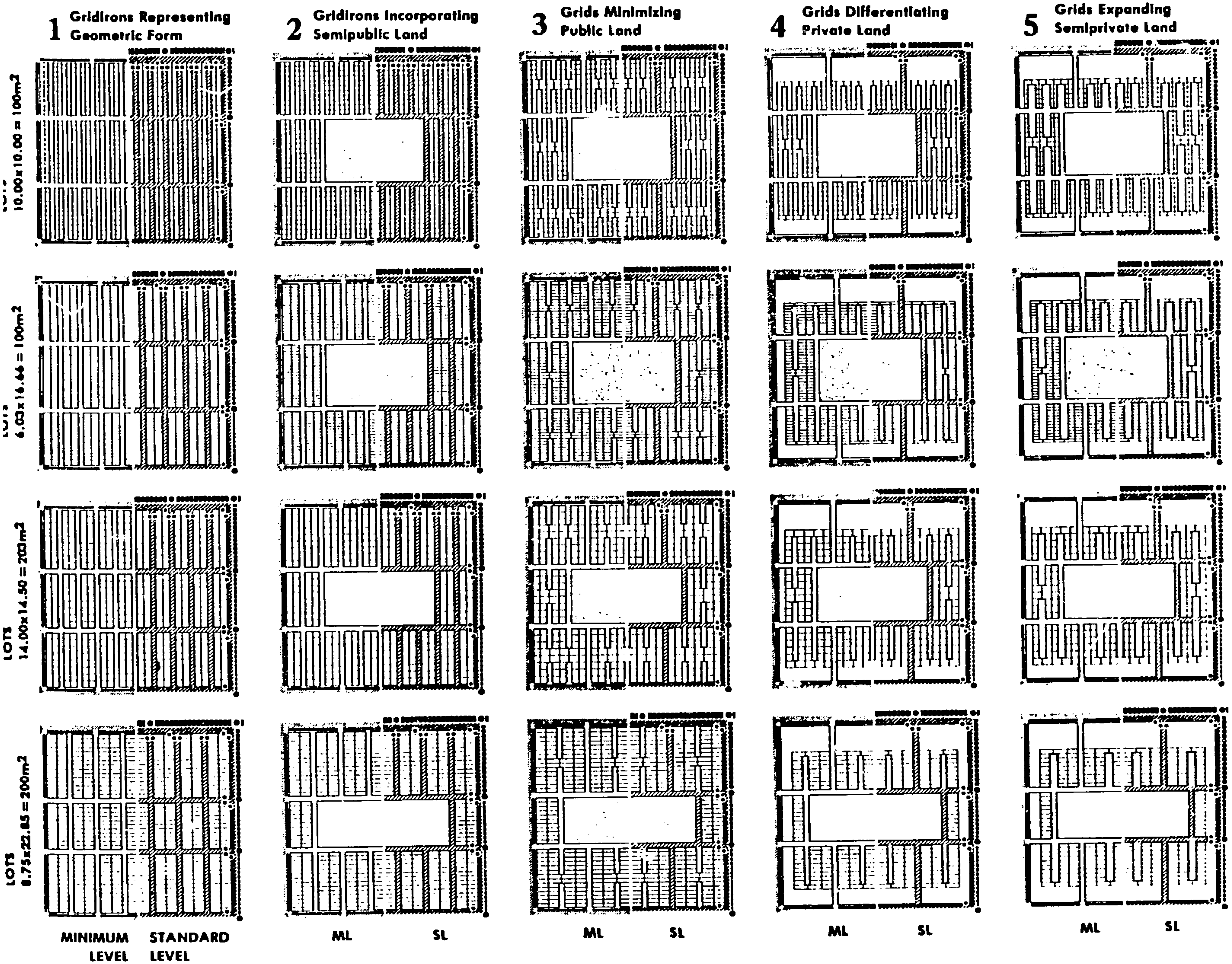
Figure 1 (opposite page): **CIRCULATION AND STORM DRAINAGE LAYOUTS FOR THE 20 REFERENCE MODELS.** They are arranged as follows: horizontally, the four types of lots; vertically, the five layouts. Each plan is divided to show minimum and standard levels of service. Scale 1/10,000.

LOTS 10.00x10.00 = 100m2

LOTS 6.03x16.66 = 100m2

LOTS

LOTS


1 Gridirons Representing Geometric Form
2 Gridirons Incorporating Semipublic Land
3 Grids Minimizing Public Land
4 Grids Differentiating Private Land
5 Grids Expanding Semiprivate Land
LOTS 10.00x10.00 = 100m2
LOTS 6.03x16.66 = 100m2
LOTS 14.00x14.50 = 203m2
LOTS 8.75x22.85 = 200m2
MINIMUM LEVEL
STANDARD LEVEL
ML
SL
ML
SL
ML
SL
ML
SL

Layouts	Lots: Area m²	Lots: No.	Basic Network: Streets (m) I-II ML-SL	Streets (m) III ML-SL	Streets (m) IV ML-SL	Deep Ditches (m) III ML	Deep Ditches (m) IV ML	Culverts (N°) III ML	Culverts (N°) IV ML	Storm Drainage (m) 12" SL	Storm Drainage (m) 30" SL	Storm Drainage (m) 42" SL	Storm Drainage (m) 48" SL	Storm Drainage (m) Main SL	Inlets (N°) SL	Man-Holes (N°) SL	Basic Network Cost/Hectare $/Ha ML	Basic Network Cost/Hectare $/Ha SL
1	100	910	5600	600	200	1200	400	8	4	810	125	140	135	200	54	4	11511	52294
	100	1044	4000	600	200	1200	400	8	4	540	124	137	140	200	36	4	9531	40947
	203	500	4400	600	200	1200	400	8	4	540	127	122	151	200	36	4	10026	43653
	200	560	3200	600	200	1200	400	8	4	480	138	107	157	200	32	4	8541	35406
2	100	728	4760	600	200	1200	400	8	4	810	125	140	135	200	54	4	10471	46611
	100	834	3453	600	200	1200	400	8	4	540	124	137	140	200	36	4	8854	37246
	203	404	3790	600	200	1200	400	8	4	540	127	122	151	200	36	4	9271	39526
	200	450	2775	600	200	1200	400	8	4	480	138	107	157	200	32	4	8015	32531
3	100	728	1600	600	200	1200	400	8	4	360	125	140	135	200	24	4	6561	24332
	100	834	1600	600	200	1200	400	8	4	360	124	137	140	200	24	4	6561	24350
	203	404	1600	600	200	1200	400	8	4	360	127	122	151	200	24	4	6561	24350
	200	450	1600	600	200	1200	400	8	4	360	138	107	157	200	24	4	6561	24341
4	100	728	1600	600	200	1200	400	8	4	360	125	140	135	200	24	4	6561	24332
	100	834	1600	600	200	1200	400	8	4	360	124	137	140	200	24	4	6561	24350
	203	404	1600	600	200	1200	400	8	4	360	127	122	151	200	24	4	6561	24350
	200	450	1600	600	200	1200	400	8	4	360	138	107	157	200	24	4	6561	24341
5	100	728	1600	600	200	1200	400	8	4	360	125	140	135	200	24	4	6561	24332
	100	834	1600	600	200	1200	400	8	4	360	124	137	140	200	24	4	6561	24350
	203	404	1600	600	200	1200	400	8	4	360	127	122	151	200	24	4	6561	24350
	200	450	1600	600	200	1200	400	8	4	360	138	107	157	200	24	4	6561	24341

ML: Minimum level; SL: Standard level

Figure 1: CIRCULATION AND STORM DRAINAGE: TABLE OF QUANTITIES OF COMPONENTS AND COSTS/HECTARE OF BASIC NETWORK FOR EACH MODEL.

The table and chart on these pages illustrate the quantities of components for each of the 20 layouts at the two levels of service. The quantities have been used for the calculation of costs; the costs/hectare of the basic network has been included in the table for reference. The comparative chart shows very clearly the direct relationships between urban layouts (*See page 109*), layouts of utilities (*See page 137*), and quantities of components (*this page*). Also note that the quantity of components is considerably less for the grid layouts.

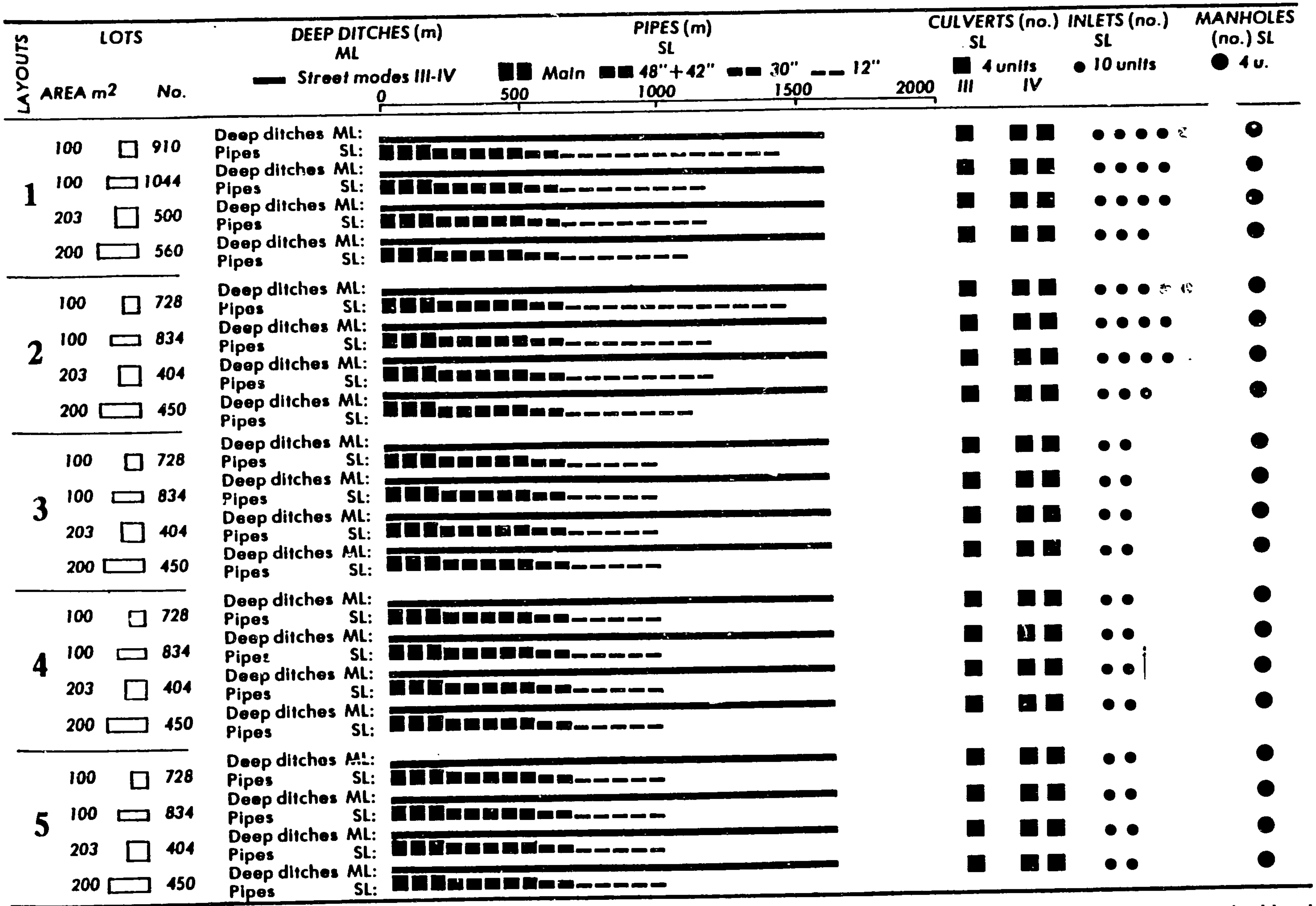


Figure I: **CIRCULATION AND STORM DRAINAGE: COMPARATIVE CHART OF THE PRECEDING TABLE.** *(Only storm drainage components shown; for comparative chart of circulation components, see: THE MATRIX, page 111.)*

310 ELECTRICITY AND STREET LIGHTING

ELECTRICITY OBJECTIVES. Although electricity is not necessary for the sustenance of life, it has become a vital service, supporting a wide range of urban activities. The more urbanized an area becomes, the more dependent it is on electricity for: *Power:* for convenience services in each household; utility services. *Lighting:* to provide security at night and to allow activities to extend for a longer period of time. *Communications:* telephone, telegraph, television, radio.

MINIMUM AND STANDARD LEVELS

Alternatives to providing minimum and standard levels of services were analyzed and discarded because there is not a clear indication that they will reduce costs, and furthermore they raise practical objections. Another approach, applicable to all utilities, is to reduce initial investment costs by controlled progressive development, which would permit the standard level to be installed step by step. In short, for practical and economic reasons only one level of service is provided. For economic reasons the distribution network is aerial. It includes service drops and meters up to the lot or cluster. Design criteria and requirements for this service are outlined below. The alternative option of a controlled progressive development would permit the gradual expansion of the services. It would start, initially, by servicing a given area, and later extending it to other areas.

BASIC DATA. The following data were used for the models: a) Plan of layout to be served (400m x 400m); b) Area of lots, number of lots; c) Semipublic land, represented by number of lots contained; d) Street lighting: number of lamps; e) Assumed demand per lot: 1.5KVA. It is based upon the following appliances per dwelling unit: From 8 to 10 fixed lights and outlets (for portable lights, or radio, or record player, or portable fan, or sewing machine, etc.), with a maximum load of 600 watts. One outlet for a hot plate, or a hand iron, or a power tool, with a maximum load of 900 watts. f) Diversity factor at transformers: 2; g) Assumed urban network connections at two opposite diagonal points of 3 x 13,800V-60Hz-600KVA each. Total 1200KVA.

BASIC CALCULATIONS. Total load demand in private and semipublic land has been calculated by considering all the areas as divided into equal lots and multiplying the number of lots by 1.5. Total load demand for street lighting has been calculated by multiplying the number of lamps by 300W.

$$\text{Total capacity of transformers (KVA)} = \frac{\text{N° of lots x 1.5}}{2} + (\text{N° of lamps x 300W})$$

$$\text{Number of transformers (N°)} = \frac{\text{total capacity of transformers}}{\text{capacity of a transformer}}$$

BASIC CRITERIA. *LAYOUT.* All primary high tension lines and transformers are in perimeter streets to facilitate access. A uniform distribution of loads in secondary low-tension circuits is adopted in order to use transformers of the same capacity.

TRANSFORMERS. The maximum load demand is 1.5KVA pe lot. Total load divided by the capacity of the transformers will deter- mine the number of transformers needed. 100KVA transformers are used in the models, but other capacities may be used. 100KVA trans- formers can be installed on a 10.5m wood pole. In cold climates a transformer can be used up to 150% of its capacity, while in warm and hot climates, use is sometimes limited to less than 100% of th transformer's capacity. A diversity factor of 2 is recommended to cal culate the load capacity of the transformer. This will compensate fo residential lots as well as for commercial lighting to which the diver sity factor is not applicable.

SECONDARY LOW-TENSION NETWORK. Recommended maximum length for circuits: 150m with a voltage drop of 5V. Only in a few extreme cases may 200m with a voltage drop of 6 be used. It ma require slightly heavier wires. A 120/240V single-phase three-wir system is recommended because it is versatile and adequate for light ing, appliances, and up to 5HP motors used in some shops. Maximum distance between poles should be 30-40m. A greater distance will re quire heavier, more expensive cables and the wires will sag and be i danger of slapping together. Using a few extra poles to reduce dis tance is more economical. No backup system to prevent temporar blackouts is provided. It will save wiring in exchange for occasion inconveniences when electricity is cut. If no backup wiring is provide at the minimum level, it may be contemplated for the standard leve

PRIMARY HIGH-TENSION NETWORK. It will be located o the perimeter streets. To minimize voltage drop, a three-phase sy tem, using one or two circuits, is recommended. The minimum voltage allowable is 2400V, but a higher voltage is recommended. A single-phase primary circuit will have a greater voltage drop. A three-phase primary circuit will allow for 80A to be drawn at each transformer as opposed to 240A for a single-phase circuit. The circuit will consist of three hot wires and a neutral wire. The four wires will go to the first transformer. Only two wires will go to the last transformer of the circuit. No backup wiring is provided at the minimum level, but this should be contemplated at the standard level. However, some alternative emergency backup system should be provided, in case one of the two high-tension sources should fail. This is usually done by providing a "disconnector switch" and by connecting up the two three-phase primary circuits with all four wires. This solution is of course expensive. The alternative is to provide man-made connections, using as little material as necessary, when a major breakdown requires it. In few perimeter streets, circuits are overlapped, which could make nighttime emergency repairs confusing. However, overlapping can be accepted because circuits have been clearly differentiated by providing 10.5m poles in these streets.

POLES. Class of poles is determined by the load to be carried. Natural wood poles are specified, but other types can be used: precast concrete, steel, aluminum, fiberglass, plastic, laminated wood. Heights of poles are determined by minimum clearance required. Poles on the perimeter streets are 10.5m high and carry: high- and low-tension network, transformers, lamps. Poles on the interior streets are 7.5m high and carry low tension network, lamps. Pole spacing averages approximately 45m. Pole lines are built in straight lines for at least 3 or 4 spans.

SERVICE DROPS. These form the electrical connection between the secondary low-tension network and the individual lot or cluster of lots. Maximum distance for service drops is 30m (100 feet). The minimum gauge wire (#6) required for service drops is more than enough for the 1.5KVA maximum load demand per lot. Thus, the possibility of linking several nearby lots to one service drop should be considered, particularly in the case of clusters or condominiums. Service drops can cross streets. Minimum height for service drops and all other wiring is 5.40m.

METERS. Consumption is measured by meters which can be used individually or collectively. A cluster can have a service drop and one meter in a pole serving several lots. A primary meter on a transformer can be used to measure the consumption of a whole circuit. If meters are not used, a fixed rate should be applied. A practical system could be the combination of a limited number of meters and fixed rates. It is not recommended to attempt to control consumption by fuses. The smallest fuse box is 15A for a service connection of 1.5KVA; it is easy to bypass the fuse box to make a direct connection, which is a dangerous practice.

COMMENTS. It has been found that in squatter settlements, electricity and street lighting have a top priority over other utilities. Street lighting is demanded by users for safety as well as for the extension of activities into the evening. Local governments and more especially the police, are usually also in favor of lighting not only because it diminishes the conditions for crime, but also because it provides much better conditions for surveillance and control. If street lighting is installed alone, the users almost immediately begin to make illegal connections on the aerial network. This not only overloads the lines, with all the attendant risks, but also hurts the electrical agency that is providing power for free. It is more practical, then, to provide simultaneously street lighting, electrical services and meters which measure and control the consumption. Service connections and meters are rather expensive items that may amount to 50% of the total costs of the electrical system. But they can be segregated from the basic network, installed in stages, and financed separately.

STREET LIGHTING OBJECTIVES: Street illumination is an urban service to improve vision at night. Design criteria and requirements for minimum and standard levels of service are outlined below:

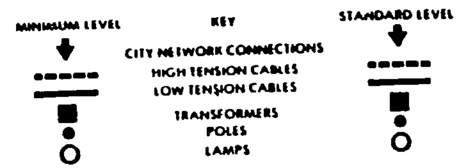
MINIMUM LEVEL	STANDARD LEVEL
It is basically "safety lighting," provided for: *Crime reduction:* There are fewer crimes committed under adequate streetlights than under dim or no lights. *Traffic safety:* Improved lighting reduces night accidents.	It is basically "activity lighting," provided for: *Extension of activity:* In developing areas social and commercial activities take place in the evening. Street lighting creates the ambience for these activities.
Poles are placed: at maximum distance of 40m; at changes of direction in wiring; at a maximum distance of 30m for individual service drops.	Number and distribution of poles are the same.
Lamps are placed at all street intersections	Lamps are placed at all poles for a minimum lighting of 0.2 to 0.5 foot candles, which are the minimum levels for public safety in residential areas (with or without commercial activities) recommended by the American Standards Association (ASA).

Design specifications should conform to minimum local standards. For economical and practical reasons, a multiple distribution lighting system is proposed. Poles and street lights on the periphery of the model are shared with the adjacent areas, except on the major circulation (Mode IV), where lights are placed on both sides of the street. In layouts where lots are grouped around a semiprivate space, it is assumed that the owners in condominium of this space will provide the wiring, poles and lamps for the lighting. Therefore, these are not considered public streetlights. Street lighting circuits use the same transformers of the electric service. Street lighting circuits independent of the electric service circuits are generally recommended. However, to reduce costs, the models provide only common circuits. Street lighting circuits will be multiple, thus requiring minimum maintenance.

A very large portion of the cost of street lighting is made up of capi-[illegible]sts or costs of components: luminaires, poles, wires, etc. Therefore, the quantities of these components should be minimized while still providing an effective lighting system. This usually means efficient luminaires, wide spacing, large lamps and high mounting heights. Effective and economically sound street lighting systems are the result of good design. Usually design services are provided by the electricity agencies. It is a highly specialized service.

Maintenance of an adequate level of illumination is concerned with many factors, including the following: a) Reduction of illumination level because of accumulated dust and dirt on lamps, reflectors and glassware. b) Decline in lumen output of lamps due to normal aging. c) Lamp outages due to lamp or circuit component failure, accidental breakage, or vandalism. d) Reduced circuit voltage or current at the lamp due to abnormal line losses or transformer loading. e) Interference by tree branches. Measures designed to minimize losses due to the foregoing factors can be listed as follows: a) Cleaning. b) Lamp replacement. c) Regulation of voltage and current. d) Contracting for maintenance. e) Prevention of vandalism. ***Vandalism:*** Willful and malicious breakage of streetlamps is a social problem. No complete and satisfactory solutions are in sight, and it is questionable whether such social approaches as attempting to improve the behavior patterns of the age groups most responsible for breakage, or relying on the police to control them, can ever achieve success. But a number of practical methods have been developed to reduce damage, even if the perpetrators cannot be discouraged. They include: a) protect the lamp with metal screens or replace the enclosing glassware with plastic materials; b) use adequate mounting heights.

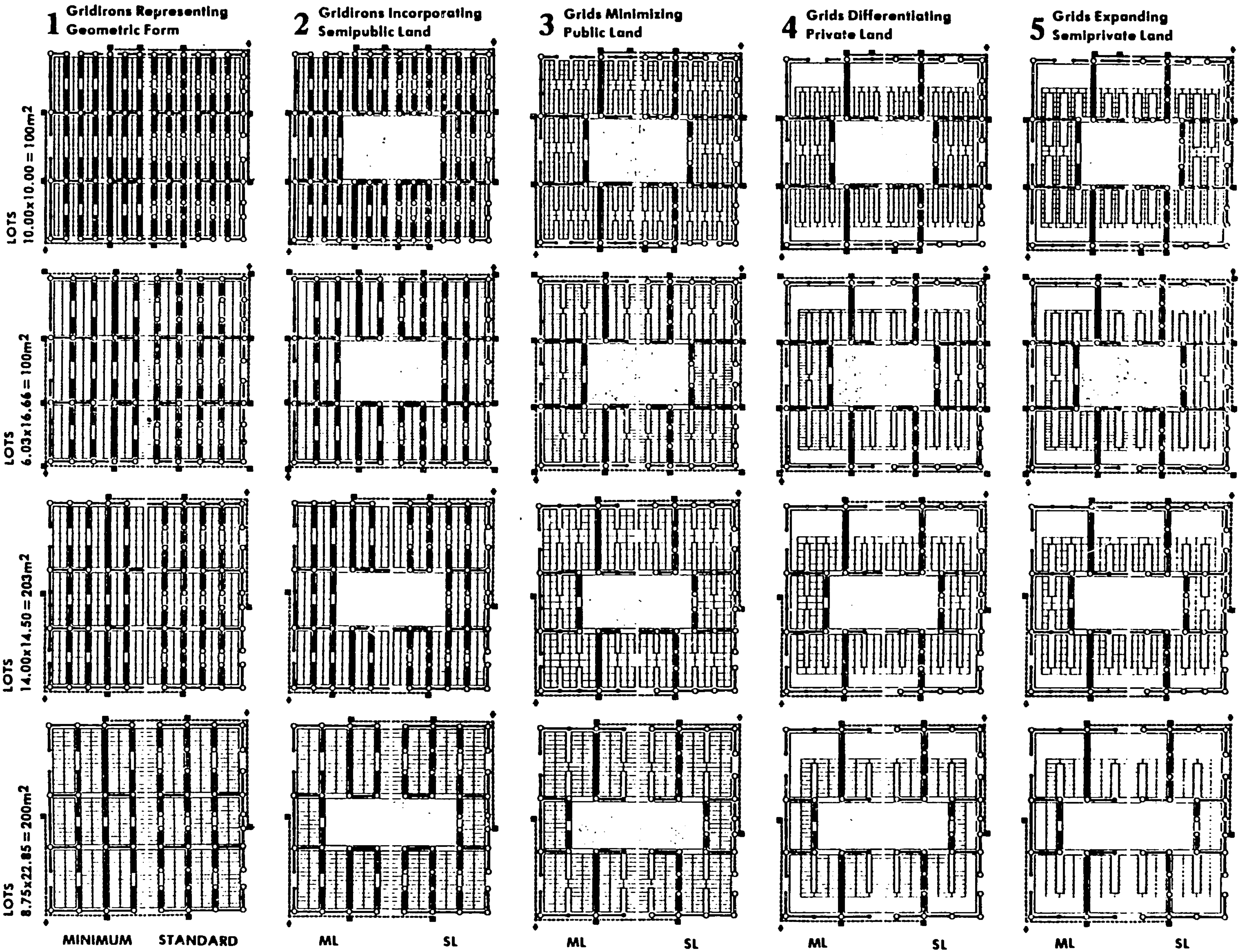
Figure 1 (opposite page): **ELECTRICITY AND STREET LIGHTING LAYOUTS FOR THE 20 REFERENCE MODELS.** They are arranged as follows: horizontally, the four types of lots; vertically, the five layouts. Each plan is divided to show minimum and standard levels of service. Scale 1/10,000.



while
; effi-
nting
ıs are
y the

with
ation
and
ging.
ental
t the
rfer-
ıe to
amp
:ting
llful
om-
able
vior
ying
ıber
n if
the
las-

JTS
ılly,
ini-



LAYOUTS	LOTS AREA m²	LOTS No	BASIC NETWORK: TRANSFORMERS (N°) ML-SL	CABLES (m) Low tension ML-SL	CABLES (m) High tension ML-SL	POLES (N°) 7.5m ML-SL	POLES (N°) 10.5m ML-SL	LAMPS (N°) ML	LAMPS (N°) SL	FACILITIES: SERVICE CONNECTIONS (N°) Individual ML-SL	SERVICE CONNECTIONS (N°) Communal ML-SL	BASIC NETWORK COST/HECTARE $/Ha ML	$/Ha SL
1	100	910	10	5600	1090	104.0	21.0	47	125	910	—	14786	15736
	100	1044	12	4361	1336	66.0	21.0	33	87	1044	—	12310	12968
	203	500	6	4806	984	80.0	17.0	37	97	500	—	12125	12856
	200	560	6	3724	975	54.0	14.0	26	68	560	—	9615	10127
2	100	728	10	5060	1090	92.0	21.0	47	113	728	—	13633	14438
	100	834	12	3983	1336	58.0	21.0	33	79	834	—	11508	12069
	203	404	6	3336	984	70.0	17.0	47	87	404	—	9348	9836
	200	450	6	3404	975	46.0	14.0	26	60	450	—	8923	9337
3	100	728	10	2700	1090	44.0	21.0	16	65	184	48	8266	8863
	100	834	12	2685	1336	30.0	21.0	16	51	306	28	8540	8966
	203	404	6	2748	984	38.0	17.0	16	55	134	32	7517	7992
	200	450	6	2564	975	30.0	14.0	16	44	218	16	7037	7378
4	100	728	10	2640	1090	42.5	16.5	16	59	344	28	6073	8597
	100	834	12	2685	1336	30.0	21.0	16	51	462	16	8540	8966
	203	404	6	2748	984	38.0	17.0	16	55	218	18	7517	7992
	200	450	6	2564	975	30.0	14.0	16	44	298	8	7037	7378
5	100	728	10	2640	1090	42.5	16.5	16	59	344	28	8073	8597
	100	834	12	2685	1336	30.0	21.0	16	51	462	16	8540	8966
	203	404	6	2748	984	38.0	17.0	16	55	218	18	7517	799[illegible]
	200	450	6	2564	975	30.0	14.0	16	44	298	8	7037	737[illegible]

ML: Minimum level; SL: Standard leve

Figure 1: **ELECTRICITY AND STREET LIGHTING: TABLE OF QUANTITIES OF COMPONENTS AND COSTS/HECTARE OF BASIC NETWORK FOR EACH MODEL.**

The table and chart on these pages illustrate the quantities of cc ponents for each of the 20 layouts at the two levels of service. quantities have been used for the calculation of costs; the costs/I tare of the basic network have been included in the table for referei The comparative chart shows very clearly the direct relationships tween urban layouts (*See page 109*), layouts of utilities (*See page 1* and quantities of components (*this page*). Also note that the quai of components is considerably less for the grid layouts.

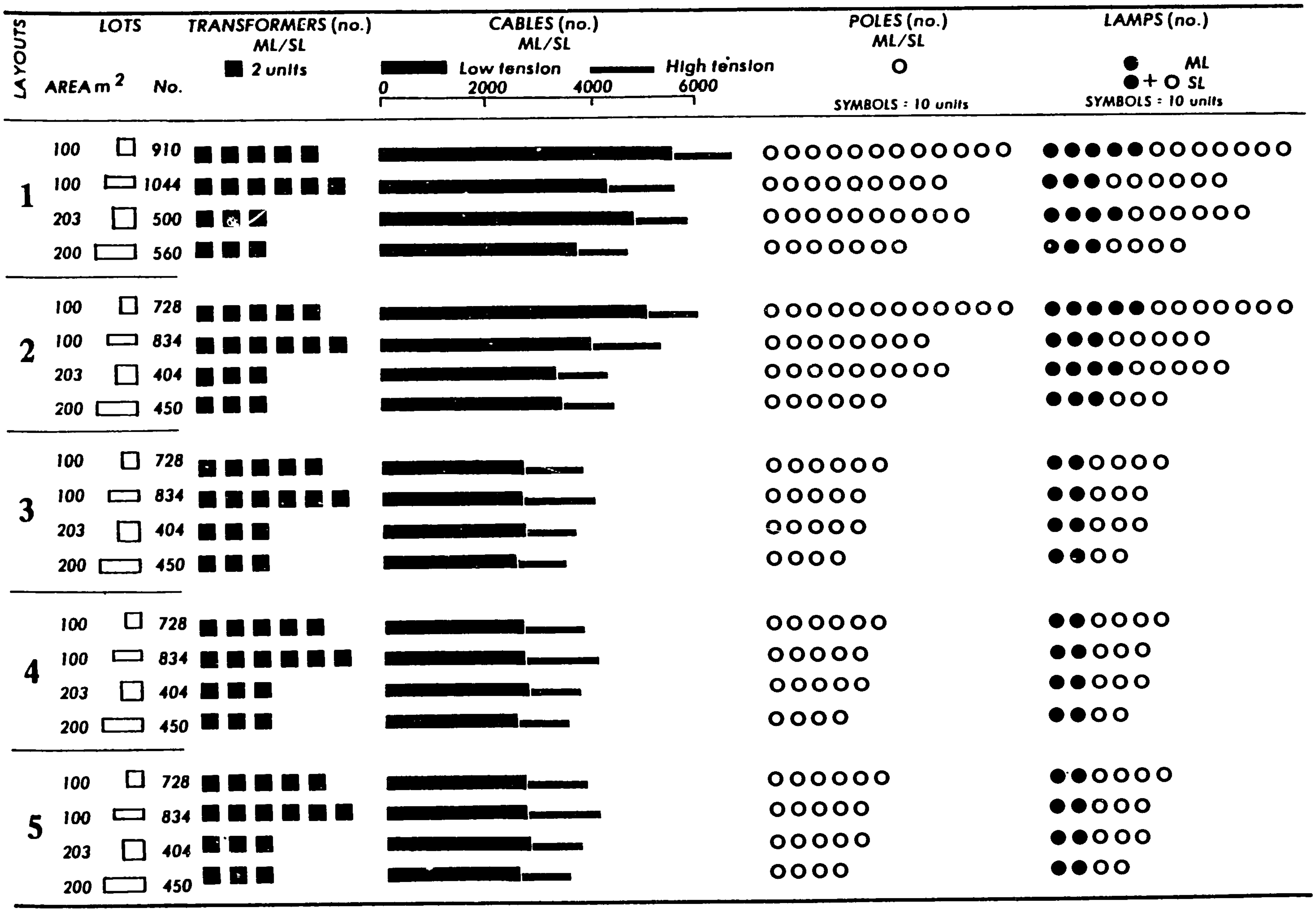


Figure 1: ELECTRICITY AND STREET LIGHTING: COMPARATIVE CHART OF THE PRECEDING PAGE.

ML: Minimum level; SL: Standard level.

3.11 UTILITIES: COST STUDIES

OBJECTIVES. Costs mean in all cases the capital costs of infrastructure not including land, unless otherwise specified. Costs of infrastructure cover only the site and do not include costs of the urban area network. Cost studies for the utilities have three objectives:

•Objective one is to provide guidelines for COST EVALUATION of projects during any stage of the design process. (*See below.*)

•Objective two is to illustrate COST IMPLICATIONS using costs per lot and per hectare of the 20 models, representing different lots and layouts. (*See this section, pages 149-163.*)

•Objective three is to provide supporting and reference COST DATA which is the base of these studies. (*See: Appendix, page 174.*)

COST EVALUATION: DETERMINATION OF SERVICE LEVELS AND OPTIMIZATION OF UTILITY LAYOUTS. These factors can be characterized as follows:

Determination of Service Levels	*Optimization of Utility Layouts*
•It aims to determine the magnitude of quantity, extent, value or quality of each service to be supplied.	•It aims to provide the infrastructure most favorable for the supply of the particular service.
•It is a policy decision in which major cost variations occur between the different levels, and small or no variations within a given level.	•It is a design decision in which substantial cost variations depend on degrees of optimization.
•The above facts are illustrated in the models with four different alternatives for the same levels of services. (*See Figure 1: page 154.*)	
•Policy decisions are usually in the province of government policy-makers, administrators, etc.	•Design decisions are definitely in the province of engineers, other designers, etc.
•Costs can be minimized by lowering the levels of services, i.e., adopting levels that are below certain standards. It is a multidisciplinary question that requires judgments on a wide variety of issues: cultural, political, health, safety, etc.	•Costs can be minimized by optimizing the physical layouts, i.e., finding the most efficient manner of providing the services at the level required. It is a technical problem that requires competent judgment, starting from the broad domain of land issues up to the specifics of individual service connections for the lots.
•It is a policy decision that affects the quality of the services offered to the users.	•It is a design decision which is always possible within a set of given performance requirements.
•In practice, since the suppliers, on one hand, may not be able to provide standard quality services to everybody, while on the other hand, they may not be able to lower them either, they may finally adopt standard levels that are hard to implement for the majority of the population and that consequently exist only as a written expression of goals and not as reality.	•In practice, however, little or nothing basic is done to optimize designs in order to reduce costs. It may be supposed that a greater price is the result of higher quality, but this is seldom the case; apparently the state of art is questionable and the technical aspects leave much to be desired.

It should be repeated that the sound basis of savings is an efficient design within the levels of desired services, or in other terms, an optimized physical product. Significant cost savings cannot be achieved a posteriori, after the design is completed; cost savings are only possible a priori. Economy is the purpose of the design per se; it is a preventive rather than a remedial action. It is clear that levels and layouts have a different impact on costs. They should be matched from the beginning, with a clear definition of the responsibilities and inputs expected from the participants in the decision-making process.

•*CHECKLIST FOR EVALUATION.*

•a) On service levels for the different utilities: 1) Find ranges for WATER SUPPLY, page 118; SEWAGE DISPOSAL, page 124; CIRCULATION/STORM DRAINAGE, page 134; ELECTRICITY/STREET LIGHTING, page 140. 2) Determine similar data for the project under consideration.

•b) On utilities layouts: 1) Find indices for areas of land utilization and lengths of circulation; indices for quantities of components of basic networks per hectare, STANDARDS FOR PERFORMANCE, DESIGN DATA, page 15. 2) Determine similar data for the project under consideration.

•*Compare: indices versus project data; levels versus layouts.*

COST EVALUATION: BASIC NETWORKS AND FACILITIES/SERVICE CONNECTIONS. These factors can be characterized as follows:

Basic Network	*Facilities/Service Connections*
•It includes all the primary distribution or collection system; occupies generally publicly owned land, with few exceptions as in easements.	•They include service drops, connections, meters, privies, septic tanks, aqua privies; occupy mostly privately owned land.
•It is part of political, economic, technical, overall, long-range programs; is carried at national or urban levels; implies large amounts in one package investment.	•They are part of political, economic, technical, partial, short-range programs; are carried at community or individual levels; imply small amounts in many investments.
•Requires continuous, scheduled and coordinated work.	•They can be implemented in discontinuous not necessarily scheduled and coordinated work.
•It should be carried out as an instant, large scale construction job in terms of contractor, materials, labor, equipment.	•They can be carried out as a progressive, small-scale construction job in terms of contractors, materials, labor, equipment.
•It is more permanent; once installed is not usually changed or affected by growth.	•They are more variable; they must frequently be replaced as a result of growth and expansion.
•Its installation is essential for the operation of services offered to the community.	•Their installation is not essential for the operation of services offered to the community, and has only partial effects on individuals.
•It is a necessary part of the initial stage of development, even at the minimum levels of services.	•They can be postponed to any stage of development, even at the standard levels of services.
•It is financed by the public sector; indirectly paid by the individual.	•They are paid for directly by the individual.

•On the basis of the 20 models at the standard level of services, it can be assumed that total costs are divided almost equally between the two parts.

In addition, basic networks are almost mandatory in either minimum or standard level of services; they are also the most substantial portion of the initial investment package. Facilities are more optional in either the minimum or standard level of services and therefore may be omitted from the initial investment and perhaps included for future stages of development when there is more certainty about users' priorities. Costs of basic networks depend primarily on the efficiency of the project, which is a design decision; costs of facilities and service connections depend primarily on the level of services to be provided, which is a policy decision.

Separation of the costs into groups is essential: a) to make proper evaluations and avoid cost distortions; b) to facilitate flexibility for policy, program and project formulation, meaning a wider range of cost options as well as more latitude to meet specific cultural and environmental requirements; c) to provide alternatives for development, meaning a wider timetable and staging combinations; d) to facilitate substantial savings in initial capital investments, meaning to minimize expenditures on those utility components that are not going to be fully utilized at the beginning.

•*CHECKLIST FOR EVALUATION.*

•a) On basic networks: 1) Find indices for relative costs per hectare, STANDARDS FOR PERFORMANCE, COST DATA, page 15; *Figure 1, page 20.* 2) Determine similar data for the project under consideration.

•b) On facilities/service connections: 1) Find indices for relative costs per unit, STANDARDS FOR PERFORMANCE, COST DATA, page 15; *Figure 1, page 20.* 2) Determine similar data for the project under consideration.

•*Compare: indices versus project data; networks versus facilities/service connections.*

COST EVALUATION: UNIT QUANTITIES OF UTILITY COMPONENTS AND UNIT COSTS OF UTILITY COMPONENTS. These factors can be characterized as follows:

Unit Quantities of Utility Components.	*Unit Costs of Utility Components*
•It is the quantity of units (m, m^2, m^3, each) of a component, contained in one hectare.	•It is the cost of a unit (m, m^2, m^3, each) or a component.

•The unit quantities of utilities components depend on layouts, which are the result of a repetitive design process that can be divided into different stages, with decisions taken at each stage as follows: Adopted level of services determines utility layout; which depends primarily on urban layout; which depends primarily on percentages of land utilization and unit circulation lengths.	•The unit costs of utilities components depend primarily on the availability, quality and characteristics of: materials (local and imported; means and distance of transportation, standards, etc.) Labor (local and from other areas, skilled and nonskilled, rates, bylaws, etc.) Equipment (level of technology, hand tools and power equipment, etc.) Overhead, profits, contingencies, etc.
•Quantities and layouts are cost indicators, which depend on the above decisions and respond to general principles, that can be universally applied.	•Costs depend on the specific conditions of a particular place, that can only be locally applied.
•These conditions are the variable factors of the project.	•These conditions are the given or invariable factors of the project.
•In short: layouts and components of utilities can be "universally" accounted for in terms of quantities per unit area. This data can be used for quick cost estimates.	•In short: unit cost of components should be "locally" calculated. This data can be used for more complete cost estimates.

Cost estimates are a frame of reference for orientation in the initial stages of a project, provided that they are properly adjusted to time and place in each particular case. Today, all over the world prices change very rapidly because of inflation and speculation, and therefore cost estimates rapidly become obsolete. Furthermore, the condition is aggravated because, as is usual in urbanization projects, the time between the initial negotiations and the actual implementation may be several years or even decades. Therefore, it is necessary to structure cost estimates in a manner that can be easily prepared and updated.

The two groups above have different cost implications and should be distinguished in order to facilitate the preparation of cost estimates as well as the comparison of costs for different projects and contexts.

•*CHECKLIST FOR EVALUATION*

•a) On unit quantities of components (first cost indicators): 1) Find indices of basic networks per hectare, STANDARDS FOR PERFORMANCE, DESIGN DATA, page 15. 2) Determine similar data for the project under consideration.

•b) On partial and/or total costs of utilities per hectare: 1) List components for each utility, including approximately: 14 components for water supply, 14 for sewage disposal, 17 for circulation/storm drainage, 9 for electricity/street lighting; UNIT COST ANALYSIS, pages 176, 178, 180, 182; COST TABLES, pages 184, 186, 188, 190. 2) Find local unit costs for each component of above list or its equivalent.

•*Compare: Index quantities of components versus project data; Costs of utilities applying local unit costs to index quantities versus costs of utilities applying local unit costs to project quantities.*

COST IMPLICATIONS: MAIN CONCLUSIONS. The cost studies make very explicit how, where, and when savings could be made.

•a) *HOW:* by an optimum urban layout that provides appropriate areas of land utilization and lengths of circulation. (*See: STANDARDS FOR PERFORMANCE, design data, areas and lengths, page 15.*)

•b) *WHERE:* in the efficient design of utilities in general, but particularly in: 1) circulation/storm drainage at the standard level of services; 2) in the economic apportionment between utility basic networks and service connections.

•c) *WHEN:* at the very beginning of the process and never at the end, by starting with the parallel development/formulation of policies, programs and comparative designs.

Furthermore, cost studies indicate many different specific ways of savings: a) By showing areas of sharp differences as in the case of water supply and sewage disposal versus circulation/storm drainage. b) By relating different items as in the case of basic networks versus facilities. c) By relating alternative components as in the case of asphalt paving versus concrete paving or communal versus individual septic tanks. d) By relating different components that can be optimized by design layout, as in the case of low-tension cables versus high-tension cables or surface drainage versus underground pipes. e) By showing where less expensive components can be substituted, as in the case of concrete curb-gutters versus drainage in the center of street. f) By showing other expensive components that may be eliminated or reduced in numbers, as in the case of supply meters for water. g) By showing the major cost components in each utility:

meters in water supply; service connections in sewage disposal; paving in circulation/storm drainage; low-tension cables in electricity/street lighting.

COST IMPLICATIONS: INDICES. Costs have been calculated in dollars and used as index numbers throughout the entire cost studies. The costs expressed in index numbers are intended for comparative purposes. In general terms, construction cost indexes reflect materials price trends and wage rates. They do not adjust for materials availability, labor efficiency, competitive conditions, management or other imponderables affecting construction costs. But they are good indicators for rapid preliminary references and estimates. In the U.S.A., data compiled in the last 60 years by the *Engineering News-Record* show the curves of increase in construction costs and, most significant, show that the ratio between costs of materials and costs of labor has remained relatively constant. Furthermore, cost estimates for specific projects can be made following the procedure indicated above.

COST IMPLICATIONS: RELATIVE COSTS PER LOT AND PER HECTARE. In order to compare costs, two types of units are used: per hectare and per lot. The observations, conclusions and recommendations derived from these unit costs are discussed further on (*pages 149-163*).

COST DATA: UNIT COST ANALYSIS. Cost analyses of the components of each utility are fully presented in the Appendices (*pages 174-183*). They include: job description; unit; unit costs of materials, labor, equipment, total; man-hours per unit. The cost analyses are intended: a) to give a brief yet documented reference of cost breakdowns; b) to permit one to break down costs to their basic elements: material, labor, and equipment; c) to provide detailed unit costs for the overall calculation of costs of utilities for each of the models.

COST DATA: TABLES OF TOTAL COSTS PER MODEL. Costs for each utility and for each model were calculated, but only two complete sets (U.S.A. and Venezuela) for one model are illustrated in the Appendices (*pages 184-191*). They include: job description, quantities; discriminated costs of each job; total cost for each job.

COST DATA: TABLES OF RELATIVE COSTS PER HECTARE AND PER LOT FOR 20 MODELS. The preceding total costs per model were used to prepare these tables, which are shown in the Appendices (*pages 192-195*).

3.12 UTILITIES: COSTS PER LOT

COSTS PER LOT are obtained by dividing any costs by the number of lots. The cost items may include basic networks, facilities, service connections for all the private, semiprivate, public, and semipublic land. These costs are shared by a variable unit: a lot. Since the lot is a unit that changes in area and proportions: a) Cost per lot only can provide comparative references for different areas, different proportions; b) Cost per lot cannot provide comparative references for the following variables: dwelling units, households, families, people. It should be clear at this point that cost per lot is a very limited index for evaluations, particularly when a common denominator is needed. To compare costs, number of lots, dwelling units, households, families, people, it is more convenient to use a single fixed unit, in this case a hectare.

Furthermore, costs per lot must assume an average lot size or else assume that all the lots are of the same size. The latter condition may be adequate in the case of small communities, but it becomes intolerable above ranges of 100 lots. A community above this size always has a variety in family composition, resources, initiative, education, incomes, etc., that can only be accommodated by a variety in lot sizes.

In the following pages, main findings are discussed and illustrated, including: General Conclusions; Comparative Costs of a) different utilities; b) levels of service; c) different alternatives.

GENERAL CONCLUSIONS ON COSTS PER LOT. The comparison of costs only illustrates the obvious circumstance that costs per lot are lower when there are more lots per unit area. More lots will result in smaller or narrower parcels of land or a combination of both.

Real reductions in costs are possible only with reductions in the lengths of basic networks. Lengths per lot are shorter when: a) given the same lot proportion, lots are smaller in area; b) given the same area, lots are narrow in proportion and with access at the shorter side; c) lots are both smaller and narrower. It is also obvious that reduction of total costs per lot is achieved by reducing the number of facilities and service connections. However, these are fictitious savings, because the unit cost of facilities and service connection is not altered.

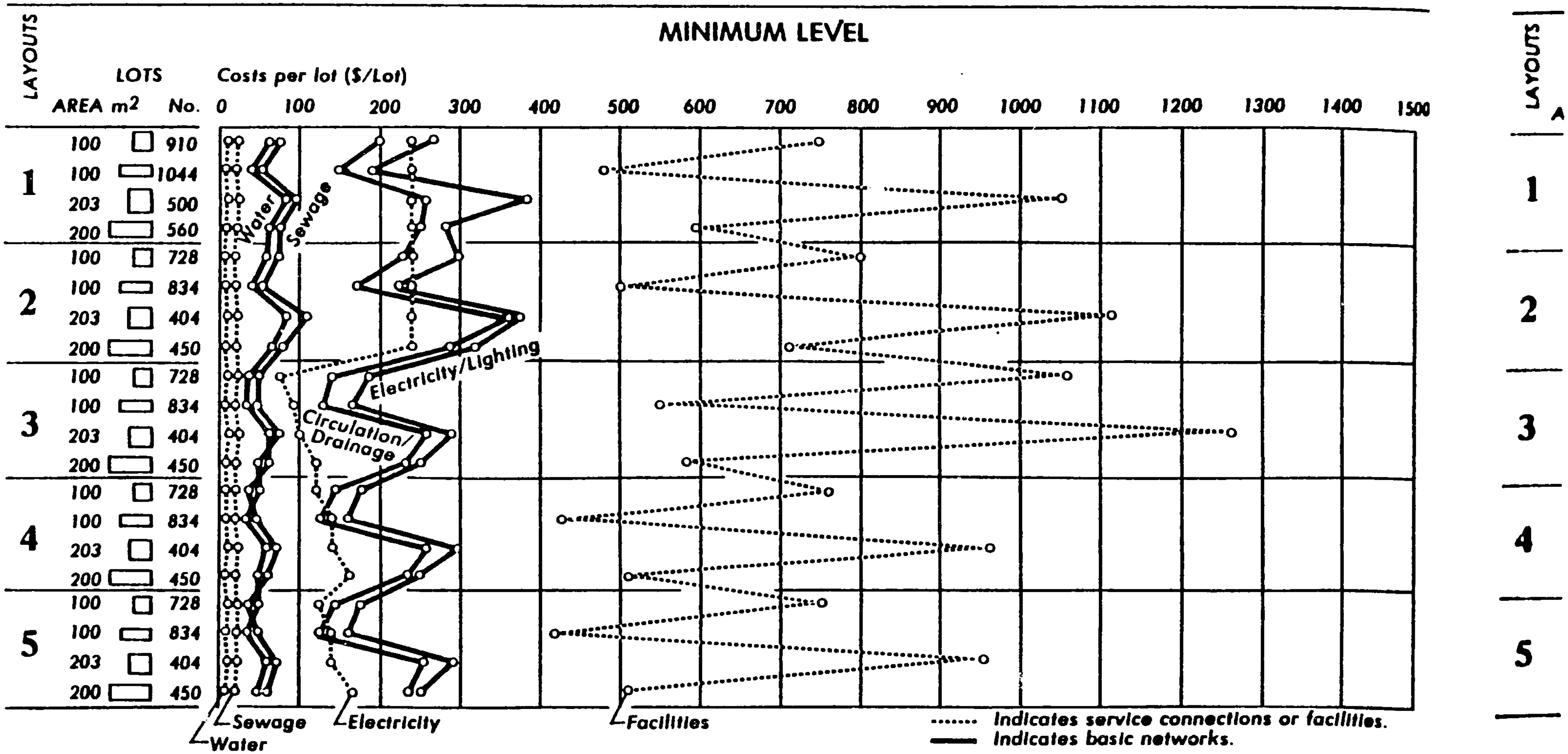


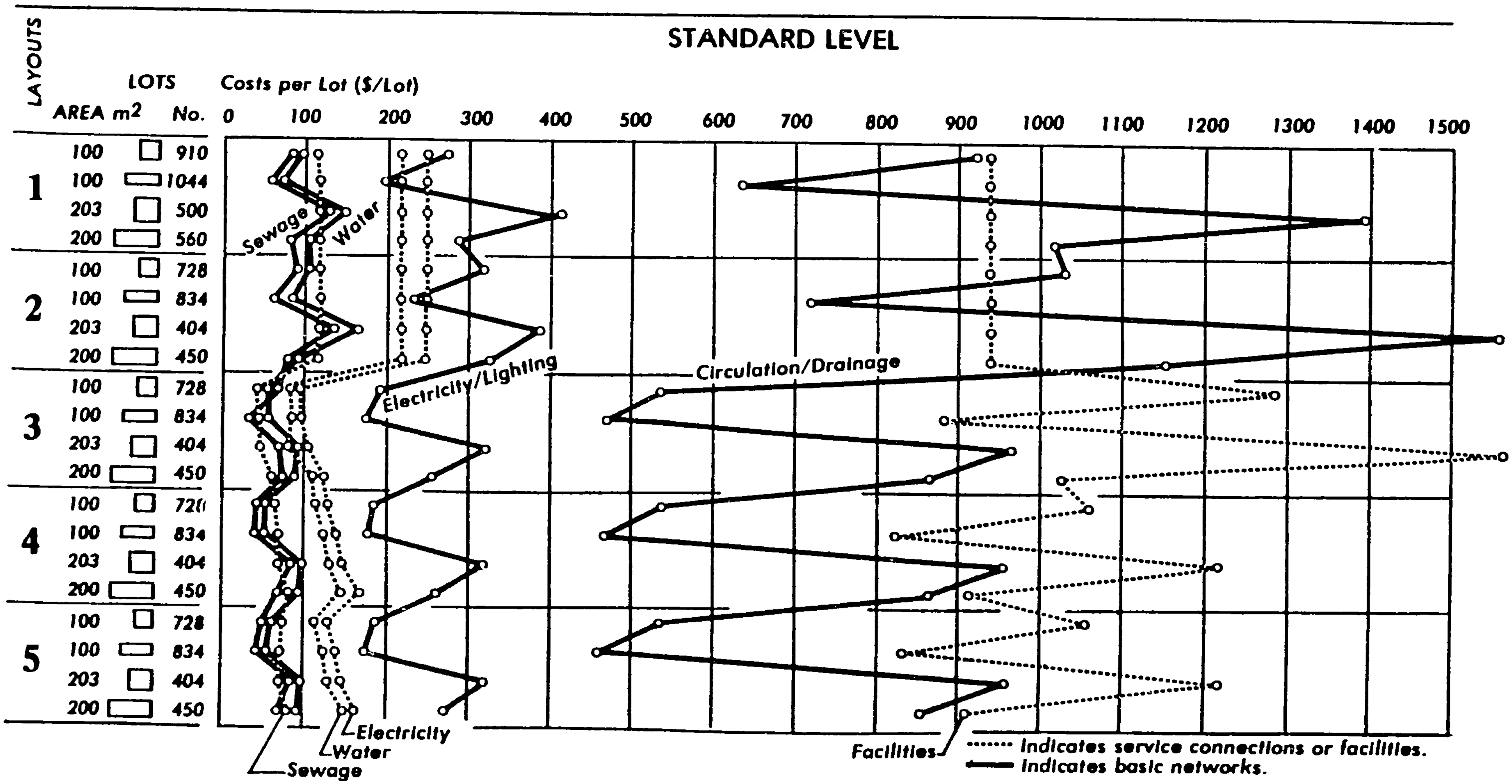
Figure 1 (pages 150-151): **GRAPHS OF COSTS OF UTILITIES PER LOT.**

The purpose of these graphs is to compare costs: a) of different basic networks; b) of service connections and facililties; c) of different lot areas and proportions.

In basic networks: water and sewage are consistently close and the lowest at minimum and standard levels. Circulation/storm drainage and electricity/street lighting are in the same range at minimum level; but diverge drastically at standard level. Circulation/storm drainage is clearly the most costly utility and therefore provides much more room for savings than other utilities that cost less.

In service connections and facilities, water supply and waterborne sewage disposal connections are consistently close and the lowest at minimum level, but separate at standard level, where water doubles the cost of sewage. Electrical connections are higher and are the same for both minimum and standard levels. Pit privy, communal and private facilities are the highest at minimum and standard levels.

In lot areas and proportions: For the same proportion but different



size: smaller lots fare better than larger lots at minimum and standard levels. For the same size but different proportions: rectangular lots fare better than square lots at minimum and standard levels. For different size and proportions: smaller, rectangular lots are the best; larger, square lots are the worst at minimum and standard levels. For the same lots grid layouts (3, 4, 5) fare much better than gridiron layouts (1, 2) at minimum and standard levels. The best combination of lots and layouts in the models are 100m2 rectangular lots, grid layouts 3, 4, 5 at minimum and standard levels. The worst combination of lots and layouts in the models are 200m2 square lots, gridiron layouts 1, 2 at minimum and standard level.

Graphs show that contrary to the case of alternatives, the substantial differences are in the costs of the different models. (*See pages 154-155.*) It is clear that the selection of a model determines automatically the costs. In this case the decision is a design decision, not hard to make because the choices are very limited. Graphs seem to demonstrate the obvious. But the obvious is usually underestimated if not ignored, as is proved by the majority of site and services layouts, those which have produced urban environments that are not only wasteful but also unnecessarily expensive.

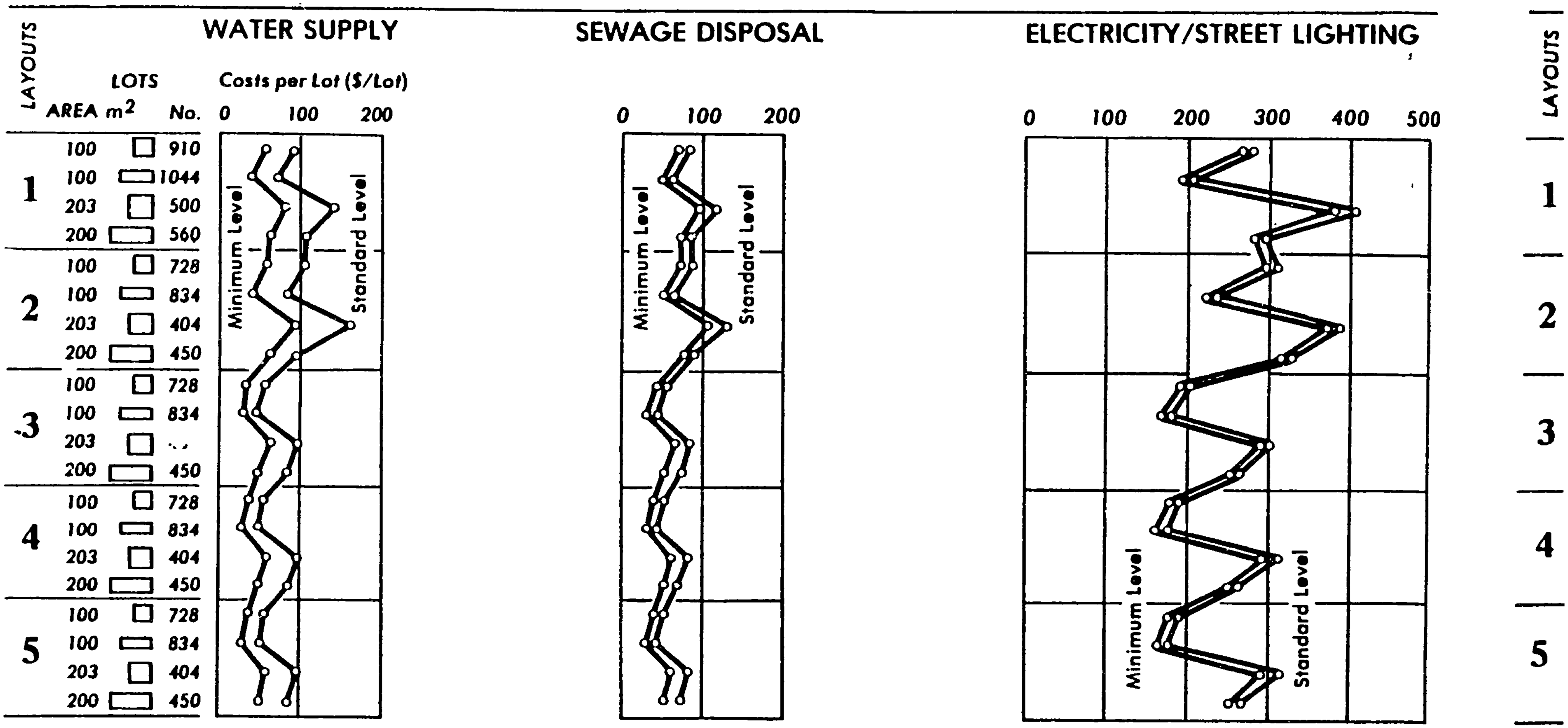


Figure 1 (pages 152-153): **GRAPHS OF COSTS OF BASIC NETWORKS PER LOT AT MINIMUM AND STANDARD LEVELS.**

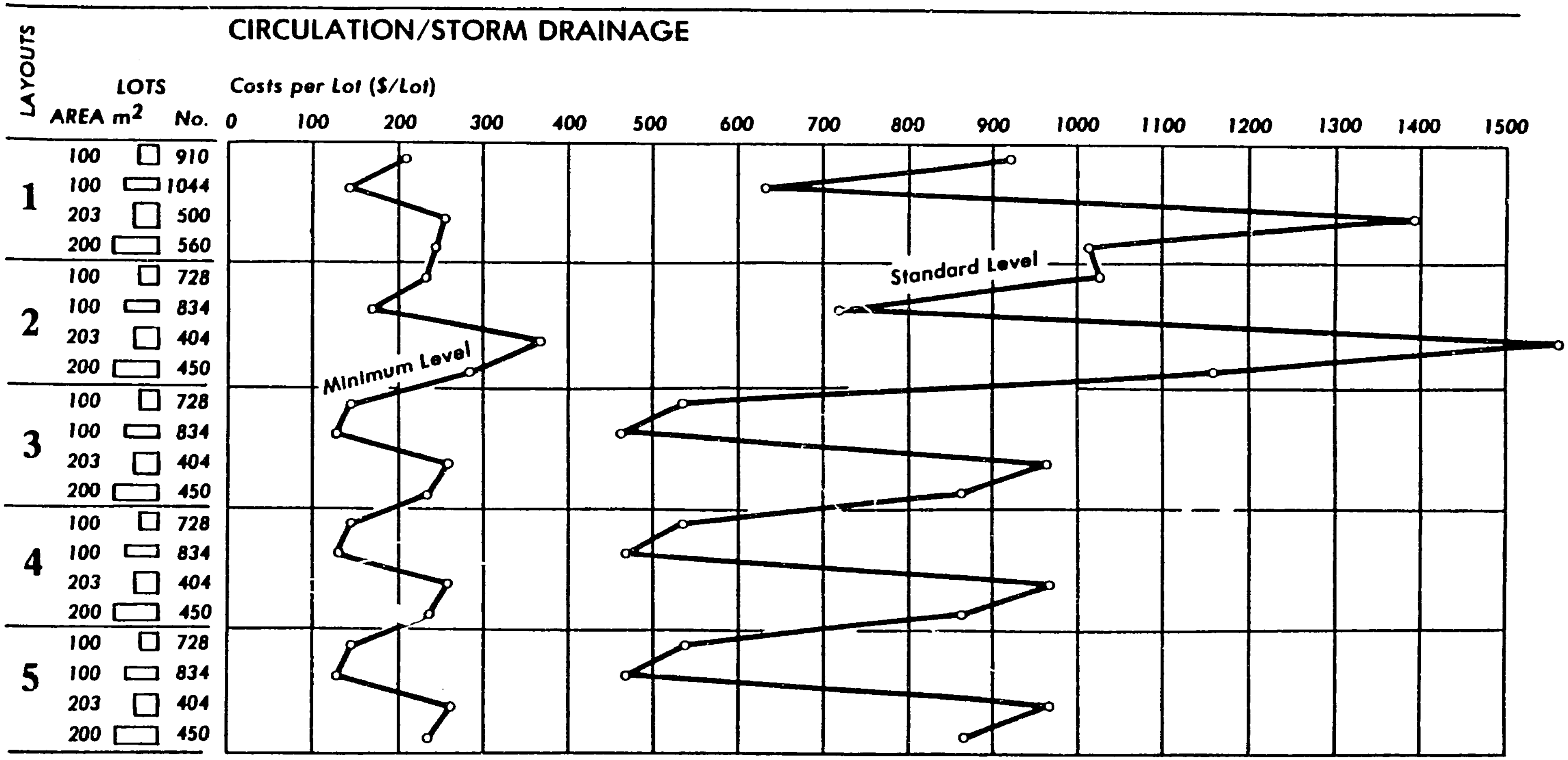
INCREASE FROM MINIMUM TO STANDARD LEVELS

	In Gridirons	*In Grids*
WATER SUPPLY	81%	53%
SEWAGE DISPOSAL	22%	31%
ELECTRICITY/STREET LIGHTING	5%	5%
CIRCULATION/STORM DRAINAGE	321%	271%

These graphs include only the curves of basic networks of the preceding pages, but here the costs of utilities are grouped in pairs representing minimum and standard levels of services. The purpose of these graphs is to compare the costs of each basic network at both levels. The percentages of increases for the different networks are shown in the following table:

Percentages correspond to lots 6.03m x 16.66m = 100m2 but are similar for other lot dimensions.

The percentage of increase in electricity is insignificant. This is because the only difference in the levels is in a greater number of street-lamps. The increase in sewage disposal and water supply are appre-



ciable and are both concentrated in the network extension. The increase in circulation/storm drainage is very substantial and is the product of the larger volume of construction (materials and labor).

Costs of staged construction versus immediate full-service-level construction could be inferred by comparing the costs of minimum and standard levels of services. The most convenient options for development are summarily described below:

•*ELECTRICITY/STREET LIGHTING. Initial stage:* instant installation of basic network at standard level. *Further stages:* progressive provision of service connections as demanded.

•*WATER SUPPLY.* Same program as electricity/street lighting.

•*SEWAGE DISPOSAL. Initial stage:* instant installation of basic network at standard level, including couplings for future connections. *Further stages:* progressive provision of service connections as demanded.

•*CIRCULATION/STORM DRAINAGE. Initial stage:* instant installation at minimum level, but only in selected streets. *Further stages:* progressive upgrading by community-aided self-help.

The graphs, in short, identify clearly where substantial savings could be made: circulation/storm drainage at the standard level of service.

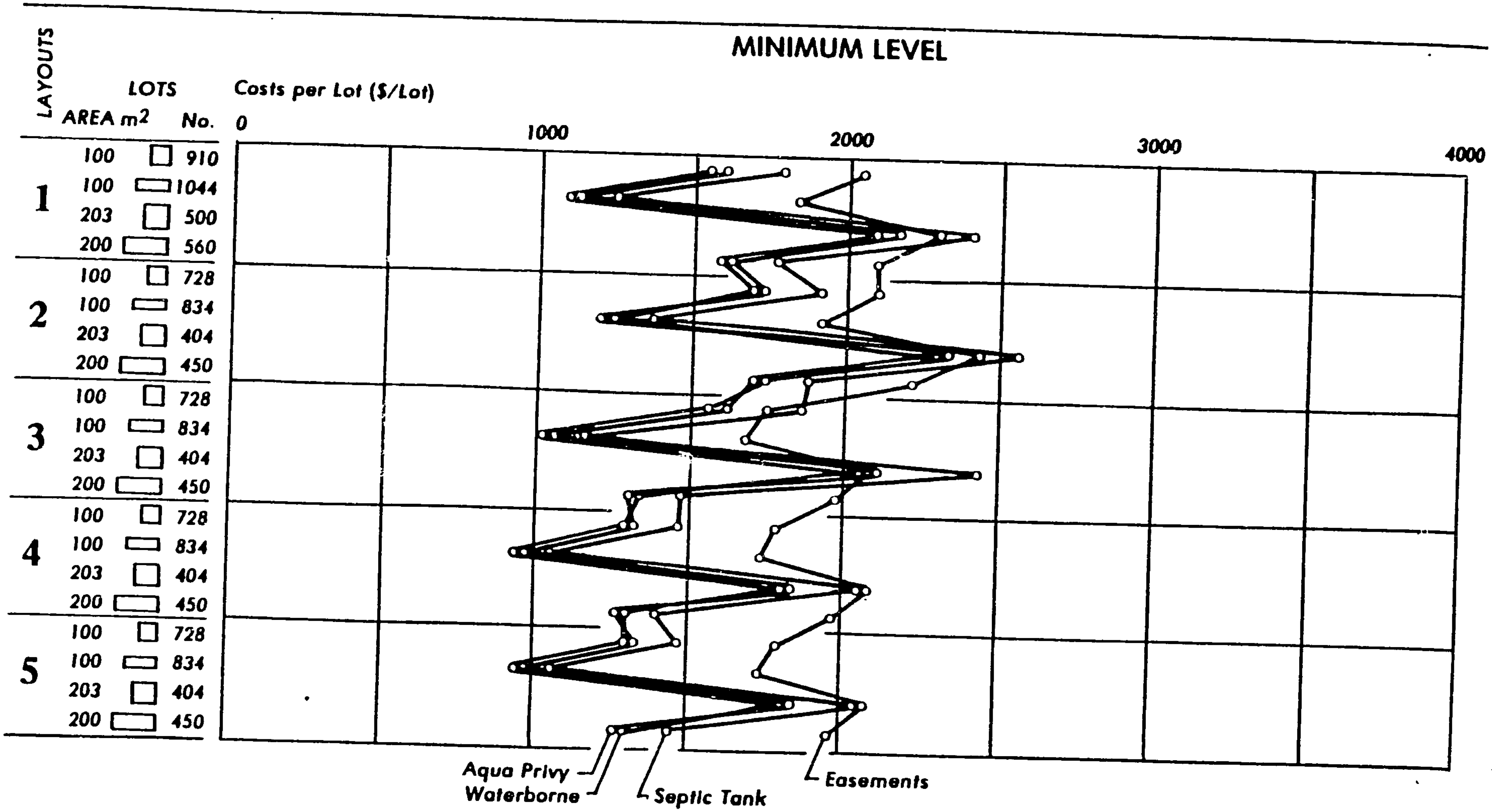
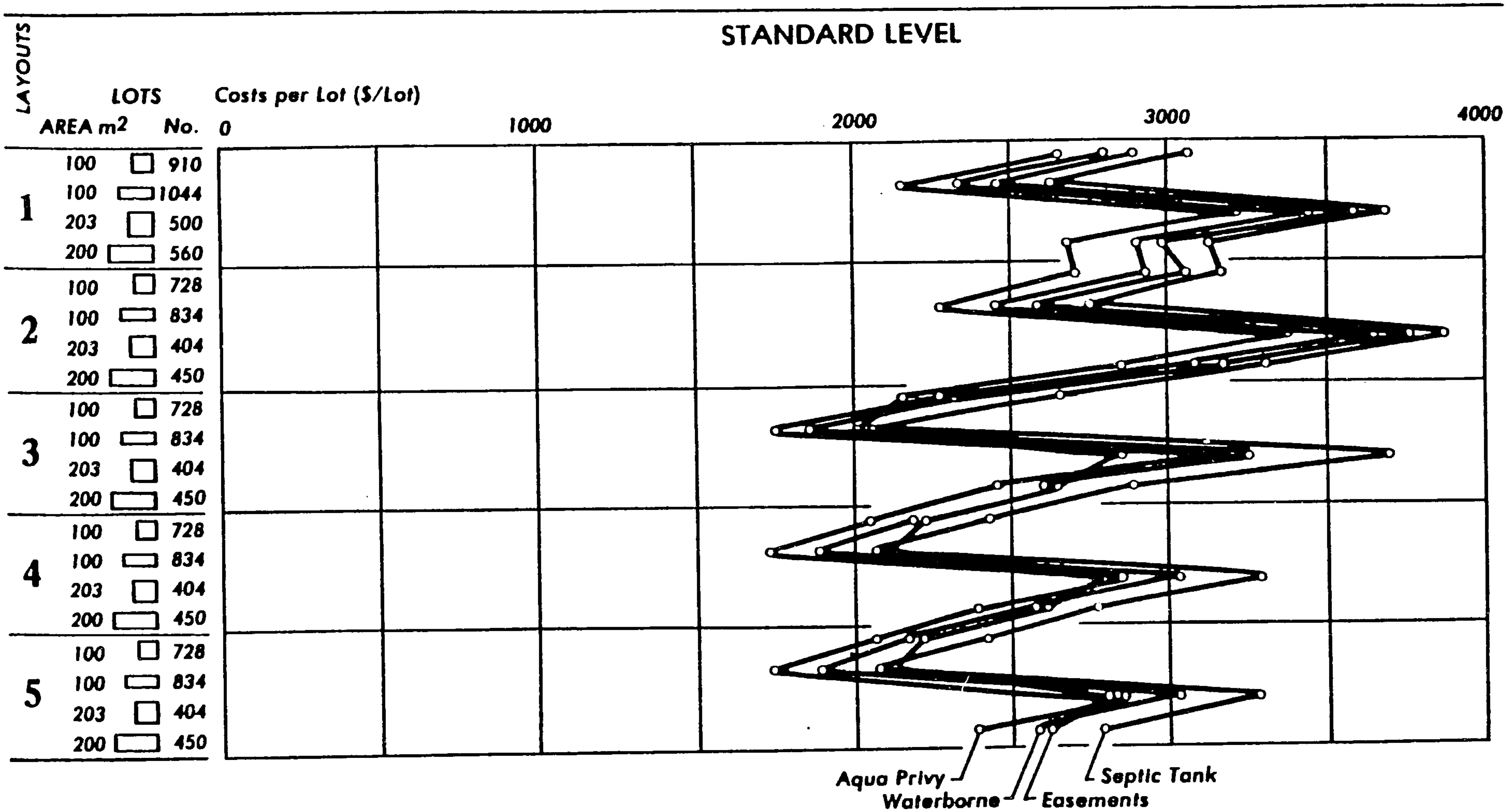


Figure 1 (pages 154-155): **COSTS OF UTILITIES PER LOT FOR DIFFERENT ALTERNATIVES.**

The purpose of these graphs is to compare costs of different alternatives within given levels of services. Each alternative includes all the utilities. Sewage disposal and corresponding facilities provide the major difference between alternatives. Water supply is only different in easements. Circulation/storm drainage and electricity/street lighting remain the same in all the four. Details on these alternatives are given in the Appendix. (*See pages 192-195.*) The costs of the alternatives show different trends. At minimum level: Aqua privy is the low-



est, followed closely by waterborne; easements are the most expensive above septic tank. At standard level: Aqua privy is again the lowest; in the middle range come easements, followed closely by waterborne; septic tank is the most expensive. Septic tank, like aqua privy, does not carry additional costs of the urban network of sewage.

The graphs show clearly that: a) There are not substantial differences between the four alternatives considered; b) The major differences occur, as can be expected, between different configurations of lots and layouts. The main conclusions are that given levels of services: a) The selection of an alternative is a decision in which different social, technical and political requirements have minor impact on costs; b) The selection of a physical solution is a decision in which efficient configurations of lots and layouts have a major impact on costs. All in all, the issue is not the selection of alternatives but rather the provision of an efficient configuration for the alternatives selected.

3.13 UTILITIES: COSTS PER HECTARE

COSTS PER HECTARE are obtained by dividing any costs by the number of hectares. The cost items may include basic networks for all the private, semiprivate, public, and semipublic land. These costs are shared by a fixed unit: a hectare.

Costs per hectare provide comparative references for the following variables: a) lot areas; b) lot proportions; c) block layouts; d) dwelling unit densities; e) household/family/population densities.

Costs per hectare provide a common denominator for evaluations (a hectare) and therefore an unlimited index.

In the following pages main findings are discussed and illustrated, including: General Conclusions; Comparative Costs of different utilities; Comparative Costs of levels; Comparative Costs of materials, labor and equipment.

GENERAL CONCLUSIONS ON COSTS PER HECTARE, as related to layouts, dwellings and population. (*See: Figure 1, opposite page.*) For clarity, the following is assumed: a) Layouts: gridiron and grid. b) Level of services: standard. c) Utilities basic networks: water supply, sewage disposal, electricity, circulation/storm drainage, street lighting. d) Units: lot, dwelling, person. e) Density of lots: number of lots/Ha. f) Density of dwellings: number of dwelling units/Ha g) Density of population: number of people/Ha.

In *GRIDIRON* layouts, total costs per hectare of basic network for *WATER SUPPLY, SEWAGE DISPOSAL,* and *ELECTRICITY* are variable. They change with lot sizes and lot proportions: the smaller the sizes or the more nearly square the proportions, the higher the total cost of the network. They change, in a lesser degree, with density of dwellings and population. For example: The higher densities will require larger diameters for pipes, wires, valves, and larger capacity for transformers; but will not affect lengths of pipes, wires, volume of excavation/fill, number of valves, hydrants, poles. In short: if costs are variable, in order to reduce them, lots should be larger and of narrow proportions; but larger lots mean lower density of dwellings and population (single dwellings), which will reduce the total costs very little and instead will increase the unit costs of networks per dwelling or per capita, because they are shared by a smaller number. The strategy to reduce costs in this case is really by providing larger lots with higher densities of dwellings and people. This eliminates the individual lot with single-family dwelling units in favor of condominiums or in favor of multifamily units such as tenements and apartments. The latter are not always acceptable.

In *GRIDIRON* layouts, total costs per hectare of basic networks for *CIRCULATION, STORM DRAINAGE,* and *STREET LIGHTING* are variable. They change with lot sizes and lot proportions: The smaller the sizes or the more nearly square the proportions, the higher the total cost of the network. They do not change with density of dwellings and population. In short, if costs are variable, in order to reduce them, lots should be larger and of narrow proportions; but larger lots mean lower density of dwellings and population (single dwellings), which will increase the unit costs of networks per dwelling or per capita, because they are shared by a smaller number. The strategy to reduce costs in this case, once again, is by providing larger lots, with a higher density of dwellings and people. This again eliminates the individual lot with single-family dwelling units in favor of condominiums or in favor of multifamily units such as tenements and apartments, and the latter are not always acceptable.

In *GRID* layouts, total costs per hectare of basic networks for *WATER SUPPLY, SEWAGE DISPOSAL,* and *ELECTRICITY* are practically constant. They may change slightly with lot sizes and lot proportions, density of dwellings and population. For example, higher densities will require larger diameters for pipes, wires, valves, and larger capacity for transformers, but it will not affect lengths of pipes and wires, volume of excavation/fill, or number of valves, hydrants and poles. In short, if costs are constant and are minimized by a proper layout, higher densities or higher demand for services will increase very little the total costs and instead will lower the unit costs of network per lot, per dwelling or per capita, because they are shared by a larger number.

In *GRID* layouts, total costs per hectare of basic networks for *CIRCULATION, STORM DRAINAGE,* and *STREET LIGHTING* are constant. They do not change with lot sizes and lot proportions, density of dwellings and population. In short, if costs are constant and are minimized by a proper layout, higher densities or higher demand for services will, once again, lower the unit costs of network per lot, per

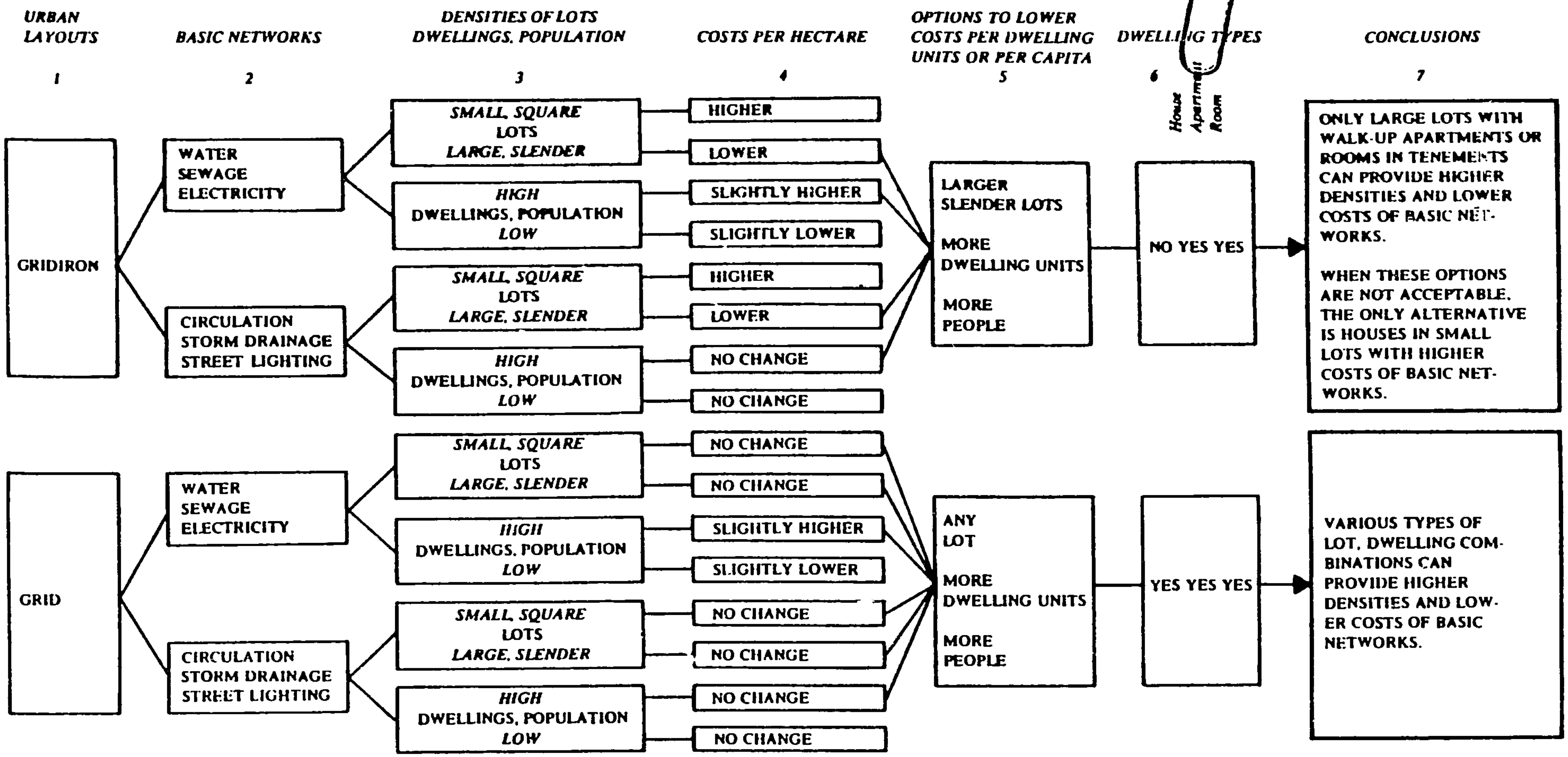


Figure 1: **DIAGRAM OF COSTS OF BASIC NETWORKS PER HECTARE AS RELATED TO LAYOUTS, LOTS, DWELLINGS AND POPULATION**

dwelling or per capita, because they are shared by a larger number.

In both *GRIDIRON* and *GRID* layouts, total costs per hectare of *SERVICE CONNECTIONS* for water supply, sewage disposal and electricity are meaningless because the unit costs of connections per lot or per dwelling are the same regardless of density. They have not been included here.

The diagram of costs attempts to illustrate these general conclusions. It follows the same sequence:

1) The two types of urban layouts.
2) The two groups of basic networks provided for the layouts.
3) The density ranges in terms of lots and dwellings/population.
4) The effect of these densities in the costs per hectare.
5) The options available in each type of layout to lower costs of basic networks per dwellings unit or per capita.
6) The dwelling types that match these options.
7) The general conclusions for the two layouts.

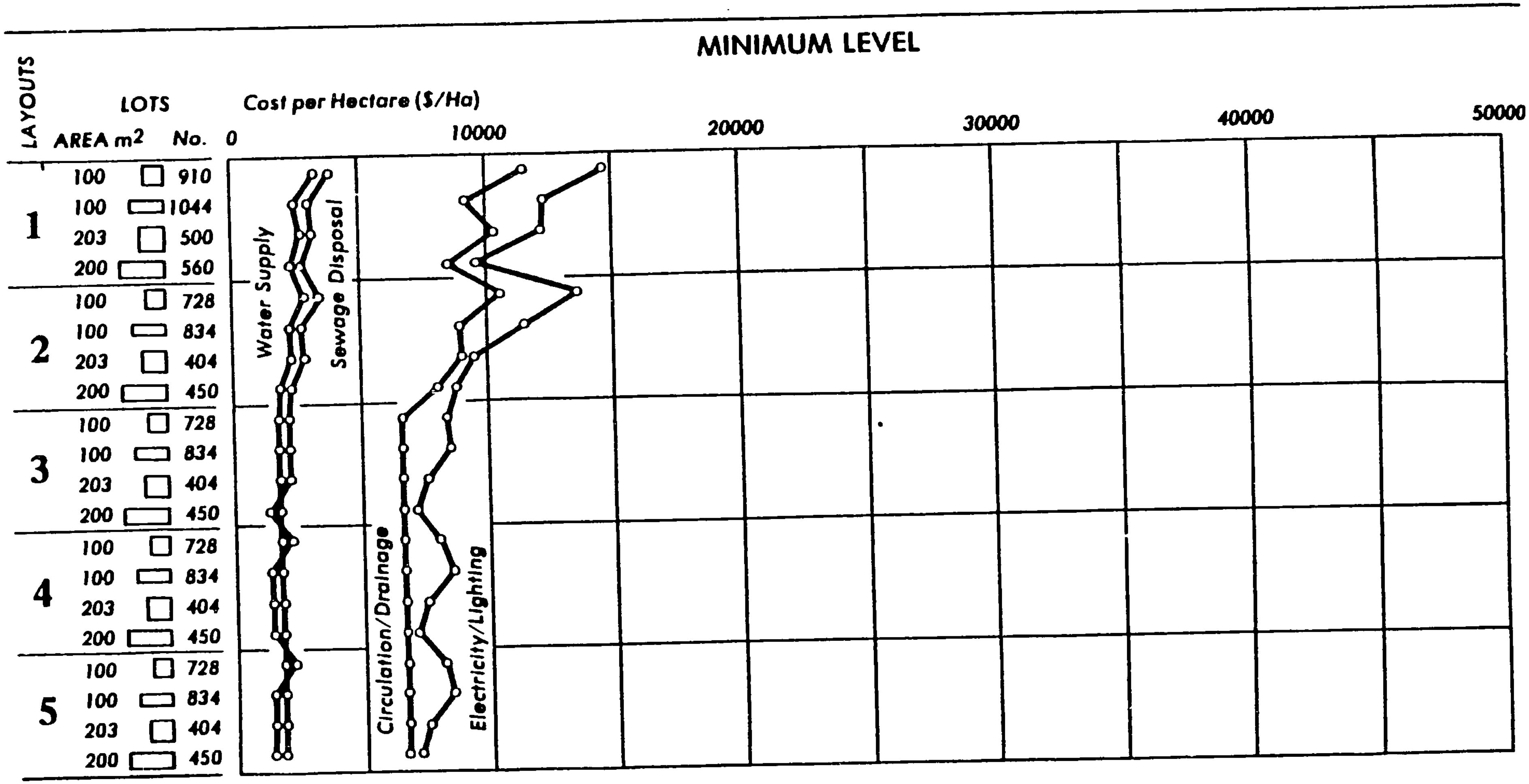
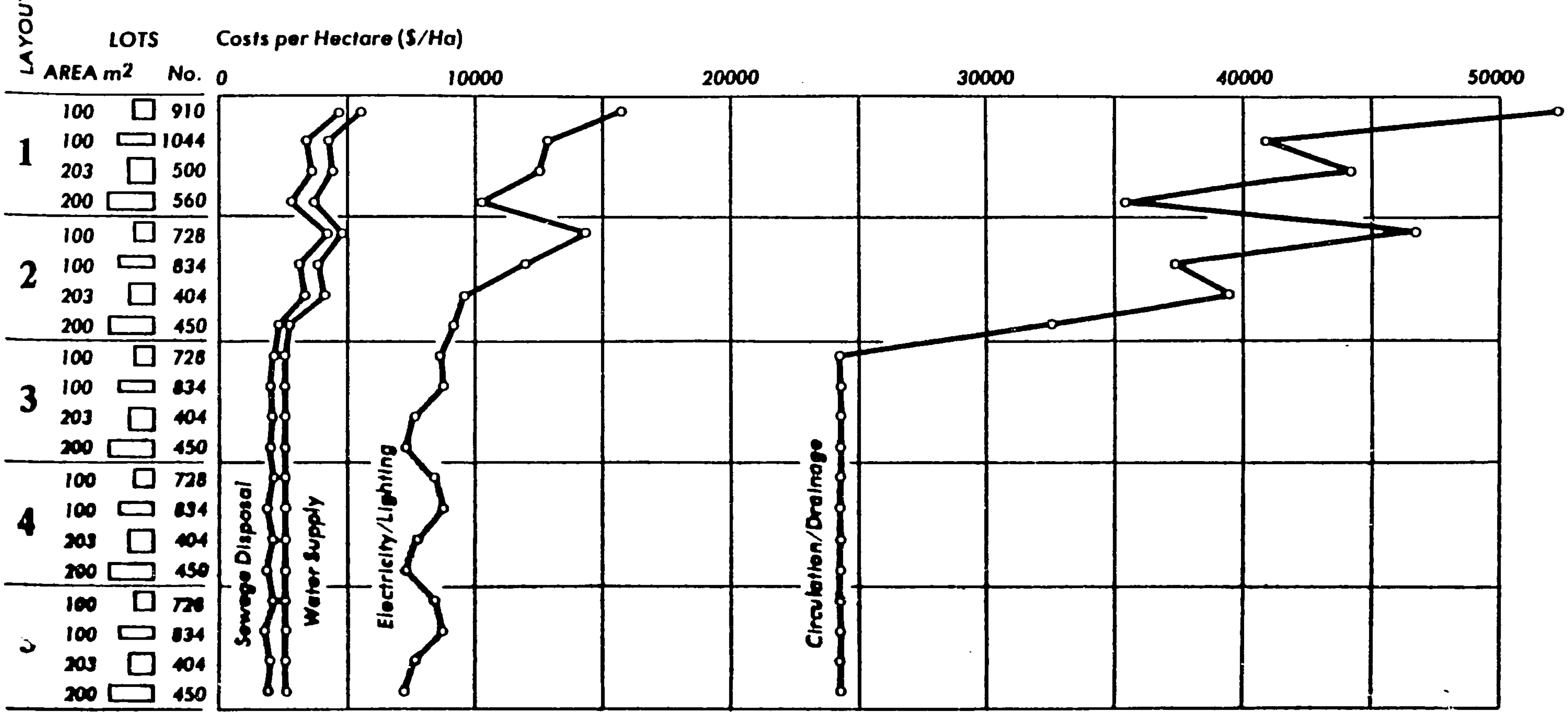


Figure I (pages 158-159): **GRAPHS OF COSTS OF UTILITY BASIC NETWORKS PER HECTARE.**

The purpose of these graphs is to compare costs: a) for different basic networks; b) for gridiron and grid layouts. Costs of service connections per hectare are not included because the unit costs of connections per lot or dwelling are the same regardless of density.

In basic networks, water supply and waterborne sewage disposal are consistently close and the lowest at both minimum and standard levels of service. Circulation/storm drainage and electricity/street lighting are in the same range at minimum level; but diverge drastically at the standard level. Circulation/storm drainage is clearly the

STANDARD LEVEL



most costly utility and therefore provides much more room for real savings than the other utilities that cost less.

In gridiron layouts (1, 2), costs of basic networks are higher at both levels of services. Different lot areas and proportions change the costs of water and sewage, but more drastic changes occur in the costs of circulation/storm drainage and electricity/street lighting.

In grid layouts (3, 4, 5), costs of basic networks are lower at both levels of services. Different lot areas and proportions do not change the costs of water, sewage, circulation/storm drainage. The only slight changes occur in the costs of electricity/street lighting.

These graphs illustrate, perhaps more clearly than others, that costs of basic networks are a direct function of circulation lengths, and also that gridiron layouts involve almost double the costs of grids, particularly at the standard level of services.

Cost savings in general can be achieved by: a) using grid layouts instead of gridiron; b) judicious choice of service levels matched by an efficient design. (*See: DEMONSTRATIVE MODEL, page 26.*)

These graphs provide quantitative indices for the main conclusions on costs per hectare and the corresponding diagram. (*See page 156.*)

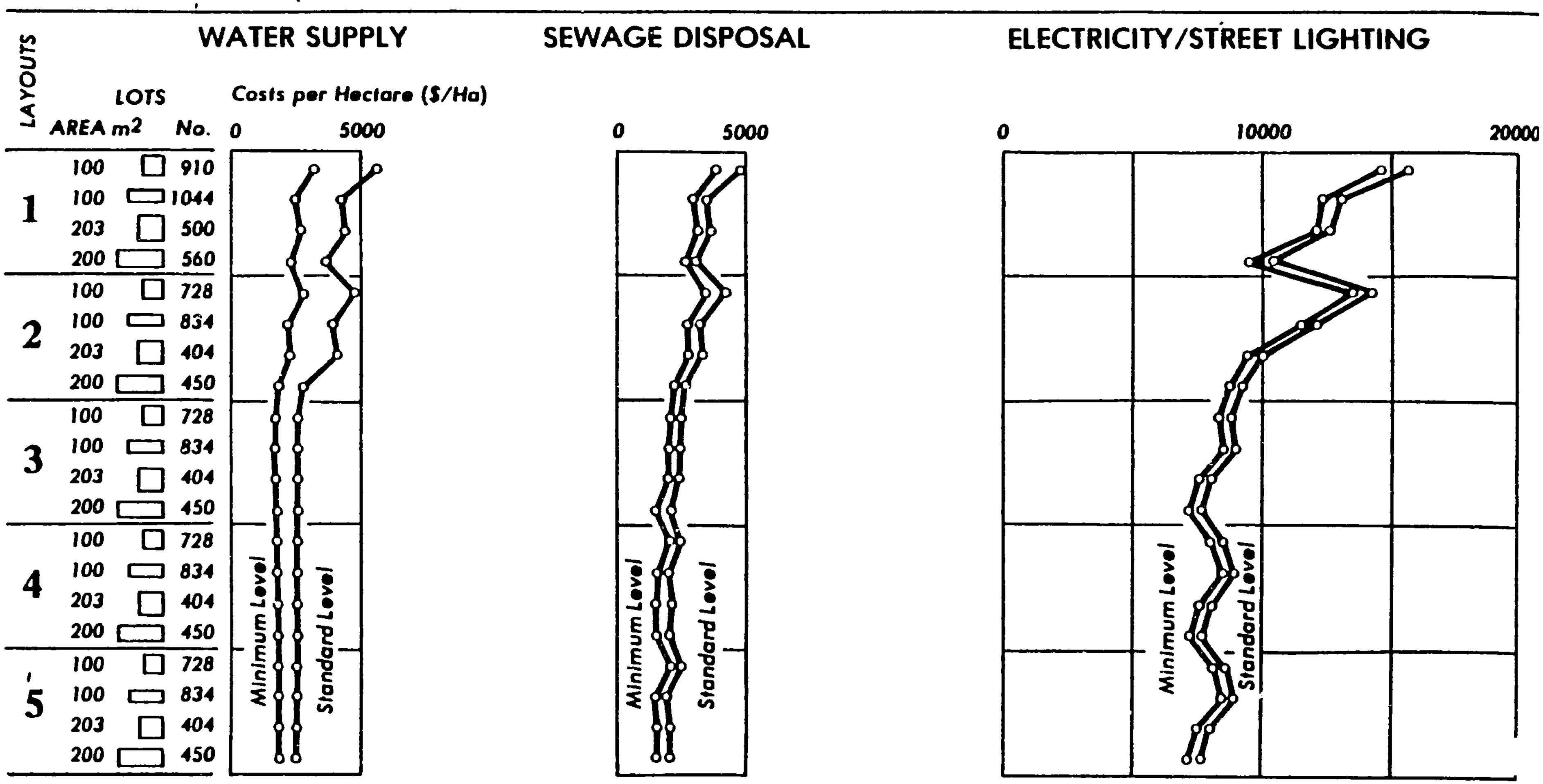


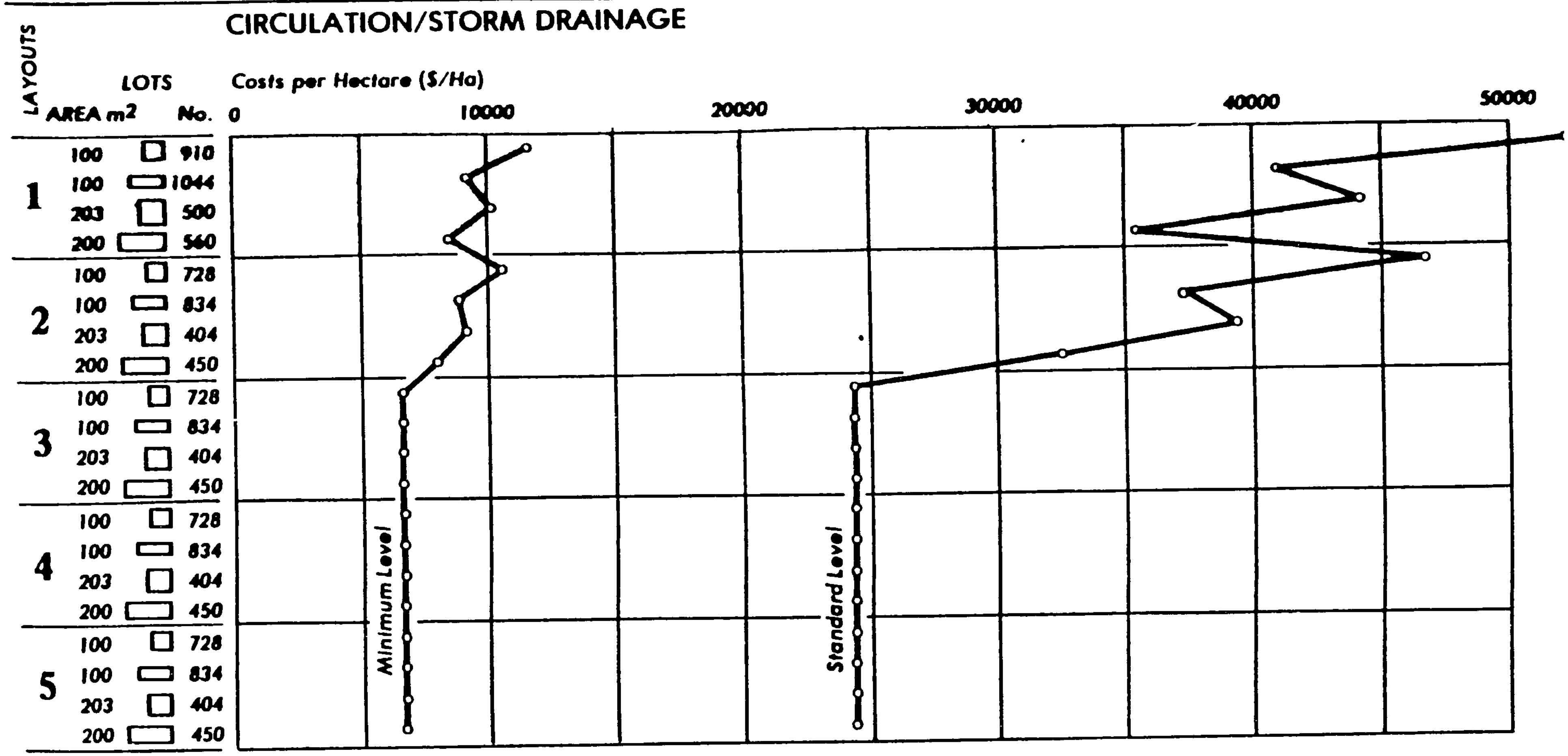
Figure 1 (pages 160-161): **GRAPHS OF COSTS OF BASIC NETWORKS PER HECTARE AT MINIMUM AND STANDARD LEVELS.**

These graphs include the same curves of costs presented in the preceding pages, but here the costs of utilities are grouped in pairs representing minimum and standard levels of services. The purpose of these graphs is to compare the costs of each basic network at both levels. The percentages of increases for the different networks are shown as follows:

	INCREASE FROM MINIMUM TO STANDARD LEVEL	
	In Gridirons	*In Grids*
WATER SUPPLY	80%	53%
SEWAGE DISPOSAL	22%	32%
ELECTRICITY/STREET LIGHTING	5%	5%
CIRCULATION/STORM DRAINAGE	321%	271%

Percentages correspond to lots 6.03m x 16.66m = $100m^2$ but are similar for other lot dimensions.

The percentage of increase in electricity is insignificant. This is because the only difference in the levels is in a greater number of street-



lamps. The increases in sewage disposal and water supply are appreciable and are both concentrated in the network extension. The increase in circulation/storm drainage is very substantial and is the result of the larger volume of construction (materials and labor).

Costs of staged construction versus immediate full-service-level construction could be inferred by comparing the costs of minimum and standard levels of services. The most convenient options for development are summarized below:

•*ELECTRICITY/STREET LIGHTING. Initial stage:* instant installation of basic network at standard level. *Further stages:* progressive provision of service connections as demanded.

•*WATER SUPPLY.* Same program as electricity/street lighting.

•*SEWAGE DISPOSAL. Initial stage:* instant installation of basic network at standard level, including couplings for future connections. *Further stages:* progressive provision of service connections as demanded.

•*CIRCULATION/STORM DRAINAGE. Initial stage:* instant installation at minimum level, but only in selected streets. *Further stages:* progressive upgrading by community-aided self-help.

The graphs, in short, identify clearly where and when substantial savings could be made: circulation/storm drainage at the standard level of service.

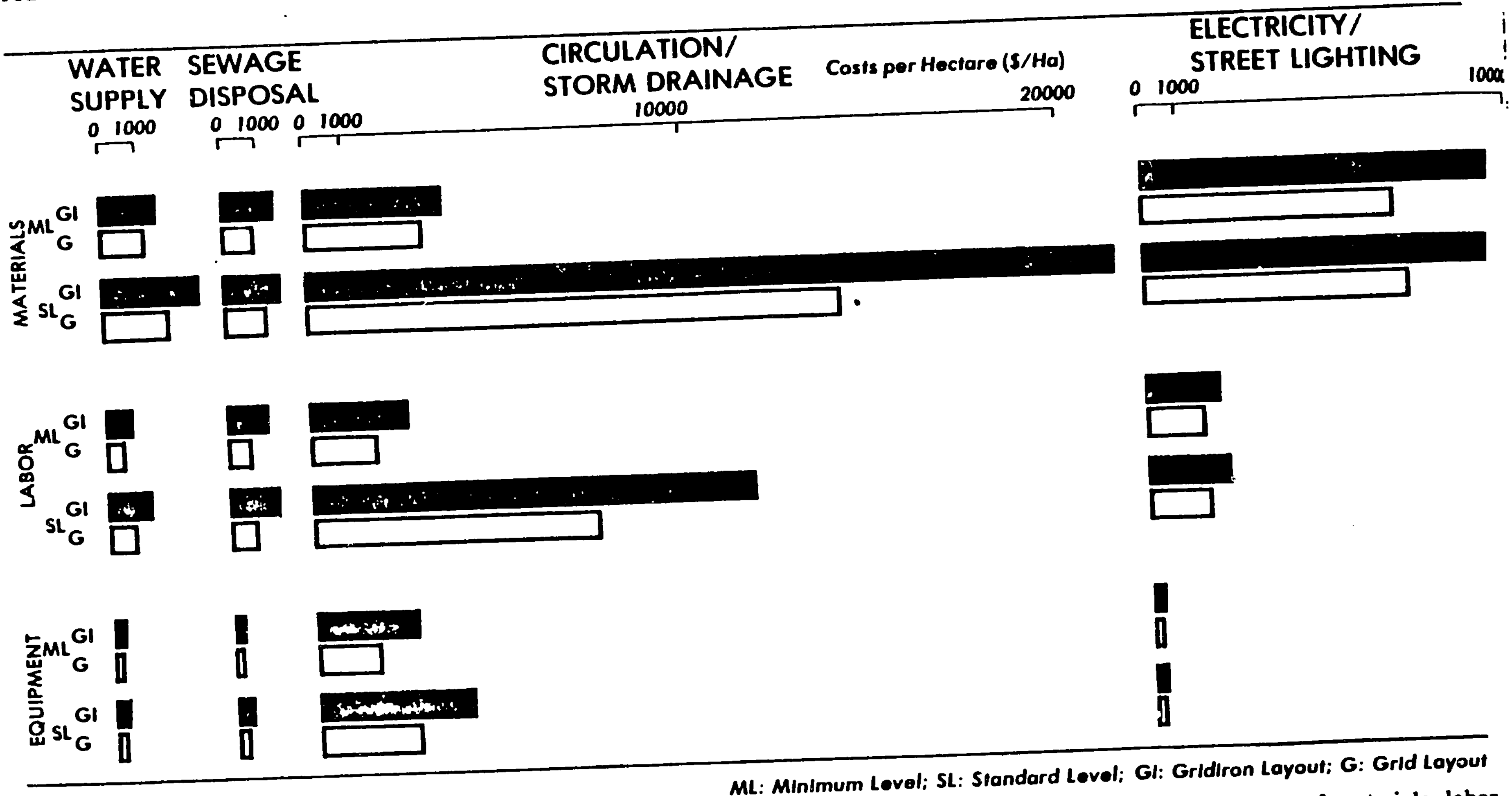
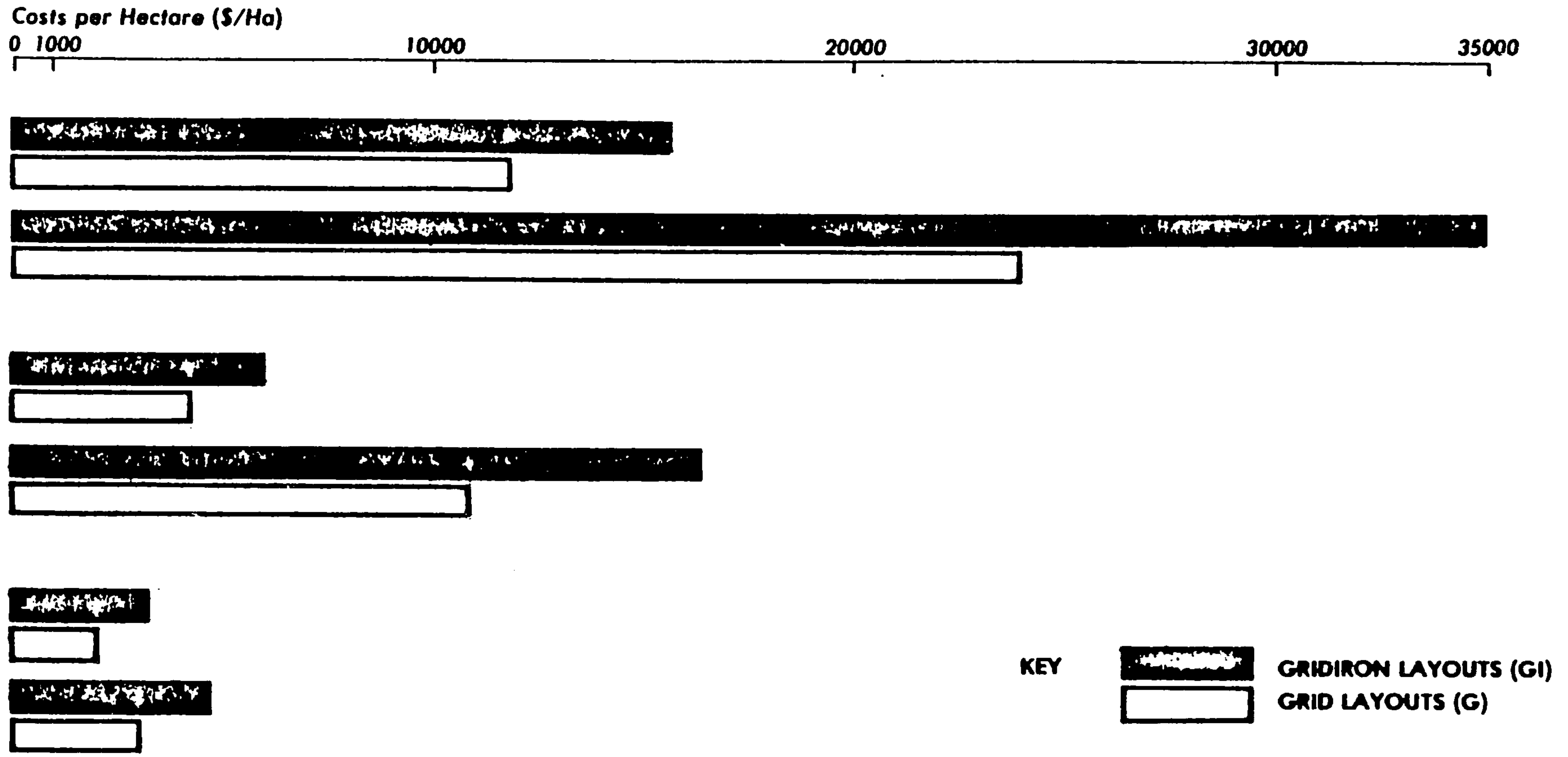


Figure 1 (across pages 162-163): **CHART OF COSTS OF MATERIALS, LABOR, AND EQUIPMENT OF BASIC NETWORKS PER HECTARE AT MINIMUM AND STANDARD LEVELS.**

The purpose of this chart is to compare costs of materials, labor, and equipment of different basic networks at both minimum/standard levels of services. Two models are used: a *GRIDIRON* layout (2) and *GRID* layout (3); both have the same lots: 6.03m x 16.66m = $100m^2$.

Materials carry the highest total costs at both minimum and standard levels. Electricity/street lighting carry the highest costs of materials at the minimum level; but circulation/storm drainage are the highest at the standard level. Sewage disposal carries the lowest costs at the minimum and standard levels.

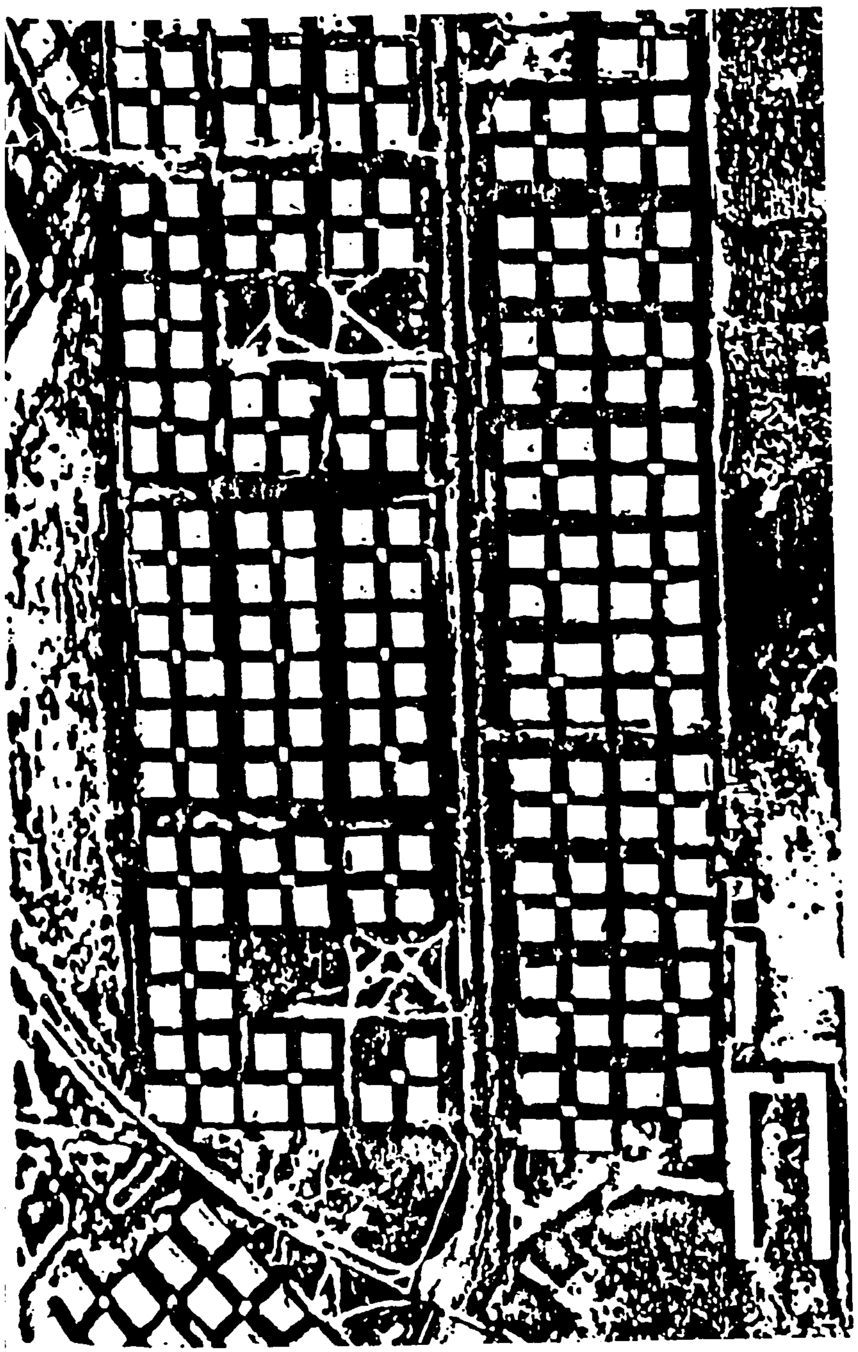
TOTALS



Labor follows materials in total costs at both levels. Circulation/storm drainage carry the highest costs at both levels. Water supply carries the lowest costs at both levels.

Equipment carries the lowest total costs at both levels. Circulation/storm drainage again carry the highest cost of equipment at both levels. Water supply and electricity/street lighting are close and carry the lowest costs at both levels.

The chart illustrates the following: a) that the application of labor-intensive technologies becomes more significant in circulation/storm drainage, because they carry the highest cost of labor and may not require much in the way of specialized skills; b) that proper circulation/storm drainage design can provide considerable savings by reducing the amount of materials and labor, mainly through optimized layouts; c) that electricity/street lighting offers only a limited opportunity for savings because the high costs of materials, even in an optimized design, do not result from quantities, but rather from the cost of the materials themselves; d) that water supply and sewage disposal provide little room for savings in materials, labor, and equipment, because they carry the lowest costs at both levels; e) that the relatively low costs of equipment in water supply, sewage disposal, and electricity/street lighting reflect the fact that only simple equipment is required.



LAND UTILIZATION. *(opposite page)* Nairobi, Kenya. Air view of Eastern Nairobi about 4 km from the city center, showing different dwelling environments, all contained in a small area of 18 hectares. From left to right: Eastleigh, with its court type private tenements (660 persons/Ha). Next: the Juja Road running from top to left. Next: Mathare Valley Village I with its "Company Housing" tenements aligned in rows (3333 persons/Ha). Next: the Village II with squatter shacks occupying the low land on the edge of the Mathare River, which is now a narrow ditch. On the right is open land not urbanized, but cultivated with maize by nearby squatters. *(See table and plans, pages 85-94-95).* *(left)* Nairobi, Kenya. Kariobangi site and services project, developed in 1964 (2660 persons/Ha). The large squares are clusters of four rooms occupied by several families. The small squares are communal latrines. *(See table, page 85). (Photos: B.S. Thethy, 1970; Survey of Kenya, 1972).*

2.0 site analysis

INTRODUCTION. This section is concerned with the analysis of the site. It provides references for the evaluation/selection/planning of sites in urban areas, particularly in relation to dwelling environments. The common cases of site investigation are: a) Given an intended use, find suitable sites; b) Given a site, determine options for use/development; c) Given a settlement, evaluate site utilization. This section includes the discussion of factors that should be considered: site attributes that define the economic and practical feasibility of development; site determinants that define the constraints of physical planning. The factors are listed in an order that is not hierarchial. The importance/significance of each factor should be established in each particular case. Some factors could be disregarded at the beginning. The presentation of each factor includes: definitions and planning/design/development considerations. They are to serve as a framework for preliminary site investigations as well as site planning. They should be viewed as guidelines within a range of alternatives for each specific factor. They are a checklist in the development of a site.

2.1 A LOCATION
B APPROACHES
C ACCESSES
D TRANSPORTATION

LOCATION, APPROACHES, ACCESSES, TRANSPORTATION are interdependent factors affecting the site. *Location* (*position-distance*) of the site in relation to: residential, commercial, industrial areas, city center. *Approaches:* the main routes that reach the site. *Accesses:* the linkages of the site with the main routes. *Transportation:* the means of conveyance along these main routes.

2.1A LOCATION. PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. Location of the site in relation to the urban context should be analyzed/evaluated to determine degrees of availability/adequacy/consistency in terms of the following existing and/or projected conditions:

URBAN LAND UTILIZATION PATTERN data are recorded in urban area plans, charts. Uses to be identified are: residential, business, commercial, small industrial, industrial, educational (schools), recreation (playgrounds, parks), other. *URBAN POPULATION DENSITY PATTERN* data are recorded in urban area plans, charts. Ranges should be identified in terms of inhabitants/hectare. *URBAN INCOME GROUP PATTERN* data are recorded in urban area plans, charts. Ranges should be identified in terms of income/family/year or in terms of subsistence levels. (*See: INCOME GROUPS, page 183.*) *URBAN LAND VALUE/COST PATTERN* data are recorded in urban area plans, charts. Ranges should be identified in terms of costs/unit area: square meters, hectares, acres. *UTILITIES, SERVICES, COMMUNITY FACILITIES* (adjacent/contiguous to the site) data are recorded in locality plans, reports. Availability should be identified at one of four levels: no provision at all, very limited or occasional, generally available but inadequate, adequate or normal service. The following utilities, services, community facilities should be identified: water supply, sewerage, storm drainage, electricity, street lighting, telephone, gas, circulation, public transportation, police, fire, refuse collection, health, schools, recreation, other. *CENTERS OF EMPLOYMENT* data are recorded in urban area/locality plans, reports. Distances to the following areas should be determined: residential, commercial, industrial, governmental or other centers of employment. (Proximity becomes a priority for those low-income groups that cannot afford transportation costs.)

LOCATION (*) situation: the way in which something (the site) is placed in relation to its surroundings (the urgan context).

It can be in terms of the *POSITION*(*) of the site in the urban context regarding primarily: *Site land use* as determined by urban land use patterns, zoning ordinances, and other government regulations. *Site value/costs* as determined by urban land value/cost patterns.

It can be in terms of the *DISTANCE*(*) between the site and other elements of the urban context, measured in *Lengths:* kilometers, yards, miles. *Traveling time:* walking, private vehicle, public transportation. *Traveling costs:* percentage of weekly, monthly, annual income. *Traveling frequency:* weekly, monthly, occasionally.

2.1B APPROACHES. PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. Approaches to the site should be analyzed/evaluated to determine availability/adequacy/quality in terms of existing and/or projected routes.

Data are recorded in aerial photographs, urban area/locality/site plans, field surveys, charts, photographs. Characteristics to be identified for each approach are: name of route; transportation modes (pedestrian/vehicular, walking, bicycling, private car, bus, subway, railway, etc.); from/to (areas linked by the route); adequacy (*See: CIRCULATION SYSTEM, page 86*); character (the nature of existing and future growth along these routes in terms of: congestion, directness of the route, physical conditions of the route, etc.).

APPROACHES (*) the main routes external to the site (pedestrian/vehicular) by which the site can be reached from other parts of the urban context.

They may include the following variety of routes: *Shared right-of-way routes* or automobile routes (main avenues, limited access highways, etc.) *Exclusive right-of-way routes* or rapid transit routes (subways, railroa.. , funiculars, etc.) *Other routes* waterway routes (ferries, launches, etc.)

They are qualified by the character of existing and future growth along these routes (congestion; directness of the route; depreciating commercial, industrial, or residential areas). Trends in urban growth may affect a site's approaches.

They are the manner in which *POSITION* and *DISTANCE* relate the site with the urban context.

2.1C ACCESSES. PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. Accesses to the site from its approaches should be analyzed/evaluated to determine their availability/adequacy/quality in terms of existing and/or projected conditions.

Data are recorded in locality/site plans, field surveys, charts. Conditions to be identified are: linear links, point links (*see following text*).

ACCESSES (*)—the pedestrian/vehicular linkages from/to the site to/from existing or planned approaches [urban streets, limited access highways, public transportation systems, and other systems such as: waterways, airlines, etc.]

They are ways that allow entrance to and exit from the site proper. They can be defined/determined by: *Linear links:* highways, streets, or paths from which the site can be entered. *Point links:* subway stations, bus stops, etc. from which the site can be entered.

2.1D TRANSPORTATION. PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. Transportation to the site should be analyzed/evaluated to determine its availability/adequacy/quality in terms of existing and/or projected conditions.

Data are recorded in urban area plans, charts. Conditions to be determined are: preferred modes of travel; distance; traveling time and costs; adequacy in relation to: high schools, playgrounds, regional recreation and shopping, employment.

TRANSPORTATION (*)—means of conveyance or travel from one place [the site] to another [other parts of the urban context].

Its means can be: *Private:* bicycle, automobile, etc. *Public:* bus, subway, taxi, "*colectivo*, etc. It can be measured in terms of: *distance, time costs.*

Transportation between the site and centers of employment is critical for the low-income groups. If employment is not located within walking distance, a site could be unacceptable to those who cannot afford transportation fares or a bicycle.

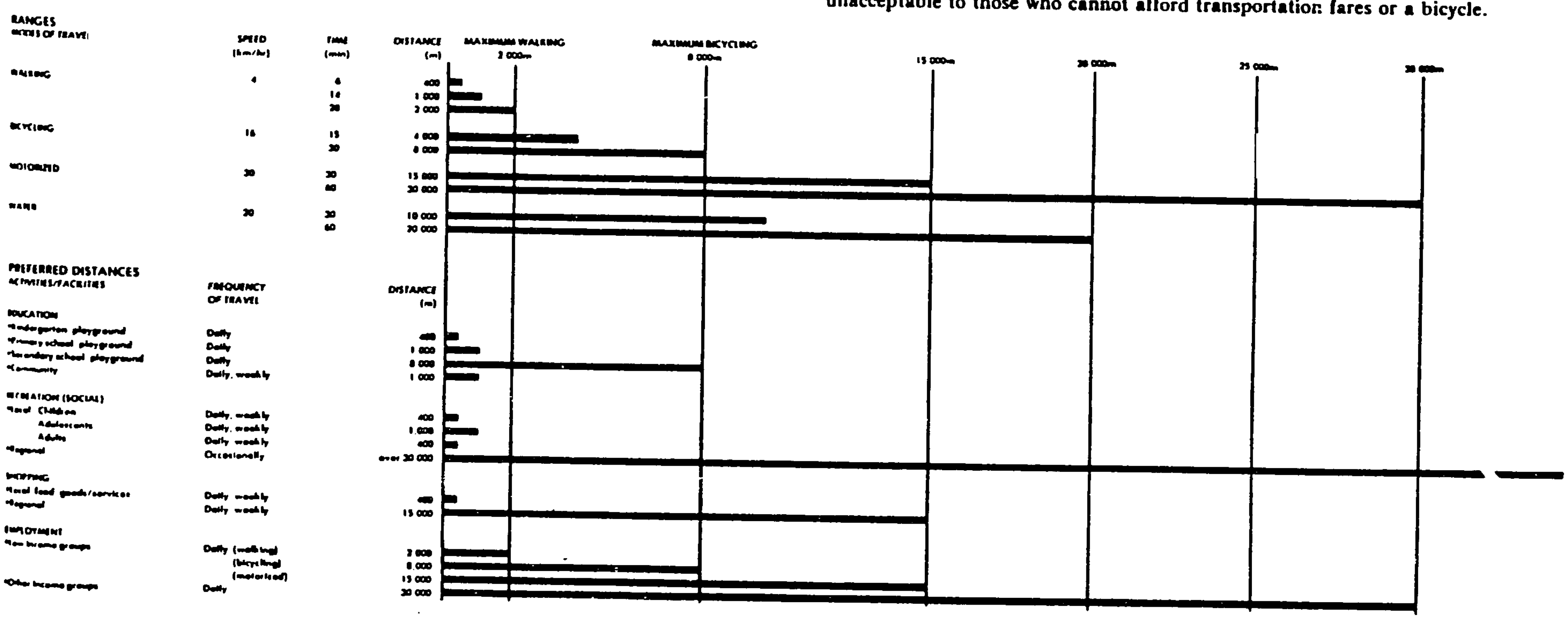


Figure 1: **DIAGRAM OF RANGES, PREFERRED DISTANCES** illustrates **MODES OF TRAVEL** (*), in terms of speed, time, and distance and activities/facilities in terms of frequency of travel and distance. In a proper environment, certain facilities may be within walking distance; others may be reached via transportation: Secondary Schools, Playgrounds; Regional Recreation and Shopping; Centers of Employment. *MOTORIZED* mode of travel includes: bus, car, subway, railway, etc. *WATER* mode of travel includes: ferry, launch, etc. In most U.S. urban areas people travel by private automobile even when the destination is within walking distance.

2.2 A SIZE
B SHAPE

Figure 1: **TABLE, DIAGRAM OF SIZE, POPULATION, LAND UTILIZATION.** Each table gives population (N°/Ha, total); number of units (N°); areas of public, semipublic and private land (%, Has) for sites ranging from 1Ha to 100Ha in size, primarily for residential use.

Each size is represented diagrammatically above the corresponding table. The diagrams show: a) Circulation grid of 100m x 100m. b) Percentage of land utilization corresponding in all cases to a population density of 600 persons/Ha, which is an average of the densities considered in the tables. c) Drawings are diagrammatic and do not represent a design/layout of the area indicated. d) Public land. e) Semipublic land. f) Private land.

Tables can be used in different ways: a) Given size of a site, find the options of: population, number of units, areas needed for different uses. b) Given a population, find the options of: population densities, number of units, sizes of site, areas needed for different uses. c) Tables can be used for preliminary studies as well as for evaluations of existing urbanizations.

SIZE, POPULATION, LAND UTILIZATION. The following tables and diagrams (*Figure 1*) are rough dimensional indicators relating size of site, population, and land utilization (percentages and areas). The tables and diagrams are based on the following parameters:

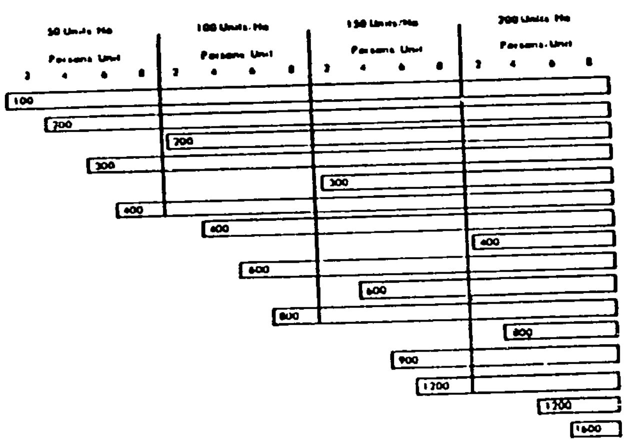
A. SITE AREAS used range from 1Ha to 100Ha.

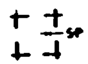
B. NET POPULATION DENSITIES (persons/Ha) used in the tables have been developed from combinations of the following units/Ha and persons/unit (P/U):

Units/Ha	*Unit Types**	*Persons/Ha* 2P/U	4P/U	6P/U	8P/U
50	Rooms, Row/Group Housing, 3-5 story walk-ups.	100	200	300	400
100	Rooms, 3-5 story walk-ups, 7-20 story high-rise.	200	400	600	800
150	Same as above.	300	600	900	1200
200	Rooms, 7-20 story high-rise.	400	800	1200	1600

(**See: GLOSSARY, page 196, for definitions of dwelling unit types.*)

C. LAND UTILIZATION (percentages and areas) used are considered in terms of public and private land as follows:

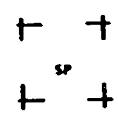




SP: Semipublic Land for 354 people.

AREA = 100M x 100M = 1 HA

POPULATION Net Density Persons/Ha	POPULATION Total	UNITS Total	PUBLIC LAND Circulation %	PUBLIC LAND Circulation Ha	SEMIPUBLIC LAND Public Facilities %	SEMIPUBLIC LAND Public Facilities Ha	PRIVATE LAND Residential %	PRIVATE LAND Residential Ha
100	72	36	25	0 25	3	0 03	72	0 72
200	138	34 69	25	0 25	6	0 06	69	0 69
300	198	33 99	25	0 25	9	0 09	66	0.66
400	252	31 63 126	25	0 25	12	0.12	63	0 63
600	354	59 88	25	0 25	16	0.16	59	0 59
800	432	54 108	25	0 25	21	0 21	54	0 54
900	459	76	25	0 25	24	0 24	51	0 51
1200	552	69 92	25	0 25	29	0 29	46	0 46
1600	640	80	25	0 25	35	0 35	40	0 40



SP: Semipublic Land for 1,416 people.

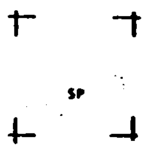
AREA = 200M x 200M = 4 HA

POPULATION Net Density Persons/Ha	POPULATION Total	UNITS Total	PUBLIC LAND Circulation %	PUBLIC LAND Circulation Ha	SEMIPUBLIC LAND Public Facilities %	SEMIPUBLIC LAND Public Facilities Ha	PRIVATE LAND Residential %	PRIVATE LAND Residential Ha
100	288	144	25	1 00	3	0 12	72	2 88
200	552	138 276	25	1 00	6	0.24	69	2 76
300	792	132 396	25	1 00	9	0 36	66	2 64
400	1008	126 252 504	25	1.00	12	0 48	63	2 52
600	1416	236 354	25	1 00	16	0 64	59	2 36
800	1728	216 432	25	1 00	21	0 84	54	2 16
900	1836	306	25	1 00	24	0 96	51	2 04
1200	2208	276 368	25	1 00	29	1 16	46	1 84
1600	2560	320	25	1 00	35	1.40	40	1 60

Public Land: CIRCULATION (streets, walkways, parking areas). Areas used by pedestrians, vehicles, or both. The percentage of land required for circulation depends on the density of the network; secondarily, width of the network. A circulation network serving large blocks takes a lesser percentage of land than a network serving small blocks. Frequency ranges of urban circulation networks are discussed in Circulation System, *page 86*. Ranges are from: 80m x 80m = 6400 square meters of area served (0.64Ha) to 200m x 200m = 40000 square meters of area served (4Ha). Assumption: The tables use a frequency of 100m x 100m = 10000 square meters of area served (1Ha) and an average width of 13.30m, which results in 25% of the land for circulation (a constant). The ranges have been derived from case studies: *URBAN DWELLING ENVIRONMENTS, Caminos, Turner, Steffian; Cambridge, Massachusetts, 1969; LAND USES IN AMERICAN CITIES, Bartholomew; Cambridge, Massachusetts, 1955.*

Semipublic Land: PUBLIC FACILITIES (schools, playgrounds, playfields, other facilities). Areas physically controlled for the use of a group or a limited number of people. The percentage of land required for public facilities depends on the population served. A small population requires less facilities and consequently less percentage of land. A large population requires more facilities and consequently a higher percentage of land. In [illegible] new facilities are required with increasing levels of population. Example: a community of 5000 people will require a primary school; and a community of 20000 people will require 4 primary schools and, in addition, a secondary school. Assumption: the tables use the following ranges: a) Supporting population 6000, 30000, 60000. b) Semipublic land for public facilities 3Ha, 19Ha, 47Ha, respectively. Ranges have been derived from: *"NORMAS MINIMAS DE URBANIZACION," Centro Interamericano de Vivienda y Planeamiento, Bogotá, Colombia, 1968;* and case studies: *URBAN DWELLING ENVIRONMENTS, Caminos, Turner, Steffian; Cambridge, Massachusetts, 1969; LAND USES IN AMERICAN CITIES, Bartholomew, 1955.* Semipublic land for city-wide facilities, such as for parks, hospitals, organized sports, etc., is not included.

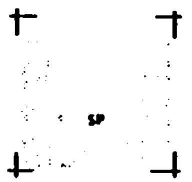
Private//Semiprivate Land: RESIDENTIAL (dwellings, commercial, professional, small industries). Areas physically controlled for private/semiprivate use. Assumption: the private land will be primarily residential but will include commercial, professional, and small industrial uses. The percentage of private land depends on the size of the urban sector considered. If the percentage of land for circulation is a constant 25%, and the percentage of public land increases with population, the percentage of private land, which is the remaining area, diminishes with population.



SP: Semipublic Land for 3,186 people.

AREA = 300M x 300M = 9 HA

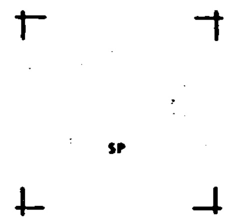
POPULATION		UNITS	PUBLIC LAND		SEMIPUBLIC LAND		PRIVATE LAND	
Net Density Persons/Ha	Total	Total	Circulation %	Ha	Public Facilities %	Ha	Residential %	Ha
100	648	324	25	2.25	3	0.27	72	6.48
200	1242	310 621	25	2.25	6	0.54	69	6.21
300	1782	297 891	25	2.25	9	0.81	66	5.94
400	2268	283 567 1134	25	2.25	12	1.08	63	5.67
600	3186	531 796	25	2.25	16	1.44	59	5.31
800	3888	486 972	25	2.25	21	1.89	54	4.86
900	4131	689	25	2.25	24	2.16	51	4.59
1200	4968	621 828	25	2.25	29	2.61	46	4.14
1600	5760	720	25	2.25	35	2.15	40	3.60



SP: Semipublic Land for 5,664 people. Includes 1 primary school.

AREA = 400M x 400M = 16 HA

POPULATION		UNITS	PUBLIC LAND		SEMIPUBLIC LAND		PRIVATE LAND	
Net Density Persons/Ha	Total	Total	Circulation %	Ha	Public Facilities %	Ha	Residential %	Ha
100	1152	576	25	4.00	3	0.48	72	11.52
200	2208	552 1104	25	4.00	6	0.96	69	11.04
300	3168	528 1584	25	4.00	9	1.44	66	10.56
400	4032	504 1008 2016	25	4.00	12	1.92	63	10.08
600	5664	944 1416	25	4.00	16	2.56	59	9.44
800	6912	864 1728	25	4.00	21	3.36	54	8.64
900	7344	1224	25	4.00	24	3.84	51	8.16
1200	8640	1080 1440	25	4.00	30	4.80	45	7.20
1600	9984	1248	25	4.00	36	5.76	39	6.24



SP: Semipublic Land for 8,700 people. Includes 1 primary school.

AREA = 500M x 500M = 25 HA

POPULATION		UNITS	PUBLIC LAND		SEMIPUBLIC LAND		PRIVATE LAND	
Net Density Persons/Ha	Total	Total	Circulation %	Ha	Public Facilities %	Ha	Residential %	Ha
100	1800	900	25	6.25	3	0.75	72	18.00
200	3450	862 1725	25	6.25	6	1.50	69	17.25
300	4950	825 2475	25	6.25	9	2.25	66	16.50
400	6300	787 1575 3150	25	6.25	12	3.00	63	15.75
600	8700	1450 2175	25	6.25	17	4.25	58	14.50
800	10600	1325 2650	25	6.25	22	5.50	53	13.25
900	11025	1837	25	6.25	26	6.50	49	12.25
1200	13200	1650 2200	25	6.25	31	7.75	44	11.00
1600	15200	1900	25	6.25	37	9.25	38	9.50

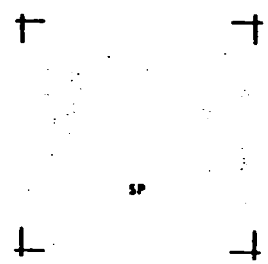
2.2 A SIZE

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. Size (area) of the site must be computed/evaluated to determine its adequacy/suitability for the development.

Data are recorded in aerial photographs, site plans, charts. Areas to be determined are: total area within site boundaries, unusable areas (due to: topography, soil conditions, easements, rights-of-way, desirable/undesirable environmental influences, desirable/undesirable existing structures).

SIZE (.)—physical magnitude or extent [of the site]; relative or proportionate dimensions [of the site].

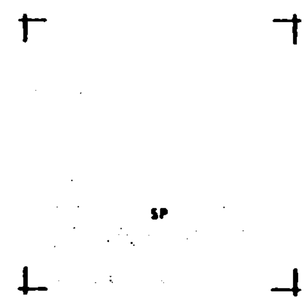
It is defined in terms of *square units:* square meters, hectares, square feet, acres.



SP: Semipublic Land for 12,528 people. Includes 2 primary schools.

AREA = 600M x 600M = 36 HA

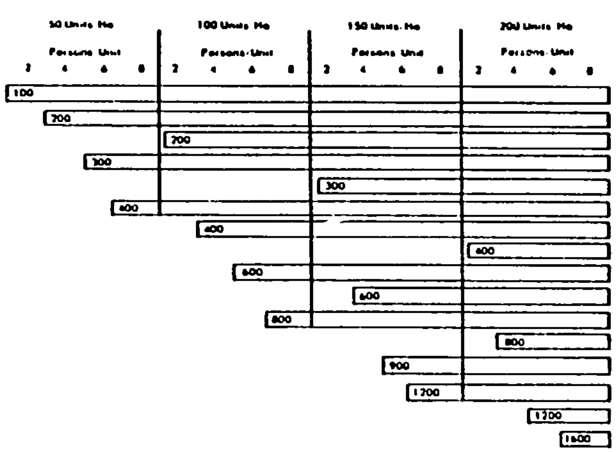
POPULATION		UNITS	PUBLIC LAND		SEMIPUBLIC LAND		PRIVATE LAND	
Net Density Persons/Ha	Total	Total	Circulation %	Circulation Ha	Public Facilities %	Public Facilities Ha	Residential %	Residential Ha
100	2592	1296	25	9.00	3	1.08	72	25.92
200	5968	1492 2984	25	9.00	6	2.16	69	24.84
300	7128	1188 3564	25	9.00	9	3.24	66	23.76
400	9072	1134 2268 4536	25	9.00	12	4.32	63	22.68
600	12528	2088 3132	25	9.00	17	6.12	58	20.88
800	14796	1849 3699	25	9.00	23	8.28	52	18.72
900	15876	2646	25	9.00	26	9.36	49	17.64
1200	18576	2322 3096	25	9.00	32	11.52	43	15.48
1600	21312	2664	25	9.00	38	13.68	37	13.32



SP: Semipublic Land for 16,464 people. Includes 2 primary schools.

AREA = 700M x 700M = 49 HA

POPULATION		UNITS	PUBLIC LAND		SEMIPUBLIC LAND		PRIVATE LAND	
Net Density Persons/Ha	Total	Total	Circulation %	Circulation Ha	Public Facilities %	Public Facilities Ha	Residential %	Residential Ha
100	3479	1739	25	12.25	4	1.96	71	34.79
200	6664	1666 3332	25	12.25	7	3.43	68	33.32
300	9408	1568 4704	25	12.25	11	5.39	64	31.36
400	11956	1494 2989 5978	25	12.25	14	6.86	61	29.89
600	16464	2744 4116	25	12.25	19	9.31	56	27.44
800	19992	2499 4998	25	12.25	24	11.76	51	24.99
900	21168	2528	25	12.25	27	13.23	48	23.52
1200	24696	3067 4116	25	12.25	33	16.17	42	20.58
1600	28224	3528	25	12.25	39	19.11	36	17.64



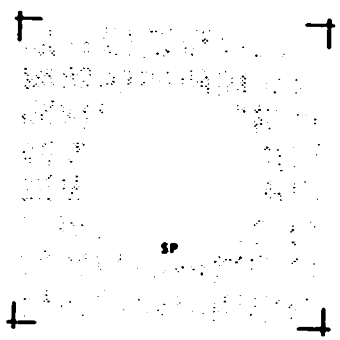
2.2 B SHAPE

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. Shape of the site must be analyzed/evaluated to determine its usability/suitability for development.

Data are recorded in aerial photographs, site plans. Conditions to be identified are: shape and usable area resulting from analysis of developable land area (size), feasibility in terms of economical/efficient development.

SIZE, SHAPE should be considered simultaneously with other land features, topography, adequacy of intended use.

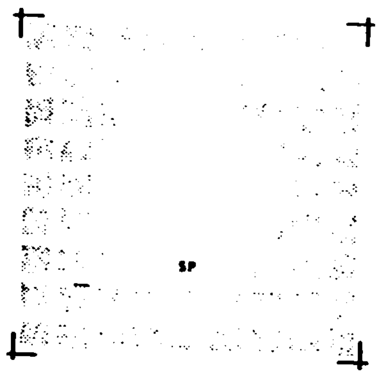
SHAPE (*) — form/configuration of the site surface as defined by its perimeter boundaries. It determines the feasibility/suitability of a site in terms of land utilization, lot and street layouts: *Compact shapes* are generally more apt for efficient development. *Irregular, dispersed shapes* may result in unusable areas and/or uneconomical/inefficient layouts.



SP: Semipublic Land for 21,120 people. Includes 4 primary schools and 1 secondary school.

AREA = 800M x 800M = 64 HA

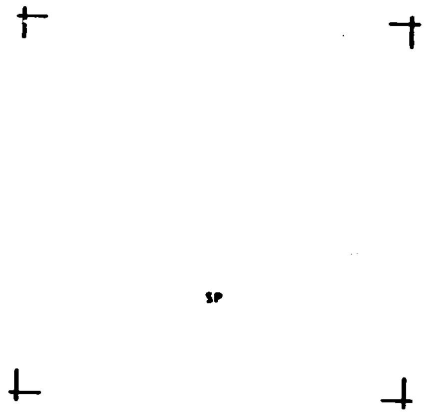
POPULATION		UNITS	PUBLIC LAND		SEMIPUBLIC LAND		PRIVATE LAND	
Net Density Persons/Ha	Total	Total	Circulation %	Ha	Public Facilities %	Ha	Residential %	Ha
100	4480	2240	25	16.00	5	3.20	70	44.80
200	8448	2112 4224	25	16.00	9	5.94	66	42.24
300	12096	2016 6048	25	16.00	12	7.68	63	40.32
400	15360	1920 3840 7680	25	16.00	15	9.60	60	38.40
600	21120	3520 5280	25	16.00	20	12.80	55	35.20
800	25088	3136 6272	25	16.00	26	16.64	49	31.36
900	27648	4608	25	16.00	27	17.28	48	30.72
1200	31488	3936 5248	25	16.00	34	21.76	41	26.24
1600	35840	4480	25	16.00	40	25.60	35	22.40



SP: Semipublic Land for 25,758 people. Includes 4 primary schools and 1 secondary school.

AREA = 900M x 900M = 81HA

POPULATION		UNITS	PUBLIC LAND		SEMIPUBLIC LAND		PRIVATE LAND	
Net Density Persons/Ha	Total	Total	Circulation %	Ha	Public Facilities %	Ha	Residential %	Ha
100	5589	2794	25	20.25	6	4.86	69	55.89
200	10530	2632 5265	25	20.25	10	8.10	65	52.u5
300	14823	2470 7411	25	20.25	14	11.34	61	49.41
400	18792	2349 4698 9396	25	20.25	17	13.77	58	46.98
600	25758	4293 6439	25	20.25	22	17.82	53	42.93
800	30456	3807 7621	25	20.25	28	22.68	47	38.07
900	32805	5467	25	20.25	30	24.30	45	36.45
1200	38880	4860 6480	25	20.25	35	28.35	40	32.40
1600	44064	5508	25	20.25	41	33.21	34	27.54



SP: Semipublic Land for 31,200 people. Includes 4 primary schools and 1 secondary school

AREA = 1000M x 1000M = 100HA

POPULATION		UNITS	PUBLIC LAND		SEMIPUBLIC LAND		PRIVATE LAND	
Net Density Persons/Ha	Total	Total	Circulation %	Ha	Public Facilities %	Ha	Residential %	Ha
100	6800	3400	25	25.00	7	7.00	68	68.00
200	12800	3200 6400	25	25.00	11	11.00	64	64.00
300	18000	3000 9000	25	25.00	15	15.00	60	60.00
400	22800	2850 5700 11400	25	25.00	18	18.00	57	57.00
600	31200	5200 7800	25	25.00	23	23.00	52	52.00
800	36800	4600 9200	25	25.00	29	29.00	46	46.00
900	39600	6600	25	25.00	31	31.00	44	44.00
1200	45600	3700 7600	25	25.00	37	37.00	38	38.00
1600	52800	6600	25	25.00	42	42.00	33	33.00

2.3 TOPOGRAPHY, NATURAL FEATURES

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. Every element of topography and other natural features of the environment should be considered as an opportunity to be used. Therefore, they should be analyzed/evaluated to permit the planning of the site to take full advantage of the positive features and to minimize the negative ones.

SLOPE data are recorded in locality/site plans, charts. Areas should be identified in terms of the slope ranges indicated in the table.

TOPOGRAPHY data are recorded in aerial photographs, locality/site plans, photographs. Characteristics to be identified for each natural feature are: specific location and type (land surface undulation, water features, vegetation, geological formations); positive and negative conditions; influence (regarding physical aspects shown in table).

TOPOGRAPHY (•) — the configuration of a [land] surface including its relief and the position of its natural and man-made features.

NATURAL FEATURES (•) — prominent objects in or produced by nature.

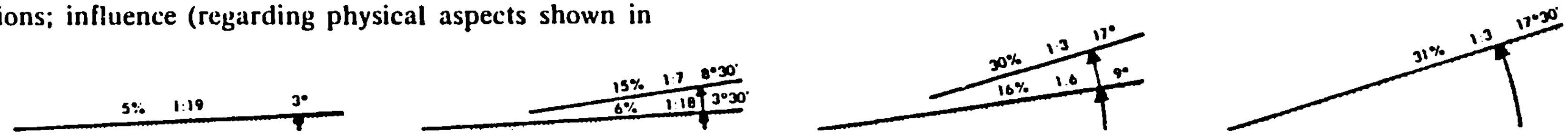
The extent and character of such features—simple or complex undulations, water-courses, near and distant views from different points of observation and individual or massed effect of trees—have varied relations to one another and to all developments that can be foreseen.

The topography of the site is a composite of its NATURAL FEATURES:

•*LAND SURFACE UNDULATIONS:* hills, valleys, slopes, flat land, etc.
•*WATER FEATURES:* streams, rivers, ponds, lakes, marshes, floodplains, etc.
•*VEGETATION:* trees, grasses, ground cover, etc.
•*GEOLOGICAL FORMATIONS:* rock outcroppings, ledges, boulders, etc.

The main indicator of topography is SLOPE or angle of inclination of the ground in relation to the horizontal plane. SLOPE can be measured in terms of Degrees, Ratios (1/cotangent of angle), Percentages (100 x tangent of angle) as shown in diagram.

Topography (SLOPE) is a major planning/design determinant. It defines, particularly, the physical aspects shown in table.



LAND USE	No restrictions	10% and up not adequate for playing fields or other large outdoor flat areas because demands heavy grading	Parks or other areas that require little or no grading	
LAND SUBDIVISION	No restrictions in lot dimensions	No restrictions in lot dimensions	30% and up not adequate for small lots, will present foundation and retaining wall problems, multi story structures will reduce costs per unit for foundations and land development	
CIRCULATION (VEHICULAR)	Safe, sustained grade for all vehicles U.S.A.	9% to 12% steepest grades for highways U.S.A.	30% to 32% steepest grades for paved streets in U.S.A. Layouts will require roads parallel or diagonal to contours to reduce slope	
DRAINAGE SEWAGE	Flat land may present numerous problems in sewage and storm drainage that will raise improvement costs	5% to 10% will facilitate sewage and storm drainage	20% and up will present problems in sewage and storm drainage that will raise improvement costs	Unusual conditions for land development will require careful study in all aspects
LAND DEVELOPMENT MAINTENANCE	Flat land may not be economical to develop	5% to 10% is more economical to develop than flat or steeper slopes, 10% and up may demand heavy grading, causing greater settlements, erosion,	20% and up will increase sharply costs of land development and maintenance	
BUILDINGS	No restrictions	10% and up will require study of soil, building type, construction system, grading, foundations, number of floors		
SPEED •BUS CAR •PEDESTRIAN	100-120 km/hour 4 km/hour	10% and up no good for sustained distances 9% - 2 km/hour; 10% and up no good for sustained distances		
SURFACE PROTECTION	Surface protection against erosion (rain, wind, intensive use) should be considered with SOIL characteristics			

Figure 1: **TABLE OF SLOPE LIMITATIONS FROM 0% TO GREATER THAN 30%.**

2.4 BOUNDARIES

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. The analysis of the *mutual influence* between the site and the different boundaries is essential in planning. The analysis will permit one to take full advantage of positive conditions as well as to minimize the negative ones. The analysis will permit one to forecast the interaction between life activities on the site and those in the surrounding environment, thus helping to define patterns of land utilization and interior circulation.

Boundaries should be analyzed to determine the existence of strong negative elements that may jeopardize the development of the site.

Data are recorded in aerial photographs, locality/site plans, charts. Characteristics to be identified for each boundary are: specific name and location; type (natural barrier, man-made barrier, meshing boundary, line, area); positive and negative conditions; influence on land use and interior circulation.

BOUNDARIES (*) — [lines or areas] that fix or indicate a limit or extent [of the site]. Boundaries are defined by: *Legal limits* of the site: property lines. *Adjacent areas* to the site.

It can be in terms of a *BARRIER* (*), which is characterized by sharp changes in land use or topography, expressed as: *Lines:* limited access highways, etc. *Areas:* mountains, lakes, etc.

It can be in terms of a *MESHING* (*) boundary, characterized by continuous, homogeneous land uses or topography, expressed as: *LINES:* property lines, political or municipal divisions, main streets, etc. *Areas:* similar residential uses, compatible uses (such as parks with residential), etc.

NATURAL BARRIERS such as mountains, rivers, lakes or other abrupt changes in land form generally prevent or limit the development of an area in terms of physical links with the surroundings. Natural barriers can have a positive or negative influence on the site: *Microclimate:* hills or mountains may affect the microclimate in terms of prevailing winds, sun exposure, precipitation, and temperature. *Views:* lakes or rivers can have a positive influence by providing visual relief and long views to contrast with man-made environments and their limited views.

MAN-MADE BARRIERS can also have a positive or negative influence. Perhaps the greatest man-made barrier is the limited-access highway. It cuts physical and social communication between adjacent communities. Because of the path and width of the highway, useless pockets and corners of land are often created.

MESHING BOUNDARIES such as political and administrative demarcations, etc., do not inhibit the social and functional continuity between contiguous communities. Parks, schools, community facilities, or minor streets do not really break the physical continuity between communities but rather act as a linkage. The activities at each of these areas can be shared, and therefore, they facilitate social bonds between different developments.

2.5 VIEWS

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. Views from the site should be analyzed to identify those that may enhance or jeopardize the development.

Data are recorded in field surveys, photographs. Characteristics to be identified for each view are: description and location, type (long or short distance), positive and negative effects.

VIEW (*)—that which is revealed to the vision or can be seen [from the site]. Views are affected by the combination of a multitude of factors very difficult to judge in abstract.

DISTANCE is perhaps the most significant factor. With *long distance,* views become less real, more abstract, more neutral. Long distances reduce or eliminate noises, odors, numbers, speeds, abruptness of movements, and the "life" of the observed objects—rather like the view from an airplane of activity on the ground. With long distances, the viewer is a spectator and has the choice of ignoring the view. With *short distance,* views are real and dominant and are accompanied by noises, odors, movements, and "life." The viewer if no longer a spectator but becomes an actor with no other choice than to participate in the action. While the view of a busy highway from a hillside (hundreds of meters above) can be interesting, the proximity of a highway is a serious nuisance.

Views are the most important psychological factor affecting the site. In fact, they may have different environmental effects: *Positive* effects will be: desirable views (harbors, rivers, mountains, forests, large public parks, commanding view from high sites, etc.) *Negative* effects will be: undesirable views (blank walls or large industrial areas, the forests of twentieth-century paraphernalia, elevated highways, gas tanks, billboards, parking lots, etc.) It is obvious that positive views should be taken advantage of/enhanced and that negative ones should be neutralized.

2.6 SOIL

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. Soil conditions of the site should be analyzed/evaluated to determine the site's suitability for development in terms of: cost of soil improvements if necessary, drainage and erosion characteristics, nature and type of vegetation that can be sustained, infrastructure and building types (including roadways, foundations and sewage systems).

Data are recorded in locality/site plans, field surveys, tables, reports. Characteristics and relative desirability for various uses should be determined. (*See Figure 1.*)

The study of soil conditions ranges from the simple examination of surface soil and general soil maps to elaborate subsurface borings. At any given time, the depth/detail/cost of the studies should be consistent with the stage of development.

SOIL (*)—soil structure: the arrangement of soil particles in various aggregates differing in shape, size, stability, and degree of adhesion to one another.

There are two commonly recognized broad groups: *Disturbed:* soils that have been disturbed by artificial processes, such as excavations, transportation, and compaction in fill. *Natural, undisturbed:* soils that have not been disturbed by any artificial process. Although natural, they depend greatly on local conditions, environment, and the geological history of the formations.

Soils are composed from varying amounts of: *Gravel:* loose/unconsolidated rock fragments (ranging from 2mm and greater in diameter). *Sand:* loose/distinguishable grains of quartz/feldspar, mica (ranging from 2mm to 0.02mm in diameter). *Silt:* loose/unconsolidated sedimentary rock particles (ranging from 0.02mm to 0.002mm in diameter). *Clay:* lusterless colloidal substance, plastic when moist (crystalline grains less than 0.002mm in diameter). *Organic soils:* soils composed mostly of plant material.

DRAINAGE CHARACTERISTICS of soils are particularly important in areas not served by public sewerage and where an on-site sewage disposal systems will be used.

When the site is located on an aquifer (water-bearing soil) or in an aquifer recharge area, all prospective land uses should be examined carefully to insure that they will not pollute this water resource.

Soils contain three elements essential to vegetation growth: water, air, and nutrients (minerals and humus). Soil, climate and topography are inseparable vegetation growth factors. Climate is the most important of these.

In land use planning the following sources of *SOIL INFORMATION* are utilized: *General soil map* is used for broad land use planning. It allows the study of available soil resources early in the planning process. Such a preview involves consideration of limitations, restrictions, hazards for use relative to the various general soil areas involved. *Detailed soil map* is needed for a careful study of individual kinds of soil as classified and mapped in accordance with the given area of interest. Detailed soil maps are essential in considering use limitations, restrictions, or hazards at later stages of planning. Also, they are used for on-site studies of the soil after planning has progressed to the point of determining specific uses for specific areas.

SOIL INVESTIGATION is conducted in increasing depth/detail/cost as the planning/design of the site progresses: *Initial soil survey:* on-site examination of surface soil conditions and reference to a *general soil map* reveal obvious limitations/restrictions/hazards for early planning considerations. *Exploratory boring:* initial subsurface investigations (borings) are done on a grid superimposed on the areas of interest and on areas indicated as limited/restricted/hazardous in the initial survey. *Construction boring:* surface boring done at the planned location of all infrastructure and building footings and roadway sub-bases for design of the foundation systems.

Figure 1: **TABLE OF SOIL CHARACTERISTICS** gives the designer an indication of the BEHAVIOR OF THE SOIL for an INITIAL SOIL SURVEY. It serves as a broad outline to act as a guide in deciding whether investigations and evaluations by a competent engineer are required/warranted. When soils are explored as foundations for structures, their natural structure, compactness, and moisture content are of primary importance. In addition, the position of the ground water table plays an important role.

The table does not indicate the variation in a soil formation. The characteristics of any group are given in relative values only. Although given a low rating, certain properties of poorly suited soils may be improved by proper construction methods.

Column 4: WORKABILITY AS A CONSTRUCTION MATERIAL. A measure of the ease with which a soil is handled and traversed by ordinary construction equipment.

Column 5: COMPACTION CHARACTERISTICS. Differentiation of the soil groups with reference to the ease with which proper compaction can be obtained, with the assumption of reasonably suitable compaction equipment being used and with proper control of moisture content.

Column 6: SHEARING STRENGTH WHEN COMPACTED AND SATURATED. It is not an intrinsic property of a given soil, shearing strength varies over a considerable range with varying conditions, such as density, moisture content, and degree of consolidation.

Column 7: COMPRESSIBILITY AND EXPANSION. Volume changes because of loading or moisture variation.

Column 8: DRAINAGE. Drainage characteristics have been rated from excellent (very porous) to very poor (impervious).

Column 9: POTENTIAL FROST ACTION. Frost action is the heave caused by ice lenses forming in a soil and the subsequent loss of strength as a result of excess moisture during thawing periods.

(1) MAJOR DIVISION		(2) GROUPS SYMBOLS	(3) TYPICAL NAMES OF SOIL GROUPS	GENERAL CHARACTERISTICS (4) WORKABILITY AS A CONSTRUCTION MATERIAL	(5) COMPACTION CHARACTERISTICS	(6) SHEARING STRENGTH WHEN COMPACTED & SATURATED	(7) COMPRESSIBILITY & EXPANSION	(8) DRAINAGE CHARACTERISTICS	(9) POTENTIAL FROST ACTION	(10) CORROSION POTENTIAL	(11) UNIT DRY WEIGHT LB/CU FT	RELATIVE DESIRABILITY FOR VARIOUS USES — ROADWAYS (12) SUB-BASE WHEN NOT SUBJECT TO FROST ACTION	(13) BASE WHEN NOT SUBJECT TO FROST ACTION	(14) SUB-BASE WHEN SUBJECT TO FROST ACTION	(15) WEARING SURFACE (UNTREATED)	(16) SURFACE STABILIZATION WITH ADDITIVES	FOUNDATION (17) LOW BUILDINGS OF COMPACTED FILL	SEWAGE (18) DOMESTIC SEWAGE DISPOSAL AREA
COARSE-GRAINED SOILS	GRAVEL & GRAVELLY SOILS	GW	Well graded gravels, gravel-sand mixtures, little or no fines.	1	1	1	1	1	1	1	125-140	1	1	1	3	1	1	1
		GP	Poorly graded gravels, gravel-sand mixtures, little or no fine.	2	2	2	1	1	1	1	120-130	2	2	2	3	2	2	1
		GM	Silty gravels, gravel-sand-silt mixtures.	2	3	3	2	3-4	2-3	1	130-145	2	2-4	3	4	1	2	2
		GC	Clayey gravels, gravel sand clay mixtures.	2	3	4	3	5	2-3	2	120-140	2	3-4	3	1	2	3	2
	SANDS & SANDY SOILS	SW	Well graded sands, gravelly sands, little or no fines.	1	1	2	1	1	1	1	110-130	1	2	2	4	1	2	1
		SP	Poorly graded sands, gravelly sands, little or no fines	3	2	3	1	1	1	1	105-120	3	2-4	2	4	1	3	1
		SM	Silty sand, sand-silt mixtures.	3	3	4	2	3-4	4	1	120-135	3	3-5	4	4	2	3	2
		SC	Clayey sands, sand-clay mixtures	2	3	5	2-3	5	4	2	105-130	3	5	3	2	2	3	NS
FINE-GRAINED SOILS	SOILS & CLAYS LL 50	ML	Inorganic silts, very fine sands, rock flour, silty, clayey fine sands, clayey silts with slight plasticity.	3-4	3-4	5	2-3	3-4	3-5	2	100-125	4	NS	5	NS	3	4	NS
		CL	Inorganic clays of low to medium plasticity, gravely clays, sandy clays, silty clays, lean clays	3	3	5	3	5	3-4	3	100-125	4	NS	4	5	4	4	NS
		OL	Organic silts and organic silty clays of low plasticity.	4	5	5	3-4	4	3-4	4	90-105	4	NS	5	NS	5	5	NS
	SOILS & CLAYS LL 50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	4	4-5	5	4	3-4	3-5	2	80-100	5	NS	5	NS	5	5	NS
		CH	Inorganic clays of high plasticity, fat clays	5	4-5	5	4	5	3	3	50-110	5	NS	4	NS	5	5	NS
		OH	Organic clays of medium to high plasticity, organic silts	5	5	5	4	5	3	4	80-100	5	NS	5	NS	5	5	NBS
Highly organic soils		PT	Peat and other highly organic soils	NS	NS		5	3-4	2	5		NS	NS	NS	NS	NS	NS	NS

NOTE: Above soil groups are rated according to relative desirability for being used.

1 - Most desirable (excellent)
2 - Desirable (good)
3 Medium (fair)
4 - Undesirable (poor)
5 - Most undesirable (very poor)
NS - Not Suitable

LL Liquid limit: The water content (0-100%) corresponding to the arbitrary limit between the liquid and plastic states of consistency of a soil

Column 10: CORROSION POTENTIAL. Some soils tend to cause corrosion in underground conduits or pipes placed in them. The corrosion potential depends on chemicals in the soil, usually dissolved in the soil moisture, and on the materials from which the conduits are made.
Column 11: UNIT DRY WEIGHT. Weight of one cubic foot of soil in pounds.
Columns 12, 13, 14: SUBBASE OR BASE MATERIALS. The soil groups are rated as to relative desirability as subbase and base materials, provided they are not subject to frost action in columns 12 and 13. In areas where frost heaving is a problem, the value of materials as subbases will be reduced, depending on the potential frost action of the material, and the relative desirability ch[illegible] to those shown in column 14.

Column 15: WEARING SURFACE (UNTREATED). This considers the wearing surfaces on unsurfaced roads. Generally, sand, clay, gravel mixtures are best.
Column 16: SURFACE STABILIZATION WITH ADDITIVES. The addition of additives to promote stabilization of soils adds materially to the strength. As in low-cost road construction underneath a foundation slab, stabilization makes the effect of mechanical stabilization through compaction more lasting.
Column 17: FOUNDATIONS FOR LOW BUILDINGS. Up to and including three stories are considered as low building. These readings do not take into account the effects of subsoils and slope stability factors.

2.7 CLIMATE

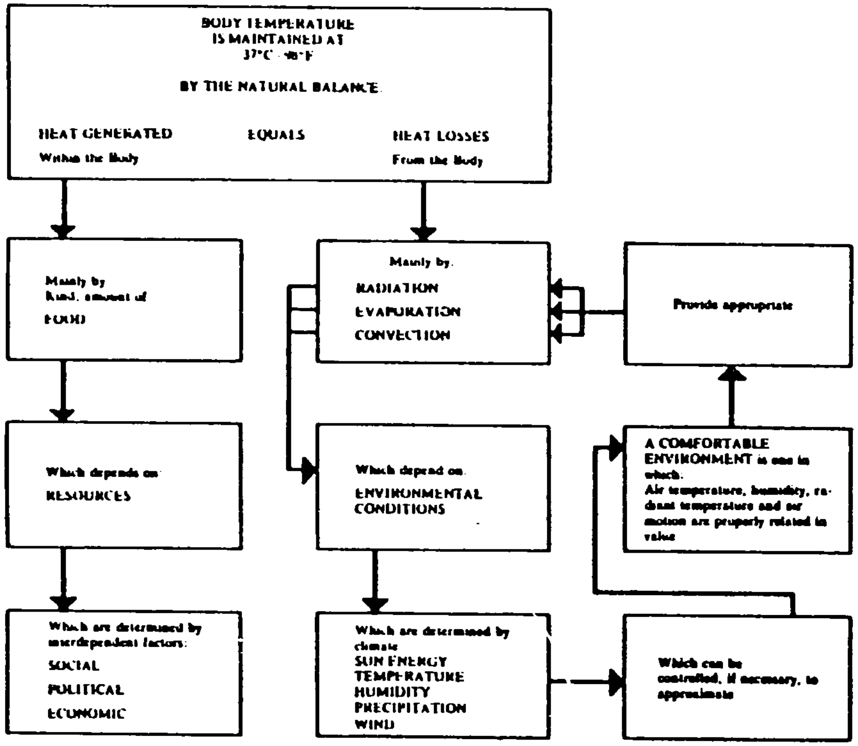
PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. Climatic conditions of the site should be identified/analyzed to determine: suitability for development; influence in the design of subdivision, circulation, buildings.

Data are recorded in diagrams, tables, reports of urban area/locality. Climatic factors to be identified are: latitude, sun, temperature, humidity, rain, snow. Design issues/goals should be identified as determined by climatic factors and climatic zones. Basic controls should be specifically determined. (*See figures on these pages.*)

WIND, STORM, FOG, DAMPNESS, TEMPERATURE INVERSIONS data are recorded in charts, graphs, tables, reports of urban area/locality. Characteristics to be checked are: direction, speed, frequency of prevailing winds; frequency, duration, intensity of fog, dampness, storms, temperature inversions.

CLIMATE(*)—the average condition of the weather at a particular place over a period of years as exhibited by temperature, wind, precipitation, sun energy, humidity, etc.

The intelligent use of climate is important in design, particularly in developing countries and low-income communities where mechanical climate control or special building materials cannot be considered for reasons of technology or cost.



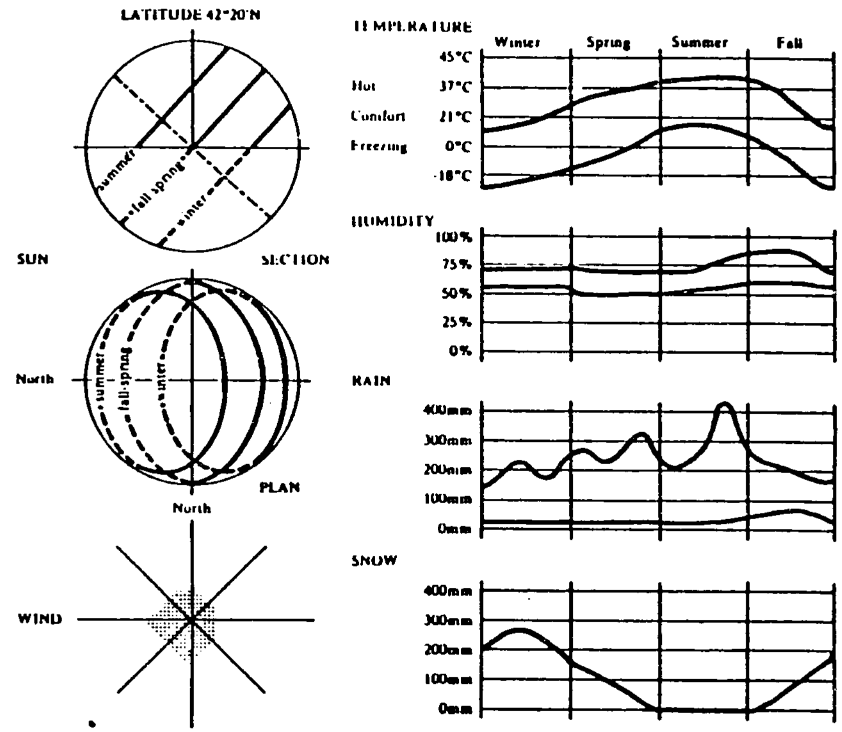


Figure 1: **CLIMATE AND HUMAN COMFORT DIAGRAM** illustrates schematically the relationship between human comfort requirements, climate, and environmental control.

Figure 2: **CLIMATIC FACTORS** are illustrated in the above graphs.

LATITUDE/SUN GRAPH gives the position of the sun on the sky for a selected locality per day, per hour during the year. Sun graphs permit the calculation of the sun exposure in terms of sun position, length of time, seasons, and orientation. The graph is a simple one. It shows in plan and section, for a given latitude, the trajectory of the sun on the sky during four days of the year: March 21-September 21 (spring-fall); June 21 (winter or summer); and December 21 (summer or winter).

WIND GRAPH shows wind directions and their frequency over time for a given locality.

AIR TEMPERATURE GRAPH shows median air temperature over time for a given locality.

AIR RELATIVE HUMIDITY GRAPH shows median air relative humidity over time for a given locality.

RAIN, SNOW GRAPHS show precipitation amount over time for a given locality.

WINDS, STORMS, FOG, DAMPNESS, TEMPERATURE INVERSIONS may be critical and should be studied, particularly in relation to other conditions such as: ...ness, flooding, dust/dirt, smoke, fumes, odors, noise, and vibrations.

WIND velocity can be measured by the BEAUFORT SCALE.

calm	up to 1 mph	smoke undisturbed	moderate gale	32-38	motion: whole tree
light air	1-3	smoke disturbed	fresh gale	39-46	breaks twigs
light breeze	4-7	wind felt on face	strong gale	47-54	removes roofing
gentle breeze	8-12	wind extends flag	whole gale	55-63	trees uprooted
moderate breeze	13-18	raises dust, paper	storm	64-72	much damage
fresh breeze	19-24	crested water	hurricane	73-up	devastation occurs
strong breeze	25-31	power lines whistle			

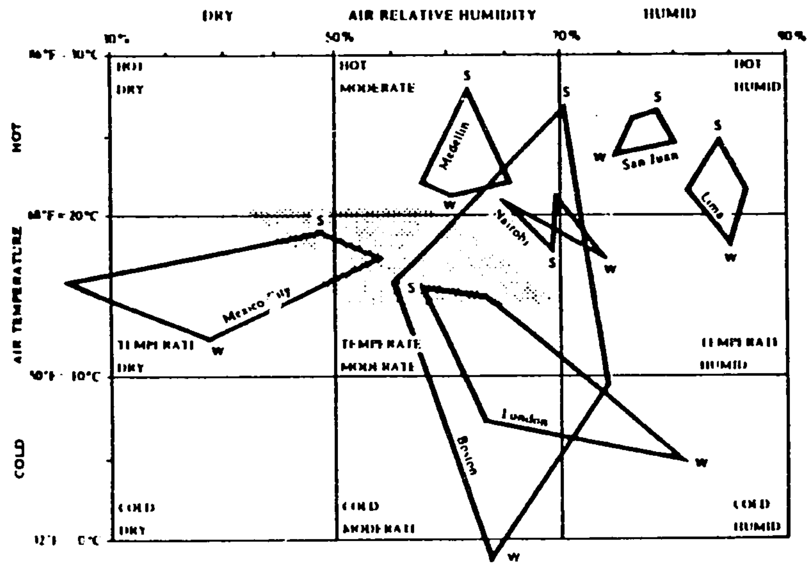


Figure 1: **CLIMATIC ZONES DIAGRAM** illustrates climatic zones determined by Relative Air Humidity (dry, moderate, humid) and Air Temperature (cold, temperate, hot). Nine zones are identified. Ranges of human body comfort are those within the shaded area: Air Temperature Comfort: working—15-18°C, resting—18-20°C; Air Relative Humidity Comfort: working- 50%-60%, resting—40%-70%.

The diagram is for general reference and does not include other factors such as: rates of air movement and the effect of radiant heat that will affect comfort conditions.

Average monthly humidity and temperature of a locality can be plotted to represent an annual curve which becomes useful as a reference. The following annual climatic curves are shown in the diagram: LONDON: summer - Temperate/Moderate, winter - Cold/Humid; BOSTON: summer - Hot/Moderate, winter - Cold/Moderate; LIMA: summer - Hot/Humid, winter - Temperate/Humid; MEDELLIN: summer - Hot/Moderate, winter - Hot/Moderate; MEXICO CITY: summer - Temperate/Dry, winter - Temperate/Dry; NAIROBI: summer - Temperate/Moderate, winter - Temperate/Moderate; SAN JUAN: summer - Hot/Humid, winter - Hot/Humid.

Storms manifest themselves by winds of unusual force or direction, which are often accompanied by rain, snow, hail, thunder and lightning, or flying dust/dirt. *Dampness* is characterized by moisture, humidity, and *fog* by atmospheric saturation with moisture, humidity. Areas subject to *temperature inversions*, which result in hazardous air pollution, should be studied carefully. Identification of the major wind direction, particularly those associated with inversion conditions, can indicate the best-ventilated sites. A site located to the windward of the urban air pollution sources will minimize the pollution hazard to the development.

	DWELLING ENVIRONMENT ELEMENTS	CLIMATIC FACTORS AND SPECIFIC GOALS: SUN	TEMPERATURE	HUMIDITY	WIND	RAIN
ELEMENTS AND BASIC CONTROLS (Orientation, Design, Materials)	WALLS	O M	O M		O D	O M
	OPENINGS	O D	O D	O D	O D	O D
	ROOF	D M	D M			D M
	OVERHANG	O D				O D
	SUNBREAKERS	O D				
	SCREENS	O D			O D	O D
	SHRUBS, TREES	O	O		O	
	LOT	O	O	O	O	
	STREET	O D	O D	O D	O D	
ZONES AND SPECIFIC GOALS	HOT - DRY	Minimize exposure	Retard inward flow of heat	..	Occasional protection against hot wind. Erosion	
	HOT - HUMID	IDEM	IDEM	Reduce effects by promoting air movements	IDEM	Protection against combined effects of rain wind erosion. Provide maximum openings to cool air
	COLD - DRY	Maximize exposure	Retard outward flow of heat		Occasional protection against cold wind. Erosion	
	COLD - HUMID	IDEM	IDEM		IDEM	Protection against combined effects of rain wind erosion

Figure 2: **CLIMATIC FACTORS AND SPECIFIC GOALS TABLE** shows two things with regard to climatic factors. First, the basic controls (Orientation, Design, Materials) of climatic factors affecting dwelling environment elements are shown, emphasizing the importance of orientation and design in climate control. Materials are basic controls only in the cases of walls and roofs.

Second, the main design goals determined by climatic zones and climatic factors are identified. This part of the table is an example and only broad outlines are indicated. In a particular case, the table should be filled with specific goals determined by the climatic factors of the locality.

2.8 FLOODING

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. Flooding of the site should be investigated to determine feasibility for development.

Data are recorded in urban area/locality plans, reports. Conditions to be identified for the 50-year flood crest are: area within the restrictive zone (defined below), special precautions which could make the restrictive zone usable by buildings or other structures.

FLOODING (*)—flood: a rising and overflowing of a body of water that covers land not usually under water.

All sites, particularly the low-lying, should be studied to determine their development feasibility in terms of: high water table, likelihood of present and future flooding (from surface runoff, tides, wind-driven seawater, etc.)

In general, land subject to flooding should not be developed. However, exceptions are made in urban areas when there are strong reasons for the urbanization of such land. In these cases, the development should be preceded by an identification of the areas lying within: *Natural floodway:* the main channel and adjacent overbanks which convey flood-flows with destructive velocity. This area must remain unobstructed so that floods can be discharged adequately and efficiently. *Restrictive zone/floodway fringe:* the flood plain area landward of the natural floodway which would be inindated by low-velocity floodwaters. This area may be developed, preferably by functions which are relatively unharmed by flooding (such as: agriculture, forestry, recreation, open space, etc.)

If buildings or other structures are contemplated in the above areas, special precautions should be taken such as: avoidance of construction (buildings, bridges, and approaches, earth fills, etc.) within the natural floodway which will constrict the flow of floods; construction of flood storage *reservoirs*, confining *floodwalls*, *channel improvements* (by straightening/widening), or *bypasses* (to divert floods away from or around the site) to decrease flood hazards; elevation of building floors above known flood crest levels; establishment of operational evacuation plans and procedures; incorporation of: waterproof walls and foundations, ejector pumps, floodgates, cutoff valves on sewers, etc.

Sites subject to flooding are not priced commercially and for this reason are commonly taken over by low-income and squatter settlements. Examples are found in lowlands on *bays* or *lagoons* (Cartagena, Colombia), on *rivers* (Guayaquil, Ecuador; Buenos Aires, Argentina), in *gullies* (Caracas, Venezuela). Some of these sites have been intelligently developed as in Cartagena and Guayaquil. Others are periodically washed away as in Caracas.

2.9 DUST/DIRT, SMOKE, FUMES, ODORS, NOISES, VIBRATIONS

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. Dust/dirt, smoke, fumes, odors, noises, vibrations which may affect the site should be investigated to determine their degree of nuisance.

Data are recorded in field surveys, charts, reports. Characteristics to be identified for each nuisance are: name and location; type; intensity; degree of nuisance.

DUST/DIRT (*) — fine dry pulverized particles of earth, grit, refuse, waste, litter, etc. **SMOKE** (*) — the gaseous products of burning carbonaceous materials made visible by the presence of carbon particles. **FUMES** (*) — gaseous emissions that are usually odorous and sometimes noxious. **ODORS** (*) — qualities of something that affect the sense of smell. **NOISES** (*) — any sounds [affecting the site] that are undesired (such as that produced by: traffic, airports, industry, etc.) **VIBRATIONS** (*) — quivering or trembling motion [such as that caused by: heavy traffic, industry, aircraft, etc.].

All the above nuisances may affect the site because of proximity to industrial plants, factories, quarries, garbage dumps, railroads, expressways, etc.

2.10 FIRE/EXPLOSION HAZARDS

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. High-hazard occupancies in the proximity of the site should be evaluated to determine how they affect the safety/feasibility of the site for development.

Data are recorded in field surveys, reports, legal documents. Characteristics to be identified for each hazard are: name, location, degree of separation from site, degree of safety.

FIRE/EXPLOSION HAZARDS(•)—dangers: the states of being exposed to harm; liable to injury, pain, or loss from fire/explosion [at or near the site].

Sites with proximity to *HIGH-HAZARD OCCUPANCIES* (areas, buildings, structures involving highly combustible, highly flammable or explosive material) should be avoided. Some examples are as follows: aluminum powder factories; cellulose nitrate plastic factories, warehouses and sales rooms; cereal mills; distilleries; explosives manufacturing plants and storage; flour and feed mills; petroleum bulk manufacturing, storage; grain elevators; lacquer/paint factories; liquefied petroleum gas charging or bulk storage plants; waste paper plants.

Many municipalities have established *FIRE LIMITS* by law, within which all construction must be fire-resistant or fireproof. These limits should be identified, because they will determine the allowable construction types, areas allowed per structure, and dimensional relationships between buildings.

2.11 AIRPORT DISTURBANCES/ZONING RESTRICTIONS

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. Existing/proposed airports which may affect the site should be investigated to determine the suitability of the site for development.

Data are recorded in urban area/locality/site plans, field surveys, reports, legal documents. Conditions to be determined for existing or proposed airports are: flight patterns, approach/landing zones, takeoff zones, noise levels at site, vibration levels at site, allowable maximum obstruction heights.

AIRPORT DISTURBANCES (•)—the act or process of destroying the rest, tranquility, or settled state of [the site by the annoyance of airport noises, vibrations, hazards, etc.] **AIRPORT ZONING RESTRICTIONS (•)**—the regulation of the height or type of structures in the path of moving aircraft.

Site location in relation to existing or proposed airports should be carefully checked, including the possibilities for construction of new airport facilities and runway extensions.

All sites should be studied in terms of their relationship to existing and proposed airport performance standards/zoning restrictions. These will vary between airports and heliports. The standards/restrictions are continually changing as a result of changing aircraft size and speed.

Proximity to airports may be undesirable because of noise, vibration, and hazards resulting in personal annoyance. These conditions may be especially critical when the site lies under a flight pattern or within zones of aircraft approaches and takeoffs.

2.12 EXISTING STRUCTURES, EASEMENTS RIGHTS-OF-WAY

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. Structures, easements/servitudes, rights-of-way may exist on the site and their effects/implications should be considered.

Data are recorded in site plans, legal documents. Characteristics to be identified for each are: description and location, positive and negative conditions, influence in layout.

EXISTING STRUCTURES(*)—anything constructed or built (on the site). **EASEMENTS(*)**—servitudes: rights in respect of an object (as land owned by one person) in virtue of which the object [land] is subject to a specified use or enjoyment by another person or for the benefit of another thing.

An easement may be (*from ABRAMS, 1972*): "An acquired right of use, interest, or privilege (short of ownership) in lands owned by another, such as an easement of light, of building support, or of right-of-way. . . . They may be permanent or limited in time upon the easement agreement." *Conservation Easement:* "An easement acquired by the public and designed to open privately owned lands for recreational purposes or to restrict the use of private land in order to preserve open space and protect certain natural resources." Some easements are negative, preventing the owner from using his land for such specified purposes as erecting a billboard or cutting trees, and some are positive, such as water access or hiking easements. *Scenic Easement:* "The grant by a landowner to a road agency of the right to use his land for scenic enhancement. This easement...bars the owner from changing the use or appearance of his land without the easement holder's consent."

RIGHTS-OF-WAY (*) — legal rights of passage over another person's ground [land]; the area or way over which a right-of-way exists such as: a path or thoroughfare which one may lawfully use, the strip of land devoted to or over which is built a public road, the land occupied by a railroad, the land used by a public utility.

Examples: *Existing structures:* buildings, walls, fences, culverts, bridges, roads, railways, utilities, etc. *Easements:* (elevated and underground) electric power lines, telephone; (underground) sewerage, storm drainage, gas, water supply; conservation; scenic, open space, etc. *Rights-of-way:* land area controlled by future or present transportation pathways.

2.13 LAND TENURE

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. The legal tenure of a site should be determined before any attempts are made to develop it.

Data are recorded in locality/site plans, legal documents. Conditions to be determined for each land parcel within the site are: number, names, and addresses of owners/lessors; type of tenure (ownership, tenancy); practicality of land assembly.

LAND TENURE (*) — the act, right, manner, or term of holding land property. Today, with the rise of individual tenancy and ownership, mortgages, squatting, multiple sales, subdivision, and inheritance laws, it is indispensable to establish property titles. These legal definitions are established to determine the division of property among various owners, or the relationship between owner and occupier, or between creditor and owner; and between private owners and the public, and includes the assessment of taxes on private land rights and the regulation of land use through government control.

The *BASIC FORMS* of land tenure are: ***land ownership,*** where the exclusive right of control and possession of a parcel of land is held. ***Land tenancy,*** which is the temporary holding or mode of holding a parcel of land of another.

Land tenure types of particular concern to a developer are: *PRIVATE LAND OWNERSHIP:* the absolute tenure of land by a person and his heirs without restriction of time. *MUTUAL OWNERSHIP:* private land ownership shared by two or more persons and their heirs under mutual agreement. *PUBLIC LAND OWNERSHIP:* the proprietorship of land by the state; privilege of use of public land granted by a government. *EXTRALEGAL TENURE:* illegal prossession or invasion of land in which a government or private owner tolerates possession. *LAND LEASE:* rent of land for a term of years and for a fixed rent; leases of land may run for as long as 99 years.

"Long term leases are highly complex instruments with provisions often covering fifty or more pages and containing particulars as to rent, methods of financing, remedies for default, provisions dealing with fire, renewals, and a host of other clauses." (*From ABRAMS, 1972*).

The owner of leased land is called the "lessor," and the tenant is the "lessee." If the lessee in turn rents to another, the latter is called a "sublessee."

It is imperative that the legal owner or owners/lessor or lessors of a site be clearly determined before making any attempt to purchase. The establishment of legal *TITLE* (*) to a site is accomplished through a ***title search.*** Once legal tenure of a site has been determined, a developer can evaluate the prudence/practicality of negotiating its purchase. There is a high degree of risk if one acts on uncertain/unverified claims.

The purchase of land on which conflicting *CONVEYANCES* (*) or titles are held by separate claimants should be avoided. If land is held by too many individuals, it may be impractical/impossible to find them all and secure the consent of each for a

Figu

sale. Frequently, a site large enough for urbanization is composed of several parcels each owned/leased by different parties. The process of putting these individual parcels together for development is *LAND ASSEMBLY*. A developer should evaluate the prudence/practicality of assembling land, particularly when the site is owned/leased by many individuals with whom negotiations must be conducted separately.

	TENURE TYPE	DESCRIPTION/DEFINITION	COMMON NAME	LEGAL TERM	QUALIFICATION AND DEGREE OF TENURE	CONSTRAINTS/COMMENTS
OWNERSHIP TYPES	1 PRIVATE LAND OWNERSHIP	The absolute tenure of land to a person and his heirs without restriction of time. Land held in ownership with all private rights except the payment of taxes and the rights of State to condemn and to police.	FREEHOLD OWNERSHIP	FEE SIMPLE ESTATE	Highest form of personal ownership the owner holds the largest possible quantity of rights for the longest period of time The rights are effective immediately	All rights of ownership except the right of State to tax, condemn, and police. Additional cost of land due to credit (interest) charge Will remain until sold or changed in form by flexibility.
			MORTGAGE	EQUITY OWNERSHIP	Subject to mortgage: requires a division of title between the mortgagee (the superior interest) and the owner's claim (equity interest)	
			INSTALLMENT PURCHASE	CONTRACT LAND OWNERSHIP	A lesser form of mortgage Land is purchased by installment payments over an extended period of time.	
		The right to use or profit from a parcel of land without becoming the owner or formal lessee Legal possession by decree without charge		USUFRUCT		
	2 MUTUAL OWNERSHIP	Private land ownership shared by two or more persons and their heirs under mutual agreement.	CONDOMINIUM COOPERATIVE	CONDOMINIUM	Portion of an estate is privately owned with the agreement to contribute to the upkeep of common grounds or property Condominiums may be either vertical (building) or horizontal (clusters).	Transfer portion of private property subject to approval of condominium Flexibility in conversion of small parcels (horizontal) into larger lot area for joint redevelopment.
	3 EXTRALEGAL TENURE	Illegal possession or invasion of land in which a government or private owner tolerates possession	SQUATTING	SQUATTER TENURE		Minimal rights to property Tenant may be legally evicted.
	4 PUBLIC LAND OWNERSHIP	Privilege of use of public land granted by a government		PUBLIC DOMAIN	In U.S. all the lands owned at any time by government and subject to sale and other transfer of ownership under its laws, exclusive of land owned by individuals or other private interests	Maximum government control.
				INCORPOREAL RIGHTS	Easements, rights of way, licensed franchises for private use, etc. are forms of incorporeal rights	
TENANCY TYPES	5 RENTAL WITH OPTION TO PURCHASE	Leasehold with option to purchase land at a later date		HIRE PURCHASE	System gives tenant hope of ownership and encourages the improvement of his house.	STATUTORY TENANCY The governmental protection for landlords against foreclosure in deflationary periods It is also governmental protection for tenant against arbitrary rent increase, eviction, and costs of property improvements Rent Control is the most common example. KEY MONEY The premium paid for the right to acquire possession under a tenancy It is also paid to tenants as a consideration for "selling" a rent controlled apartment Key money tenure is the result of rising costs in land, dwellings and rent in underdeveloped countries
	6 LAND RENT/LEASE	Rental of land for a term of years and for a fixed rent Leases of land may run for as long as 99 years.	LAND LEASE	BUILDING OWNERSHIP	All rights of ownership except the right of state to tax, condemn, and police.	
	7 TENANCY (RENT)	The transfer of the limited rights of possession from landlord to tenant in exchange for payment or service		ESTATES FOR YEARS	A lease having a definite term of duration	
			LEASE	TENANCY BY SUFFERANCE	Tenant remains in possession after term of lease expires	
				TENANCY AT WILL	No definite term of duration. A less secure type of rental	
	8 MOBILE OWNERSHIP	Building (structure) which is not permanently affixed to the land may be moved by building owner to other site NOT A FORM OF LAND TENURE.		MOBILE OWNERSHIP	Building owner may relocate shelter when landlord demands possession or a rent that the tenant cannot afford	

Figure 1: TABLE OF TENURE TYPES

2.14 LAND COST

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. Land costs of the site must be analyzed/evaluated to determine their suitability/consistency with the type of development (income groups, intensity of use) and the total investment the developer is prepared to make.

ACTUAL LAND COSTS data are recorded in urban area/locality/site plans, charts, legal documents. Ranges should be identified in terms of costs/unit area: square meters, hectares, acres (includes: professional and developer's fees and profits; financing).

LAND DEVELOPMENT COSTS data are recorded in charts, reports. Costs to be determined are: land clearance, demolition, excavation, landfill, overloaded fill, other improvements, installation of: water system, sewerage, storm drainage, circulation, electricity, street lighting, telephone, gas, etc. (Includes: professional and developer's fees and profits; financing.)

BUILDING COSTS data are recorded in charts, reports. Costs to be determined are: construction, landscaping. (Includes: professional and developer's fees and profits; financing.)

LAND COST(•)—price: the amount of money given or set as the amount to be given as a consideration for the sale of a specific thing [the site].

REAL LAND COST is the sum of: *Actual land cost:* the costs set by the level of demand. The price of land is not a function of any cost conditions; it is set by the users themselves in competition. *Land development costs:* the costs of making raw land ready for development through the provision of utilities, services, accesses, etc.

Actual land cost varies with the *LOCATION* of the land relative to the city center. *Highest land costs* will generally be found near the center of the city, the point of highest access to markets (highest location demand). *Lowest land costs* will generally be found in outlying areas, where transportation costs (in time and money) to the city center are incurred (lowest location demand).

Land development costs vary with topography and natural features: *Highest development costs* will generally be incurred on steep/rough or low/damp terrain. *Lowest development costs* will generally be incurred on nearly level land.

REAL LAND COST plus building costs determine the *TOTAL INVESTMENT*. Therefore, land cost will have an impact on the type of housing built. Higher-cost sites will require greater unit densities to reduce the land cost per dwelling unit.

Urban land costs can be affected by elements of public policy such as: *Zoning regulations:* These stabilize land values by restricting the type and degree of development permitted on a particular site. *Location of public works:* Proximity to utilities and/or community facilities will increase the actual land cost but reduce the land development costs. *Property taxation:* High taxes can lower the demand for a site and thus lower its costs; low taxes can raise demand for and cost of a site.

Changes in land use through zoning variances will affect the land costs in the proximity of the changes.

In developing particularly large sites, it is important to ascertain the local controls against *LAND SPECULATION*.

LAND SPECULATION is possible because: 1) There is a fixed quantity of land in a given location; the supply cannot be increased as demand increases. 2) Under the pressure of urbanization, demand for land outruns the supply. 3) There is uncertainty as to where (and when) urban land development will take place.

The prime consideration in speculation is that profits from increases in land value accrue to the speculator. This occurs even though the increases in value are due to community growth, which makes urban land "scarce," and therefore more valuable. Furthermore, the speculator may obstruct development and increase costs by buying land ahead of urban development, withholding the land until the price is right, and then selling it.

An attack on speculation must therefore control *PROFITS*, which result from combinations of low acquisition cost, small holding cost, high selling price.

The following methods have been proposed for **CONTROLLING LAND SPECULATION:**

a) *SITE VALUE TAXATION:* puts tax only on the assessed unimproved value of the land, with no taxes on improvements. It forces the improvement of vacant land to make the land productive enough to pay the tax. The principle is that the value of the land derives from the people as a whole, and therefore that increases in value created by their efforts should be appropriated for the public benefit.

b) *SPECIAL CAPITAL GAINS TAX:* puts tax on land sales. Profits from land speculation are often taxed as *Regular* capital gains (in the U.S. 25% maximum). A *Special* capital gains tax on land would reduce speculation by reducing profits and returning those profits to the communities responsible for them.

c) *METROPOLITAN LAND CORPORATION:* controls urban land supply and lowers land costs by means of land acquisition through a public or public/private agency.

d) *OTHER METHODS:* 1) Zoning/planning restrictions remove uncertainty about "where" development will take place, but do not remove uncertainty about "when." 2) Rent control to control *land price* controls speculation, but promotes neglect of land since returns for capital investment are limited. 3) Reduction of uncertainty surrounding development can be further achieved by, for example, providing information about land use trends, construction trends, economic/population growth to all possible investors.

2.15 UTILITIES

(WATER SUPPLY, SEWAGE DISPOSAL, CIRCULATION/ STORM DRAINAGE, ELECTRICITY/STREET LIGHTING: See pages 118-144 for detailed discussion.)

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. The following primary utilities should be examined:

WATER SUPPLY available at the site should be analyzed/evaluated to determine its suitability/adequacy in terms of the following existing and/or projected conditions:

•*CONNECTION.* Data are recorded in locality/site plans, charts, reports. Conditions to be determined are: location of connection point(s), piping easements; hindrances to piping connection (due to: topography, natural features, soil, existing structures, other easements, rights-of-way); distance from main(s) to site along authorized connection route(s); costs of connection, piping to site.

•*CAPACITY.* Data are recorded in charts, tables, reports. Amounts to be determined are: water quantity, pressure in relation to demands for water. *(See figure 1, page 78)*

•*QUALITY.* Data are recorded in charts, reports. Conditions to be verified are: water source, system protection; bacteriological quality; physical characteristics; chemical characteristics.

•*OWNERSHIP/CONTROL/OPERATION.* Data are recorded in charts, reports, legal documents. Conditions to be determined are: names, addresses of local agencies; type of control (private, public); standard of service, maintenance.

SEWAGE DISPOSAL available at the site should be analyzed/evaluated to determine its suitability/adequacy in terms of the following existing and/or projected conditions:

•*CONNECTION.* Data are recorded in locality/site plans, charts, reports. Conditions to be determined are: location of connection point(s), sewage easements; hindrances to piping connection (due to: topography, natural features, soil, existing structures, other easements, rights-of-way); distance from site to main(s) along authorized connection route(s); costs of connection, piping from site.

•*CAPACITY.* Data are recorded in charts, tables, reports. Amounts to be determined are: sewage flow, velocity in relation to the sewage discharge.

•*OWNERSHIP/CONTROL OPERATION.* Data are recorded in charts, reports, legal documents. Conditions to be determined are: names, addresses of local agencies; type of control (private, public); standard of service, maintenance.

CIRCULATION. *(See: CIRCULATION SYSTEM, page 86.)*

STORM DRAINAGE available at the site should be analyzed/evaluated to determine its suitability/adequacy in terms of the following existing and/or projected conditions:

•*CONNECTION.* Data are recorded in locality/site plans, charts, reports. Conditions to be determined are: location of connection point(s), drainage easements; hindrances to drainage connection (due to: topography, natural features, soil, existing structures, other easements, rights-of-way); distance from site to storm drain(s) along authorized connection route(s); costs of connection, piping from site.

•*CAPACITY.* Data are recorded in charts, tables, reports. Amounts to be determined are: storm-water flow, velocity in relation to surface runoff (affected by: rainfall intensity, runoff-rainfall ratios, size of drainage area).

ELECTRICITY/STREET LIGHTING at the site should be analyzed/evaluated to determine its suitability/adequacy in terms of the following existing and/or projected conditions:

•*CONNECTION.* Data are recorded in locality/site plans, charts, reports. Conditions to be determined are: location of connection point(s), power line easements; hindrances to wiring connection (due to: topography, natural features, soil, existing structures, other easements, rights-of-way); distance from power lines to site along authorized connection route(s); costs of connection, wiring to site.

•*CAPACITY.* Data are recorded in charts, tables, reports. Conditions to be determined are: adequacy of the systems during demand peaks; frequency, duration, schedule of demand peaks.

•*OWNERSHIP/CONTROL/OPERATION.* Data are recorded in charts, reports, legal documents. Conditions to be determined are: names, addresses of local agencies; type of control (private, public, cooperative, industrial); standard of service, maintenance.

WATER SUPPLY and SEWAGE DISPOSAL alternatives in the development of a site are: a) connection to an existing network; b) development of a new communal system; c) development of individual systems (wells; septic tank, aqua privy, pit latrines).

Connection to an existing network is most desirable. When this is not possible, the alternative of developing a new system should be explored with appropriate agencies. The alternative of individual systems is generally not appropriate in urban situations.

STORM DRAINAGE alternatives in the development of a site are: a) connection to an existing storm drainage network; b) use of existing natural streams/valleys.

Connection to an existing storm drainage system is most desirable. When this is not possible, the use of existing natural streams/valleys should be explored with the appropriate agencies.

ELECTRICITY/STREET LIGHTING should be connected to an existing network. Development of communal or individual systems is generally not feasible.

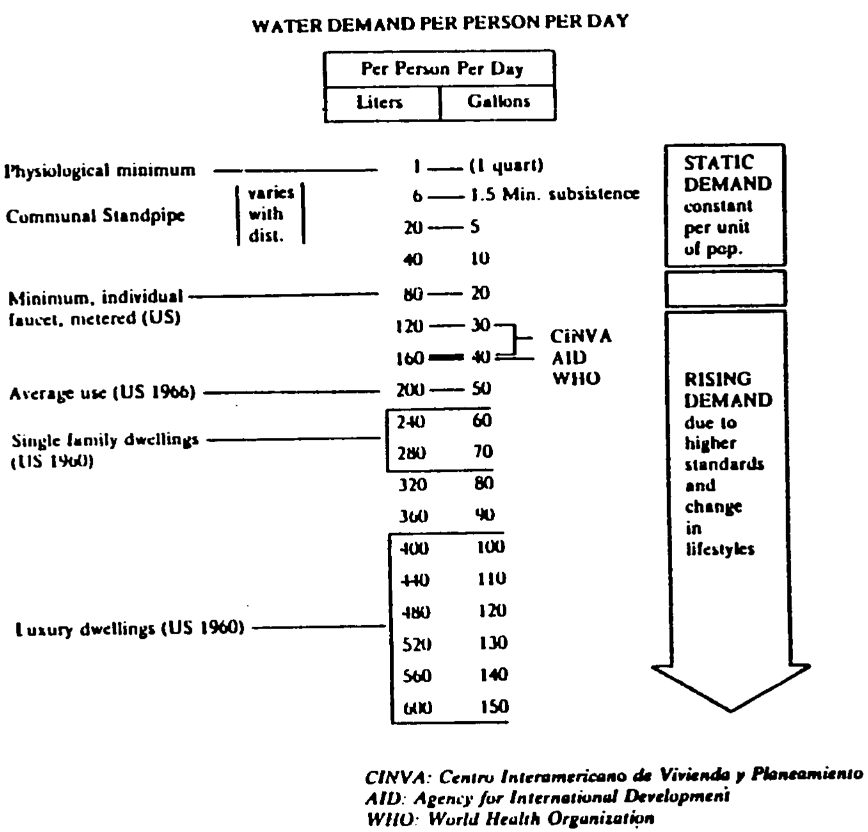


Figure 1: **CHART OF WATER DEMAND PER PERSON PER DAY.**

The chart above indicates the range of water demand per person per day with regard to actual demands and various standards. Note that the demands in luxury dwellings are approximately 100 times greater than demands in communal facilities. Similar extreme ranges exist for the other utility services.

2.16 GAS, TELEPHONE

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. Gas, telephone service available at the site should be analyzed/evaluated to determine their adequacy/quality in terms of the following existing and/or projected conditions:

GAS data are recorded in locality/site plans, charts, reports, memos, legal documents. Conditions, amounts, characteristics to be determined/checked are:

- *CONNECTION.* Location of connections point(s), piping easements; hindrances to piping installation (due to topography, natural features, soil, existing structures, other easements, rights-of-way); distance from main(s) to site along authorized connection route(s); costs of connection, piping to site.
- *CAPACITY.* Gas volume, pressure in relation to demands for gas.
- *SYSTEM QUALITY.* Safety of the network in relation to age, maintenance.
- *OWNERSHIP/CONTROL/OPERATION.* Names, addresses of local agencies; type of control (private, public); competitiveness with electricity (in heating, cooking, refrigeration, etc.); standards of service, mainetnance.

TELEPHONE data are recorded in locality/site plans, charts, reports, legal documents. Conditions to be determined are:

- *CONNECTION.* Location of connection point(s), telephone wiring easement(s); hindrances to wiring installation (due to topography, natural features, soil, existing structures, other easements, rights-of-way); arrangement of cables (overhead, underground); distance from cables to site along authorized connection route(s); costs of connection, wiring to site.
- *OWNERSHIP/CONTROL/OPERATION.* Addresses of local agencies; standards of service, maintenance.

GAS (•)—a system of supplying natural gas, manufactured gas, or liquefied petroleum gas to a site and individual users.

TELEPHONE(•)—an electrical communication network interconnecting all subscribing individuals and transmitting over wires (or by other electronic means).

2.27 COMMUNITY FACILITIES/SERVICES

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. Facilities/services available to a site should be identified/evaluated to determine their adequacy/quality in terms of existing and/or projected populations. Facilities/services should be considered in terms of: *IMMEDIATE:* available in the vicinity. *MEDIATE:* to be provided in the settlement.

The following should be considered: (*Major sources of data are from the U.S.A. when not otherwise specified.*)

SCHOOLS. Characteristics to be determined for each school: names, addresses of local agencies; type of school: preschool, primary, secondary; walking distance from site; student capacity; practicality of expanding facilities.

HEALTH SERVICES. Conditions to be determined are: amount and nature of services demanded by the public in relation to population density, water supply, waste disposal, hygienic condition of housing stock, etc.

RECREATION, PARKS, OPEN SPACES. Characteristics to be determined for each recreation facility: names, addresses of local agencies; type of facility: playground, playfield, park; walking distance from site; facility capacity.

POLICE PROTECTION. Conditions to be determined are: amount and nature of service demanded by population, land use.

FIRE PROTECTION. Conditions to be determined are: amount and nature of service required by population, land use and intensity of its use, physical condition of surrounding/affected areas.

PUBLIC TRANSPORTATION. Conditions to be determined for each transportation mode or type are: capacity, termini; quality of service; names, addresses of local agencies; type of ownership/control: private, municipal.

COMMUNITY FACILITIES(*)—facilities used in common by a number of people (ownership/operation of which is either public: streets, schools, parks, playgrounds, etc.; or nonprofit private: churches, settlement houses, community centers, etc.).

SCHOOLS are generally organized by the age of users as follows: Preschools (kindergarten), ages 2-7; primary and elementary schools, ages 6-16; secondary (junior, senior high), ages 12-20; colleges and universities, ages 18-up. At the residential scale, the pre-, primary, and secondary schools are the main concerns.

Areas served by schools are generally defined by walking distances, which are related to the ages of users. (*See: LOCATION, APPROACHES, ACCESSES, TRANSPORTATION: Diagram of Ranges, Preferred Distances, page 60.*)

In Latin America, secondary schools in general do not serve a determined district; rather, they draw students from the whole urban area. Therefore, the zone of influence is not so limited by walking distances. Finally, the mode of travel is not by school buses or private cars but by public transportation.

HEALTH services are planned/regulated by national/state/metropolitan/municipal agencies and provided/operated by public/private volunteer organizations.

The *availability* of existing/proposed health services in relation to a prospective site is a factor to be considered in site selection. A site should have convenient access to the following at the city or district level: public health services, practicing physicians and dentists, general hospital facilities.

RECREATION facilities can be listed by users' age group: playlots, ages 2-7; playgrounds, ages 6-16; playfields, 12-20; parks, all ages.

In densely settled localities where dwellings have no individual open spaces, playlots should be located within clear view of all dwellings served. Parks, on the other hand, supply the main facilities for city-wide recreation, organized sports, public golf courses, open-air entertainment, and zoological/biological gardens. Therefore, at the residential scale, the *playgrounds* and *playfields* are the main concerns.

Areas served by neighborhood recreation facilities are generally defined by walking distances, which are related to the ages of users (U.S.A.). (*See: LOCATION, APPROACHES, ACCESSES, TRANSPORTATION: Diagram of Ranges, Preferred Distances, page 60.*)

The principal component of outdoor recreation is *open space*. Outdoor recreation facilities are generally: *Active:* includes playgrounds, playfields, swimming pools, beaches, golf courses, etc. *Passive:* includes neighborhood parks, large urban parks, regional parks (state/national reservations), etc.

POLICE, FIRE PROTECTION SERVICES are planned/provided by state/metropolitan/municipal agencies. The primary concern is availability.

PUBLIC TRANSPORTATION is planned/regulated by public agencies and provided by municipal/private companies.

COMMUNITY FACILITIES other than those discussed previously can be: *Community center:* a neighborhood building for social, recreational, and cultural activities (such as: adult education, recreation programs, etc.) *Church:* a place of worship of any religion. *Settlement house:* an institution founded and maintained (often under the auspices of a church, college, or similar organization) to supply various educational, recreational, medical, and other services to a community.

In site selection/evaluation, preference should be given to a site conveniently served by any of the above established semipublic/private institutions and facilities. They can assist settlement of a site by meeting the social, cultural needs of people in-migrating to a city.

The **TYPES** of organizations/services for which space may be required in a community include: *Social:* department of welfare; religious organizations, churches, YMCA, YWCA; vocational guidance bureaus; other public/private social service agencies, etc.; *Cultural:* department of education; library service; museum; settlement house; dramatic, musical clubs; community, fraternal organizations; professional entertainment; etc.

2.18 REFUSE COLLECTION

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. Refuse collection services available to a site should be analyzed/evaluated to determine their suitability/adequacy in terms of the existing/projected population.

Data are recorded in charts, reports, legal documents, memos. Conditions to be determined are: quantities, quality of service and responsibility/control/operation; cost; frequency of collection; preparation (separation, special treatment, storage, location of receptacles, quantity limitations); names, addresses of local agencies; type of collection responsibility (government agency, contractor under contract to government, contractor under contract to refuse producers, producer of refuse); standards of service.

REFUSE COLLECTION (*)—the services of collection and disposal of all the solid wastes from a community. They are planned/regulated by metropolitan/municipal agencies and provided by public/private collectors. The disposal of the refuse is a critical factor in urban areas.

The *PRIMARY PURPOSE* of refuse collection services is the sanitary removal and disposal of solid wastes, especially garbage, to minimize the possibility of disease and to reduce the effects of littering/private dumping on the environment.

Refuse will continue to be a major problem of urban areas. With a rising population, an increase of refuse production per capita, and increasingly inadequate means of refuse disposal, new disposal solutions and better utilization of current methods are needed.

The amount of waste generated is generally too great to permit individual disposal in a desirable manner; consequently, urban areas usually provide the services of removal and final disposal.

The increased population with its increased refuse production results in greater dangers of ground pollution. Great care must be exercised in the placement of disposal areas to insure the proper respect for economic as well as environmental costs.

The problem of pollution from solid wastes can take several forms: gross or surface pollution, and pollution of subsoil, water and air. In reviewing these problems, it was found that they were especially important in the fringe areas of Eastern and Western Pacific regions, Africa, and Latin America, because of a shortage of basic sanitary facilities.

The components of refuse materials can be classified in several different ways. Sometimes they are classified by point of origin (domestic, industrial, institutional, commercial, agricultural or street sources); and other times they are classified as organic or inorganic, putrescible or nonputrescible, combustible or noncombustible. One of the most useful classifications is based on the character of the materials:

•*GARBAGE:* wastes from preparation, cooking, serving of food.

•*RUBBISH:* combustible: paper, cardboard, wood, plastics, rags, cloth, leather, grass, leaves, etc.; noncombustible: metals, cans, soil, stones, bricks, glass, etc.

•*ASHES:* residue from fires used for cooking or heating.

•*BULKY WASTES:* large auto parts, tires, large appliances, furniture, trees, stumps, branches, etc.; require special collection arrangements, vehicles.

•*STREET REFUSE:* street sweepings, leaves, catch basin dirt, contents of litter receptacles.

•*DEAD ANIMALS:* from cats, dogs, to horses, cows; require special arrangements.

•*ABANDONED VEHICLES:* autos, trucks; require special equipment.

•*CONSTRUCTION, DEMOLITION WASTES:* lumber, roofing, rubble, conduit, wire, insulation, etc.; require special collections.

•*INDUSTRIAL WASTES:* residues of industrial processes/manufacturing operations; removal should be the responsibility of the industry.

•*SPECIAL WASTES:* hazardous: pathological wastes, explosives, radioactive materials; security wastes: confidential documents, negotiable papers, etc.; require very special handling and disposal.

•*ANIMAL, AGRICULTURAL WASTES:* manures, crop wastes; collected only when agricultural areas are engulfed by urban growth.

•*SEWAGE TREATMENT RESIDUES:* coarse screenings, grit, sludge, etc.

The *CAPACITY* of existing/proposed refuse collection service available to a site should be adequate for the *QUANTITY* of refuse produced by the proposed settlement as well as by future developments in the areas served by the utility. The developer in his preliminary site considerations should ensure that adequate refuse collection is available to a site.

The *QUANTITY* of refuse collected as related to the quantity produced is a function of such factors as:

•Population: As population increases, refuse production increases.

•Land use and intensity of its use: Industrial, commercial, and residential areas produce varying quantities of refuse; there may be variations between high, medium, and low income residential areas; as the density of an area increases, the refuse collection services required by that area increase.

•Material consumption: as per capita consumption of disposable material goods increases, per capita refuse production increases.

•Frequency of collection: With frequent service, more refuse per capita is collected; but smaller quantities are set out each collection day.

•Refuse separation: Communities requiring separation of refuse may make more frequent collections of smaller quantities than those making combined collections.

•Amount of on-site disposal permitted: When on-site burning is allowed, refuse quantity decreases; installation of garbage disposals has reduced the quantity collected from 25% to 10% of total refuse; with on-site disposal, collections may only amount to 50-75% of the total refuse produced.

•Cost of collection: Where direct collection charges are made, householders may dispose of more combustibles on-site; costs increase with increased collection frequency.

•General trends: While garbage and ash quantities are decreasing, amounts of combustible rubbish, particularly paper, plastics, are increasing; there are great increases in volume of refuse and considerably lesser increases in weight of refuse.

2.19 GOVERNMENT/MUNICIPAL REGULATIONS

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. The government/municipal regulations that will affect the site should be investigated to determine constraints/requirements on the development of the site and in the design of the project. Data are recorded in legal documents. Regulations to be identified are: master plan, zoning ordinances, subdivision regulations, building code.

The development of the physical environment is the responsibility of everybody when the source of all power lies in the hands of the majority of the people. The implication of this principle is that the inhabitants of a town or city, through the mechanism of government, have the right to enact rules that will express their thoughts about what is best for their community.

In most countries the principal restraint upon law is that it shall not be in conflict with the national constitution or the constitution of the state in which it is enacted.

AGENCIES, AUTHORITIES responsible for the development of the physical environment include:

•*Legislative Body:* This is part (council, commission, board of aldermen, etc.) of any municipal government that has general legislative powers and decides on the character the city aspires to achieve.

•*Planning Commission:* This group has the legal responsibility for planning and recommending the master plan, zoning regulations, and subdivision regulations; serves usually in an advisory capacity to the legislative body.

•*Planning Department:* This department prepares the master plan and formulates the provisions of the zoning ordinance and subdivision regulations through its technical staff.

•*Zoning Board:* The variety and volume of improvements in a large city may require an independent board for administration of the zoning ordinance; the board renders interpretation of the zoning ordinance applicable to specific cases and may issue Variance Permits when warranted.

•*Real Estate Commission:* This body ensures compliance with state subdivision procedures; checks legitimacy of sales organizations, quality of lots for sale; ascertains that the required improvements are either installed or assured by a bond posted by the subdivider prior to approval of the subdivision and sale of the land.

•*Building Department/Department of Building Inspection:* This department enforces provisions of the building code and acts on any relevant questions.

•*Appeals Board:* This body conducts hearings on appeals from decisions of the Planning Commission/Zoning Board/Building Department and offers objective attention to appeals warranting reconsideration.

TAX STRUCTURE is the legal instrument through which all urban dwellers participate in the development of the physical environment, by their payment of taxes for public services.

In urban areas the development of the physical environment is a process usually controlled by a government/municipality through all or some of the following regulations: *MASTER PLAN, ZONING ORDINANCE, SUBDIVISION REGULATIONS, BUILDING CODE.*

MASTER/GENERAL/CITY PLAN(*)—a comprehensive, long-range plan intended to guide the growth and development of a city, town, or region, expressing official contemplations on the course its transportation, housing, and community facilities should take, and making proposals for industrial settlement, commerce, population distribution, and other aspects of growth and development. It is usually accompanied by drawings, explanatory data, and a prefatory *apologia* explaining its limitations. Few aspects of the city-planning process have aroused more controversy than the master plan. Conceptions of what it should be run the gamut from the futurama down to the simple zoning scheme. No master plan can be fulfilled specification by specification in face of the ever-recurring changes caused by industrialization, population shift, traffic increase, suburbanization, and periodic political undulations.

LEGISLATION for a master plan originates with state enabling acts. State legislation usually requires the preparation of a master plan and sets forth its scope.

JURISDICTION of a master plan may include land outside the town, city, county, or regional boundaries, provided that the plan is officially certified by the planning commission and the legislative body.

SCOPE. The provisions of the master plan apply to the pattern of physical development of the city. It provides the basic point of reference for all administrative and regulatory measures relating to the physical development of the city—the zoning ordinance, subdivision regulations, urban renewal, the capital improvement expenditures.

OBSOLESCENCE. The dangers of any comprehensive master plan are: public reaction that it will cost too much; mobilization of the opposition; the difficulty of altering it once compromises have been made and public approval secured; the tendency of any plan to become obsolete owing to the supervention of unanticipated changes and circumstances.

Two basic ELEMENTS comprise the General Plan: the Plan for Land Use and the Plan for Circulation. Each of these elements is supported by complete documentary evidence, the social, physical, and economic facts and premises from which they were derived.

•*The Plan for Land Use* indicates the areas adapted to development for different urban land utilization: public, semipublic, private, semiprivate. It establishes the standards for density of land use in terms of population or building volumes; it designates the areas to be reserved for recreation, conservation, and agriculture. It determines the allocation of neighborhood facilities, schools, parks, playgrounds. It establishes the areas and standards for subdivisions of new land. It is the basic plan which will provide the framework for the layout of utilities—water supply, sewage disposal, circulation and storm drainage, electricity and street lighting, telephone, gas, etc.

•*The Plan for Circulation* is the plan for highways and streets, routes for public and private mass transportation, railroads, airports, and waterways. It designates the different types and characteristics of the highways and streets. It charts the course of bus and rail routes about the metropolitan area. It is the plan where all the lines of communication are integrated for the circulation of people as well as goods in and about the city.

DATA supporting the master plan are: a) inventory of the physical structure; b) inventory and classification of land use; c) inventory of social and economic factors.

SUBDIVISION REGULATIONS(*)—regulations governing the development of raw land for residential or other purposes. They prescribe standards for the street improvements, lot sizes and layouts, procedures for dedicating private land for public purposes and other requirements. Procedures are also given for filing maps; for receiving the approval of the public engineer, planning commission, and other departments.

Subdivision regulations should prevent excessive governmental operating costs. At the same time, they should assure to the maximum degree possible the means whereby land can be developed for the highest possible use with all of the necessary protections against deterioration and obsolescence.

LEGISLATION. Subdivision regulations in the U.S. usually originate with state laws which vest in cities and counties the right of policy making power, or in planning acts which outline the procedures for preparation of the master plan.

JURISDICTION. Subdivision regulations cover all land within the adopting authority's boundaries.

SCOPE. The provisions of subdivision regulations apply to the division of a parcel of land into two or more lots or parcels for the purpose of transfer of ownership or building development, or if a new street is involved, any division of a parcel of land.

ADMINISTRATIVE PROCEDURES required by subdivision regulations include: a) preparation of tentative subdivision map; b) filing of tentative map; c) preparation of final subdivision map; d) recording of final map.

OBSOLESCENCE occurs in the light of up-to-date land planning design and land development techniques. In addition, many requirements are excessive with regard to such matters as local street and roadway pavement widths, type and thickness of paving, and other items within the city, in contrast to outlying areas, where in some cases regulations are more equitable or may be absent or wholly inadequate to assure a suitable residential community. There are instances where requirements are so severe as to make the construction of modest homes impossible.

The following is the *CONTENT* of most Subdivision Regulations:

1. Definitions and Procedures
2. Standards and Design Requirements
3. Presentation Requirements
4. Requirements on Grading Plans, Profiles
5. Improvements Required in the Development

ZONING ORDINANCE(*)—the demarcation of a city by ordinance into zones (areas/districts) and the establishment of regulations to govern the use of land and the location, bulk, height, shape, use, population density, and coverage of structures within each zone.

The purposes of the zoning ordinance are to:

•Encourage the most appropriate use of land.
•Prevent overcrowding of land.
•Conserve the value of land and buildings.
•Lessen congestion of traffic.
•Prevent undue concentration of population.
•Provide for adequate light and air.
•Reduce hazards from fire, other dangers.
•Assist in the economical provision of transportation, water, sewerage, schools, parks, and other public facilities.
•Preserve and increase the amenities of the town.
•Give effect to the policies and proposals of the master plan.

LEGISLATION for zoning originates with the states, which give policy power to the cities by specific legislative acts or grant this right to communities in their state constitutions.

JURISDICTION. A zoning ordinance covers all land within the adopting authority's boundaries.

SCOPE. The provisions of a zoning ordinance apply to the establishment of zoning districts within which the building heights, coverage, and setbacks; land use; open space; and population density are designated.

ADMINISTRATIVE PROCEDURES have been devised to cope with complications such as natural/man-made conditions of the land, unusual demands not evident when the ordinance was adopted, or developments requiring adaptation of the ordinance to new ideas: a) zone change/amendment; b) zoning variance; c) conditional use permit; d) administrative committees.

OBSOLESCENCE. Zoning as provided for in the usual ordinance does not encourage comprehensive land development. Recent urban growth has fully demonstrated that zoning based on preservation of the status quo does not meet the needs of a growing community. Zoning is a tool of planning and good planning is a prerequisite to good zoning. The trend to planned development has emerged, but the liberalization of zoning is lagging.

The following is the *CONTENT* of most Zoning Ordinances:

1. General Administration, Definitions, Permits, Maps, Types of Districts
2. Row Housing, Apartments
3. Gas Stations
4. Additional Height Controls
5. Parking
6. Building and Accessory Uses
7. Lots Smaller Than Required by Zoning
8. Changes and Expansions With No Legal Uses
9. Large Residential Developments
10. Large Commercial and Industrial Developments
11. Canopies/Marquees, Signs, Concessions
12. Miscellaneous

BUILDING CODE(*)—a body of legislative regulations or by-laws that provide minimum standards to safeguard life or limb, health, property, and public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location and maintenance of all buildings and structures within the city and certain equipment specifically regulated.

LEGISLATION authorizing the adoption, administration, and enforcement of building codes by cities/counties usually originates with national/regional/state agencies. In the U.S., organizations such as the National Fire Protection Association and the American Insurance Association have promulgated the NATIONAL FIRE CODES and the NATIONAL BUILDING CODE.

JURISDICTION of a building code covers all land within the adopting authority's boundaries. Uniform building codes bring uniformity into the area of building regulation, freeing developers from the varying requirements which can occur with individual municipal/county codes. A uniform code can lower building costs and insurance rates.

SCOPE. The provisions of a building code apply to the construction, alteration, moving, demolition, repair, and use of any building or structure within the city, except work located primarily in a public land.

ADMINISTRATIVE PROCEDURES required by building codes in the construction and use of buildings include: a) application for building permit; b) action on application; c) issuance of permit; d) issuance of certificate of occupancy; e) inspections; f) appeals.

OBSOLESCENCE. As in zoning, many building codes are badly in need of revision to embrace modern building materials and construction practices. Builders and community developers should take an active interest in securing good building, sanitary, and subdivision regulations.

The following is the *CONTENT* of a basic Building Code (*From: BOCA 1969.*)

1. Administration and Enforcement
2. Definitions and Classifications
3. General Building Limitations
4. Special Use and Occupancy Requirements
5. Light and Ventilation
6. Means of Egress
7. Structural and Foundation Loads and Stresses
8. Part A: Materials and Tests
8. Part B: Steel, Masonry, Concrete, Gypsum and Lumber Construction
8. Part C: Building Enclosures, Walls and Wall Thickness
9. Fire-Resistive Construction Requirements
10. Chimneys, Flues and Vent Pipes
11. Heating Equipment and Appliances—Mounting, Clearances and Connections
12. Fire Protection and Fire-Extinguishing Equipment
13. Precautions During Building Operations
14. Signs and Outdoor Display Structures
15. Electric Wiring and Equipment
16. Elevator, Dumbwaiter and Conveyor Equipment, Installation and Maintenance
17. Plumbing, Drainage and Gas Piping
18. Air Conditioning, Refrigeration and Mechanical Ventilation
19. Prefabricated Construction
20. Light-Transmitting Plastic Construction

Most building codes in Latin America are based on standards used in economically developed countries (U.S.A., Europe). But only a limited sector of the population can meet these standards; as a result, the majority of the dwellings built are well below code requirements. This situation is being recognized and reasonable minimum standards for developing countries have been proposed. These standards try to take a more comprehensive view of the process of urbanization by incorporating provisions on zoning as well as subdivision. They also claim to put the emphasis in performance rather than in specification standards.

2.20 INCOME GROUPS

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. The target income groups for the project should be considered to determine policy/program. Data are recorded in reports. Ranges should be identified in terms of income/family/year or in terms of subsistence levels. (*See also: LOCATION, TRANSPORTATION, pages 60-61.*)

METHODS OF COMPUTATION OF INCOME GROUPS. The overall computation of income groups of the urban area as well as a more detailed computation of the low-income groups is very useful in the planning of a project because it permits one to relate the different needs of the groups with their different economic capacity. A common method of computation is income measured by quintiles, which is a distribution based on the income for each "fifth of all families for a year." But the quintile method of computation is abstract and does not illustrate the purchasing power of the different groups. There is a method that attempts to satisfy this question by relating the groups to the level of subsistence and, in addition, to the goods that can be afforded by each group. It was proposed by John F.C. Turner and was applied in a study for Mexico City. Briefly it is as follows:

Five general divisions of annual income distribution are designated, based upon the established subsistence level for the area of study. *Subsistence level* is the minimum amount of money (as of food and shelter) necessary to support life. In this level, 80-90% of the household income is used for diet; there is little or no margin of income for rent, housing, clothing, or savings. In many cases, the subsistence income is considered to be equivalent to the official minimum wage for an area. The income groups, based on the subsistence income method (with values illustrated for Mexico City), are:

1) *VERY HIGH* (*10 x subsistence level*). The income group that represents the most economically mobile sector of the population.
2) *HIGH* (*5 x subsistence level*). The income group that can afford housing without subsidy, by cash purchase, through mortgage payments, or by rent.
3) *MODERATE* (*3 x subsistence level*). The income group that can afford limited housing and rent only with government assistance.
4) *LOW* (*1 x subsistence*). See text above.
5) *VERY LOW* (*below subsistence level*). The income group with no household income available for housing, services, or transportation.

2.21 POPULATION DENSITY

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. The target population densities for the project should be considered to determine policy/program. Data are recorded in plans, charts, reports. Ranges should be identified in terms of inhabitants/hectare, gross and/or net densities, type of development, etc. (*See also: LOCATION, page 60.*)

DENSITY is the ratio between the population of a given area and the area. It is expressed in people per hectare. *GROSS DENSITY* includes any kind of land utilization: residential, circulation; public facilities, etc. It implies a mechanical operation, which is measuring the area and counting heads. *NET DENSITY* includes only the residential land and does not include land for other uses: circulation, public facilities, etc. It implies more than a mechanical operation, namely delimiting the area to be considered as residential. This may be subject to error because in many cases this area does not have its physical boundaries clearly defined.

The lower the density, the larger is the land area required for a given population, which results in higher costs per capita in land and infrastructure. At the opposite extreme, very high densities not only may put an excessive load on the services, but what is more serious, could create negative and destructive social conditions. It is always possible to determine a range of density limits compatible with adequate services and infrastructure. But very little can be done to determine similar indices for social conditions. At the moment, the only methods available to anticipate or forecast social and behavioral implications of population densities in a given physical environment are at best tentative methods such as personal experiences, case studies, evaluations of similar situations.

The table on the opposite page indicates densities of population in different existing urban dwelling environments. Its purpose is to provide a useful reference by illustrating the relationships between densities and physical characteristics. The table includes localities in three different settings: Boston and vicinity, U.S.A.; urban areas in Latin America; and Nairobi, Kenya. The localities cover a wide variety of combinations of physical characteristics, with emphasis on low-income-group users. Each of the localities has only one uniform type of development. The table contains the following items: *LOCALITY*, identifying the community and urban location; *DWELLING TYPE* (*See: GLOSSARY, page 196*), identifying the physical arrangement of the dwelling units: detached, semidetached, row-grouped, walk-up, high-rise; *DWELLING UNIT TYPE* (*See: GLOSSARY, page 196*), identifying the space: room, apartment, house, shanty; *DWELLING DEVELOPER* (*See: GLOSSARY, page 196*), identifying the sector involved in the supply of dwellings: popular, public, private; *DWELLING FLOORS*, indicating the average number of floors; *LOT AREA*, indicating the area of an average lot; *LOT COVERAGE*, indicating the percentage of land covered by the construction on the typical lot; *DWELLING UNIT AREA*, indicating the average area of a dwelling on a lot; *PERSONS PER DWELLING*, indicating the number of people living in the dwelling to illustrate the range of occupancy; *DWELLING UNIT AREA PER PERSON*, indicating the average area available to each person to illustrate the range of space; *GROSS DENSITY*, including all land; *NET DENSITY*, including only residential land.

Physical factors affect densities in different degrees. It can be assumed that higher densities are associated with specific values: higher number of floors; higher land coverage; smaller lot and dwelling unit areas; smaller dwelling area per person; rooms and shanties as opposed to houses. The table shows that in reality some values can offset others, as is the case in Latin America and Nairobi, where people are crowded in one-story shelters. General observations: *BOSTON AREA*. High and medium densities are the result of apartment dwelling units and also result from the number of floors: 3 to 5 in walk-ups; 7 in the only case of high-rise. These densities are reached despite low land coverage and large dwelling area per person.

URBAN AREAS IN LATIN AMERICA. All cases are of one-story houses. Despite that, densities are high and medium because of larg land coverage, small lots, small dwelling units and small dwelling are per person.

NAIROBI, KENYA. Extreme living conditions: people are packed i one-story shanties or rooms, covering the land and leaving narro passages that are the only spaces for circulation and outdoor activi ties.

Figur
DEN:
MEN
1969.
Cami
The t
densit
tion 2

LOCALITY	DWELLING TYPE AND UNIT	DWELLING DEVELOPER	DWELLING FLOORS	LOT AREA	LOT COVERAGE	DWELLING UNIT AREA	PERSONS/ DWELLING	DWELLING UNIT AREA/ PERSON	GROSS DENSITY	NET DENSITY
			No.	m^2	%	m^2	No.	m^2	No./Ha	No./Ha
BOSTON AREA, U.S.A.										
Columbia Point	High Rise, Apartment	Public	7	NA	-	78	4	20.0	747	1449
North End	Walk-up, Apartment, Row	Private	4-5	168	65	47	2	24.0	708	1040
Charlestown	Walk-up, Apartment	Public	3-4	NA	-	70	4	18.0	395	570
East Boston	Walk-up, Apartment	Public	3-4	NA	-	65	4	16.0	414	510
South End	Walk-Up, Apartment, Row	Private	4-5	144	50	58	3	19.0	287	480
Washington Park	Walk-up, Apartment, Detached	Private	3-4	243	50	119	4	30.0	232	317
Cambridge Port	Walk-up, Apartment, Detached	Private	3-4	319	38	114	3	38.0	112	148
Lincoln	Detached, House	Private	1-2	17500	1	195	4	49.0	2	2
LATIN AMERICA										
El Agostino (flat), Lima, Peru	Row House	Popular	1	36	100	36	6	6.0	525	664
Villa Socorro, Medellin, Colombia	Grouped House	Private	1	96	45	43	6	7.0	279	574
El Agostino (hill), Lima, Peru	Row House	Popular	1	62	69	43	6	7.0	403	552
Cuevas, Lima, Peru	Row House Shop	Popular	1	158	89	140	6	14.0	273	410
El Ermitaño, Lima, Peru	Row House	Popular	1	160	69	110	10	11.0	208	341
Mendocita, Lima, Peru	Row House	Popular	1	46	100	46	8	6.0	166	238
El Gallo, Ciudad Guayana, Venezuela	Detached House	Public	1	300	22	65	6	11.0	124	186
Mariano Melgar, Arequipa, Peru	Row House Shop	Private	1	240	92	221	10	18.0	87	126
NAIROBI, KENYA										
Mathare Valley	Grouped, Rooms, Tenements	Private	1	-	100	12	4	3.0	1600	3333
Kariobangi	Grouped, Rooms, Site & Services	Public	1	-	100	14	4	3.5	532	[illegible]
Karura Village	Grouped, Shanties, Temporary	Popular	1	-	100	41	11	3.7	720	2400
Kirinyaga Village	Grouped, Shanties, Temporary	Popular	1	-	100	13	2	6.5	450	2250
River Road	Row, Rooms, Tenement	Private	2-3	255	87	10	3	3.3	769	1280
Uhuru Phase 4	Row, Houses, Subsidized	Public	2	-	-	71	6	12.0	312	780
Kawangware	Grouped, Rooms, Tenement	Private	1	-	-	14	4	3.5	552	699
Eastleigh	Row, Rooms, Tenement	Private	1	300	41	10	15	0.7	480	666
Pumwani	Walk-up, Apartments, Subsidized	Public	3	-	-	52	6	9.0	313	549
Bahati	Row, Rooms, Subsidized	Public	1	-	-	17	11	1.5	320	405
Kariobangi South	Row, Houses, Subsidized	Public	1	133	47	63	4	16.0	270	380
Woodley-Kibera	Row, Houses, Subsidized	Public	2	222	47	166	7	24.0	217	310
Quarry Road	Detached, Houses, Subsidized	Public	1	150	32	48	6	8.0	114	173
Quarry Road	Semidetached, Houses, Subsidized	Public	1	250	40	100	9	11.0	72	83
Woodley I	Detached, Houses, Subsidized	Public	1	1800	6	100	7	14.0	35	41
Dagoretti	Grouped, Rooms, Traditional	Private	1	-	-	28	19	1.5	36	41

Figure 1: **TABLE OF LOCALITIES, PHYSICAL CHARACTERISTICS AND DENSITIES OF POPULATION.** (*Taken from: URBAN DWELLING ENVIRONMENTS, Caminos, Turner, Steffian, M.I.T. Press, Cambridge, Massachusetts, 1969, for Boston and Latin America; PEOPLE, DWELLINGS AND LAND, Caminos, Goethert, Chana, Nairobi-Cambridge, 1974, unpublished, for Nairobi.*) The table illustrates existing cases. Other references are the following examples of densities assuming specific physical characteristics. *LAND UTILIZATION:* Circulation 20%; Semipublic 15% (open 12% + building 3%); Private 65% (open 43% + covered 22%). *DWELLINGS:* rooms in tenements, apartments, houses, row and groups: Land coverage 1/3 of private land; Dwelling area per person 12m²; Shops and miscellaneous area per person 3m²; Open area per person 10m².

NUMBER OF FLOORS:	1	2	4
GROSS DENSITY persons/Ha:	147	294	588
NET DENSITY persons/Ha:	225	450	[illegible]

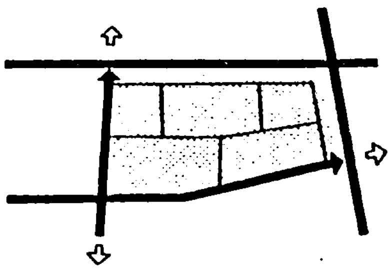
2.22 CIRCULATION SYSTEM

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. The circulation system for the project should be considered to determine the network layout. Data are recorded in plans, charts, reports. Conditions should be identified in terms of modes, users and road characteristics.

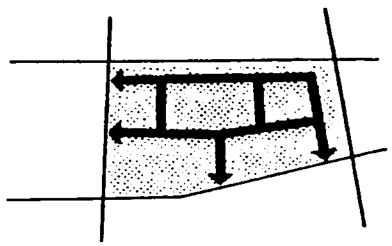
The SYSTEM OF CIRCULATION is one of the most important components of the urban layout; it not only channels the movement of pedestrians and vehicles but, since it is on public land, it also determines the patterns of land utilization, land subdivision and the layout of utilities: water supply, sewage disposal, street paving, storm drainage, electricity and street lighting.

In designing a system of circulation, the following factors should be considered: forms of circulation, modes of circulation, lines of circulation, lines of access, urban layout, intervals.

FORMS OF CIRCULATION. In relation to a site, circulation exists in two forms as illustrated.



Exterior circulation/accesses: the existing and proposed circulation system/accesses outside but affecting the site. These include limited-access highways as well as meshing access to the surrounding areas. Exterior circulation/accesses are generally given conditions.



Interior circulation network: the pedestrian/automobile circulation system inside the site. It should be designed based upon the exterior circulation/accesses and land development requirements.

MODES OF CIRCULATION. This framework identifies users and the relative domination by either pedestrians, vehicles, or both, in the circulation system. It is illustrated on the opposite page. The following parameters were considered:

Modes (1): This specifies the relative dominance of pedestrians or vehicles. *Types (2):* The common names used to designate different modes. *Speed (3), (5):* The usual speed, expressed in kilometers per hour (Km/H). *Character (4), (7):* The use characteristics, basically expressed in terms of pedestrians and vehicles. *Capacity (6):* Expressed in vehicles per lane per hour (V/L/H). *Control (8):* The manner of achieving the desired use. *Width (9):* The right-of-way (R.O.W.) expressed in terms of meters (m); it includes sidewalks, parking and traffic lanes, median and/or green strips. *Lanes (10):* Expressed in number of lanes (No.); this includes parking, median and traffic lanes. *Grade (11):* The acceptable inclination of the road, expressed as percentage (%). *Function (12):* The primary function of the road. *Spacing:* The distance between roads within the road network (grid), expressed in meters (m).

LINES OF CIRCULATION AND LINES OF ACCESS. The layout of any urban area is basically composed of a surface (*lots*) served by lines of circulation and access (*streets*). It is important to identify these two functions and their corresponding form since they determine when the utilization of the street is the domain of the general public that circulates through the urban area (*circulation*) or when the utilization of the street is the domain of a limited group of neighbors who share its use (*access*). The following comparisons will help the identification:

LINES OF CIRCULATION	*LINES OF ACCESS*
They are streets for vehicles, pedestrians or both that serve primarily, the population of the city for through circulation, and, secondarily, to provide direct access to the lots on their sides. Through circulation is all the circulation that uses the street only as a through way; that is, to go to different parts of the urban area and not necessarily for the purpose of access.	They are dead-end streets or loops for pedestrians, vehicles or both, that serve only the abuttors by providing direct access to the lots on their sides from the lines of circulation. They are never for through circulation.
They serve an unlimited number of people.	They serve only a limited number of people.
As streets for through circulation they should be on public land.	As streets for access they should be on private or semiprivate land.
Lines of circulation are long and generally connected at both ends with different circulation lines.	Lines of access are short and generally connected at one or both ends with the same line of circulation.
	For reasons of safety (fire regulations), dead-end streets are limited to a maximum length of 100m.

MODES	TYPES	USERS						ROAD CHARACTERISTICS				
		PEDESTRIAN		AUTOMOBILES				WIDTH	LANES	GRADES	FUNCTION	Accepted SPACING
		SPEED Km/H	CHARACTER	SPEED Km/H	CAP. V/L/H	CHARACTER	CONTROL	m	No.	%		m
1	2	3	4	5	6	7	8	9	10	11	12	13
PEDESTRIANS	Paths	4	Pedestrian circulation and other social functions: Children games, people gathering, strolling, leisure, etc.	NOT APPLICABLE		NOT APPLICABLE Only emergency vehicles access	Is established by the design, the street layout and use.	3-4	NOT APPL.	80	Serve primarily for pedestrian access to interior lots and communal parking facilities. Secondarily for limited and controlled access of service and emergency vehicles such as fire trucks, ambulances, police patrols, etc.	80-200
PEDESTRIANS (dominate) AND VEHICLES	Residential Street Neighborhood Street Minor Street Local Street	4	Pedstrian circulation, strolling	16 24		Pedestrians dominate over vehicles. Usually local traffic limited to pedestrians and private, emergency, service vehicles.	Control of traffic frequency, character and speed are mainly established by the street layout and use.	9-12 12-16	2 3	32	Give access to residential property.	80-200
VEHICLES AND PEDESTRIANS	Collector Street Secondary Street — Connector Street	4	Pedestrian circulation, strolling	30 40	300	Vehicles dominate but do not control circulation. Usually local and through traffic for all kinds of vehicles and pedestrians.	Controls are established for the protection of pedestrians: crosswalks, traffic lights rails, overpasses and underpasses.	12-16 18-22 23-28	3 4	5 to 15	Provide for through traffic, may delineate a neighborhood, give access to communal parking lots, pedestrian paths, service streets and are used for secondary transport routes.	400-800
VEHICLES (dominate) AND PEDESTRIANS	Inter-Community Access Minor Arterial Distrubutor Primary Street Main Spine R.	4	Pedestrian circulation	60	600 900	Vehicles dominate strongly over pedestrians. Usually through traffic for all kinds of vehicles and pedestrians.	Stricter controls are established for the protection of pedestrians: rails, traffic lights, overpasses and underpasses.	23-28 29-36	4 6	5 to 15	Provide access to the locality from intra-community highways and also usually determine major transportation routes within locality; forms the principal focus or spine of the development.	1200-1600
VEHICLES	Major Arterials	NOT APPLICABLE		56-72	1000 1800	Exclusive use by vehicles; relatively high speed with large volume of traffic flow. Through traffic for all kinds of vehicles.	Controls for driving safety are established.	29-36	6 or more	2 to 4	Provide unity throughout contiguous urban area. Usually form boundaries for neighthorhoods.	2400-3200
	Expressways Intra Community Highway			60-80				60-76			Provide metropolitan and city continuity and unity.	1000-5000
	Freeway Thruway Tollroad Interstate			96 100				60-90			Provide regional and metropolitan continuity and unity.	Variable

Figure 1: **TABLE OF CIRCULATION MODES, USERS, ROAD CHARACTERISTICS.** For modes of circulation see opposite page.

INTERVALS OR SPACING BETWEEN LINES OF CIRCULATION. They are the distances between lines of circulation. The size of the intervals is a basic factor in the urban layouts and their determination is a compromise between the following opposing requirements: a) The intervals should be small enough to facilitate pedestrian circulation among the community elements: dwellings, shops, services, etc.; b) The intervals should be large enough to minimize land area percentage and redundancy in order to minimize public costs in construction, maintenance and operation of utilities and services. The smaller the intervals, the greater is the intercommunication between people and the more widespread the shared activities in the community. But, on the other hand, the costs are greater in land, construction, maintenance and operation of utilities and services to be paid by the city. With larger intervals, the above effects reverse: the intercommunication is less and the costs are less. The greater costs of small intervals can never be reduced by any circulation layout. On the other hand, the poor community intercommunication of large intervals can be greatly improved by an adequate circulation layout. In short, the intervals of circulation are a compromise of the above conditions and are within the approximate range of 80m minimum (*cost limitations*) and 200m maximum (*intercommunication limitations*). These distances—found in urban settlements everywhere that were developed by different pre-automobile cultures—were based upon pedestrian circulation and limited use of low-speed vehicles ordinarily powered by animals or people. These intervals become the minimum and maximum dimensions of the blocks.

Mean circulation intervals or mean block dimensions for the above limits are: $\frac{80+200}{2} = 140$m as shown in Figure 1 (opposite page). The following are numerical values of a mean block 140m x 140m.

•*Block circulation length:* $\frac{140\text{x}4}{2} = 280$m. (This is half of the perimeter of the block, the other half belonging to the adjacent block.)

•*Block area:* 140 x 140 = 1.96Ha. (This is the area measured between the center lines of circulation.)

•*Unit circulation length:* $\frac{280}{1.96} = 142$m/Ha. (This is the ratio between circulation length and block area. It is an index of efficiency based on the length in meters of the circulation serving one hectare.)

The matrix (*See Figure 2*) of the same urban segment illustrates and compares different circulation intervals or block dimensions and unit circulation lengths. The urban segments are 400m x 400m or 16Ha, with lines of circulation spaced at 80, 100, 133 and 200m intervals. The unit circulation length varies between 100 and 250m/Ha. Layouts above 250m/Ha are not efficient and consequently not economical, while layouts below 100m/Ha are not adequate for pedestrian circulation. The unit circulation length $\frac{3680\text{m}}{16\text{Ha}} = 230$m/Ha corresponds to a segment with blocks 80m x 80m and a semipublic area 160m x 160m. (*See: STANDARDS FOR PERFORMANCE, page 14.*)

Urban models illustrated farther on (*See: THE MODELS, page 105*) include two gridiron layouts and three grids. The gridirons have only lines of circulation and therefore cannot be minimized. The grids combine lines of circulation and lines of access, and therefore allow the minimization of public circulation. The following table shows the values of the unit circulation length for the 20 models developed. It should be noted that the gridiron models have the higher values. On the other hand, the grids have a much lower and constant value, which is 150m/Ha and which is compatible with the 142m/Ha that corresponds to the average intervals of circulation or average blocks.

TYPES OF LOTS		*TYPES OF LAYOUTS: UNIT CIRCULATION LENGTH m/Ha*				
		Gridrion Blocks		*Grid Blocks*		
Area m²	Proportions	Represents Geometric Form	Incorporates Semipublic Land	Minimizes Public Land	Differentiates Private Land	Expands Semi-private Land
100	square	400	347	150	150	150
	rectangular	300	265	150	150	150
200	square	325	286	150	150	150
	rectangular	250	223	150	150	150

INTERVALS OR BLOCK DIMENSIONS (m)

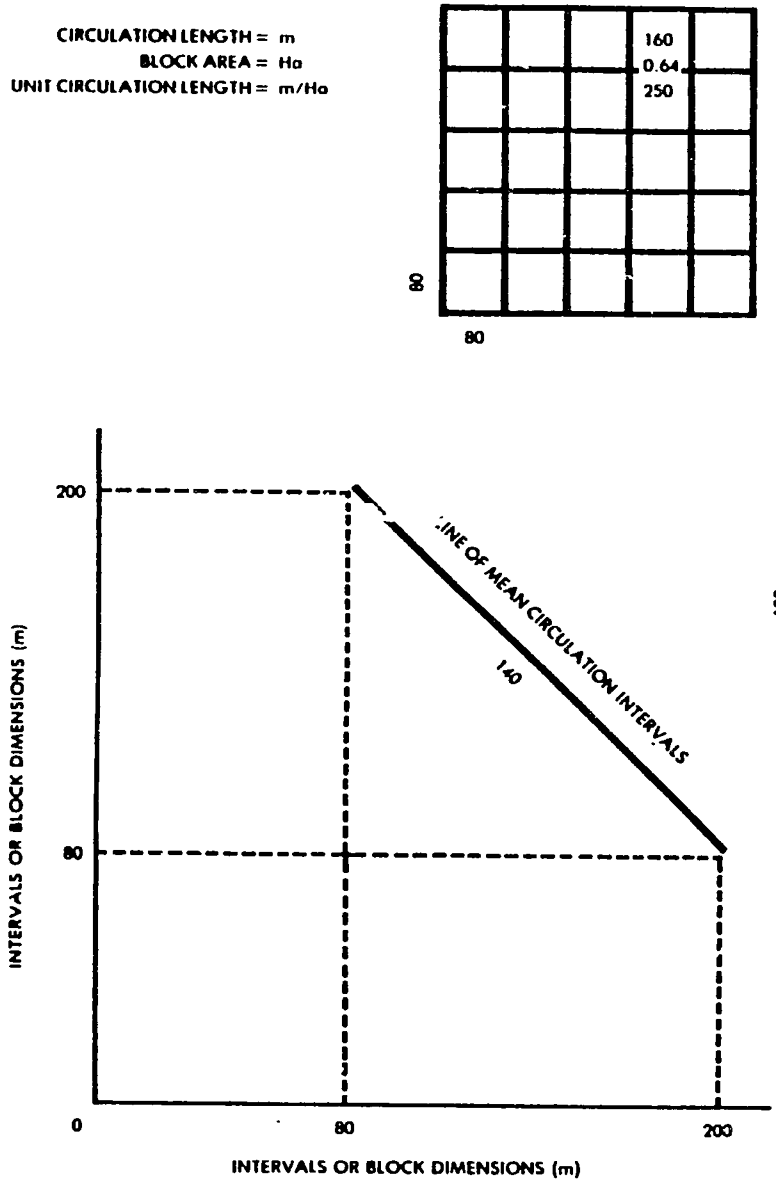


Figure 1: **MEAN CIRCULATION INTERVALS OR MEAN BLOCK DIMENSIONS FOR THE LIMITS 80m to 200m.** The values are the co-ordinates of any point on the 140m line, such as 80 x 200: 90 x 190: ... .

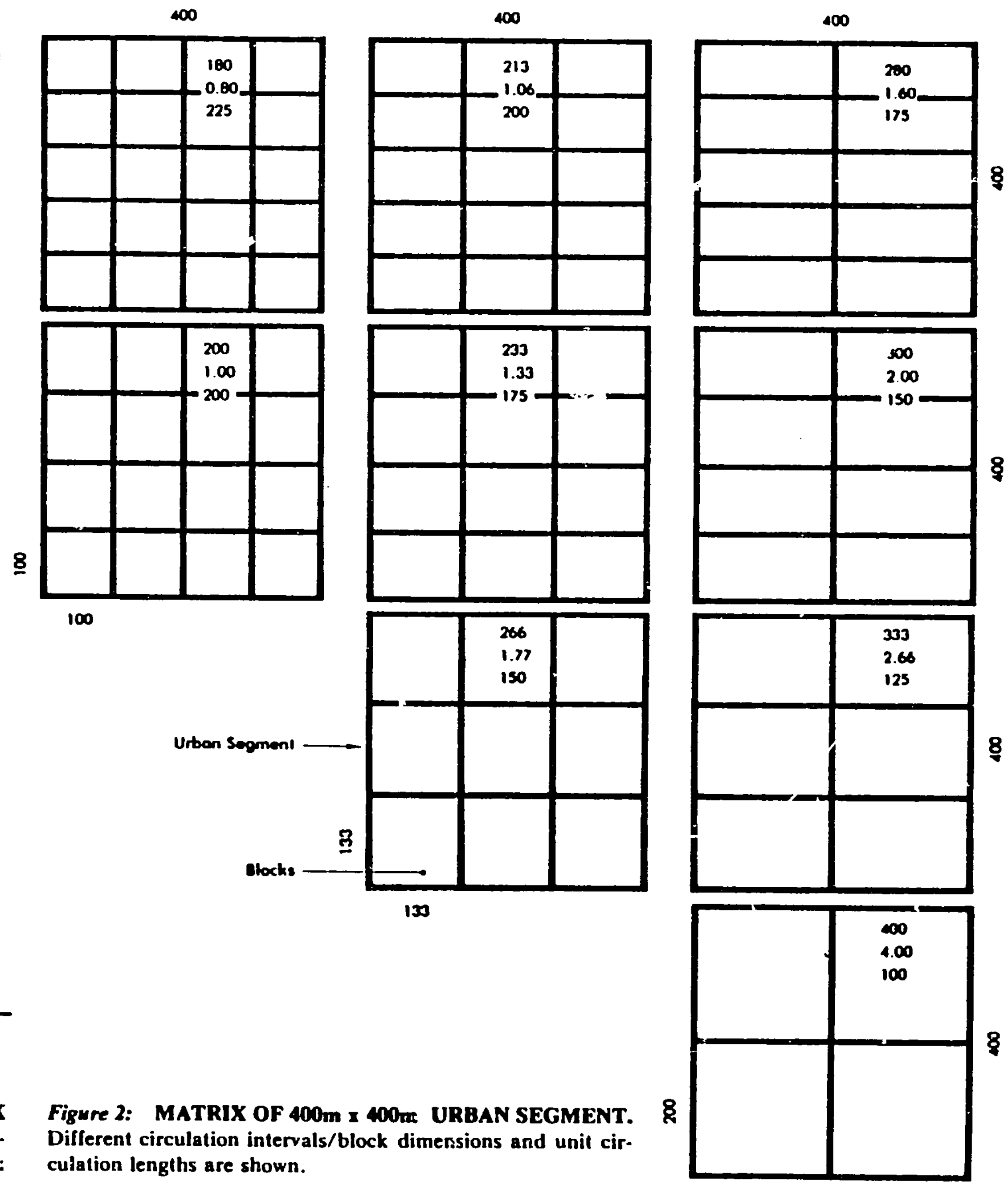


Figure 2: **MATRIX OF 400m x 400m URBAN SEGMENT.** Different circulation intervals/block dimensions and unit circulation lengths are shown.

URBAN LAYOUTS. The block is the characteristic element of urban layouts. A block is a portion of land containing one or more lots, bounded and served by lines of circulation. There are two basic types of blocks:

- *GRIDIRON BLOCKS*. These are blocks where the distances or intervals between lines of circulation and boundaries are determined by the dimensions of the lots, because they do not have lines of access. The most typical cases of the gridiron consist of rectangular blocks or curvilinear blocks. Both patterns can be most clearly identified in cities in the United States. The rectangular is found in the downtown areas; the curvilinear in the suburbs. But in fact, gridiron layouts have been used by most cultures.
- *GRID BLOCKS*. These are blocks where the distances or intervals between lines of circulation and boundaries are independent of the dimensions of the lots because the lots do have lines of access. Grid layouts have also been used by most cultures.

The Roman-Spanish layout of towns and cities of colonial Latin America was basically a gridiron where the intervals between lines of circulation were determined by the size of the lots contained in the block (generally four). However, in the course of time, the original lots were successively divided, becoming narrow strips of land with varied depths. In these cases, the new lots did not change the intervals of the lines of circulation, but on the contrary, their dimensions were the result of the configuration of the existing block.

The simple conditions of elementary geometry described above impose the following critical limitations upon urban layouts: a) It is not possible to minimize lines of public circulation when the urban layout is determined by the dimensions of the lot, or, in other words, in gridiron blocks; b) The only way to minimize lines of public circulation is when the urban layout is determined by circulation requirements and not by the dimensions of the lots, or in other words, in grid blocks.

Figure 1: **GRIDIRON BLOCKS. MERIDA,** Venezuela. Two cases are illustrated: Urbanización Santa Maria, developed by the Universidad de Los Andes, with large lots approximately $800m^2$; Urbanización Don Pancho, private development with medium lots approximately $200m^2$. The blocks are bounded by lines of circulation. In both cases the dwellings are detached, with a 3m setback from the property lines required by the zoning ordinance. Today these setback areas are encroached on by all kinds of construction.

Figure 2: **GRID BLOCKS. MERIDA,** Venezuela. One case is illustrated: Hoyada de Milla, a popular, progressive development, with varied lot sizes. It shows the lines of access: dead-ends and loops. The lots are deep and narrow, containing row housing.

Figure 3: **GRIDIRON-GRID LAYOUT. CAMBRIDGEPORT,** Massachusetts, U.S.A. Plan of a segment 400m x 400m. The original gridiron blocks vary in size. 150m x 60m, 105m x 80m, 110m x 90m. The streets are approximately 12m wide and circulations intervals range from 72m to 162m. The change over time from gridiron to grid can be observed in the land subdivision. Many properties have been divided longitudinally into deep and narrow lots. But others have been divided transversely into more nearly square lots. Those lots in the back are provided with lines of access to public streets. The buildings (not represented) are 3 to 5 stories high; but, in contrast with Mérida, they have detached or semi detached structures with open spaces around.

Figure 4: **ROMAN-SPANISH LAYOUT. MERIDA,** Venezuela. Plan of a segment 400m x 400m in the city center. The gridiron blocks are approximately 80m x 80m, the streets are 8m wide, and the circulation intervals are approximately 88m x 88m. The change over time does not affect the basic layout as it can be observed in the land subdivision. Most of the blocks have been subdivided into deep and narrow lots. The buildings (not represented) are 2 to 4 stories high and cover practically all the land leaving only the interior courts, which are small perforations in the solid layer of masonry and concrete. The few properties that have survived without change are: the Plaza Bolívar, the Cathedral and Catholic headquarters, the Universidad de Los Andes, all which occupy complete blocks; the Government House and the Market, which occupy only half-blocks.

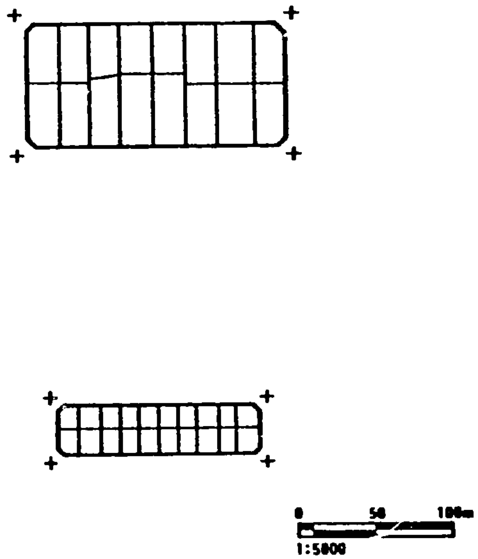


Figure 1: **GRIDIRON BLOCKS. MERIDA,** Venezuela.

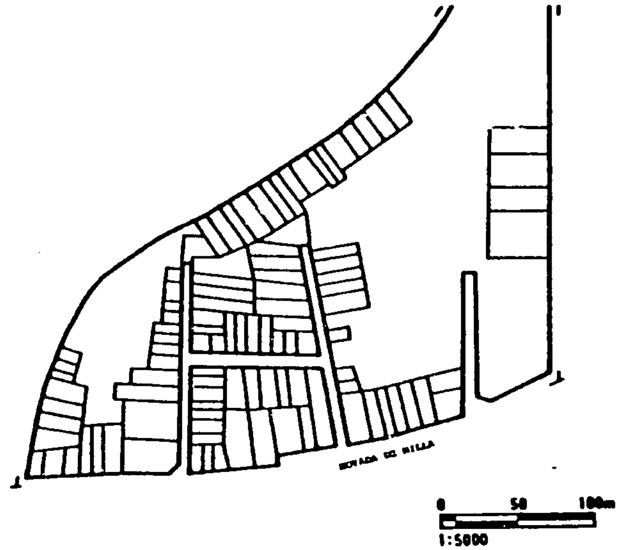


Figure 2: **GRID BLOCKS. MERIDA,** Venezuela.

Figure 3: **GRIDIRON-GRID LAYOUT. CAMBRIDGEPORT,** Mass., U.S.A.

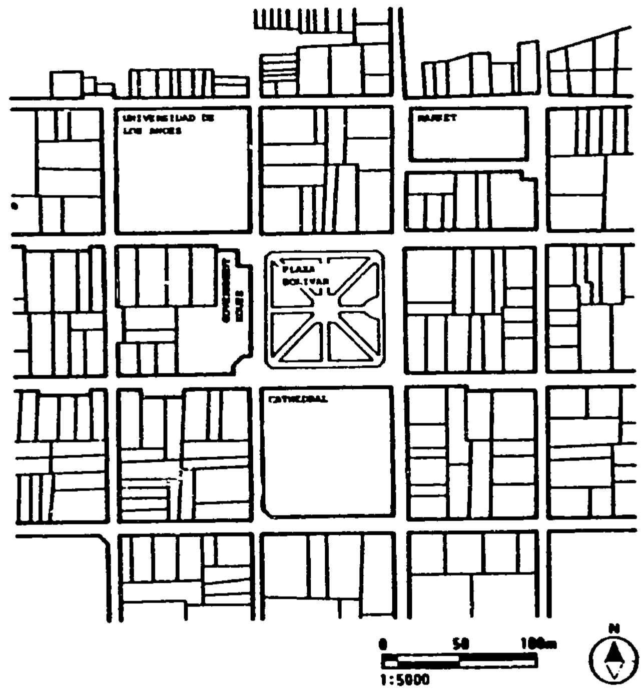


Figure 4: **ROMAN SPANISH LAYOUT. MERIDA,** Venezuela.

2.23 LAND UTILIZATION

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. The land utilization for the project should be considered to determine its urban layout. Data are recorded in plans, charts, reports. Types should be identified in terms of users, responsible agent, physical controls. (*See also: LOCATION, page 60.*)

DESCRIPTION. The utilization of the land in urban dwelling environments is a complex process; it involves the users as well as the public sector; it has wide social, political, economic implications. The utilization of the land is at the very foundations of any culture. Large-scale urbanization, however, is engulfing traditional cultural patterns everywhere, with negative consequences for the users and the public sector. A more rational land utilization is fundamental to environment, housing, public utilities and growth. The framework described below is not addressed to this high level of policy but rather to daily life problems. It draws from practical experience because there are no prescribed procedures. From repeated observations it is clear that the key to proper, adequate land utilization is a coherent relationship among users, responsibility and physical controls. This coherence should unequivocally be reflected by the physical design or plan. Proper, adequate controls of the land should: define the extent of a territory, facilitate its specific function, allow/encourage the users to assume their responsibility in terms of maintenance and operation. Neglect of these aspects is very common, for example, in the design of public housing everywhere. It takes the form of land waste, particularly in developments where walk-up apartments stand in open areas of undefinable use. The most common consequences are misuse of the environment, destruction, vandalism, unsafety, crime, poor maintenance, garbage thrown everywhere. Open areas become a no-man's land and frequently users in desperation resort to expediency controlling devices to make use of the land. Expediency controlling devices are fenced areas: for clothes drying, playgrounds, lawns. In public housing in Boston most of the above are used. In San Juan, Puerto Rico, entire housing projects are divided with wire fences to control the access to different areas, including parking lots. In public housing in Nairobi, open areas are garbage dumps. In some developments, occupants of the ground-floor apartments have been forced to define their territory with fences made out of bamboo in order to protect their privacy and to make use of the parcels of land in front of their dwellings. In Kampala, Uganda, open "no-man's-land" areas between walk-ups have become garbage dumps. But in Caracas, Venezuela, people have shown a more positive attitude by filling open areas between high-rise blocks with squatter shacks. The gravity of the consequences increases with the density of population. In low population densities of around 50 persons per hectare (as in the suburbs of high-income sectors, with lots of 500m^2 or more) the portion of land per capita is large enough to avoid conflicts originated by propinquity. But when the densities reach magnitudes of 200 persons per hectare or more (as happens in any settlement with a low- and very low-income population) the portion of land "per capita" has shrunk so much that conflicts are inevitable if the proper physical conditions are not created.

The following table indicates the four types of land utilization considered:

TYPE	*USER*	*RESPONSIBLE AGENT*	*CONTROL*
PUBLIC LAND is the urban area for circulation of pedestrians and vehicles. It includes streets, pedestrian lanes, open spaces.	crowd, unlimited number, anybody	public sector	minimum (legal)
SEMIPUBLIC LAND is the urban area of community utilization. It includes open spaces, playing fields, schools, etc.	groups, limited number, community	users and public sector	partial or complete (legal, physical)
SEMIPRIVATE LAND is the urban area of shared utilization held in condominium by a group.	groups, very limited number, owners, tenants, squatters.	co-users	partial or complete (social, legal, physical)
PRIVATE LAND is the urban area of residential, commercial, or small industries utilization. It includes lots and dwellings.	individuals, very limited number, owners, tenants, squatters	individual user	complete (legal, physical)

The components of the table are defined as follows: *Land utilization* is a qualification of the land around a dwelling in relation to user physical controls and responsibility. *Users* are the people or group of people who ordinarily and directly use a piece of land and the facilities that it contains. *Responsible agents* are those—users, co-users or the public sector—who have the obligation to assume the moral, legal or mental accountability for the proper use, operation and maintenance of the piece of land and the facilities that it contains. *Physical controls* are the physical, legal means or methods to direct, regulate and coordinate the use, operation and maintenance of the land by the responsible agent.

In the case of a project or an evaluation, it may be convenient to start by identifying the type of utilization; next, to anticipate the users; next, to determine the individual group or sector that should be responsible; finally, to provide the proper physical controls. Another course would be to start by identifying the users and then to follow a similar process.

The elements of physical control should be a part of the urban layout and should be extremely direct and simple. For example: The configuration and width of the streets provide control for the mode and intensity of circulation; location, boundaries and entrances provide control for the semipublic area; the entrance is the main control for private and semiprivate areas, etc.

LAND UTILIZATION TYPES. The different types of land utilization considered are as follows:

Public land is primarily allotted for circulation (streets). The percentage of land required for this purpose depends on the density of the network, which primarily is a function of the intervals of the circulation network and secondarily of the widths of the circulation land. A circulation network serving large blocks requires less land than a network serving small blocks. A city usually contains blocks of different sizes and therefore percentages of land for circulation are averaged. Surveys of urban areas show percentages that very between 20% and 30%; in practical terms however, the percentages of circulation can be considered as a constant. In the models illustrated further on (*See: THE MODELS, page 105*) the percentages vary between 21% and 38%. This last figure exceeds 30% as the result of small lots (100m^2) and inefficient proportion (1:1) in one of the layouts. In addition, the blocks are of the same size, which does not permit the averaging of percentages that occurs at the urban scale. (*See: LAND USES IN AMERICAN CITIES, Bartholomew, Cambridge, Massachusetts, 1955; URBAN DWELLING ENVIRONMENTS, Caminos, Turner, Steffian; Cambridge, Massachusetts, 1969.*)

Semipublic land is primarily allotted for public services (schools, playgrounds, etc.). The percentage of land required for this purpose depends on the population that it serves in terms of number and density. A small population requires certain public services; a larger population requires not only a proportional increase of these services but also the addition of new ones and consequently a higher increment in the percentage of semipublic land. For example: A community of 5000 people requires a primary school; but a community of 20,000 people, which is four times larger, will require not only four primary schools but also a secondary school. In the case of the models, however, for reasons of size they do not include secondary schools, parks, or any other public or semipublic areas that serve larger sectors of the population. In the community scale of the models the public services that demand more land are the primary schools with their playgrounds; other public services are located in buildings that do not require much land. In the models, an approximate percentage of 16% has been adopted for semipublic land, which corresponds to 16Ha of the model; a net density of 600 persons per hectare and a population of approximately 5632 persons. (*See: POPULATION DENSITY, page 84.*) The 16% has been derived from different sources like case studies and various zoning ordinances; it also has been tested with models. (*See: idem, Public land; NORMAS MINIMAS DE URBANIZACION, CINVA, Bogotá, Colombia, 1968: SIZE AND SHAPE, page 62.*)

Semiprivate land is primarily allotted to common uses (courts, shared jointly by neighbors in condominium). (*See: LAND SUBDIVISION, page 96.*)

Private land is primarily allotted for residential uses (dwellings but also shops and small industries). In this preliminary stage, semiprivate and private land is considered together since this simplifies matters without impairing the objectives. The percentage of land required for these purposes depends on the extension of the community as well as the density of the population. In the models the percentages vary between 45% and 63% and result from the subtraction of land devoted to other uses. (*See: idem, Semipublic Land.*)

The model represents cases with efficient and inefficient percentages of land distribution that can be identified in physical and economic terms. In fact, the raison d'être or function of the public land is to serve the private land; this originates capital costs (construction) and operation costs (administration and maintenance). In the public streets which provide both circulation and storm drainage, these costs include: paving, repairs, cleaning, street lighting and signalizing, control of public order and safety, administration, etc. All of these costs must be paid by levies or taxes on the private land served. The greater the proportion of public over private land, the greater is the burden on private land. The following examples illustrate this point.

CASES FROM THE MODELS		*AREAS (Ha)*		*SUPPORTING PUBLIC LAND PER Ha OF PRIVATE LAND*
Lots (m x m)	*Layouts (n)*	*Public Land*	*Private Land*	
14.00 x 14.50	2	5.29	8.20	$\frac{5.29}{8.20} = 0.64$Ha
14.00 x 14.50	3, 4, 5	3.40	10.09	$\frac{3.40}{10.09} = 0.34$Ha

The burden over the private land in the first case (0.64Ha) is twice that of the second case (0.34Ha). This circumstance is critical in the economic implications of the urban layout, particularly in the case of large developments where the factors that benefit or burden the community are multiplied several times.

All the above considerations make very clear the goals of land distribution in urban design: public land should be minimized to maximize semiprivate and private land. The semipublic land should be suited to the anticipated population density. The models also illustrate how to optimize these percentages to reach a constant level of public land that depends on the circulation intervals.

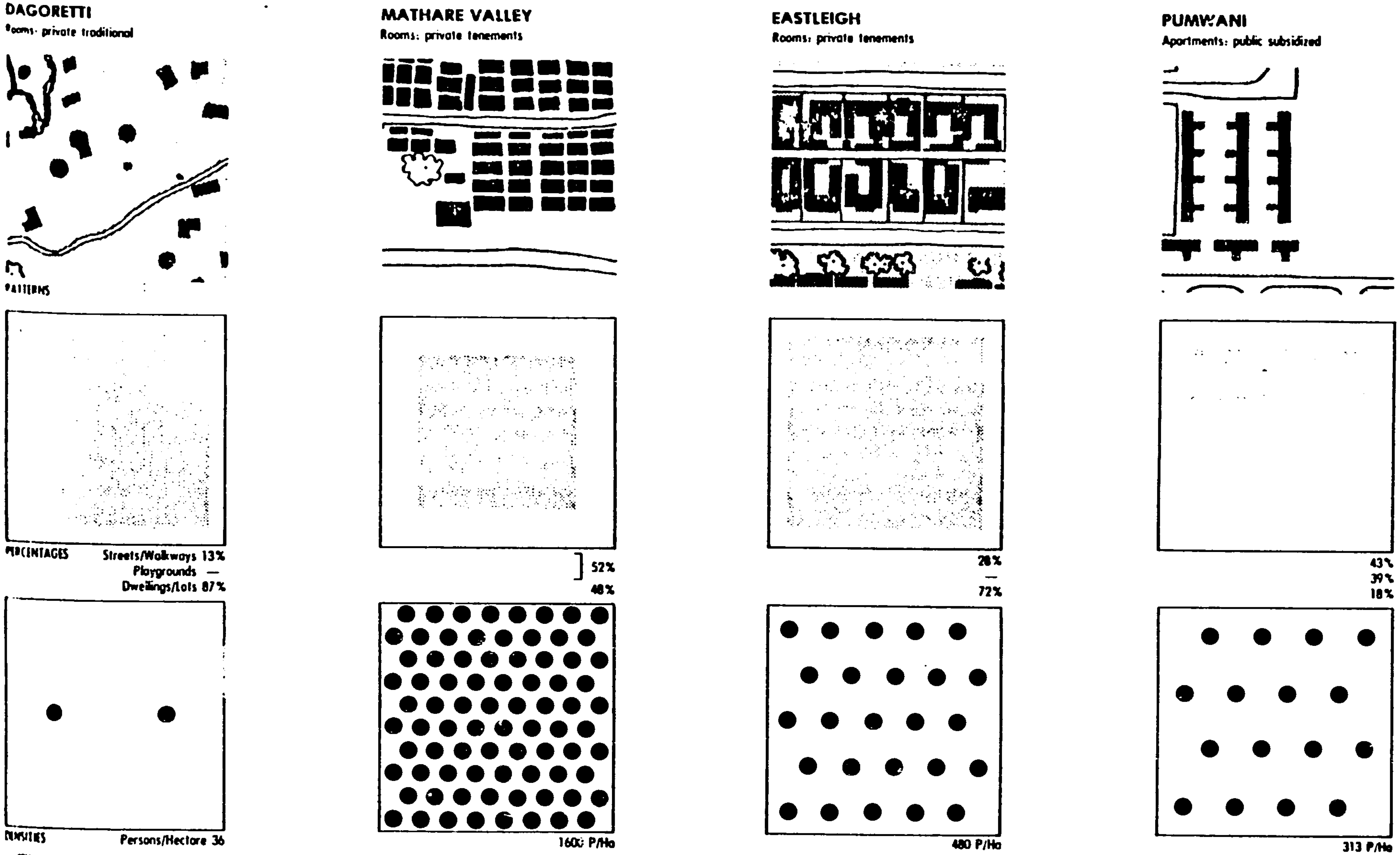
Figure 1 (opposite page): **FOUR EXAMPLES OF LAND UTILIZATION IN NAIROBI, KENYA.**

DAGORETTI. Rooms, private traditional. Income group: very low. Density: 36 people/Ha. Dagoretti is a group of villages with both traditional rural and squatter settlements. The villages were developed as early as the nineteenth century. Today, Dagoretti is being engulfed by the expansion of the city. Roads and walkways take only a small area leaving most of the land for private use. Despite these proportions, Dagoretti is a burden to the municipality because of the low population density; the low-income settlers are unable to pay for utilities and services.

MATHARE VALLEY. Rooms, private tenements. Income group: low. Density: 1600 people/Ha. Mathare Valley contains a series of squatter settlements started in 1939. In 1970, companies and cooperative societies built the rows of single-room tenements schematically shown. Today, this type of building shelters 40,000 low-income people. Walkways and alleys take a considerable part of the land, but they also provide the only open spaces available, since all the private land is covered by the buildings. There is no semipublic land. The high population density aggravates the poor living conditions.

EASTLEIGH. Rooms, private tenements. Income group: low. Density: 480 people/ha. Eastleigh is an area developed by Asians around 1910 as single-family dwellings. In 1963, after Independence, the dwellings were transformed into tenements with room units and occupied by Africans. Today they are overcrowded and badly maintained. The proportion of public land is within an acceptable range, despite the redundant service alleys. Most of the land is left for private use. Semipublic land is not provided. The population density is medium-high. Eastleigh could be improved in terms of land utilization if service alleys are eliminated and semipublic areas provided. Buildings need to be upgraded in terms of safety, ventilation, privacy, and cooking, washing and toilet facilities.

PUMWANI. Apartments, public-subsidized. Income group: middle. Density: 38[illegible] people/Ha. Pumwani is a tenant purchase/rental housing project developed by the public sector in 1967 to relocate the low-income residents of the area. Today it is occupied by middle- and even high-income groups: skilled laborers, professionals, small businessmen. Streets, walkways, and undefined open spaces take most of the land. A very small area is left for private use. Population density is medium-low. These factors do not allow user control and responsibility over the semipublic space; as a consequence, maintenance is very poor and privacy nonexistent. These factors make Pumwani a burden to the municipality.



The plans on the top row represent one hectare of land (100m x 100m). The **PATTERNS** of land utilization are illustrated as follows:

PUBLIC:	streets, walkways, open spaces	
SEMIPUBLIC:	open spaces	
PRIVATE:	lots	
	dwellings	

The squares of the center row represent the **PERCENTAGES** of land utilization of each environment. The land utilization tones are the same as the above; land occupied by dwellings is included in private. The squares in the bottom row represent the population **DENSITIES** of one hectare. Each dot represents 20 people.

2.24 LAND SUBDIVISION

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. The land subdivision for the project should be considered to determine block and lot layouts. Data is recorded in plans, charts, reports. Conditions should be identified in terms of types, areas, proportions, accesses, buildings, coverage.

DEFINITIONS. Land subdivision includes the components described below. *Block:* a portion of land containing one or more lots, bounded and served by public lines of circulation. *Lot:* a measured parcel of land having fixed boundaries and access to public lines of circulation. *Lot cluster:* a group of lots around a semiprivate common court that serves for access to the lots as well as for other activities of their occupants. This court is owned in condominium by the owners of the lots wo share its use, control and responsibility. *Condominium:* a system of direct ownership of a single unit in a multi-unit arrangement. The individual owns the unit in much the same manner as if it were a single-family dwelling; he holds direct legal title to the unit and a proportionate interest in the common areas and underlying ground.

The models included farther on (*See: THE MODELS, page 105*) are comparative and illustrate a variety of subdivisions found not only in site and services projects but also in other urban layouts. The following types and ranges are included:

BLOCKS (layouts): gridiron and grid. (*See Figures 1-4, pages 90-91.*)

LOTS (areas): from 20m^2 to 400m^2, to cover a variety of income ranges and dwelling options.

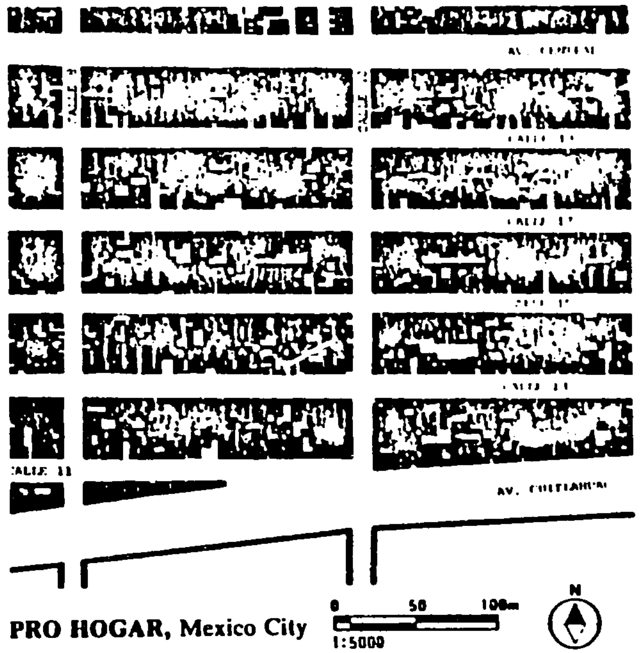
LOTS (proportions): Square and rectangular. Lot width (the narrow side) is facing the street or access. Minimum lot width is not less than the width of a room measuring approximately 4m.

LOTS (accesses): only lots with access on one side (the shorter) have been considered, except for the lots that are at the corners of the block. Consequently, lots with two, three, and four accesses have not been included because two accesses are extravagant; three and four are absurd. However, these configurations are often found in site and services projects. There are two types of configurations with two accesses. The first type has access on two contiguous sides of the lot and is the result of grouping a cluster of four lots surrounded with public circulation. In most cases there is no justification for this layout, particularly when lots are small. This configuration has been used in some projects with the added feature of grouping the four sanitary facilities of the dwellings at the intersection of the four lots in order to have only one service connection for water supply and one for sewage disposal, and therefore saving lengths of pipes. Other examples go back to the European colonies in Africa. Here the layout was meant to facilitate government surveillance of the natives as well as the movements of troops in the compounds where the natives were confined. The second configuration has access on two opposite sides of the lot and is the result of aligning rows of lots with access in the front facing a street and in the rear facing a service lane. This type is universal and has been particularly used in row housing. In the original layouts developed in the past, the lots were narrow and deep. In more recent layouts the depth of the lots was much shortened and the service lane became very narrow. This last version is applied today in site and services projects despite its negative results: the service lane is redundant and soon becomes a garbage dump, when not the stage for more serious offenses. In short, for social and economic reasons the question of lot accesses is crucial in land subdivisions. The configurations with two accesses have not been considered from the outset in the models because there is overwhelming evidence that they are a waste of land and a burden for both user and public sector in terms of maintenance, operation and control. These effects are even worse when lots are small, as is the case with most site and services projects. The models also include easement layouts with the lines of water supply and sewage disposal running through the center of the blocks (private land) in order to facilitate sanitary services in the back of the lots, thus reducing lengths of individual connections. (*See: WATER SUPPLY AND SEWAGE DISPOSAL [EASEMENTS], page 130.*)

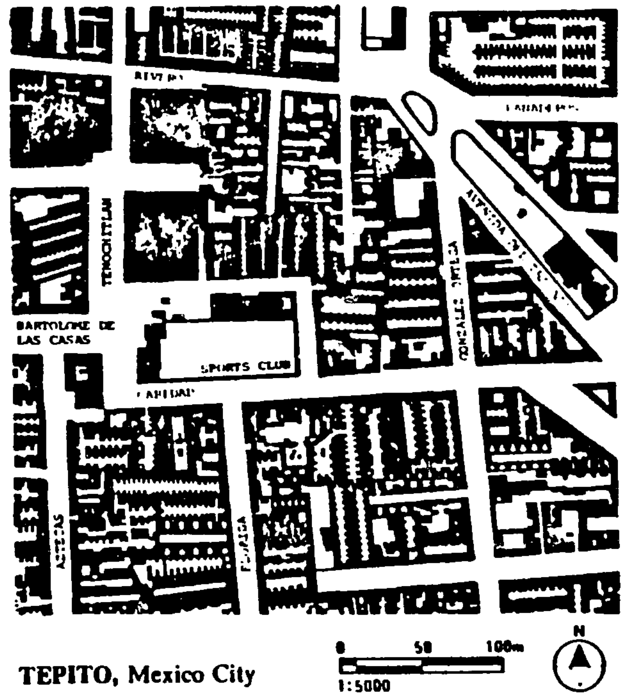
LOTS (building structures): Buildings will be predominantly 1 or 2 stories high, but may reach up to 4 or 5 stories. These heights will permit to cover a wide variety of dwelling options.

LOTS (coverage): assumed to be variable and of little or no significance. Despite rules, land is usually completely covered at the saturation stage of development, when the need arises of lodging more population without going into more expensive multistory structures. This pressure put on the land is difficult to control, for various rea sons: the lack of realistic codes; the lack of government mechanisms and resources for enforcement; the lack of other options offered by the government; etc.

The public sector could determine an adequate land coverage, but at the same time, it should create the instruments of control through groups of owners sharing the tenancy and use of the same semiprivate area. The models contemplate this option by including layouts that expand semiprivate land in clusters of individual lots. By minimizing the private land of the lots and maximizing the land owned in condominium, control of open areas is assured, because even in the event that some individual may overbuild on his own property, he will be prevented by the others from encroaching on the land owned in common.



PRO HOGAR, Mexico City



TEPITO, Mexico City

***Figure 1:* EXAMPLES OF LOT COVERAGE AND LAND SUBDIVISION IN MEXICO CITY.** (*Taken from: URBAN DWELLING ENVIRONMENTS: MEXICO CITY, Davila, Bazant, Cortes, Espinosa; Cambridge, Massachusetts, 1974.*)

PRO HOGAR (top). Plan of 400m x 400m segment. Gridiron layout, row houses, low income private development. Density: 410 people/Ha. Colonial Pro Hogar was developed in the early 1940's for workers of nearby industries. The lots are almost completely covered with buildings, for the backyards have been filled with rental apartments and rooms. Only small openings remain in a few of the lots. The public streets have become the only spaces available for play and other outdoor social activities.

TEPITO (bottom). Plan of 400m x 400m segment. Grid layout, low income, private tenement. Density: 796 people/Ha. Tepito is located in the city center near El Zócalo, the Cathedral and the Presidential Palace. It combines the largest second-hand market and the largest area of "slum tenements" (*vecindades*). It began to develop in the 1840's. The blocks are entirely covered with shops on the periphery and tenements on the interior. The white spinal columns on the plan are the narrow open alleys used by the tenants as playgrounds and for social activities.

2.25 LAND DEVELOPMENT

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. The mode of development for the project should be considered in order to determine staging priorities. Data are recorded in plans, charts, reports. Alternatives should be identified in terms of progressive, instant, combined.

DEFINITIONS. Three modes of development should be considered: *Progressive* is essentially the traditional procedure of the construction of the dwelling and the development of the local infrastructure to current standards by stages, often starting with provisional structures and underdeveloped land. It is generally practiced by the popular sector in illegal developments or by squatters with de facto security of tenure and an adequate building site. *Instant* is the formal and modern development procedure in which all the structures and services are completed before occupation. It is generally practiced by the private sector in commercial developments for the middle- and high-income population, and by the government in public housing. In the U.S.A. "super" instant developments have reached a peak in the so-called "turnkey" projects, which are complete housing "packages," provided with appliances, built-in cabinets, closets and carpets, ready to be occupied at the "turn of a key." The models illustrated further on (*See: THE MODELS, page 105*) are suitable for the two modes although the emphasis is on progressive developments. *Combined* is the development procedure which utilizes both progressive and instant modes. It may be practiced in large projects involving different types of programs and public as well as private organizations.

In the development process, those urban elements relatively permanent and those relatively changeable should be distinguished. They are characterized by land utilization and land tenure. The permanent elements are intrinsically the public and the semipublic land, which have untransferable tenure and a utilization that, once determined, will seldom change. The changeable elements are intrinsically the private and semiprivate land, which have transferable tenure, and which can be reduced or expanded in size by subdivision or by annexing adjacent properties, and which may contain all kinds of structures that are in a continuous process of change. Public and semipublic land can grow, if necessary, by taking private land, by direct purchase or by expropriation. All these are costly procedures in most cases. The private and semiprivate land cannot grow by taking public land and can only change within.

It is clear that an important question in any plan of development is the layout, extension and distribution of the different types of land utilization. In the case of public and semipublic land, this is an important point, not only for reasons of economy and efficiency as previously discussed in other sections, but also because while an excess of public and semipublic land is wasteful, scarcity is also undesirable if and when, in later stages of development, the need to provide a new school or playground makes imperative the purchase or expropriation of a relatively large piece of land that is by now high-priced. In the case of private and semiprivate land, since there is no possibility of change either in shape or in size, the flexibility or capacity for change depends on an adequate size and proportion of the block that will allow changes and modifications within. Narrow blocks, 30m to 40m wide, as frequently found in site and services projects, are totally inadequate because they will constrain the possibilities of internal changes to the point of paralysis. When, in addition, these narrow blocks are trapezoidal or curvilinear in shape, the condition is critical. This was the case in a large site and services project proposed for Dakar, Senegal.

A DEVELOPMENT PLAN should be prepared after preliminary studies in terms of stages; time; population to be settled; financing; social, economic and physical programs. Rigid plans or plans that do not leave room for changes are inoperative. A good plan is only anticipatory in the best of cases, particularly when it recognizes that land utilization, circulation, and modes of development are inseparable and interacting systems. For example, the staging of utilities will determine patterns of land utilization and vice versa. Maximum *FLEXIBILITY* should be provided to facilitate a continuous, smooth process of construction, habitation, evaluation and revision. The *INITIAL DEVELOPMENT* should permit: easy and direct access from existing roads; convenient pedestrian access to public transportation or extension of rapid transit; immediate utilization of existing available utilities, services and adjacent community facilities; minimization of costs to allow the focusing of resources on higher-priority items; and the rapid creation of an environment for the community.

It is paramount to set the stage for community activities from the very beginning. This need is attested by abundant evidence, social and economic. Anyone recognizes that the environment plays an important function in helping people to become identified with their surroundings and to share common interests; so much so, that if the environment does not contribute, the result is not neutral but destructive. For this reason it is essential to rapidly set the stage from the beginning. Negative and positive examples of these conditions are frequently found. In the public housing projects of instant development it is easy to recognize that positive environmental conditions have been ignored in favor of decorative or graphic effects for the benefit of the blueprints. The consequences are more than grotesque because they affect people; in fact, the deficient configuration of areas of different land utilization and the layout of buildings make very difficult the use and maintenance of the grounds, make very difficult the creation of an environment for the community, and make very difficult the social control that results from friendly relationships among users. Instead, the setting facilitates apathy, indolence, vandalism. This is repeated again and again in the "pampas" of concrete of the "monumentality"-inspired public housing in Mexico City, as well as in the "green areas" covered by garbage in the "garden city" public housing in Nairobi.

The situation is quite different in the popular settlements: squatters communities or illegal developments where the stage for community activitties is created from the start. Because of necessity coupled with lack of economic resources, the users resort to their ingenuity and imagination to develop places for the daily life of the community. Such is the case of stores, kiosks, open-air markets built in the squatter settlements in Nairobi. The people lay out these places and then erect simple stalls with wood posts and bamboo cane as a frame; leaves, tin, cardboard, plastic sheets as a cover. There they sell vegetables, food staples, and household goods. The market is the center of economic activity and the main source of self-employment in the neighborhood but, equally important, it is the meeting place for the community.

Figure 1: **PROGRESSIVE DEVELOPMENT. Kale, Ankara, Turkey.** Low income, traditional urban houses, popular development. (*Taken from: URBAN DWELLING ENVIRONMENTS, Ankara, Turkey; K. Bulent Tokman; Cambridge, Massachusetts, 1975.*)

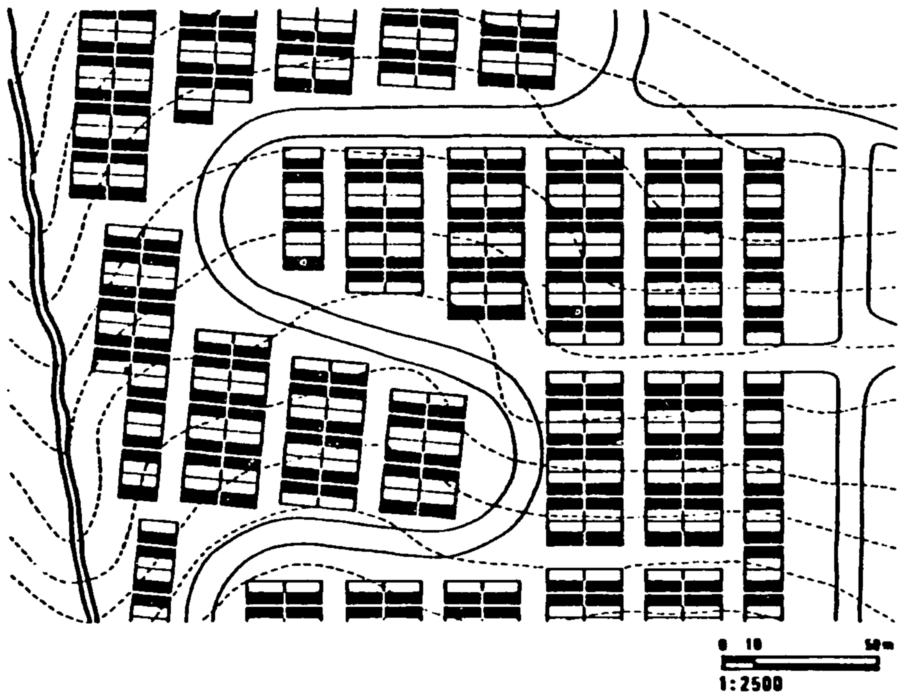


Figure 2: **INSTANT DEVELOPMENT.** Villa Socorro, Medellín, Colombia. Low income, group housing, private development. (*Taken from: URBAN DWELLING ENVIRONMENTS, Caminos, Turner, Steffian; M.I.T. Press, Cambridge, Massachusetts, 1969.*)

2.26 BASIC AND PHYSICAL-ECONOMIC DIAGRAMS

PLANNING/DESIGN/DEVELOPMENT CONSIDERATIONS. Basic and physical-economic diagrams for the project should be considered in order to anticipate physical-economic effects. Data are recorded in plans, charts, reports. Patterns should be identified in terms of circulation, land utilization, land commercial potential, land demand and market land values.

BASIC DIAGRAM. An urban area is essentially formed by the combination of two environments that can be the stage for all kind of activities and functions. In one, the emphasis is on any function except circulation. In the other, the emphasis is on circulation over any other activity. The differences in emphasis are an important factor in defining the main channels of circulation and basic networks of utilities. The following can be assumed: the first environment is provided by private, semiprivate and semipublic land; the second environment is provided by public land. (*See: LAND UTILIZATION, pages 92-94.*)

These two environments can be represented in a basic diagram in order to identify the primary most permanent structure of an urban layout and to provide a reference framework. A few simplifications should be performed in the diagram: a) to dispense with accessory elements such as lots, since it is important to make them independent of the circulation and not its determinant; b) to use only primary elements such as the blocks.

The basic diagram as well as the matching physical-economic diagrams shown on the opposite page, represent only the *grid layouts* of the models illustrated further on. (*See: MATRIX OF 20 BASIC REFERENCE MODELS, pages 108-109.*) These particular layouts are constituted of grid blocks of medium size and 150m/Ha as the unit length of circulation. (*See: CIRCULATION SYSTEM, page 128.*) Also, the central block provides the semipublic land; the perimeter blocks provide the semiprivate and private land.

The diagrams do not represent the two *GRIDIRON LAYOUTS*, included also in the models.

PHYSICAL-ECONOMIC DIAGRAMS. Circulation and land utilization patterns determine patterns of commercial potential, of demand and market land values. The physical plan should attempt to recognize these relations because they are reflected in the density of population, type of construction, and intensity of commercial activity, which particularly affects the configuration of both lots and buildings in terms of size. If the physical plan does not anticipate these relations or does not have flexibility to channelize the forces that they represent, the results are negative for the community. Several examples may help illustrate this point. The most common cases are found, as usual, in public housing. There are projects in which the developing agency expressly forbids shops and workshops in public housing. Consequently, the need has been filled in different ingenious ways. Street vendors are one of them. They temporarily park their vehicles in strategic points. But if the business prospers, the temporary becomes permanent. Here a lack of provision has been partially solved by popular enterprise. But the situation is often not better in those developments where the agency has proceeded with opposite criteria and provided spaces for shops on the ground floors of the buildings. Unfortunately, the spaces are dispersed and inadequately located. As a result, nobody is interested in renting them, they remain vacant, and they are soon vandalized and filled with garbage.

But the implications of ignoring these physical-economic patterns are really more serious. The families are deprived of perhaps the most important source of employment or additional source of income; the families are deprived of popular facilities and services: of easy access in terms of short distances, small and frequent purchases, and credit without credit cards; the families are denied the possibilities of progressive improvements; the traditional places of social activity in the neighborhood are eliminated, such as corner shops, etc.

As a contrast to the planned examples, the physical environment created by squatters and illegal developments have flexibility and capacity to absorb changes in many instances. Such is the case of the Mathare Valley settlement in Nairobi. In Mathare the development is progressive; self-employment prevails, with manufactured products that supply the local needs: clothing, shoes, household utensils, furniture, and even "changa," a corn gin illegally brewed on the premises. In Mathare, also, the "companies" or cooperatives speculate for lack of control but they still represent an important resource in the provision of dwellings for the low-income groups. The Mathare settlements have developed steadily along a strip of land between a small river and a major road. As can be imagined, the most valuable land is adjacent to the road. There, the original huts of mud and wattle are being rapidly replaced by better structures made of timbers, clapboard or corrugated iron sheets to accommodate shops, small industries, and rooms for rent. These structures have been developed by the "companies" or cooperative societies constituted a few years after the beginning of the invasions. But farther from the road and closer to the river, the original huts are still there. In Mathare, in short, the physical environment is in continuous change and reflects the different demands put on the land.

The accompanying diagrams are a very crude attempt at recognizing these physical-economic patterns. Nevertheless, their purpose is twofold: a) to recognize or anticipate the effect of the previously mentioned forces on the models; b) to incorporate in the models the proper physical configuration that will take advantage of these forces. In addition, the diagrams help to project an image of the possible process of development. The diagrams only indicate zones in a schematic manner; it must be clear that within these zones there will be other spots or subzones, such as corners or the private land across from the semipublic land, that will be insertions of a different pattern. Furthermore, because of the general character of the models, it has been decided to maintain the diagrams at a simple level to illustrate a principle more than anything else. In real cases, the acknowledgment of local factors will allow the developing of more detailed diagrams.

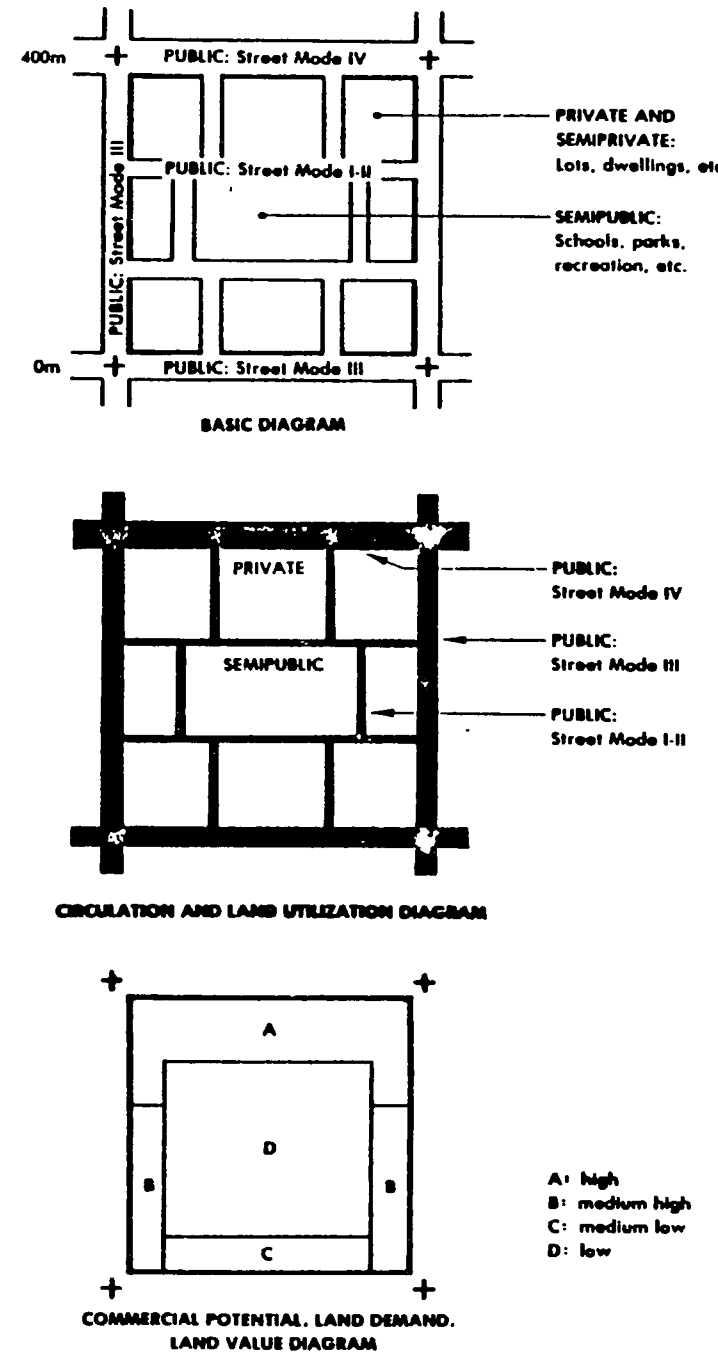


Figure I: **THREE DIAGRAMS.** The basic diagram shows the primary structure of the urban layout, which is a configuration of blocks and streets. Within this diagram, circulation and land utilization patterns determine patterns of commercial potential, of demand, and market land values as shown in the last two diagrams.

The April and May, 1979 numbers of _The Urban Edge_ are included here for their coverage of infrastructure planning issues when affordability by the urban poor is a major objective, and of innovative technology "appropriate" for application in societies where labor is plentiful and inexpensive relative to the availability of capital.

THE Urban Edge
FACTS & IDEAS

Vol. 3, No. 4 April, 1979

Water and Sanitation: Meeting Basic Needs

The members of the United Nations have declared the 1980s to be the Drinking Water and Sanitation Decade. However, to provide safe water and excreta-disposal systems to all people is an enormous task, considering that more than one billion currently lack these services and that another billion will also have to be served during the 1980s, based on the projected population growth.

Table I shows the number of urban dwellers in developing countries in need of access to safe water.* At least an equal number (about 1/3 of the urban population) need improved excreta-disposal systems, according to WHO statistics.

TABLE I: Urban Water Needs

Region[1]	Estimated Lacking Access To Safe Supply (millions)	Total Population To Be Served 1975-1985
Eastern Africa	7.8	19.6
Western Africa	8.6	19.7
EMENA[2]	16.2	46.0
Latin America and Caribbean	47.0	87.8
East Asia and Pacific	30.9	53.8
South Asia	78.9	136.1
TOTAL	189.5	363.1

[1]World Bank operational regions.
[2]Europe, Middle East, North Africa

Without better water and sanitation facilities, public health programs cannot succeed inasmuch as excreta-related diseases are responsible for many of the most common and severe illnesses in urban areas (cholera, typhoid, dysentery, malaria, and those associated with worms). In a 1971 study of West African cities, for example, about 40% of reported illnesses were water related, the most common being malarial, gastro-intestinal, and parasitical diseases. As noted in TUE (Vol. 2, No. 1), small children suffer most from these illnesses.

Providing safe water and sanitation facilities to the urban poor, particularly to densely populated squatter settlements, is among the most difficult challenges faced by officials. Ideal or preferred solutions, such as waterborne sewerage and individual house connections, are usually too expensive for urban poverty groups, at least initially. The costs of installing and maintaining a sewerage system, for example, may amount to as much as 50% of a community's income. 5% of income for water and sanitation services is frequently used as a rule of thumb for estimating affordability. Often, however, that is an unreasonable and unrealistic burden for the poor.

In addition to financial considerations, cultural, technical, institutional, political, and other factors must be investigated. What is important is to consider the range of alternatives, which we will attempt to do in this issue.

Water for the Urban Poor

Table II presents a classification of types of water-supply services. The extent to which this service is continuous, phased into other types of service, and includes "community education" must also be taken into account in doing urban development projects.

Table II: Major Types of Service

A. Individual house connections with multiple taps.
B. House connections with single taps
   B1. Individual house connections with single tap or a tap installed in a core facility, sometimes including a wash basin, a shower, and a WC.
   B2. A "courtyard" or "patio" single tap connection used by one family or groups of families.
C. Standpipes—public.
D. Wells, springs and surface sources.

*P.U. Report No. PUN 31, World Bank, Energy, Water and Telecommunications Department, August 1977. This issue relies heavily on the research of this Department, particularly its seven volume study of appropriate technology for water supply and waste disposal in developing countries (1978)

The Urban Edge is published monthly by the Council for International Urban Liaison, 818 18th Street, NW Washington, D C 20006 as a clearing house for practical experience in low cost service delivery and employment creation projects in developing countries. Material appearing here may be reprinted with source citation. Copies of reprints appreciated. Herbert H. Werlin, *Editor*. George G. Wynne, *Publications Director*

E Rainwater collection.

F Truck and vendor delivery to door or distribution point.

The per-capita costs of providing household connections to urban dwellers is estimated to be almost three times the amount necessary for standpipes. However, the price-difference may be even greater than this, depending on such factors as number of taps provided, sources and quantity of water, availability of skilled personnel and good materials, topography and soil type, accessibility, organizational and financial arrangements, political and cultural conditions, etc.

Because of the expense of individual house connections, some governments are recognizing the possibility of initially introducing standpipes to low-income areas and then, as it becomes financially feasible, to convert them to yard connections and, ultimately, house connections. Because lower income groups are frequently ignorant of the relationship between unclean water and disease, a hygiene-education program should be instituted in parallel with or ahead of a water project. With increasing public understanding of the importance of clean water, residents may be willing to pay for a higher level of service. In a Latin American city, this happened within five years of standpipe construction, causing barrios to petition for a full water distribution network including metered house connections. Examples of countries which are approaching their water-supply problems in a progressive way include:

• *Liberia*

In Monrovia, as in many other cities, many of the poorest inhabitants are found scattered among high income residential areas as well as in high density, well defined slum areas. The poor in high income residential areas often obtain their water through illegal connections. However, an estimated 70,000 Monrovians have limited or no access to pipe water.

To encourage legal connections in areas with access to piped water, the current $35 water-connection charge will be abolished in the first World Bank-supported water supply project here. Instead, a more progressive tariff structure will be introduced, subsidizing service to the poor. At the same time, about 100 standpipes are to be installed, together with more than 50,000 feet of piping, providing water to most of the city's slum areas.

• *Cameroon*

The Cameroon Republic is currently planning to provide all urban residents with water service by 1990. The approach being used is to provide: individual house connections at 10 persons per connection to the upper 40-50% income group in Douala and Yaounde and the upper 30% in all secondary centers; yard connections serving 30-35% of the population with an average of 50 persons to connection in all centers; and the remainder with standpipes at 500 persons per standpipe.

While cost recovery through the use of yard connections should be possible in some of the better organized urban communities, the government recognizes the difficulty of cost-recovery of standpipe consumption. Consequently, a cross-subsidization system is being developed, under which much of the cost of the project is being borne by commercial and industrial customers.

• *Philippines*

Currently, less than half of Manila's 5.5 million population receive water from the Metropolitan Waterworks and Sewerage System (MWSS). The others are largely dependent upon vendors, wells, or rainwater containers, resulting in water likely to be expensive, unreliable, and polluted.

Under a World Bank-financed $130 million water-supply project, 60% of the population is to be provided a safe water supply by 1982. However, there is the problem of what to do in the meanwhile for those without any water supply at all. As a possible solution, a pilot project is being attempted in Pateros, a poor municipality of approximately 40,000 within Metro Manila. This will involve bringing in water by road tankers, filled at MWSS pumping stations or similar installations, during off-peak hours, and discharged into large storage tanks.

For this pilot project, a system of five distribution points has been devised, located so that most families will be within 300 meters of one of them. Each family will be allocated no more than 2 gals. per head per day, but this would be available at a controlled price which would be considerably lower than that charged by vendors. Thus, for the first time, the quality, reliability, and price of the supply would be guaranteed; and residents would no longer be totally dependent upon water vendors, though they could continue to buy additional water from them.

By 1982, when the main supply will be available, no household will be farther than 200 meters from a standpipe. Each household will then be provided with at least 20 liters per capita per day.

Paying for Water

Some countries could provide the poor with access to safe water if they could develop a system for charging users and collecting the amounts owed. The lack of such a system may mean that higher-income groups with household connections escape paying for water, while low-income groups, dependent upon vendors, are increasingly burdened by the cost of water. In one large Central American city, for example, many low-income families pay seven times as much for water per liter as middle-income families and five times as much as high-income families. Consequently, their per-capita water consumption is about one-fifth the average consumption here.

Water-metering is the conventional approach used to charge for water supplies and to prevent waste of water.* Without it, cities face the expense

*World Bank, P.U. Report No. PUN 29 a, June 1977 not only of providing increasing quantities of water but also of removing, treating, and disposing of additional wastewater.

Unfortunately, many countries lack the administrative capacity to keep meters properly repaired and read and to detect and repair leaks. In one large East African city, according to a recent World Bank study, only about 40% of the water delivered was being metered, and much of that was of dubious accuracy. In many cities, over 50% of the water is unaccounted for or wasted. The problem is particularly great for cities in which much of the water comes out of standpipes. However, research is currently being undertaken into coin-activated or similar dispensing mechanisms suitable for use on these standpipes. While more research and experimentation is needed, some countries have developed innovative administrative systems for dealing with this problem, including:

• *Sudan*

In Port Sudan, standpipes are situated every 40-50 houses in a number of the newer serviced areas. Each standpipe is rented to a kiosk owner who is responsible for the connection. The water is metered and sold at a standard rate to the kiosk owner, who resells it at controlled prices to the public. In addition to small sales carried away in tins, a number of houses are supplied by pipes connected to kiosk meters, based on which consumers pay the kiosk owners.

• *Kenya*

Under the second World Bank-financed Kenya Urban Project, the Nairobi City Council has agreed to provide water kiosks at appropriate locations in a number of low-income areas of the city. Operators will be licensed and regulated. To ensure that water is supplied at a cost affordable by the poor, water charges to kiosk operators will be reduced by 50%, enabling them to reduce their charges to customers by about two-thirds. Inspections are to be periodically carried out to ensure that the appropriate quality, quantity, and cost of water is maintained.

• *Brazil*

Because of the difficulties of water-metering, some countries absorb the costs of providing water through high lump-sum charges for an initial connection and subsequent high monthly fixed charges. However, according to World Bank research, consumers in the lowest 40% of income levels typically use only 12% of the total domestic water consumption. Therefore, to give these consumers service at half-cost would only add 7% to the bills of the other consumers.

In Salvador, the State Water Company charges a highly subsidized water connection fee to poor people. In Recife, the State Water Company charges full average costs as a connection fee, but this is forgiven on a case-by-case basis. In 1977, it forgave 42% of connection fees. The State Water Company in Fortaleza is proposing to capitalize connection costs into the tariff structure and only charge nominal connection fees. In Florianopolis and Juiz de Fora, the water companies agreed to work with the planning agencies to define poor areas so that connection fees would not be a serious impediment to the obtaining of water supplies by the urban poor.

Community Acceptance

There are many examples of people ignoring, rejecting, or misusing sanitary and water facilities provided by governments.* Each innovation requires behavioral changes or adjustments: acceptance of increased taxes or charges, new hygienic practices, cooperation with neighbors to maintain the facility and prevent misuse of it, training and supervision of children's utilization, etc. Unless people understand and appreciate what is offered or available, innovation may do more harm than good.

What is necessary is increased communication or dialogue between communities and government agencies. Using a dialogue approach, agencies should encourage communities to play a major role in: (1) defining their existing situation; (2) choosing among alternatives; (3) determining methods of implementation; and (4) setting up social controls for continued use and maintenance.

As pointed out in TUE (Vol. 2, No. 1), cities, such as Jakarta, Calcutta, and Manila, use voluntary or community health workers to provide information to local families on many aspects of health, including personal hygiene and environmental sanitation. What may also be effective are visits to demonstration projects, lectures and slide or movie presentations (particularly in schools), and the use of radio and other mass-media devices. While particular attention must be paid to community leaders, it is also important to include women insofar as they are responsible for the health, training, and well-being of their families.

Training

Next to insufficient financing, the lack of trained personnel was considered in 1970 by officials in 86 countries to be the greatest constraint to the improvement of community water supplies, according to a WHO survey.** This same survey found that, except in a few countries, training facilities were available for only a small fraction of the professional staff serving the water sector. It noted that, while the situation may be somewhat better for subprofessionals in the water supply field, it tended to be worse for sanitation or sewerage staff.

The inadequacy of competent personnel at the operating as well as the managerial levels accounts for the frequent lack of spare parts and preventive maintenance in developing countries. As a result, some of these countries excessively rely upon European or North American engineers and contractors, who are oriented towards highly mechanized facilities.

*World Bank, P.U. Report No. RES 15, September 1978

**World Bank, P.U. Report No. PUN 28, June 1977

Ideally, a sanitation engineer should have a multidisciplinary university education covering the fields of engineering, chemistry, biology, and the health sciences.* It is also important for training to continue on the job. In-service training through specialized short courses is particularly important for sub-professional personnel to supplement whatever training they may have received from technical institutes.

Some of the countries that have recognized the importance of training in water-supply and sanitation include:

• *Brazil*

Brazil's National Housing Bank (BNH) utilizes the Brazilian Association of Sanitary Engineers (ABES) to prepare trainers who serve the needs of the 22 state-owned water companies, using, whenever possible, existing training and educational institutions. The policy of BNH is to provide an incentive to these companies, facilitating the systematic and continuous training of their personnel at all levels through grants amounting to 1% of their payroll. This incentive decreases as the states take on the responsibility for training. So far, more than 40,000 professional, technical, and administrative personnel have benefited.

Periodically, BNH arranges seminars at attractive locations where the directors of state water companies can meet with distinguished intellectual and business leaders to discuss the planning, management, and finance of projects. The purpose of these seminars is to get these directors to develop a greater concern for the people they employ and serve, rather than merely for facilities. One outcome has been the establishment by each company of similar types of seminars for their second tier of executives.

• *Tunisia*

The Tunisian National Water Company (SONEDE) has undertaken a comprehensive manpower management plan for personnel at all levels "to create a healthy and positive working environment." Full use is made of training resources provided by government, universities, technical institutes, USAID, and other organizations.

• *Colombia*

Since 1966, the Bogota Water and Sewerage Company, with World Bank encouragement, has had one of the most ambitious programs in Latin America to upgrade its organization and staffing. The result has been that salaries have improved and staff turnover cut. Between 1967 and 1971, the number of employees with university degrees increased from 44 to 150. In addition, more than 300 employees during this period were put through various types of training programs. Consequently, work which used to be contracted entirely to consultants is now done to some extent in-house.

*One of the universities with specialized programs for those from developing countries interested in water and waste engineering is the Loughborough University of Technology, Loughborough, Leics, England. Readers may write to John Pickford there for more information, c/o Dept. of Civil Engineering.

Intermediate Sanitation Systems

Because of the expense of the conventional sewerage system, many developing countries are studying alternative solutions. The suitability of these technologies depends upon water supply service levels, soil conditions, housing density, financial constraints, hygiene habits, and institutional capability. Richard Feachem and Sandy Cairncross of the Ross Institute have evaluated a number of different systems based on these and other considerations.

John M. Kalbermatten and DeAnne S. Julius of the World Bank staff suggest the importance of a step-by-step approach, leading from one option to another and designed from the outset to minimize costs over the long run. Thus, a community could initially select one of the low-cost technologies in the knowledge that, as their socio-economic status improves, it could be upgraded, depending on the desires of the users.

To demonstrate the feasibility of using a staged sanitation system, the following schemes are described. (See Figure 1) Each scheme could be started at any stage or terminated at any stage and varied as needed:

I. *The Waterless Latrine Scheme.* The initial installation would consist of a ROEC or vault latrine with the vault extending outside the latrine housing to permit easy emptying. Emptying would be required every five years. This stage would last until the community water supply was upgraded from communal standpipes or wells to yard hydrants. With increased water availability the dry latrine would be converted to a pour flush latrine by adding a squat plate or bowl with inverted siphon or aquaprivy waterseal. A baffle and overflow pipe would also be added to the vault to carry the overflow liquid to a soakage pit or drain field. Annual collection of accumulated sludge would be required along with a facility to compost or digest it. The third stage would begin when the water supply service is upgraded to house connections and a large quantity of sullage water has to be disposed. At this point a small diameter sewer system would be constructed to accept the overflow from the vaults (replacing the drain fields). This solution would permit the use of cistern flush toilets. Annual collection of sludge would still be required.

II. *The Pour Flush Latrine Scheme.* The initial installation would be a pour flush latrine with a vault which is emptied by vacuum truck at one month intervals. The collected nightsoil would be composted, digested, or treated in stabilization ponds. As the water supply was upgraded this scheme could follow the same second and third stages as Scheme I.

III. *The Cistern Flush Scheme.* This scheme is essentially for those few users in an urban poor area who already have water connections in their houses. It begins at the second stage of Schemes I and II but with a flush toilet rather than a hand flushed bowl or squat plate. The eventual installation of small bore sewers would depend on water usage and population density.

Below are some examples of countries that are following a step-by-step approach, each step being based on a realistic assessment of conditions and needs.*

• *Tanzania*

In its first World Bank-supported site and service project (1974), traditional pit latrines were used for excreta-disposal, with construction and maintenance being the responsibility of residents. These have proved acceptable enough to be used in Tanzania's more recent urban development projects.

Because of persistent problems with odour and harmful insects, the government has encouraged experimentation with possible improvements. One apparently useful innovation is the provision of a 150 mm black-painted vent pipe located externally on the sunny side of the latrine superstructure. The air in the vent pipe heats up, circulating in such a way as to eliminate odours. By screening the vent pipe, fly nuisance can be substantially reduced. It can also be designed to be emptied manually or mechanically. The ventilated pit (VIP) latrine appears to be a low-cost, trouble-free, and hygienic solution.

Following a recent UNDP mission, the Tanzanian government is planning to construct approximately 100 VIP latrines in a sites and service area in Dar es Salaam. These will be tested to determine the most appropriate methods for construction, emptying, and maintenance. Based upon this research, VIP latrines are expected to be used in the Morogoro Urban Development Project and other projects throughout the country. (We will keep readers informed of the results of these tests.)

• *Zambia*

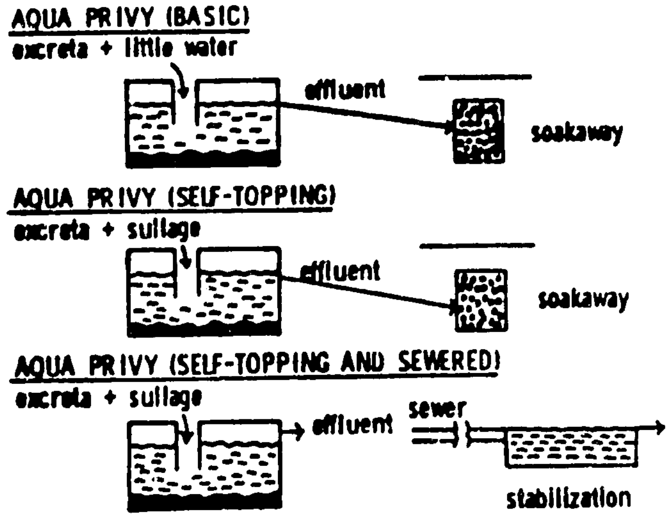
Conventional aqua privies, consisting of water-filled tanks located directly beneath squatting plates have not proven successful in Zambia. The water seal frequently has not been maintained, causing strong odour and fly or mosquito nuisance.

More successful has been the connection of aqua privies to a low-cost sewerage system, with treatment of the sewage in a series of waste stabilization ponds. (See Figure 1) Because the sewered aqua-privy system is designed to carry only sullage (i.e., waste-water), the pipes can be small in diameter (100-150 mm) and laid at flat gradients. As such, it is about half the cost of conventional sewerage.

Provided there is a reliable on-site water supply, sewered aqua privies work extremely well. In Matero, a suburb of Lusaka, they have worked for 18 years without any municipal maintenance whatsoever. Ordinarily, however, it is important to properly maintain the sewer network and the treatment ponds and to regularly desludge the aqua-privy tanks.

*For more information on this subject, readers should write to Ross Institute at the London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, London WC1E 7HT, England.

Figure 1: Sample Sanitation Sequence



• *Taiwan*

In Taiwan, sewerage systems serve only a minority of the population. In some cities, such as Pingtung, there is no public sewerage system for the approximately 200,000 population. While 57% are served by septic tanks, the remainder is dependent upon nightsoil collectors, one-third of whom are employed by private contractors. Private collectors are most active in the peripheral areas of the city where nightsoil is freely collected for agricultural use and for use in the local family-size biogas plants.

The city of Pingtung employs 40 workers for its public collection of nightsoil from vaults, which need only be emptied at fortnightly intervals. While much of the work continues to be done by hand, using dippers, buckets, and three-wheeled carts, it is being increasingly mechanized with the use of small motorized vehicles and equipment. The nightsoil is transferred to three 4.2 ton trucks, each equipped with an additional trailer of 2 ton capacity. Under normal circumstances, one of these trucks is held in reserve, while the other two are operated.

• *Japan*

While an increasing number of Japanese cities are introducing or expanding sewerage systems, less than one-third of the population is estimated to be served by these systems. Much of the remaining population relies upon publicly operated nightsoil collection and disposal systems. A considerable portion of the population uses flush toilets, connected to domestic septic tanks.

In Kyoto, for example, municipal nightsoil collectors serve a population of more than 600,000 within a service area of 326.1 sq. km. Using more than 200 vacuum trucks, they collect directly from household vaults twice monthly. Removal of sullage from areas served by this system is through the use of concrete-lined drainage canals maintained by the city.

The nightsoil is either transported to transfer stations or directly to the municipal treatment plants. At the transfer stations, the nightsoil is stored for discharge into municipal sewers during off-peak hours.

Solid Waste Management

An increasing number of cities are concerned about the problem of trash-collection. Many cities have no organized system for garbage collection, and citizens increasingly complain about the resulting filth, odour, insects, rats, and diseases. The efforts being made in some developing countries, including Egypt, to more effectively use scavengers was considered in TUE (Vol. 2, No. 5). We will return to this problem in a later issue.

Readers interested in this subject might wish to obtain Frank Flintoff's MANAGEMENT OF SOLID WASTES IN DEVELOPING COUNTRIES (New Delhi: World Health Organization, 1976). It covers, among other topics: data gathering, refuse storage methods, systems of collection, use of vehicles, street cleansing, treatment and disposal, and financial evaluation of methods used.

Urban Poverty Targeting in World Bank Water Supply/Sanitation Projects

by J. Courtney & A. Cooperstock

The World Bank has committed itself to a program to help national governments alleviate poverty in the rapidly growing cities in the developing world. An overall Bank lending target has been set for 1980 that at least one-third of all urban related lending will be directly beneficial to the urban poor. The water supply and sanitation projects financed by the Bank are an integral part of the program. Recently particular attention has been given to improving the planning process to significantly increase the benefits to the urban poor. As a result, with the new approach to project design, it is possible to address the needs of a substantially larger number of the urban poor with substantially the same or a marginally larger allocation of funds. Many examples can be found, such as in recent projects in Cameroon, Morocco, and the Philippines.

Meeting the needs of the urban poor requires some tailoring of projects to supply water they can afford. The prime objective is to spread basic benefits in a community. Often this will conflict with the traditional patterns of serving the needs of the rich first. The poor are often spending a high percentage of their income needlessly on costly methods of supply, and many are not reached by the municipal supply. The goal has been to provide a safe and sanitary supply of basic water (15-20 litres/capita/day) in a manner that permits reaching the broadest number at a price they can afford.

This is not a grant program. The projects have to be economically viable and financially feasible. Investments should be structured to provide a spread of benefits across the whole income range with particular focus on the poor population.

Recent water supply projects reflect this new approach. To facilitate the inclusion of urban poverty components, specific urban poverty analysis and targeting work has been either programmed or provided in the past two years for 30 projects distributed throughout the world. Criteria and processes for identifying the urban poverty groups and their water supply and sanitation needs are now being systematized. A realistic program for addressing those needs is simultaneously being developed. In some cases, this means emphasis on reduced standards of service, e.g., standpipes or patio connections rather than house connections; something which many governments would have to be induced to accept or support as an ongoing program. Rationing of water may also be required.

The process, which has evolved for city-wide analysis and targeting for the urban poor, not only has application to water supply and sanitation projects, but also to shelter, transport, education, and other sectors. Conceptually, the approach is to identify spatially the urban poverty group in a particular city, determine their basic needs (water, sanitation, shelter), and develop a program to meet these needs over a five to ten year period. In doing the urban poverty analysis, consideration is given to the following factors:

1) the size and location of the urban poverty target group in the project city or cities;

2) the need of the target group for basic water/sanitation services which the project could provide;

3) the impact of the project on the target group after the project is completed;

4) the number of the urban poor which will still remain in need of the projects' basic services after its completion and how these will be provided, by whom and over what period of time.

Obviously the earlier this is done in the project development cycle, the more influential the work will be in directing funds for water supply and sanitation to satisfy the urban poverty groups' basic needs.

The poor are the main victims of inadequate—or non-existent—water supply and sanitation both because of inability to pay and lack of knowledge of the consequences of their unsanitary living conditions. Recognizing this fact, the Bank is placing increasing emphasis on the needs of the poor. Thus, it requires the following to be taken into account:

(1) the percentage of the poor benefiting from the project relative to others served; and

(2) the percentage of the project cost (and the loan/credit amount) producing direct benefits to the urban poor.

A recent detailed look at ten World Bank water supply and sanitation loans for FY 79, amounting to about US $690 million, shows that an estimated 22 million people—of whom 9.7 million (42%) are in the urban poverty group—will benefit directly. In individual projects, the percentage of urban poor beneficiaries ranges widely from a low of 11% to a high of 70%.

The experience to date has resulted in a substantial improvement in the techniques and methods used. A new sensitivity has emerged which is now reflected in current project design. While a good start has been made, there is still a big job to be done to meet the urban poor's basic water and sanitation needs.

ISSN 0163-6510

Vol. 3, No. 5 May, 1979

Traditional Construction: Adapting Old Ways

In developing countries as a whole, it is estimated that about 10% of total employment is derived from construction activity. Insofar as the capital investments per worker are kept low by enterprises involved, this industry is a good employment source for the urban poor. Moreover, while not actually employees of the construction industry, a large percentage of the population are periodically active in it because of the traditions of self-help building. Consequently, the United Nations has recommended that public policy "be directed towards preserving, encouraging, and improving this type of production."

Traditional construction is often of high quality and durability. In Botswana, for example, thatch roofing and mud bricks can be expected to have life spans of 20 years or more with only minimal investments in maintenance* (see Figure 1).

Unfortunately, many countries have attempted to impose unrealistically high construction standards in urban areas, thereby discouraging traditional technologies. This practice may stem from the use of European or North American standards and codes or from an excessive reliance on foreign contractors and professionals. Typically, the effect of this is to divert more than 50% of total building costs into the importation of building materials. Another is that imported materials often inflate building costs. In Ghana, for example, experts have indicated that it is possible to reduce the cost of a house by 15% through using such indigenous components as fired clay products, stabilized soil, and timber rather than those currently used. Thus, only 8% of the value of this house would have to be imported instead of 40%. Delays stemming from the lack of facilities are additional reasons for reducing imports. In some countries, shortages of imported building materials are estimated to cause the final building costs to fluctuate by as much as 60% above the initial tendered sum. These higher costs result from the need of contractors to pay more for scarce materials and to pass on to consumers the costs of employees kept idle by shortages.

The following are suggestions that have been made to encourage the development and use of indigenous materials:

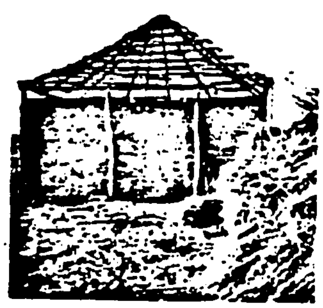
(1) Suppliers of locally produced building materials should be given preferential treatment in regard to government contracts, credit, and research or training programs.

(2) Residents using local materials should be given training and assistance in using these materials.

(3) Existing prejudices against local materials should be reduced by demonstration programs, mass-media presentations, and marketing or promotion efforts. Public buildings should set an example, using local materials as much as possible, based on design competitions among professional societies. In urban development projects, special effort should be made to design and construct community facilities and model houses with this objective in mind.

(4) Wherever necessary, governments should set up production centers for standardized doors, windows, flooring, furniture, bricks, and other such structural components. In addition, they may have to establish cooperative stores for these products, if the private distribution system is inadequate.

Figure 1. Soil block house with thatched roof under construction in Botswana (left) and completed structure (right).



*Earl Kessler, A ROLE FOR REPLENISHING RESOURCES IN SHELTER PROGRAMS (Washington, D.C.: Foundation for Cooperative Housing, 1979); BUILDING MATERIALS INDUSTRY, UNIDO Monograph No. 3, 1979.

The Urban Edge is published monthly by the Council for International Urban Liaison, 818 18th Street, NW, Washington, D.C. 20006, as a clearing house for practical experience in low cost service delivery and employment creation projects in developing countries. Material appearing herein may be reprinted with source citation. Copies of reprints appreciated. Herbert H. Werlin, Editor; ...

(5) Governments should improve their research programs dealing with the replenishment, processing, and utilization of local materials. Insofar as local materials are subject to pest and water damage, structural weakness, and rapid deterioration, ways should be studied to protect and strengthen them. Likewise, the technology of assembling, finishing, standardizing, and transporting these materials may have to be improved.

While here emphasizing the importance of developing indigenous materials, other considerations must also be taken into account in making appropriate technological decisions, including speed of delivery, initial cost, recurrent cost, labor requirements, ease of maintenance, and replicability.* Mud bricks, for example, are not necessarily the best choice for a large urban housing project. The location and climate may not be suitable. The soil may not be good enough, or it may be expensive to analyze and use properly. Experienced supervisory personnel may not be available. Nevertheless, the following countries, among others, have recognized the importance of encouraging the use of indigenous materials in some of the ways indicated:

- *Peru*

Peru's *Colegio de Ingenieros* (College of Engineers), encouraged by the Ministry of Housing and Construction has established what is called the *Proyecto Experimental de Vivienda* (Experimental Housing Project). This project has received UNDP aid in helping the local building industry to adopt appropriate technology.

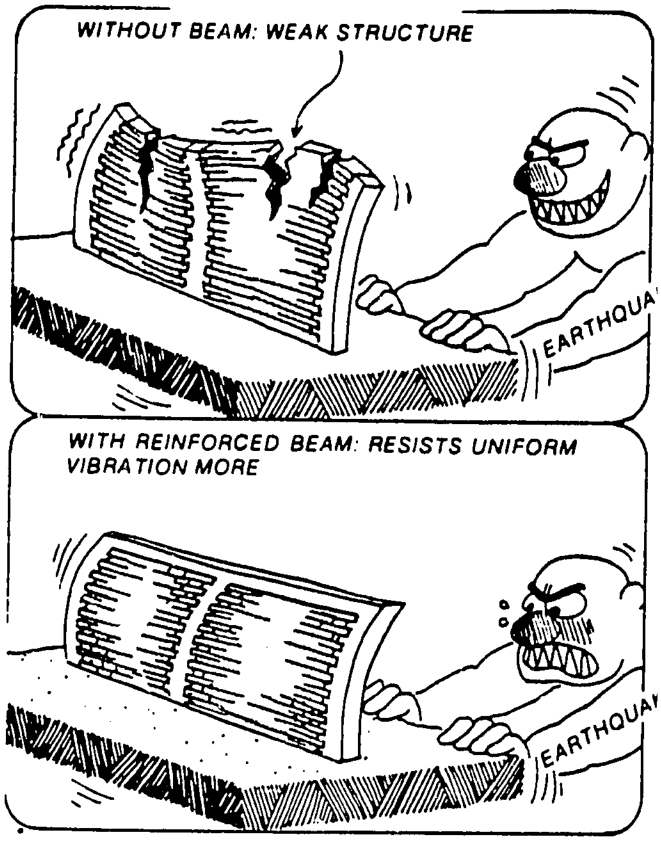
The result of one of its efforts has been the development of interlocking sand-cement blocks requiring minimal amounts of mortar and reducing the need for reinforced concrete. Under this system (EDI Thermond), 400 blocks, each weighing 5 kilograms, can be made daily in a hand mold. By using them, builders can reduce their costs by an estimated 15%.

The PREVI-UNDP program, under the direction of Christopher Alexander, has also developed a system for spraying two-pound density polyurethane fire-retardant foam on six-centimeter diameter bamboo rods placed over plywood templates. This process makes beams that are half as expensive as comparable reinforced concrete beams. Because they are relatively light in weight, they can be readily handled by two men and cut with simple tools.

Peru's Ministry of Housing and Construction is interested not only in research but also in technical assistance and training, particularly for those in low-income areas undertaking self-help and mutual-help construction. This training is carried out by the Housing Institute (INIAVI), with the assistance of the College of Engineers. For this purpose, it has prepared a number of simple manuals, including an amusing as well as excellent one in comic book form on brick construction. (See Figure 2.)

*John Burfield and Alastair Law, CONSTRUCTION STANDARDS AND METHODS APPROPRIATE FOR SIMPLE BUILDING NEEDS. World Bank, 1979.

Figure 2: The Importance of a Beam or Girder



- *India*

The Central Building Research Institute (CBRI) in Roorkee, Uttar Pradesh has made a great many contributions to India's building industry based on experiments with local clay for precast tile units, corrugated-clay roofing sheets, structural flooring units, reinforced brick, and reinforced-brick concrete.* The pre-cast tile units (Guna tile) are 110 cm long, 25 cm wide, and 12 mm deep, and weigh 41 kg. Compared with conventional reinforced concrete (RC) slabs, they require 28% less cement and 55% less steel. The corrugated-clay sheets can be made with hand-labor, and are water-resistant and strong enough for general roofing purposes. The reinforced brick (RB) slabs have proven to be about 10% less expensive than RC slabs, and they are used extensively in India as an alternative to RC slabs for floors and roofs of residential buildings.

CBRI has also introduced an alternative to thatched roofing. In India, as in most other developing countries, thatched roofs are built of locally available grass or palm leaves, supported on wooden posts and rafters and tied to suitably placed bamboo battens. While cheap and relatively easy to construct, they deteriorate rapidly, harbor insects, and catch fire easily. The chemicals that are sometimes used to make these roofs more durable and fireproof have to be imported and need frequent reapplication in rainy weather. For this reason, CBRI has developed a stabilized mud plaster, which is applied on the lower surface of the roof to reduce its rate of burning. As an extra precaution, a thin wash of mud can be applied periodically on top of the roof.

*National Technical Information Service (discussed later), ROOFING IN DEVELOPING COUNTRIES, PB-234, 503, 1974.

Another roofing material that CBRI has successfully experimented with is coconut husks. Since coconut husks comprise ten per cent of Calcutta's waste, their use in construction not only utilizes a material in abundant supply, but helps to solve the problem of their disposal. CBRI has developed a machine that chips the husks of mature coconuts, prepares roofing board from the husks and renders these boards waterproof with the addition of a resin adhesive. Roofs made from coconut husks in this manner have been shown to be sufficiently impervious to fire as to need no fire-retardant treatment.

CBRI is making an effort to reduce the need for cement, steel, and imported asbestos. It has therefore been developing techniques and machinery, used at factories or construction sites, to manufacture and install innovative roofing units. One of these—a precast doubly curved tile unit—weighs only 27.2 kg and needs no reinforcement at the edge beams. Using this tile, it was possible at a site in Delhi to save 25% in the consumption of both cement and steel, compared with the conventional RC slab. Another—a precast cellular tile unit—could be used with 30% less cement and 70% less steel when rectangular beams were added to support the units. Other units that were developed—prefabricated concrete; double-cored; precast channel; and precast-concrete waffle—required more cement or steel but offered such advantages as design flexibility and construction ease.

Because of the common use of asbestos-cement corrugated sheets in India, some U.S. $14 million worth of chrysolite asbestos must be imported annually. To conserve foreign exchange, the CBRI has developed a process for full or partial replacement of imported chrysolite with indigenous amphibole asbestos. It has also successfully used fly ash (a by-product of coal-burning power-generating plants) as a partial substitute for cement, thereby reducing the costs of materials by 40%. Fly ash has the added advantage of being lighter, allowing its use for thermal insulation of roofs, reinforced concrete foundations and lightweight blocks.

• *Pakistan*

Pakistan has also been looking for ways to reduce the need for cement which is becoming increasingly expensive to manufacture. The Building Research Station at Lahore has led the search for substitutes. Of the materials so far investigated, the most promising has been rice-husk ash.

This ash, when combined with hydrated lime, can be substituted for Portland Cement in many ordinary applications, particularly in masonry and plastering works. Its use would not only reduce the need for cement, thereby saving foreign exchange, but would also reduce problems of ash disposal encountered by rice mills. The necessary lime is obtainable from Pakistan's abundant limestone. Thus, systems for efficiently extracting and storing this lime are currently being developed.

Gypsum is another neglected resource in this country, despite a long history of widespread use for building purposes in many countries, going back to ancient times. Gypsum is particularly useful for partition walls and panels, for filling or repairing cracks, for finishing the surface of walls and ceilings, and for fireproofing. For this reason and because it is abundantly available in the country, the Lahore Building Research Station is attempting to widen and popularize its use.

Gypsum boards are superior to such materials as plywood and fibre-board in strength, hardness, and other physical properties. These boards can be easily manufactured by a small factory with limited equipment; and, because of their lightness, they can be readily transported. While gypsum boards are most useful for inside construction, they can be used on the outside of buildings in areas of limited rainfall (i.e., less than 10 inches annually), if properly painted.

The Lahore station has evaluated the quality of local gypsum rock, tested various surfaces for casting gypsum boards and sheeting, and investigated ways to reinforce the material. Based on this research, as well as that carried out elsewhere, staff members have made available to the local construction industry a variety of high quality gypsum products.

Stabilized soil blocks have also been extensively studied in Pakistan to facilitate self-help construction of low-cost houses.* The blocks are formed by blending local silt with 30% sand, 5% dry cement, and 14% water to form blocks 11½" x 5½" x 3¾". Then they are sprinkled with water and a silicate-sodium solution for 7 days before use.

A number of pilot projects using these blocks have been organized and funded in Islamabad and other parts of the country by the Cooperative for American Relief Everywhere (CARE). The most interesting experiment has been a village destroyed in the border war with India near Sharkargarh (District Sialkot) at Lasser Kalan. Here 222 houses and two schools were built during a 4½ month period in 1973, using mostly local material and labor. About 3,000 stabilized soil blocks were required to build each standard two-room unit.

To make these blocks, a cinva-ram press was used. This press, developed in South America, but locally manufactured, was operated by the villagers themselves, albeit under extensive supervision. This need for supervision is one of the reasons why construction costs cannot be reduced by substitution of indigenous materials for imports alone. Despite the need for supervision, however, the soil-cement houses constructed in this project were estimated to be only twice the price of the conventional mud-wall house with wooden beams, battens, dried leaves, and mud covering. Moreover, these conventional houses are generally of poor quality and require high maintenance costs, while the soil-cement houses have proven so far to be strong, durable, and economical. Consequently, they are being introduced in other parts of the country.

*Dept. of Civil Engineering, LOW COST HOUSES OF STABILISED SOIL BLOCKS (Lahore: W. Pakistan U. of Engineering and Technology: 1973)

Low Cost Construction: Building More for Less

In his recent highly provocative book, HOUSING AND BUILDING TECHNOLOGY IN DEVELOPING COUNTRIES (Michigan State University), W.P. Strassmann uses the following categories to classify innovations: off-shelf, adapt-advanced, improve-traditional, science-dependent, and organizational. "Off-shelf" innovations are those imported without change. If they require sophisticated adaptations, they are referred to as "adapt-advanced;" if not, as "improve-traditional." If extensive research must be done, the innovation is characterized as "science-related;" and, if new methods or procedures alone are involved, it is considered "organizational."

Strassmann concludes that non-technological innovations may be the most important for cost-reduction. This is because of the effect of such impediments to efficient house-production as lack of finance, inappropriate building codes, inadequate infrastructure, inflationary land costs, and the insecure tenure of the urban poor. Unless these problems are well-understood, the introduction of new designs, materials, equipment, or components is likely to be useless, or counter-productive.

Moreover, despite the availability of technical information and the evidence of applied research, the bulk of building continues to be produced without benefit of these innovations. What prevents the transfer of technology are such factors as building codes and administrative practices that seek to encourage the conventional approach. Building more for less will only become a real possibility when these attitudes are changed.

Because of the impact of non-technological factors, technological innovations are difficult to evaluate. Nevertheless, according to Strassmann, the potential usefulness of some of the innovations already mentioned have been clearly demonstrated. Others that appear promising include:

- *Ferrocement*

A number of developing countries are experimenting with ferrocement for use in roofing. Made of wire mesh, sand, water, and cement, it can be constructed with a minimum of skilled labor and imported materials. Highly durable, weather-resistant, and versatile, it can be substituted for wood and steel in many applications. It is also labor- rather than capital-intensive, requiring no expensive machinery, though units can be factory mass-produced.

Instead of wire-mesh, cement can be sprayed on balloons. Haim Heifetz has patented and used such a system for building hundreds of dwellings in the Sinai desert. After the cement has hardened, the balloons can be deflated and reused numerous times. Cost per square foot for six to ten units was US $3.10 for a 33-ft. diameter shell and US $6.35 for a 99-ft. diameter shell.

- *Bored foundation piles*

This type of foundation was developed in Jamaica during the early 1960's for low-cost construction and is standard practice in many countries in difficult terrain. After pile holes are bored, concrete is poured into adjustable fiberglass forms which are placed over the holes. Over these forms is built a reinforced concrete frame upon which the houses can rest above ground, allowing underhouse ventilation and protection from earthquakes and hurricanes. By lengthening the piles above ground to various heights, it is possible to build on uneven terrain, thus reducing the expense of site grading or leveling. In one project of 1,900 dwelling units, this innovation was found to speed construction as well as to reduce the costs of materials and supervisory personnel.

- *Self-aligning blocks*

A somewhat different system of interlocking blocks from that developed in Peru and earlier described has been used at Ras Tabia, near Tunis, in a 5,000 unit project financed by a USAID $10 million loan. The blocks in this system (*bloques africaines*) are of hollow concrete, 50 centimeters long, with grooves and protrusions that allow quick placement without mortar. Although the blocks can be handmade, there is now a portable German machine for mass producing them.

- *Natural rubber-bagasse roofing sheets*

Experiments in Ghana, Jamaica, and the Philippines are currently being undertaken, combining natural rubber with bagasse (the waste-material from cane-sugar production) to produce roofing sheets that are expected to be between one-third and one-half the cost of imported roofing materials. This technology was developed by the Monsanto Research Corporation, together with local research groups, under a USAID grant.* It is likely to be especially useful for countries in which bagasse is locally available.

- *Hand-operated looms*

The Building Research Station, Dept. of Public Works, Port Moresby has developed a simple hand-operated loom that can be used by unskilled workers for weaving sago palm-wall matting. The life expectancy of this matting is projected to be 17 years, and it is competitive in price and usefulness to less labor-intensive hardboard, asbestos sheets, and galvanized iron. Using this loom, an unskilled worker can produce what it previously took eight skilled weavers to do, and he can make a better product at lower cost.

*DEVELOPMENT OF LOW-COST ROOFING FROM INDIGENOUS MATERIALS IN DEVELOPING COUNTRIES. NTIS (see below), 1978.

Industrialized Housing: An Unworkable Idea

The mass-production of components that can be quickly and easily combined into houses or apartments has been advocated in many countries.* The hope of such advocates is to bring to the construction industry the higher quality, speed and reduced cost that mass-production has allowed in the manufacture of automobiles, household appliances, office machinery, etc.

Even in developed countries, industrialized building poses difficulties. And similar ventures in Africa, Asia, and Latin America during the past twenty years have all ended in failure for various reasons: faulty cost analysis, insufficient capital investment, inept management, insensitive design, difficulty of storage and transportation, problems of maintaining and repairing complicated machinery, lack of water and electricity, labor problems, and prohibitive cost or unavailability of foreign products and experts.

Because of the problems involved in industrialized systems of building, international organizations, such as the World Bank, USAID, and the U.N., generally discourage them. Instead, they advocate the mass-production of small and simple components which can be readily utilized by self-help builders.

Based on his experience in Chile, Sergio Rojas Ibanez suggests that small workshops for prefabricating wooden doors and windows might be adopted in developing countries.** With simple machinery and a four-person organization, such a workshop, if rationally organized, could succeed even with an output of only two units per man-day, according to his cost-study.

The potential of small factories to produce most of the building components needed by the urban poor has been demonstrated in a large number of developing countries. In Indonesia, for example, bamboo products, including components for walls, roofs, partitions, and furniture, come largely from small factories (often referred to as "kampong industries"). Using labor-intensive technologies, these industries also produce bricks fired in open kilns, hand-sawn timber, lime from coral and lime-clay blocks, and palm leaves for roofing.

Unfortunately, few of these "kampong industries" have benefitted from the booming housing construction that has taken place throughout the urban areas of Indonesia during the last decade.*** This is because of the general weaknesses of these industries. The quality of their products tends to be uneven and does not comply with accepted standards and norms.

Small-scale industries in Indonesia almost invariably suffer from a lack of capital, preventing them from taking advantage of new technologies to improve the production and marketing of their products. Not only is their machinery and equipment inadequate in every respect but their labor force is unskilled and unstable.

To help these industries, the government has undertaken the following measures:

(1) long-term loans at low interest to establish or expand the production of key building materials

(2) increased import duties on building materials and components that can be replaced by locally produced commodities

(3)subsidies and other types of assistance for the purchase of appropriate machinery and equipment and

(4) research activities to assess potential construction uses of local natural resources and industrial and agricultural wastes. Such materials researched have included pozzolana, asbestos cement and cement products, timber and timber products, particle and fibre boards, and high quality clay products. Other types of assistance, such as long-term contracts for participation in government construction projects, training programs, realistic minimum standards for building materials, and improved marketing/transportation and supply arrangements, are also being considered.

Research in Africa

In 1976, USAID's Office of Housing undertook a survey of low-cost housing research and project development being carried out in Sub-Saharan Africa. The purpose of this survey was to facilitate information exchange among the institutions involved. Below are some examples of work being done:

- *Materials Research and Testing Dept., Faculty of Technology, Addis Ababa University, Ethiopia*

(1) The production of stabilized soil blocks using lime and cement as stabilizing agents.

(2) The survey of local raw materials for the production of bricks, mortar, and concrete.

(3) The analysis of different preservatives on the termite resistance of some common Ethiopian timbers.

- *Building and Roads Research Institute, Council for Scientific and Industrial Research Kumasi, Ghana*

(1) The study of such local materials for building purposes as clay, lime, bauxite-waste, stone, stabilized earth, bagasse, and rubber.

(2) The design and construction of components such as windows, doors, sanitary wares, etc., thereby encouraging factories to produce them.

(3) The development of methods to improve the termite resistance of timber and other building materials.

(4) The design of more comfortable and earthquake-resistant houses.

(5) The revision of building codes.

*I.D. Terner and J.F.C. Turner. INDUSTRIALIZED HOUSING. 1972. also available from NTIS.

**THE PREFABRICATION OF WOODEN DOORS AND WINDOWS, U.N., ST/SOA/117, 1973.

***From reports by San Shearer, a consultant to the World Bank, and Albert Kartahardja, Director of the Building Research Centre in Bandung (a U.N.-supported regional housing center responsible for much of the building materials research currently being carried out in Indonesia).

Housing Research and Development Unit (HRDU), University of Nairobi, Nairobi, Kenya

(1) The development of cheap blocks and lime-based finish materials for upgrading soil-walled structures.

(2) The investigation of ways to reduce the cost of roofs and to improve their durability and thermal performance, using locally available insulating materials such as papyrus matting, bamboo, and sisal stems.

(3) The evaluation of commercially available walling materials, windows, doors, and other products, including foreign exchange requirements.

(4) The establishment of appropriate standards for housing and community planning.

(5) The construction of experimental houses and community facilities in collaboration with public and semi-public bodies.

(6) The improved teaching of low-cost construction, architecture, and planning.

(7) The dissemination of information based on multinational research.

- *Centre de la Construction et du Logement a Cacavelli, Lome, Togo*

(1) The production of lightweight panels, fired clay bricks, and ceramics.

(2) Lime production techniques using local dolomitic rock.

(3) The development of low-cost waterproofing and rotproofing materials.

(4) The demonstration of earth stabilization techniques in house building, and the training of masons and foremen for this work.

(5) The promotion of small-scale enterprises utilizing indigenous materials and traditional techniques, to produce high-quality products.

(6) The development of standard designs for urban buildings and housing, together with appropriate standards and systems of control monitoring.

NTIS/AMTID

The National Technical Information Service (NTIS) is an agency within the United States Department of Commerce, dedicated to the international exchange of scientific and technical information. It is the largest clearinghouse and dissemination network of the U.S. Government-sponsored research and development, but it also draws upon other public and private information sources throughout the world. The NTIS collection exceeds one million titles with over 150,000 documents from sources outside the U.S.

NTIS operates as a public service to store and channel technical information which is appropriate to the needs of the user. Information in the public domain is collected and stored on computer tapes which comprise the bibliographic data file: a comprehensive listing of all the documents in the NTIS collection. The public may quickly locate summaries of interest using on-line search or by consulting the various published searches prepared by information specialists at NTIS. The desired documents (in full text) can then be ordered in papercopy or microfiche.

As a part of a new initiative to aid economic development, NTIS, under the sponsorship of the U.S. Agency for International Development, has become actively involved in the acquisition and dissemination of appropriate technology information for developing countries.

This joint NTIS/AID international program already consists of a worldwide information network with some 30 cooperating agencies in developing countries around the world. They collect AT information and send the documents to NTIS. They also make available NTIS services to meet local and national development needs. This network has become a major clearinghouse for the two-way flow of appropriate technology information, a worldwide sharing of technical information which will continue to grow in the future.

While NTIS is obligated by the U.S. Congress to recover its operating costs from the sale of documents, it has received a USAID grant to provide Latin American and Caribbean residents documents at discounted prices, if used to serve low-income groups.

Below are some recent reviews of publications dealing with low-cost construction appearing in AMTID (AID-OST-79-2), including the order numbers. You may obtain information about NTIS publications or project contacts on any of the topics contained in this issue by writing to THE URBAN EDGE.

Usage Manual for Sampling and Testing Laterite and Lateritic Soils and Other Problem Soils of Africa
Lyon Associates, Inc., Baltimore, MD
1971, 72 pp.

Soil testing is an important part of highway design and construction. This easy-to-use manual has all the basic details on identifying the various soils, the laboratory equipment required to perform the tests, exploration and sampling techniques for soils, and laboratory test procedures. Even inexperienced engineers and technicians will find this manual straightforward and simple to understand. Illustrations are included.
PB 207 618/GIH PC-A04/MF-A01

Basics of Concrete
Department of Housing and Urban Development, Washington, DC; Office of International Development, Washington DC.
Nov. '60, 25 pp.

This publication consists of articles on good practice in the preparation and use of concrete—one of the most versatile of building materials and used throughout the world in the production of housing. The articles contain simple rules for individuals to follow for production of good quality buildings of concrete.
PB 285 764/GIH PC A02/MF A01

THE Urban Edge
FACTS & IDEAS

Vol. 2, No. 5 May, 1978

Appropriate Technology for Urban Areas

"There are no widely accepted definitions of what constitutes an appropriate, low cost, or intermediate technology," according to Nicolas Jequier, in his respected book on the subject.* Yet, there is growing recognition that technology is appropriate not in itself, but in relation to particular objectives and situations. As such, it refers to products, services, techniques, institutional reforms, and other innovations that serve to solve existing problems. The questions that need to be asked are:

(1) Does the technology support the goals of development policy?

(2) Is the final product or service useful, acceptable, and affordable to the intended users?

(3) Does the production processes make efficient use of inputs?

(4) Are the production processes, the products delivered, and the institutional arrangements compatible with the local environment and culture?

In some countries, there is a prejudice against "appropriate technology" because it is associated with "inferior" or "backward" ways of doing things. Therefore, those advocating "appropriate technology" must demonstrate to skeptical governments that small-scale, labor-intensive, resource-conserving alternatives to conventional technologies do exist and that products work better when workers and beneficiaries participate in making decisions on their use.

Applications of appropriate technology are exemplified in the case of the World Bank-sponsored urban development project in Upper Volta. Instead of signing a $600,000 contract to develop sophisticated aerial maps, the project preparation team chose a $3,000 alternative using a rented helicopter and a government camera. Six months and thousands of dollars were saved.

The growing awareness of the importance of appropriate technology accounts for many of the urban innovations presented in earlier issues of *TUE*. In later issues, we will examine particular approaches, such as the utilization of low-cost construction techniques.

Nurturing the Spirit of Innovation

Appropriate technology is the product of a "way of life." It will only flourish under certain conditions, and can be easily undermined by careless policies or mistaken practices.

Lack of finance and training are among the obstacles to technological progress encountered in certain countries. Available assistance tends to be difficult or costly to obtain because of bureaucratic red tape. Frequently, also, the local currency is artificially pegged to the point that it is profitable to import such products as prefabricated building materials, despite high unemployment locally.

There are countries, however, that encourage appropriate technology. In some cases, they are doing so merely by working through market forces: reducing the costs and increasing the rewards of undertaking innovative activities. In other cases, they are making available more research and travel grants, credit, and technical information. Tax reforms and the easing of legal requirements or restrictions also facilitates the spread of appropriate technology. Examples include:

• *The Korean approach*

Among developing countries, the Republic of Korea is acknowledged to be a leader in the development of appropriate technology. Korea's success is thought to stem from the following policies:

(1) *The subsidization of innovative activity.* The Government provides subsidies of 50% or more to cover research and development (R&D) expenses incurred in government-approved projects. Tax exemptions are available to cover royalties paid for foreign technology and the results of contracts with non-profit research organizations and universities. Equipment needed for R&D can be imported duty-free. A special "tax depreciation" is allowed for equipment necessary for technological development.

**Appropriate Technology: Problems and Promises.* Paris, OECD, 1976

continued on page 2

Nurturing *continued from page 1*

(2) *The provision of technical information and help.* The Korean Fine Instruments Center provides technical extension services to small and medium-sized firms. Universities are also given grants to help local firms. Generous scholarships are available to students in applied science and engineering fields, together with exemption from military duty. Those with foreign training are given special incentives to make local jobs attractive for them.

(3) *The availability of financial and marketing assistance.* Low-interest financing is available for small and medium-sized firms, particularly those in the strategic industrial sectors favored by the government. Foreign investments and joint-ventures with foreign firms are also encouraged in some cases.

• *The Indian experience*

Among the lessons emerging from Indian experience is the importance of facilitating the craftsmanship developed by various ethnic, religious, and social groups. By so doing, the Planning and Research Institute in *Uttar Pradesh* has, through the help of extension agents, enabled the local potters to produce their traditional wares more efficiently and to develop new products. The potters have thereby been able to survive competition by industrial firms.

India has also been successful in helping firms use modern scientific technology. By concentrating educational, transportation, administrative, and financial resources at *Poona* (near Bombay), the State Government has encouraged the development of nearly 900 small firms since 1961, most of them in the engineering, metal processing, chemical, textile, printing, and electrical sectors.

The educational and research institutes, including six major technical colleges and several national and state laboratories, have been a major factor. Because of the large number of highly qualified technicians, an increasing number of small enterprises are being started, cooperating as well as competing with the larger firms. These are assisted by a Small Industries Service Institute and by the local chapters of various professional organizations.

• *The Ghanaian experience*

In Ghana, the Technology Consultancy Centre, set up by the University of Science and Technology in *Kumasi*, has helped both rural and urban entrepreneurs use more effectively local products. The Centre's emphasis has been on the development of cottage industries, using locally available raw materials and finance and requiring a modest investment in plants and machinery (typically less than US $5,000).

Much of the work of the Centre involves helping clients improve their existing skills, secure loans, obtain technical information, and find proper equipment and materials. In some cases, when local industries lack interest or competence in producing a needed product, it establishes a small-scale production unit with the following objectives:

• the training of craftsmen and managers in the required skills;

• the overcoming of production and marketing problems; and

• the encouragement of local entrepreneurs to undertake new industrial activity.

Despite the lack of trained personnel and financial resources, the Centre has been responsible for the development of a number of small enterprises, including factories that turn out hand tools (using local hardwoods), soap, broadlooms for village weavers, nuts and bolts, and laundry starch (from cassava roots and local wild plants). Perhaps its most successful project has been the manufacture of paper glue from cassava starch. Ghana is now able to export rather than import glue. Not only has the project created jobs, it has gained respect for the capacity of local artisans, entrepreneurs, and inventors to create or adapt improved methods of producing goods and services.

Foreign Assistance for Appropriate Technology

For an invention to be really useful, it must be fully comprehensible to local technicians. They must be able to replicate it, repair it, and, if necessary, redesign it to meet local conditions. Thus, the importation of foreign technology can never be a substitute for the building up of an indigenous innovative capacity.

Nevertheless, to quote the old saying, "it is no use reinventing the wheel." Unfortunately, the local craftsman often works in isolation without the benefit of technical information that might help him improve his work. He may not be aware of appropriate technology in another part of his own country, much less, what is available from abroad.

To assist craftsmen and entrepreneurs in developing countries, a number of American and European organizations and agencies exist. Some of them have evolved as part of a cultural revolution in the Western world—the search for a simpler way of life that is personally more gratifying and more harmonious with nature. "Those who believe in small entrepreneurial capitalism, decentralist Marxism, European socialism, African communalism, and Buddhism," to quote Ken Darrow and Rick Pam of Volunteers in Asia, "can all find much of value in the ideas underlying appropriate technology."* A leading philosopher of this movement was Dr. E. F. Schumacher (1910-77), whose writings, particularly *Small is Beautiful*, have inspired a number of organizations, including:

• *The Intermediate Technology Development Group (ITDG)*

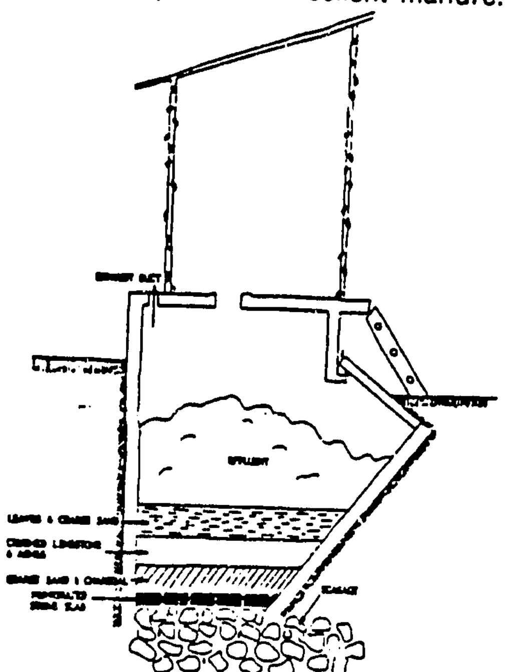
This organization was founded by Dr. Schumacher to do research on self-help technologies relevant to such problems as rural unemployment and mass migration to the cities. It also demonstrates the results of this research and communicates this information through governments, organizations, and publications, particularly *Appropriate Technology*, which is published quarterly and available from Intermediate Technology Publications LTD., 9 King Street, London WC2E 8HN, England.

continued on page 3

**Appropriate Technology Sourcebook* (Stanford, Calif. 94305 VIA, Box 4543, 1976)

Foreign Asst. *continued from page 2*

While primarily concerned with rural and village life, *Appropriate Technology* contains a number of articles in recent issues that are relevant to urban areas. One (mentioned below) has to do with solar ovens. Another, by Kenneth King (Vol 2, No. 4, 1975), deals with machine-making in Kenya. A third, by Krisno Nimpuno (Vol 3, No. 4, 1976), describes an excreta-disposal system (see diagram below) which works without water, is harmless and odourless, and yields an excellent manure.



Biopot. Complete decomposition and pastorisation through high temperature composting. Chemical filter controls humidity even in humid tropical climate. Yields valuable manure.

• *Volunteers in Technical Assistance (VITA)*

VITA is an American organization consisting of more than 7,000 skilled individuals and various affailiated organizations, institutions, and corporations. It publishes a newsletter and a great many technical bulletins and manuals, distributing them widely and making some of them available in French and Spanish, as well as English.

VITA has a request-answering program, which has responded to over 25,000 inquiries from individuals, officials, and organizations throughout the world. In some cases, these inquiries can be handled through already published information. To facilitate this service, VITA maintains a large library of appropriate technology materials. In most cases, however, the staff turns for assistance to affiliated individuals and organizations.

VITA also undertakes special projects in developing countries to find, adapt, and design appropriate technologies, working closely for this purpose with many organizations and professionals. Its work is supported by a number of agencies and foundations, including the U.S. Agency for International Development, the U.S. Dept. of Agriculture, the Peace Corps, and the Ford Foundation. Its headquarters are: 3706 Rhode Island Ave., Mt. Ranier, Maryland, U.S.A. 20822.

continued on page 6

• *The Brace Institute*

This is another organization, well known for it publications and research on innovative village an small community equipment. Its highly-regarde *Handbook on Appropriate Technology* is availabl in both English and French from its headquarters Ste Anne de Bellevue, Quebec H10A 1C0, Canada

The Brace Institute works closely with loca technicians in the Third World to develop easily made and maintained equipment using as much as possible local material and human resources. A recent activity has been the preparation of a number of state-of-the-art surveys dealing with such subjects as solar refrigeration and air conditioning, low-cost sanitary technology, and experimental windmills. This work is funded by the Canadian International Development Agency and by private sources.

• *A.T. International* (1709 N St., N.W., Washington, D.C. 20036, U.S.A.)

This agency was set up in 1976 by the U.S. Congress "to coordinate private efforts to promote the development and dissemination of technologies appropriate for developing countries." While primarily concerned with increasing the standard of living of the "poorest of the poor," it attempts to respond to the priorities and needs of agencies and groups in developing countries rather than imposing preconceived projects or programs on them.

Among the projects currently being considered are cement plants, one-tenth the size of the smallest existing units; the development of a system of basic extension services for small-scale family enterprises; and the development of high-protein foods from agricultural waste. Each of these projects is based on the development or adaptation of equipment and techniques that have proven useful in a number of places. Also, these projects involve cooperation with individuals and private voluntary organizations having experience in methods of training and conveying knowledge to entrepreneurs in developing countries.

Appropriate Technology: Ideas Wanted

A future issue of TUE will be devoted to those low-cost, locally-produced products, equipment, and innovations, that agencies like ITDG, VITA and AT International have found to be popular and useful. No one is better qualified than some of our readers to add to this collection, and we urge those professionals working in urban areas to share with TUE readers appropriate technology which they consider successful. If you have photos, or drawings, send them along please together with a brief description of what the tool or method can do in terms of output or service performed.

New Sources of Energy

There is now a worldwide interest in appropriate technology using new sources of energy. This is particularly true in oil or coal-importing countries with concern about environmental pollution as well as expenditure. Poor people in many developing countries must depend on firewood for energy, but often they are encountering a decreasing supply of it.

Since wealthier countries are as anxious as poorer ones to find inexpensive and nonpolluting sources of energy, their efforts to do so may have a universally beneficial effect. Denis Hayes of the Worldwatch Institute is a leading advocate in the United States of solar energy. He argues that most developing countries have a particular advantage in this regard, being so well endowed with sunlight.* Moreover, they are less encumbered by buildings and equipment dependent on fossil fuel.

There is a possibility that many homes in developing countries could eventually utilize photovoltaic (solar) cells made from silicon, one of the earth's most abundant elements. These cells generate electricity directly when struck by sunlight. Because they have no moving parts, they require practically no maintenance. They are now the principal power source of space satellites. In Third World countries, they have been successfully used to power educational television receivers in India and Niger and radio transmitters in the Andes. Unfortunately, they are still too expensive for most purposes. But during the 1980's, the price is expected to become low enough for widespread use.

At present, solar water heaters can be easily manufactured, using indigenous or readily available materials, such as old window panes, scrap metal, wood, and bamboo. Solar water heaters are now very common in Japan and Israel. In Australia, they are required by law on new buildings in the Northern Territory. While there is less experience with solar cooling systems, the government of Kuwait, among others, has undertaken a number of demonstration projects to solar cool as well as heat buildings and houses.

Solar cookers cannot be used for frying or baking, but they are well suited for foods that require long, slow cooking, such as stews, cereals, vegetables, bread and cake. Mohan Parikh, the director of the Agro-Industrial Service Centre at *Bardoli*, India, describes the one developed by his organization in APPROPRIATE TECHNOLOGY, Vol. 3, No. 2, 1976:

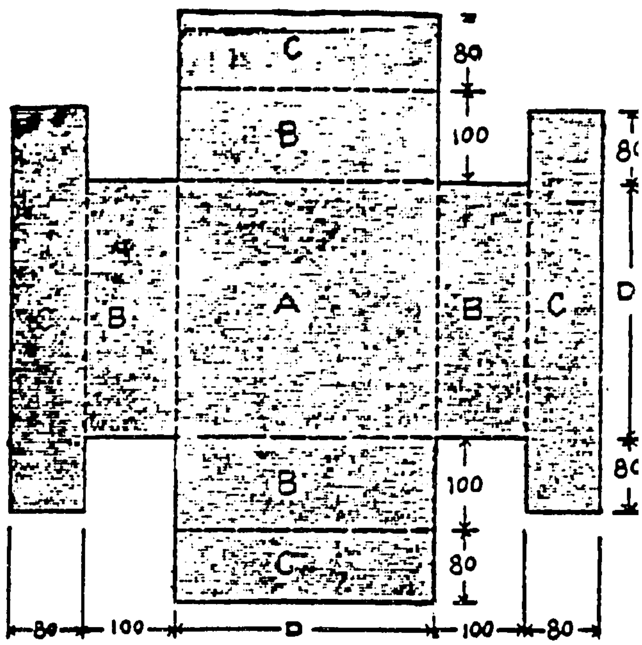
"This solar oven is a double walled box with a double glass lid on it. The sun's rays which are of short wave length enter the box through the glass of the lid. The interior of the oven is of blackened metal. It absorbs almost 95% of the sun's rays and converts them to heat. These heat waves are of long wave length and cannot pass out through the glass of the lid.

"A poor heat conductor fills the space betwee the double walls and the air gap between the tw glasses of the lid prevents heat passing awa outside the box into the atmosphere. The temperature inside the oven is maintained from 50 to 7 degrees centigrade above the atmospheric temperature outside the oven."

Working design of the solar oven

There are four components of a solar oven.

1. Inside box
2. Outside box
3. Cooking utensils
4. Doubled glass lid



A plan for inside box

A is a bottom – according to the requirement.
B are the vertical sides – should not exceed 100mm.
C are the horizontal sides – to cover bad-conducting material.

There are other sources of energy being considered in developing countries. In the Gambia, an experiment is being conducted using groundnut shells to generate electricity by burning. Brazil is experimenting to turn cassava roots into alcohol fuel. At the same time, it has developed auto engines that run on an alcohol mixture. In many countries, pedal power has long been used, not only for transportation but also for light machinery.

China leads other countries in the development and use of biogas plants, digesting animal dung, human excreta, and other organic wastes to produce methane. In Szechwan province alone, 17 million people are reported to use biogas for cooking and lighting. Since the technology was introduced, more than 100,000 technicians have been trained and 4.3 million units put into operation. While perhaps not useful for large cities, this technology may be appropriate for small or low-density urban areas. The residue of this process can be used as a high quality fertilizer.

Energy for Development: Third World Options (Washington, D.C. 20036 Worldwatch Inst., 1776 Massachusetts Ave., N.W., 1977)

Solid Waste Management: Improving an Old Profession

In many urban areas, scavengers perform an important role in both collecting and recycling garbage. Among the products that can be reused from this process are: paper and cartons, bottles, cloth materials, bones, cans, and scrap metals. The number of people involved can be considerable, even when not officially paid. In *Medellin*, Colombia, for example, authorities estimate that 2% of the population (24,000) live from this activity.

While the work of scavengers to a large extent represents "appropriate technology," it is frequently handicapped by the lack of tools, storage facilities, disposal sites, and education. For this reason, scavengers often are dependent upon middlemen (i.e., "junkdealers") who either own or have the use of transport and upgrading facilities. Thus, the profit from the marketing of recoverable wastes goes primarily to junkdealers rather than to the scavengers.

Easing the work of scavengers is important for various reasons. First of all, the poor areas of the city which tend to be neglected can be better served. Second, scavengers are able to reduce the cost to the municipality of garbage-collection. Third, the price of raw materials and commonly used products can be reduced. Fourth, garbage dumps can be made less ugly and environmentally harmful. Fifth, it might be possible to reduce the occupational hazards faced by scavengers.

A number of suggestions have been made for increasing scavenger efficiency:

(1) The proper location and adequacy of disposal sites, recycling centers, and warehouses.

(2) Persuading the public to separate and place garbage in such a way that it can be easily collected and handled.

(3) Adequate transportation facilities to facilitate garbage collection and the sale of recovered products.

(4) The provision to scavenger cooperatives of water and electricity for cleaning and recycling purposes, together with such equipment as sewing machines to fabricate mops, mattresses, and clothing.

(5) The development of machinery and technology for processing bones into chicken and hog feed, making parts for cars and bicycles, etc.

(6) Training in carpentrywork, metalwork, and other skills necessary to better utilize scrap materials.

(7) Help and education in bookkeeping and business practices, dealing with manufacturing enterprises, and bargaining with suppliers and middlemen.

The success of any effort to improve the efficiency and standard-of-living of scavengers may ultimately depend on the extent to which they can be organized. Ideally, cooperatives might be developed, in which all the pickers would be registered as members. This would facilitate a division of labor into collectors, transporters, handlers at the disposal site, recycling and upgrading workers and sellers. The bargaining position of scavengers could be enhanced, and resources could be used more effectively. More public assistance is likely to be forthcoming to the extent the cooperative proved effective and responsible.

- *A proposal for Egypt*

Solid waste management is currently receiving increased attention in Egypt. In *Alexandria* and *Cairo*, a Coptic community (the Zabaline) have long established rights to collect and recycle domestic waste. Their way of life has been studied by, among others, Dr. Sherif Mahmoud El Hakim of Cairo's American University. Because the recycling of wastes is of such intense interest to industrialized nations, his report was presented on Danish and Norwegian television networks.*

The Zabaline purchase the right to collect refuse from middlemen who charge a monthly fee to upper and middle class residents for this service. After picking up refuse in their donkey carts, the Zabaline sort it at their settlements and sell all reusable matter. In *Cairo*, they feed the organic matter to pigs which they raise and sell as a major source of income. Animal droppings, together with other organic wastes, are turned into compost which is sold for agricultural purposes.

While this system works well insofar as wastes get collected and recycled without burdening taxpayers, it does not service lower-income areas. Consequently, garbage from most of the urban population is thrown into the streets. Local authorities are not able to remove most of this waste as it accumulates, thereby clogging drains, degrading the appearance of the city, and intensifying fly and rodent breeding. The Zabaline themselves perhaps suffer most from their way of life. They live in temporary, unserviced squatter settlements. Dr. El Hakim estimates that only 40% of their live-born babies survive the first year.

The Egyptian government is considering a number of recommendations to improve this system of garbage collection and recycling. One of these is to pay the Zabaline to collect from every dwelling not now receiving this service. Other recommendations include improving the capacity of local authorities (the Governorates) to sweep all streets on a regular basis, using better handcarts and tools. Wastes from this activity would be taken to regulated transfer points and depots, where composting could be properly carried out.

For the benefit of the Zabaline, it has been suggested that permanent sites be established where public services, such as water and community facilities, would be provided. Better equipment for handling and marketing scrap metal, pigs, and compost might also be provided with the understanding that the Zabaline production and marketing methods would be more carefully supervised. Consequently, the Zabaline operation could be made more environmentally compatible in the process of improving their efficiency.

*Summarized in *Urban Innovation Abroad* (February 1977).

Low Cost Waste Treatment: A Follow-Up Report

In *TUE* (Vol. 1, No. 2), we discussed some intermediate sanitation alternatives. We reported then on experiments carried out by NASA's Space Technology Laboratories in Mississippi, using water hyacinths for sewage-treatment in stabilization ponds. The objective is not only to purify sewage but also to obtain an inexpensive source of protein, methane, fertilizer, and fish-feed.

Following this article, we received more than twenty requests for details and technical assistance from public and private agencies in developing countries. This interest has led us to further correspondence with Dr. Bill Wolverton, senior scientist, and Rebecca C. McDonald, a research chemist with the National Space Technology Laboratories in Bay St. Louis, Missouri, who pioneered the technology. Among the conclusions so far reached are the following:

- a one hectare (3 acre) lagoon can purify to acceptable levels the daily wastes of 2,000 people given a sewage retention time of two weeks.
- water hyacinths can treat industrial effluents polluted with toxic metals. In laboratory experiments, the plants rapidly absorbed and retained in their roots cobalt, strontium, cadmium, nickel, lead and mercury.
- water hyacinths show promise as an animal feed supplement. A meal made by drying whole plants to a water content of 15% provides a 20% diet supplement for cattle. The high mineral level of the plants imposes this ceiling to avoid a nutritional imbalance.
- water hyacinth meal makes a good organic fertilizer because of its high nitrogen and mineral content. Harvested plants can also be spread directly on the ground as a mulch or compost.
- biogas containing 60-80% methane can be produced from water hyacinths as a fuel with properties similar to natural gas. One kilogram of the dried plant produces a fuel value of 21,000 BTU per cubic meter, a hectare would yield 7-14 million BTU daily.

We will continue to keep readers informed about the results of experiments using water hyacinths, particularly the World Bank-supported project in East Calcutta, where a combination of algae and hyacinths is being used to purify the sewage of several thousand people and to promote fish culture. Another project of note is in the Sudan, where small-scale digestors developed by NASA will be tried out to obtain fuel from the thousands of tons of water hyacinths harvested mechanically from the White Nile.

VITA *continued from page 3*

Probably the best known of VITA's publications is the *Village Technology Handbook*. How much of it is relevant to large metropolitan areas is difficult to say. Certainly much of it would be useful to residents of small communities and the poorer sections of large cities, both for home improvement and income earning, including:

(1) A simple hand-operated washing machine which has been used successfully in Afghanistan. It can be made out of heavy galvanized sheet metal with tinsnips, pliers, hammer, and soldering equipment. See Figure 1.

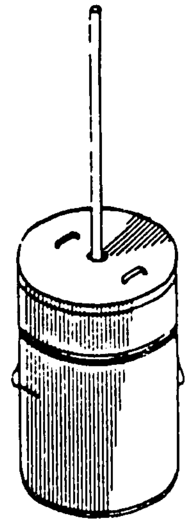


Figure 1

(2) An iceless cooler consisting of a burlap-covered bamboo basket, set on water-covered bricks or stones within an earthen ware or metal container. See Figure 2.

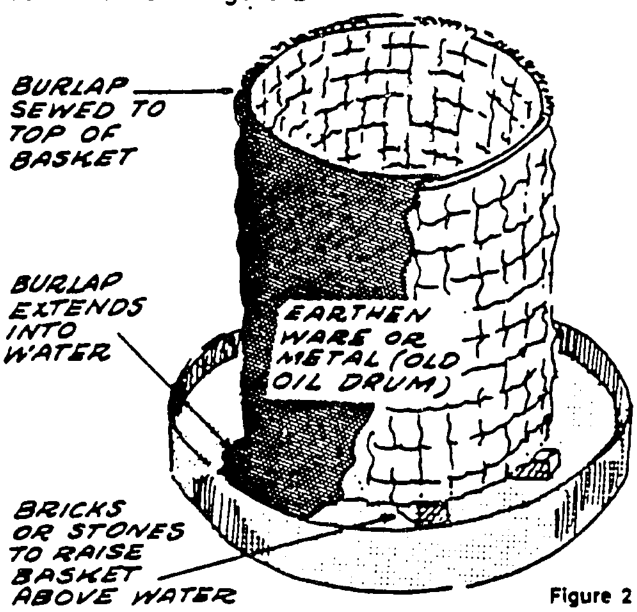


Figure 2

(3) A nest of low-cost beds made from local materials, taking up limited space. See Figure 3:

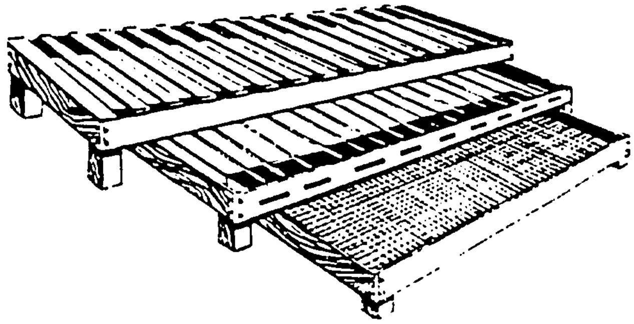


Figure 3. The three beds are made to fit one under the other, saving on space when not in use. Three difference kinds of springs are shown: wood on the largest bed, rope on the middle-size bed, and chicken wire on the smallest bed.

Office of Housing
Agency for International Development

SHELTER TRAINING WORKSHOP

November 5-30, 1979

The following material on alternative sanitation technologies is taken from a report of the Central Projects Staff, Energy Water and Telecommunications Department of the World Bank:

P.U. Report No. RES 22
Alternative Sanitation Technologies for Urban Areas in Africa,
February, 1979

Authors: Richard G. Feachem,
D. Duncan Mara, Kenneth O. Iwugo

Source of Copies:
The World Bank
1818 H Street, N.W.
Washington, D.C. 20433
USA

S U M M A R Y

1. EXCRETA DISPOSAL IN AFRICA

The World Health Organization reported in 1976 that at the end of 1975 -

- 75% of the urban population in Africa had "adequate" excreta disposal facilities,
- but only 28% of the rural population in Africa had similar facilities

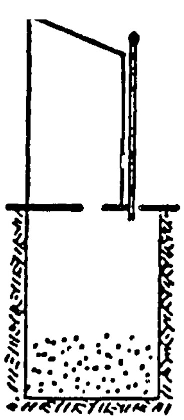
The targets set by the World Health Organization are that by 1980

- 95% of the urban population should have adequate excreta disposal facilities - 20% with sewerage and 75% with "household" facilities,
- 30% of the rural population should have adequate facilities

This means that in the quinquennium 1976 through 1980 27 million additional people in urban areas and 11 million in rural areas have to be provided with sanitation facilities. The capital costs to meet these targets were estimated to be US $ 1100 million and US $ 150 million respectively (1976 prices). The corresponding per capita costs are US $ 41 and US $ 14 for urban and rural areas respectively.

These per capita costs are much lower than the costs we have found for sanitation systems in urban Africa, especially conventional sewerage (>>US $ 100). This indicates that only very low-cost systems are applicable in both urban and rural Africa. In this report we review recent experience in Africa with pit latrines, composting toilets, bucket latrines and aqua-privies and we attempt to integrate our findings to provide specific and clear-cut guidance on the choice of a truly appropriate sanitation technology in any given urban environment in Africa.

2. PIT LATRINES



Pit latrines are the most common sanitation facility in both urban and rural Africa. They are often the cheapest system to install and they are simple to use. Recent work has shown that it is now possible to build a pit latrine which is free from odour and with very little fly or mosquito nuisance; these major improvements are due to the simple provision of a 150 mm vent pipe located externally on the sunny side of the latrine superstructure and painted black. The air in the vent pipe heats up, causing a vigorous updraught with a corresponding down-draught through the squatting plate; thus odours are exhausted only through the vent pipe and so the latrine superstructure does not smell. Fly nuisance is substantially reduced because any flies that hatch in the pit fly up the vent pipe to the light but they are prevented from leaving because the vent pipe is screened; they eventually fall back exhausted, to die in the pit.

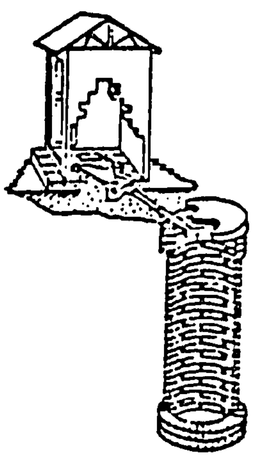
The ventilated improved pit latrine is a low-cost, trouble-free, hygienic, and indeed sophisticated toilet. Existing unimproved simple pit latrines can be easily upgraded to the improved design.

An alternative design for ventilated improved pit latrines is Reed's Odourless Earth Closet (ROEC). This is an offset pit, excreta being introduced into the pit via a curved chute. ROECs have very large pits and so long lifetimes, 15 - 20 years. They have been tried on a limited scale in southern and eastern Africa and have been found to be extremely satisfactory (although fly breeding in the chute remains a small problem).

The annuitized costs of pit latrines (excluding the superstructure) in urban Africa are as follows:

unimproved pits	US $ 19 - 60 per unit per year
ventilated improved pits	US $ 20 - 24 per unit per year
ROECs	US $ 14 - 34 per unit per year

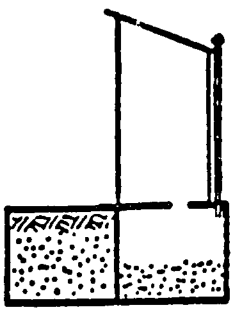
The variation in costs for each type reflects differences in squatting plate design and pit volumes, whether the pit is supported or not and differences in labour and material costs in different countries. The provision of a good superstructure generally doubles the total cost, but this can be reduced by self-help construction.



A pit latrine system widely used in India and the Far East and Latin America is the pour-flush water seal latrine. The pit is completely displaced from the toilet unit, the pour-flush bowl of the latter being connected to the pit by a short length of 100 mm pipe laid at not less than 1 in 40. Excreta can, with a little practice, be flushed along the pipe with as little as 1 litre of water. When the pit (which is often lined with open brickwork) is full, a new one is excavated in an adjacent position and the toilet unit connected to it. This type of latrine has no odour, fly or mosquito nuisance and can even be installed inside the house. If the ground conditions are not suitable for infiltration and percolation, it is necessary to pump out the pit contents from time to time: the toilet is then properly described as a vault toilet (see Section 4 below).

3. COMPOST TOILETS

There are two types of composting toilets: continuous and batch. The continuous types are generally similar to the Swedish 'Multrum' design. Excreta and biodegradable wastes (such as grass, sawdust, vegetable wastes) and ashes are deposited into the vault below the squatting plate, and the mass of excreta and waste materials slowly moves down the inclined floor and into a humus vault. During its passage, thermophilic aerobic composting takes place - the high temperatures (>50°C) destroy excreted pathogens and the mixture of excreta and wastes is converted by bacterial activity to a stable, inoffensive humus. This humus is periodically removed from the vault and can be used as a fertilizer. It is crucial to control the moisture of the composting material to <55%; this is achieved by the addition of absorbent material (sawdust, ashes) or, if the ground conditions are suitable by providing an underdrainage system for liquid removal by infiltration. The organic matter also achieves the correct C:N ratio (ideally 20-30:1) and ashes raise the pH to above 7.

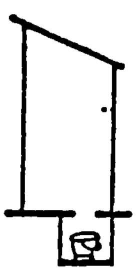


Batch composters are normally of the double vault variety. One vault is used until it is three-quarters full; it is then sealed and the other vault used. As with continuous composters it is necessary to add organic materials and ashes. The composting process is predominantly anaerobic, and as a result the temperature of the composting mass is only a few degrees (may be 5 - 10°C) above ambient. Pathogen destruction is therefore slower than in continuous composters. Each vault is generally used for a period of 3 - 6 months (but ideally 1 year), and after the same composting period (when the other vault is in use), the vault contents can be reasonably safely removed and used on the land.

Compost toilets have only been tried experimentally in Africa in Botswana and Tanzania. Experience in both countries indicates that continuous composters are not suitable in urban Africa, principally because it is impossible to ensure that fresh excreta is not washed down into the humus vault. Batch composters do not of course suffer from this major disadvantage. They have been found to work well, but a very high degree of user care is required to ensure their successful operation: the major problem is moisture control of the vault contents - ashes and grass (or other easily biodegradable organic matter) has to be added in the correct quantities and at the correct time and water must be excluded. Conscientious user care is only likely to be provided where there is a tradition of reusing human waste products in agriculture and where the value of this practice is realized. In much of Africa these conditions do not apply. In dense urban areas it is unlikely that people will feel motivated to produce humus for agricultural purposes and they may lack suitable organic material to add to the toilets.

Annuitized costs for batch composting toilets (excluding the superstructure) were US $ 34 per unit per year in Botswana and US $ 15 per unit per year in Tanzania.

4. BUCKET LATRINES

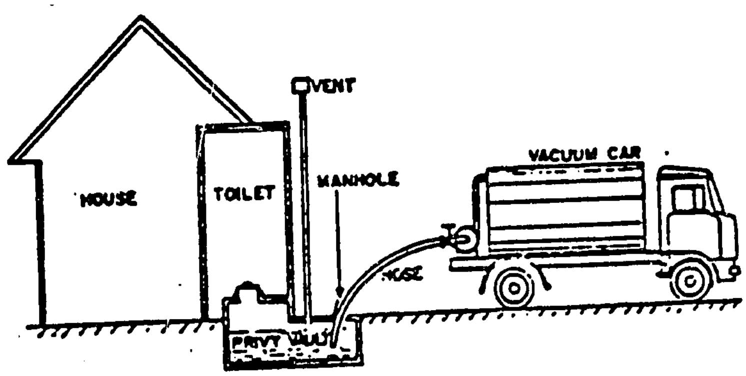


Bucket latrines are in practice the worst form of sanitation facility that we have examined in urban Africa. The reason for this is the high degree of spillage of excreta from the buckets when they are emptied by the collection labourers ('scavengers') into slightly larger collection buckets. As these buckets are carried to the nearest nightsoil depot, more spillage usually occurs. There is thus a wide dissemination of excreted pathogens in the environment, with clearly grave consequences to public health. At the collection depot the nightsoil is emptied into tankers and taken away either to a trenching ground for burial or (more rarely) to a treatment works, such as a waste stabilization pond or aerated lagoon system or a composting plant where it may be composted with domestic refuse. A major operational problem is tanker maintenance: it is not uncommon for half or more of the tankers to be out of operation at any one time.

The annuitized costs for bucket latrine systems (including collection and treatment costs) are:

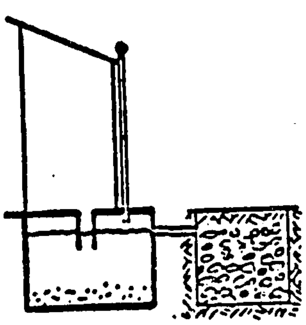
El Hasaheisa, The Sudan	US $ 117 per bucket per year
Ibadan, Nigeria	US $ 147 per bucket per year
Kumasi, Ghana	US $ 360 per bucket per year

A better nightsoil cartage system is the vault toilet and vacuum truck system which is extensively used in Asia, but which has yet to be tried in Africa. Excreta are deposited via a simple pour-flush water seal unit into a vault, from where they are removed directly by a small vacuum truck usually every two weeks. This system is appropriate for many high density areas in urban Africa where on-site disposal systems such as pit latrines cannot be used.



5. AQUA-PRIVIES

Aqua-privies are essentially septic tanks located immediately below the squatting plate. A simple water seal is provided by a 100 - 200 mm "drop-pipe" cast integrally with the squatting plate and extending 100 mm below the liquid level in the aqua-privy tank, which has to be watertight. This water seal has to be maintained otherwise there is strong odour release and a high degree of fly and mosquito nuisance. The seal is maintained in the simple, or "conventional" aqua-privy by the user pouring about 3 - 5 litres of water each day into the tank via the drop-pipe. The small amount of effluent from the tank is disposed of in a small adjacent soakage pit.



Experience in urban Africa, notably Zambia, showed that this simple maintenance task was rarely done, and as a result conventional aqua-privies suffered from fly and odour nuisance. One solution is to divert sullage water into the tank from a sink located immediately outside the toilet. The aqua-privy is then termed a "sullage aqua-privy" (or "self-topping" aqua-privy). The soakage pit has to be larger to accept the higher effluent flow from the aqua-privy tank. As household water usage, and thus sullage generation, increases a simple soakage pit is insufficient to dispose of the tank effluent. In such cases it is possible to connect the aqua-privy to a low-cost sewerage system, with treatment of the sewage on a series of waste stabilization ponds. As the aqua-privy tank retains all large solids, the sewers can be small (100 - 150 mm) and laid at flat gradients (1 in 150 - 200), as it is not necessary to obtain the self-cleansing velocities of 1 m/s required for conventional sewers; a nominal flow of 0.3 m/s is normally sufficient. Sewered aqua-privies are widely used in Zambia (where the sewered aqua-privy system is about half the cost of conventional sewerage), and also in the resettlement town of New Bussa in northwestern Nigeria. Provided there is a reliable on site water supply, sewered aqua-privies work extremely well; in one case (Matero suburb of Lusaka) they have worked for 18 years without any municipal maintenance whatsoever. However municipal maintenance should not be neglected and the municipality should regularly desludge the aqua-privy tanks and properly maintain the sewer network and the treatment ponds.

Annuitized costs for aqua-privy installations in urban Africa are as follows:

	US $ per a.q. per year
Gabarone, Botswana (Sullage aqua-privy for 6.4 people)	83
Ibadan, Nigeria. (Sullage aqua-privy for 800 people)	5202
Ndola, Zambia (Sewered aqua-privy for 6 people)	161
New Bussa, Nigeria (Sewered aqua-privy for 25 people)	524

6. TECHNOLOGY SELECTION

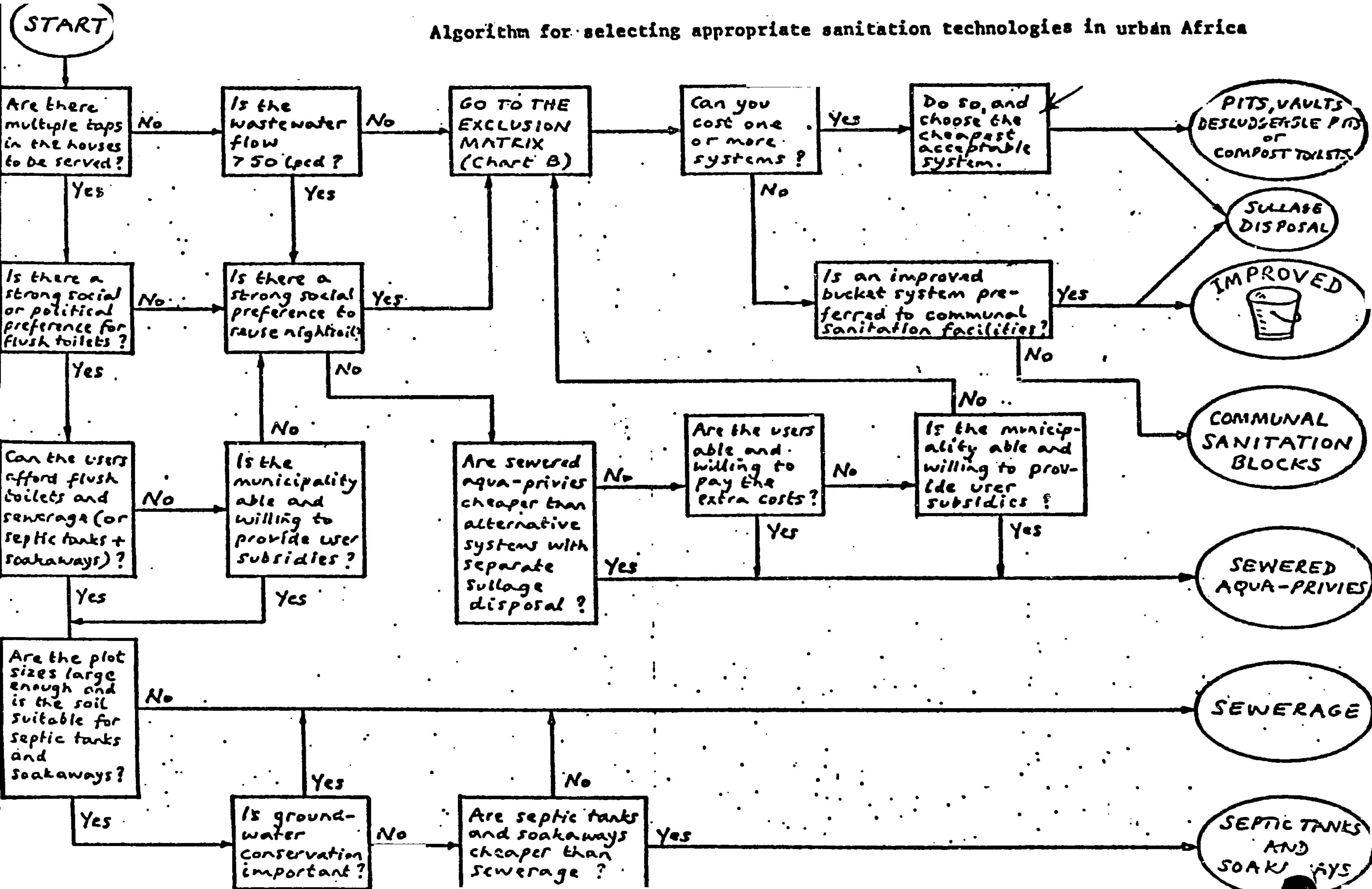
There are 6 sanitation technologies which are suitable for use in the urban tropics. They are:

(1) Improved pit latrines (including ROECs, pour-flush toilets and desludgeable wet pit latrines).
(2) Double vault batch composting toilets.
(3) Vault toilets (with vacuum trucks).
(4) Sewered aqua-privies.
(5) Conventional sewerage.
(6) Septic tanks.

Conventional and sullage aqua-privies are excluded because is preferable (both economically and technically) to have an improved pit latrine with separate facilities for sullage disposal. Buckets are excluded for health reasons, although an improved bucket latrine system may be the only possible solution in some cases.

The question facing sanitary engineers and urban planners is: Which sanitation technology is the most appropriate for a given community in the urban tropics? We have formulated a general answer to this question in the form of a combined algorithm and exclusion matrix, which is reproduced on the next two pages. We take as our starting point the level of

Algorithm for selecting appropriate sanitation technologies in urban Africa



B - EXCLUSION MATRIX

INSTRUCTIONS FOR USE:

1. Answer each question for the area under consideration (a cross indicates that the question is irrelevant for the technology concerned).
2. Cost each technology for which all the answers so obtained correspond to those given in the Matrix.

Question	Vault toilets	Desludgeable wet pits	Pit latrines	Compost toilets
Compost questions*	X	X	X	all yes
Is groundwater conservation important?	X	No	No	X
Is there access for collection vehicles?	Yes	Yes	X	X
Are there adequate facilities for vehicle maintenance?	Yes	Yes	X	X
Is the soil permeable?	X	No	Yes	X
Is the grounwater table within 2 m of ground surface?	X	No	No	X
Is there land available for two pit sites?	X	X	Yes	X

*Compost questions:

(1) can sufficient user care be reasonably expected?
(2) is there sufficient waste organic material available?
(3) are the users willing to handle humus?
(4) is there a local market or use for the humus?

water supply service to the community and we ask a series of questions, the answers to which lead the engineer and planner to the most appropriate choice of sanitation technology for the community in question.

7. RESEARCH PRIORITIES

We conclude our report by identifying several major areas where research is urgently needed. These are:

(1) Methodology for determining user preference.
(2) Sanitary entomology of pit latrines.
(3) Evaluation of vault toilets and desludgeable pit latrines in Africa.
(4) Economic comparative evaluation of minimum cost conventional severage and sewered aqua-privies.
(5) Design of communal sanitation facilities.
(6) Squatting plate design (materials).
(7) Sullage disposal systems.
(8) Measurement of odour levels in toilets.
(9) Excreta reuse in Africa.

ACKNOWLEDGEMENTS

The Authors would like to express their special gratitude to Mr John Kalbermatten, Mr Charles Gunnerson and Dr DeAnne Julius, all of the World Bank's Energy Water and Telecommunications Department in Washington DC, who assisted in the organization of these studies and helped us especially with the derivation of the cost data presented herein.

The authors would also like to express their great appreciation of the help given to them in the field by the following people:

Botswana

Mr Michael D. Blackmore, Mr Robert A. Boydell and Mrs E. Nomtuse Mbere, all of the IDRC sponsored Low-Cost Sanitation Research Project at the Ministry of Local Government and Lands, Gaborone.

Ghana

Professor Albert M. Wright, Dr K.Y. Balija and Mr S. Bonsu, Department of Civil Engineering, University of Science and Technology, Kumasi; Mr S.E. Owunsu, Faculty of Architecture, UST, Kumasi; Mr Nana Ofori, Ghana Water and Sewage Corporation Ghana; The City Engineer and the Principal Cleansing Officer, Kumasi City Council.

Nigeria

Mr P.A. Oluwande, Department of Preventative and Social Medicine, University of Ibadan; Mr S. Sulu, Mr A. Adekunle and Mrs M.A. Williams, Ibadan Wastes Disposal Board; Alhaji A. Dantoro and Mr M.I. Sule, Borgu Local Government Authority, New Bussa; Dr Adekolu John, Lake Kainji Research Centre; Mr J.T. Ajayi and Mr H.B. Idoko, National Electricity Power Authority, Kainji; Dr F.A. Bashua and Mr E.A. Alaba, Lagos City Council.

Tanzania

Professor W.I. Kilama and Mr E.K. Simbeye, Tanzania National Scientific Research Council.

Zambia

Mr A.J. Adamson and Mr J.T. Robertson, Ministry of Local Government and Housing, Lusaka; Mr G.H. Mutale, Mr R.K. Oliver and Mr M.K. Khan, National Housing Authority, Lusaka; Mr J.M. Bakhda, Mr F.A. Khan, Mr A.F. Banda, Mr P. Tembo, Mr S.O. Mensa and Mr F.M. Ntaimo, Lusaka City Council; Professor J. Amorin, Department of Community Health, University of Zambia, Lusaka; Mr S.M. Shomari and Mr S.L. Mufukana, UNICEF, Lusaka; Mr P. Pathmanathan, Dr M.E. Limbambala, Mr D.D. Kaonga and Mr P. Senthoorar, Ndola City Council; Dr S.M. Silangwa, National Council for Scientific Research, Lusaka; Dr Luwou, Provincial Medical Officer, Kabwe.

CHAPTER 1

EXCRETA DISPOSAL IN AFRICA

1.1 THE CURRENT LEVEL OF SERVICE - GLOBAL

Before describing excreta disposal in Africa it is useful to examine all the developing countries in order that the African situation may be set in perspective. The most recent survey of excreta disposal services in developing countries was carried out by The World Health Organization in 1975 and published in World Health Statistics Report (Vol. 29, No. 10, 1976). Many of the figures reported to WHO are open to doubt concerning their accuracy, while some are clearly optimistic*. However, they are the best figures that are available for inter-country and inter-regional comparisons and so we will be quoting them extensively.

Regarding the level of urban services in 1975, and the comparison between 1975 data and the data collected in the previous survey conduc in 1970, WHO (1976) writes:

> "-Percentage of people served: There has been an increase in the percentage of urban population served by excreta disposal facilities from 71% to 75% in the five-year period 1970-75. These were served either by connection to the public sewerage system or through household systems.
> There was actually a drop in the percentages of population with house connections to the public sewerage systems from 27% in 1970 to 25% in 1975, that is to say, any increase in connections to the public sewerage system did not keep pace with the increase in urban population. In absolute numbers, urban population having excreta disposal facilities were 337 million in 1970 compared with 437 million in 1975.

* For instance, WHO (1976) reports that 100% of both urban and rural people in the Central African Empire have adequate excreta disposal facilities. We are also told that 48% of rural Kenyans have adequate facilities, whereas a recent Government survey of Central Frofince (a relatively prosperous area) showed that only 20% of the whole population (urban and rural) were served.

"-<u>New targets</u>: No targets had been adopted by WHO for excreta disposal facilities prior to 1976, except in the Region of the Americas. Based on this mid-decade survey the World Health Assembly in 1976 adopted regional targets for excreta disposal for attainment by 1980, the weighted average of which on a global basis means that 95% of the urban population would have excreta disposal facilities by 1980. Of these, 38% would be served by connection to public sewerage systems and the remaining 57% by household systems. 245 million additional urban dwellers will have to be served in the five years 1976-80 to meet these targets.

"-<u>Investments</u>: Based on data provided by the 60 countries reporting, the investment on urban excreta disposal for additional persons served is estimated to be the equivalent of US $34 per additional person served in the period 1971-75; 5% of this was external assistance. The additional people served by urban excreta disposal in the five years 1971-75 were 100 million; an additional 245 million will have to be served in the five years 1976-80 to meet the target, an increase of approximately two-and-a-half times (at constant dollars). If inflation were taken into account the investment required in 1976-80 to meet the WHO target for 1980 is estimated at nearly five times that made in 1971-75. Roughly US $16,000 million would be required in the five-year period 1976-80."

In <u>rural areas</u> the situation is very much worse. WHO (1976) states:

"-<u>Percentage of people served</u>: 11% of the 1970 rural population had adequate excreta disposal facilities; this percentage rose to 15% in 1975. In other words, 134 million people in rural areas had adequate excreta facilities in 1970; the corresponding figure for 1975 was 209 million.

"-<u>New targets</u>: Based on the mid-decade (1975) survey, WHO in 1976 adopted specific regional targets for 1980 giving a weighted global average of 25%; 178 million additional rural dwellers will

"-Investments: From data provided by the 57 countries reporting the investments in rural excreta disposal per additional person served is estimated to be the equivalent of US $6 in the five-year period 1971-75, approximately 0.5% consisting of external assistance. The additional rural population served in the five years 1971-75 was 75 million; an additional 178 million will have to be served in the five years 1976-80 to meet the targets - an increase of almost two-and-a-half times (at constant dollars). Allowing for inflation in the five-year interim period, it is estimated that a four-and-a-half times increase over that made in 1971-75 period will have to be made in the 1976-80 period to meet the targets, i.e., the investment required in the five-year period will be approximately US $2,000 million."

The figures on global provision of urban and rural excreta disposal services are summarised in Table 1.1. It must be borne in mind, however, that the figures and percentages presented are, especially in urban areas, optimistic. For instance, the 437 million urban people (75%) stated to be served in 1975 will include many people who are only served by grossly unhygienic and unsatisfactory systems (for instance, bucket latrines in Ibadan and Kumasi - see Chapter 4). The data give little idea of the numbers served by acceptable and well operated systems.

1.2 THE CURRENT LEVEL OF SERVICE - REGIONAL

Table 1.2 sets out the inter-regional comparisons in excreta disposal service in the six WHO regions. Again we must note that some of these figures appear optimistic. For instance, few people with wide experience of sanitation in Africa would believe that over one in four rural Africans have adequate excreta disposal services.

The data indicates that the African region is better served than the Eastern Mediterranean and European* regions with respect to urban

* European region countries included in the survey were Algeria, Malta, Morocco and Turkey.

TABLE 1.1

Numbers and percentages of people in urban and rural areas of developing countries served by some excreta disposal system

Population group	Population served by sewers or household systems	
	1970	1975
	millions (%)	millions (%)
Urban	337 (71)	437 (75)
Rural	134 (11)	209 (15)
Total	471 (27)	646 (33)

TABLE 1.2

Percentages of urban and rural people in the six WHO regions with excreta disposal services

Region	Urban				Rural	Total	
	% served	Of those served, % with			% served	% served	millions unserved
		sewerage	pits or septic tanks	buckets			
Africa*	75	19	75	6	28	38	108
Americas*	80	73	27	0.1	25	63	85
Eastern Mediterranean*	63	17	80	3	14	27	20
Europe**	38	54	46	0	18	27	56
South-East Asia	79	33	33	34	6	20	930
Western Pacific	81	30	44	26	43	58	101

* For these three regions there are printing errors in the data presented in Table 3 of WHO (1976) and some interpretation has been necessary to arrive at the values given in this table.

**European region countries included in the survey were Algeria, Malta, Morocco and Turkey.

services and better than all other regions except the Western Pacific with respect to rural areas. Moreover, the figures on the millions of people unserved highlight the fact that 63% of all unserved people live in the South East Asia region, while only 7% live in the African region. When we examine the figures from the South East Asia region we find, alarmingly, that 82% of the 930 million unserved people come from only two countries - India and Indonesia. Indeed the unserved people in India alone constitute 42% of all unserved people in all the developing countries surveyed by WHO.

1.3 THE CURRENT LEVEL OF SERVICE - AFRICA

Turning to the African region, WHO (1976) writes on the urban situation as follows:

> "-Percentage of people served: There has been an appreciable increase in the percentage of urban population served by excreta disposal facilities from 47% to 75% in the five-year period 1970-75, most of which was by service through household systems. The increase in connections to public sewers was from 8% in 1970 to 15% in 1975; in absolute numbers, urban populations having excreta disposal facilities were 14 million in 1970 compared with 30 million in 1975.
>
> "-New targets: No targets had been adopted by WHO for excreta disposal facilities prior to 1976, except in the Region of the Americas. Based on this mid-decade survey the World Health Assembly in 1976 adopted regional targets for excreta disposal for attainment by 1980, the target for the African Region of WHO is: 95% of the urban population to have excreta disposal facilities by 1980. Of this, 20% would be served by connection to public sewerage systems and the remaining 75% by household systems. 27 million additional urban dwellers will have to be served in the five years 1976-80 to meet these targets.
>
> "-Investments: Based on data provided by the 13 countries reporting, the investment on urban excreta disposal is estimated to be the equivalent of US $19 per additional person served in the period 1971-75; 13% of this was external assistance. The additional people served by urban excreta disposal in the five

years 1971-75 were 16 million; an additional 27 million will have to be served in the five years 1976-80 to meet the target - an increase of approximately 1.7 times (at constant dollars). If inflation were taken into account, the investment required in 1976-80 to meet the WHO target for 1980 is estimated at nearly three-and-a-half times that made in 1971-75. Roughly US $1,100 million would be required in the five-year period 1976-80."

Considering the rural areas of Africa, WHO (1976) comments:

"-Percentage of people served: 23% of the 1970 rural population had adequate excreta disposal facilities; this percentage rose to 28% in 1975. In other words 38 million people in rural areas had adequate excreta facilities in 1970; the corresponding figure for 1975 was 55 million.

"-New targets: Based on the mid-decade (1975) survey, in May 1976 a target of 25% was proposed to the Twenty-ninth World Health Assembly, which it adopted. Additional information since available shows the progress already made is in the region of 28%. Hence a target of 30% for attainment by 1980 has been assumed in this report for estimates and computations. An additional 11 million rural people will have to be served in the five years 1976-80 to meet this assumed target.

"-Investments: From data provided by the countries in 1970, the unit cost per capita has been taken as US $7 in the 1971-75 period. There was practically no external assistance. The additional rural population served in the five years 1971-75 were 17 million; an additional 11 million will have to be served in the five years 1976-80 to meet targets. The investment required in the five year period 1976-80 will be approximately US $150 million."

This information strongly suggests that substantial progress has been, and is being made in Africa but that much remains to be done. The cost figures quoted are very much lower than the cost figures presented in Chapters 2-5 of this report. This reflects partly inflation over the intervening period but probably also inadequate costing procedures under which some costs, such as the costs of water needed to make some excreta disposal systems operate, are excluded.

1.4 REPORT OUTLINE

The purpose of this report is to review a variety of excreta disposal technologies which may have application in the towns and cities of Africa. Chapters 2, 4 and 5 are devoted to three technologies (pit latrines, bucket latrines and aqua-privies) which are already widely found in urban Africa. Chapter 3 is devoted to composting toilets, a technology which has recently aroused considerable interest but which has only been tested on a very limited scale in Botswana and Tanzania. In each of Chapters 2-5, considerable space is devoted to the reporting of actual case studies of excreta disposal technologies in Botswana, Ghana, Nigeria, Sudan, Tanzania and Zambia. The sites of these case studies, and the particular technologies involved, are shown in Figure 1.1.

Chapter 6 considers a variety of important factors which affect the successful outcome of an excreta disposal project, and Chapter 7 discusses the issues related to the disposal of sullage and the use of water for toilet operation. In Chapter 8 we try to integrate all the material previously presented in order to provide specific and clear-cut guidance on the choice of a truly appropriate sanitation technology in a given urban environment. Finally in Chapter 9 we list several major areas of current ignorance which we recommend should be investigated as research priorities as soon as possible.

1.5 REFERENCE

WHO (1976) Community water supply and excreta disposal in developing countries: a review of progress. World Health Statistics Report 29 (10), 543-603.

CHAPTER 6

MISCELLANEOUS FACTORS

6.1 INTRODUCTION

In this chapter we discuss several factors which are not adequately covered in other chapters. The fact that we label them miscellaneous in no way implies that they are minor and, indeed, most of them are absolutely crucial to the successful implementation of any improved sanitation system. We discuss them briefly, partly to prevent this report from becoming too long and partly because, in some cases, there is little except a few words of common sense to say. Such factors as institutional development, user acceptance and health education do not have a well developed body of theory and practice. The central facts are relatively obvious and simple while the subtleties and complications are largely unknown and unstudied.

6.2 HEALTH

We have dealt only very briefly with health in Chapters 2 - 5. Health is the main social benefit and one of the economic benefits which investors in excreta disposal hope to achieve and it is therefore of the utmost importance. Health and excreta are reviewed at length in Feachem et al. (1978) which should be consulted for more detailed information.

6.3 INSTITUTIONS AND MANPOWER

It is evident that any urban sanitation system requir[illegible] carefully designed, well managed and well staffed agency to operate it. It seems to us that few general prescriptions can be made and that the correct institutional arrangements will depend very much upon the existing municipal organisation and the type of excreta disposal system to be managed. For instance, an institution set up to operate a bucket latrine system, which is very demanding of any municipality, may be quite inappropriate for a sewage system or a vented pit latrine programme.

One institutional point which has emerged from our African stu[illegible] (Iwugo et al., 1978a, 1978b, 1978c and 1978d) is that problems may arise when institutional control is given to a health authority, or other agenc[illegible] which lacks the necessary engineering expertise. A fundamental

MISSING PAGE

NO. 9-138

prerequisite of successful management must be the employment of a sufficient number of adequately paid, well motivated and appropriately trained engineers. In most African countries, these appropriately trained and motivated engineers do not exist. They are not being produced by most African university departments of civil engineering (which generally follow European syllabi), nor yet by the new postgraduate courses in sanitary engineering (at Nairobi, Kenya, and Ahmadu Bello, Nigeria). There is an urgent need to not only increase the rate of production of African sanitary engineers* but also to drastically revise the syllabi. How many graduating sanitary engineers in Africa have been exposed to the kind of material contained in this report? Very few, if any!

6.4 USER ACCEPTANCE

There is clearly no point in investing in excreta disposal facilities which are unacceptable to the users. It is also mistaken to suppose that problems of user acceptance can be sorted out after construction through education programmes. Statements like "if the people don't like it we will teach them to like it" are simplistic, paternalistic and unrealistic.

However, having accepted that user acceptance is crucial it is of little help to make vague exhortations to designers and planners to involve the community in decision making. Designers and planners require very precise guidance about how to involve the community and how to ensure that user preferences are fully accounted for in design. It will probably require a few more years of field experience with user-choice design techniques before a well-tried method emerges. However, in the meantime we suggest that the outline given in Figure 6.1 may be some help.

In many cases user preference and user acceptance will be more closely linked to superstructure design than to substructure design.

* It is noteworthy that the training of professional engineers of all kinds has been seriously neglected in many African countries. In each of the nine African countries of which we have first hand experience there are considerably more fully trained doctors than engineers.

FIGURE 6.1

Possible sequence for community involvement in the choice and design of excreta disposal systems

Initial data gathering

↓

Community data gathering including surveying existing facilities and establishing close working relationships with community leaders and organisations. Obtain preliminary data concerning community preferences.

↓

Macro-design and feasibility study preparation. Follow methods described in Chapter 8 and select a short list of potentially suitable technologies.

↓

Intensive interaction with the community. Inform community of technical options. Construct several examples of options and allow inspection and use. Arrive, through interation with community, at a choice of which option is most preferred. Superstructure preferences may need careful attention.

↓

Detailed design of selected option.

Provided that the excreta are removed from view and that the latrine does not smell, users may be influenced most by the design and colour of the latrine house and the seat or squatting slab. Considerable attention must therefore be given to details which may be trivial in the engineering sense but could be all important in determining the eventual use and hygienic maintenance of the new facilities.

6.5 USER EDUCATION

The need for user education will be reduced by following the guidelines for user acceptance which are discussed in Section 6.4. If the users have taken part in the selection and design of the new facilities, and if they feel that the choice of technology was partly theirs, they may well have a positive attitude towards the innovation and be at least moderately aware of its technical characteristics. However, it will still be necessary to mount a continuing and vigorous community campaign with special emphasis on the following points:

(1) personal and latrine cleanliness;

(2) correct operation of the system;

(3) correct and conscientious maintenance of the system;

(4) full use of the new facilities by children; and

(5) at least partial payment in cash or kind for the benefits received.

6.6 CHILDREN

Many of the excreted infections have a very markedly non-uniform distribution of prevalence between different age groups. While all of them are found among people of all ages, many of them are concentrated in particular age groups. Table 6.1 states the age group which is most afflicted by the main excreted infections in areas where these infections are endemic.

This table clearly shows that many of these infections are primarily infections of childhood or that they afflict children as well as adults. This has the greatest relevance for disease control through excreta disposal improvements.

In all societies children below the age of about 3 will defaecate whenever and wherever they feel the need. A proportion of these children will be excreting substantial quantities of pathogens. In some societies their stools are regarded as relatively inoffensive

TABLE 6.1 The age of maximum prevalence of some major excreted infections in indigenous populations of endemic area

Infection	Age group in which highest prevalence of infection is typically found			
	Babies 0 - 2	Children 3 - 12	Teenagers 13 - 19	Adults 20 +
Enteroviruses	*	*		
Hepatitis A virus	*	*		
Rotavirus	*			
Entamoeba histolytica			*	*
Giardia lamblia		*		
Balantidium coli			*	*
Enterobius	*	*		
Hymenolepis	*	*		
Salmonella typhi	*	*	*	*
Other *Salmonellae*	*	*		
Shigella	*	*	*	*
Vibrio cholerae		*		
Path. *E. coli*	*			
Yersinia	*	*		
Ascaris		*	*	
Trichuris		*	*	
Hookworms		*	*	*
Strongyloides		*	*	*
Taenia			*	*
Clonorchis			*	*
Diphyllobothrium			*	*
Fasciolopsis		*	*	
Paragonimus			*	*
Schistosoma spp.		*	*	*

and they are allowed to defaecate anywhere in or near the house. In this case it is highly likely that their stools will play a significant role in transmitting infection to other children and adults. This applies not only to those infections without a latency period but also to infections like ascariasis, hookworm and trichuriasis where the defaecation habits of children will determine the degree of soil pollution in the yard and around the house and this, in turn, will largely determine the prevalence and intensity of these geohelminthic diseases in the household.

In other societies by contrast, strenuous efforts are made to control and manage the stools of young children, either by making them wear nappies (diapers) or by cleaning up their stools whenever they are observed. Either of these ractions should have an important influence on the intra-familial transmission of excreted pathogens.

Between these two extremes there is a whole range of intermediate behaviour patterns with regard to the reaction of adults to the stools of young children. In most poor communities, the picture is closer to the first example than to the second. The relevant response of government and other responsible agencies to this situation is health education of mothers to encourage a belief that the stools of young children are dangerous and should be hygienically disposed of. The problem is primarily connected with attitudes and behaviour. However, the provision of some form of toilet for the disposal of the child's stool, and, maybe more importantly, a convenient water supply will greatly assist child hygiene.

Turning to children over 3 years; they are capable of using a toilet if one of suitable design is available. Children in the age range 3 - 13 frequently do not use toilets even where they are available because:

(1) they find it inconvenient and are not encouraged to by adults;
(2) they are afraid of falling down the hole or of being attacked by pigs or other animals which may live next to the latrine;
(3) they cannot because the toilet is so designed that little people cannot use it;
(4) they are prevented from doing so by adults who do not want the children messing up their nice clean toilet.

As with the very young children, it is of vital importance that the stools of these children are hygienically disposed of because some of them will be rich in pathogens. The solution lies in a combination of the provision of a toilet which children are able and happy to use and health education for the mothers so that they compel their children to do so. Education for school children could also be effective here and it is vitally important that all schools have well-maintained latrines so that the children may learn from positive experience.

6.7 COMMUNAL OR PRIVATE?

Experience with public latrines of all kinds in all countries has often been unsatisfactory. The basic problem is that a public facility appears to belong to no-one individually and so there is very little commitment by individual users to keeping it clean and operating it properly. This is as true in Manchester as it is in Calcutta.

Public or communal latrines should usually only be considered for institutions (e.g. schools) or where special cultural condition apply - as for instance the use of communal blocks by extended families in Ibadan (see Section 5.9.4). In any case it will nearly always be necessary for paid employees to be engaged with responsibility for cleaning and upkeep. The task of cleaning is made much easier if there is a tap in the block which may be used to hose down the floors and walls several times a day.

Communal latrines often require lighting, or they will not be used after dark. Arrangements must be made beforehand to pay for this, because communities are seldom able to raise money regularly by voluntary collections. Another difficult question surrounding communal facilities is that of privacy. The requirements for privacy of the population must be clearly understood and respected.

A compromise between public and private latrines, which is used in some parts of India, is to have a central latrine block serving 8 - 15 households, in which each household keeps its cubicle locked and is responsible for its upkeep. Experience shows that each household will zealously guard its cubicle and keep it clean, but that maintenance to the overall system (e.g. blockage in the effluent pipe) will cause organisational problems.

In areas where communal latrine blocks are provided, it is usually desirable to enlarge the latrine block to include personal washing and laundry facilities. With good design it should be possible to provide at reasonable cost both private shower and toilet facilities for individual households within the communal sanitation block. Private facilities for clothes washing would not normally be required. To obviate organizational problems the municipality should employ a maintenance labourer and also be responsible for levying and collecting monthly rental fees from each household using the sanitation block.

Lastly, a communal latrine is necessarily a certain distance from each household, and this may be enough to deter some users, particularly at night or during wet or cold weather. In some societies, it may be essential that each family have its own latrine, in or very close to the house.

REFERENCES

Feachem, R., Bradley, D.J., Garelick, H. and Mara, D.D. (1978) Health Aspects of Excreta and Wastewater Management. Washington: World Bank.

Iwugo, K.O., Mara, D.D. and Feachem, R.G. (1978a) Sanitation Studies in Africa - Site Report No. 1, Ibadan, Nigeria. Washington: World Bank.

Iwugo, K.O., Mara, D.D. and Feachem, R.G. (1978b) Sanitation Studies in Africa - Site Report No. 2, New Bussa, Nigeria. Washington: World Bank.

Iwugo, K.O., Mara, D.D. and Feachem, R.G. (1978c) Sanitation Studies in Africa - Site Report No. 3, Kumasi, Ghana. Washington: World Bank.

Iwugo, K.O., Mara, D.D. and Feachem, R.G. (1978d) Sanitation Studies in Africa - Site Report No. 4, Ndola and Lusaka, Zambia. Washington: World Bank.

CHAPTER SEVEN

W A T E R   A N D   S U L L A G E

7.1 INTRODUCTION

In this Chapter we discuss the engineering feasibility of using different sanitation systems for different types of low-income housing with different levels of water supply service and hence different quantities of on site sullage generation.

The sanitation systems we consider are:

(1) pit latrines;
(2) compost toilets;
(3) aqua-privies (sewered and unsewered);
(4) conventional sewerage (to serve flush toilets); and
(5) nightsoil cartage systems (buckets and vaults)

We consider three levels of water supply service:

(1) public standpipes (20 lcd);
(2) single tap house connections (80 lcd); and
(3) multiple tap house connections (>150 lcd);

and two types of low-income housing:

(1) modern suburban housing estates with fairly small plot sizes (around 300 m^2); and
(2) older high density, low rise housing in central areas which has little or no space between houses.

In this Chapter we discuss only the engineering feasibility of the different sanitation systems. We do not discuss their desirability or undesirability in any situation, nor do we compare their intrinsic merits or limitations; this we do in Chapter 8.

7.2 SANITATION SYSTEMS FOR MODERN LOW-INCOME SUBURBAN HOUSING ESTATES

7.2.1 Public standpipes

Pit latrines, compost toilets and nightsoil cartage systems are generally feasible, whereas aqua-privies and conventional sewerage are not. Aqua-privies are excluded because of the reluctance of users to carry home enough water to maintain the water seal.

None of the three appropriate systems (pits, composters or cartage) have much ability to dispose of sullage. Indeed, the successful operation of composters depends on the complete exclusion of sullage. We assume that the small volumes of on-site sullage produced (<20 lcd) will be disposed of adequately by tipping in the yard or on the garden. Where this is not acceptable, on-site sullage disposal in small soakaways might be provided, or drains could be built linking the yard to the stormwater drains in the street.

7.2.2 Single tap service

The feasibility of the different sanitation systems remains almost the same as for the public standpipe service, except that aqua-privies become feasible. There should now be no difficulty with water seal maintenance, and the decision to install sullage or sewered aqua-privies depends on the quantity of sullage generated and the permeability of the soil.

If aqua-privies are built they can be designed to accept all the sullage produced. However, as above, in the case of pits, composters or cartage, separate arrangements for sullage disposal must be made. Sullage generation is probably too high for simply tipping in the yard and the provision of simple soakaway pits is indicated. Alternatively, sullage may be led to street drains.

7.2.3 Multiple tap service

Conventional sewerage or sewered aqua-privies are commonly regarded as the most feasible systems for a multiple tap level of water service. Flush toilets leading to a large septic tank with subsurface disposal of the effluent is an alternative to conventional sewerage if sufficient suitable land for a drainfield is locally available; or the septic tank effluent may be discharged into a series of waste stabilization ponds; or it may be discharged into a small, flat sewer (so that the system becomes essentially a variation of the sewered aqua-privy system).

It is feasible to use pit latrines, compost toilets and nightsoil cartage systems provided that their cost and the cost for the separately required sullage disposal system (Section 7.4) are less than the cost of the cheapest system which accepts excreta and sullage.

7.3 SANITATION SYSTEMS FOR HIGH DENSITY, LOW INCOME URBAN HOUSING

7.3.1 Public standpipes

It is assumed that the housing density is sufficiently high to exclude pit latrines. Aqua-privies are excluded because of the lack of on-site water. Sewerage is excluded for the same reason. This leaves cartage systems or composters as possibilities. The feasibility of double vault batch composters depends on: (1) whether there is sufficient space for the "double" toilet; (2) the availability of waste organic material, ash, etc; (3) humus collection by the municipality; and possibly (4) the existence of a local market or use for the humus.

Sullage disposal will not be possible in on-site soakaways and so tipping into street drains is the most likely solution. (See Section 7.4).

7.3.2 Single tap service

Sewered aqua-privies are feasible if sufficient sullage is generated. Otherwise the feasibilities are as described in Section 7.3.1.

Where sewered aqua-privies are not used, drains must be provided to lead water from the tap or sink to the street drains (see Section 7.4).

7.3.3 Multiple tap service

Conventional sewerage, either with or without commumal septic tanks discharging into "aqua-privy sewers", is feasible. Otherwise the situation is as described in Section 7.3.2. Sullage must be discharged into a sewerage system or street stormwater drains.

7.4 SULLAGE DISPOSAL

There are three kinds of separate sullage disposal systems:

(1) casual disposal by tipping in the yard;
(2) on-site disposal by soakaway;
(3) drainage in open drains.

Tipping in the yard may create breeding sites for Culex pipiens which is a major nuisance mosquito and also the vector of bancroftian filariasis in some areas of the world. It may also create muddy and insanitary conditions in the yard which could help to promote the development of nematode ova which require a fairly moist environment. A clean, dry yard is less likely to be used for defaecation by children and any ova deposited are unlikely to develop. A wet muddy yard will conceal any faeces deposited and will promote development of worm eggs and larvae. Sullage containing pathogens from babies' bath water or adults' ablution water may infect children playing in the yard. In well-draining soils, where sullage production or housing density are low, tipping of sullage water outside the home is unlikely to be a major health hazard. However, where soils are less permeable, and where water use or housing density are high, an adequate method of sullage disposal becomes essential.

Sullage disposal by soakaway provides a low risk of groundwater contamination. It is worth noting that the risk of microbiological groundwater pollution is very much lower with sullage than it is with sewage. The same is true of high nitrate pollution, since sullage contains very little nitrogen compared to sewage.

Drainage in open drains such as stormwater drains, provides a readily identifiable health risk - namely that of promoting Culex pipiens and other mosquito breeding. Assume that sullage is being introduced into the stormwater drainage system. In areas of year-round rainfall, these drains will contain water continuously. If they are kept free of garbage and are well designed they will flow freely and provide few sites for mosquito breeding. The presence or absence of sullage will make no difference. However, in areas of seasonal rainfall, and where the drains are liable to blockage and pondage, the addition of sullage will create year-round water and thus year-round Culex breeding where previously only seasonal Culex breeding may have occurred. Thus, it is not the quality of the sullage which is important, since ponded stormwater will also be sufficiently polluted to allow Culex pipiens breeding. It is the continuous production of sullage which may have the effect of converting wet season breeding into year-round breeding in areas where the stormwater drains are liable to pond. The change from wet season breeding to year-round breeding may have a considerable impact on filariasis transmission and lead to increased prevalence and intensity of infection.

The solution to these problems is either to use an alternative method of sullage disposal or to protect drains from blocking by covering or by vigorous efforts to keep them clear. The latter approach is the more realistic and can be implemented either by the employment of municipal gangs, or by sub-contracting the job to the private sector, or by organising and motivating community effort on a neighbourhood basis. Drainage channels should be lined and have a central section of smaller cross-sectional area to increase flow velocities at low flows. Where the sullage water is to be reused or discharged into low flow streams, it may require treatment. Sullage may contain substantial levels of readily biodegradable organics but is unlikely to contain a significant load of pathogenic micro-organisms. Treatment in waste stabilization ponds, or in conventional treatment plants, is appropriate.

7.5 SUMMARY

The engineering feasibility of the different sanitation and sullage systems under different housing and different levels of water supply service is summarised in Tables 7.1, 7.2, 7.3 and 7.4. We wish to stress again that these Tables refer only to engineering feasibility and not to what potential users, municipal authorities or or consulting engineers may consider desirable. In particular we wish to stress that, if a non-sewered system is to be used in areas served by single or multiple tap water supplies, detailed attention must be paid at the design stage to the provision of adequate facilities for sullage disposal.

Table 7.1 Engineering feasibility of different individual household sanitation systems for modern low-income suburban housing estates with different levels of water supply service.

Sanitation facility	Public Standpipe	Single tap	Multiple tap
Pit latrines	F	F*	F*
Compost toilets	F	F*	F*
Aqua-privies (unsewered)	I	F**	I
Aqua-privies (sewered)	I	F**	F
Conventional sewerage	I	I	F
Nightsoil cartage	F	F*	F*

F : Feasible

I : Infeasible

* : Adequate sullage disposal facilities required (see Table 7.2)

** : Feasible only if sufficient sullage generated

Table 7.2 Engineering feasibility of different sullage disposal systems for modern low-income housing estates with different levels of water supply service.

Sanitation facility	Public Standpipe	Single tap	Multiple tap
Pit latrines	T/S/D	S/D	D
Compost toilets	T/S/D	S/D	D
Aqua-privies (unsewered)	-	S	-
Aqua-privies (sewered)	-	Se	Se
Conventional sewerage	-	-	Se
Nightsoil cartage	T/S/D	S/D	D

T : Tipping in yard or on garden

S : Soakaway on-site

D : Stormwater drains

Se : Sewer

\- : Condition not feasible (see Table 7.1)

Table 7.3 Engineering feasibility of different individual household sanitation systems for high density low income urban housing with different levels of water supply service

Sanitation facility	Public standpipe	Single tap	Multiple tap
Pit latrines	I	I	I
Compost toilets			
Aqua-privies (unsewered)	I	I	I
Aqua-privies (sewered)	I	F**	F
Conventional sewerage	I	I	F
Nightsoil cartage	F	F*	F*

F : Feasible

I : Infeasible

* : Adequate sullage disposal facilities required (see Table 7

** : Feasible only if sufficient sullage generated

Table 7.4 Engineering feasibility of different sullage disposal systems for high density, low-income urban housing with different levels of water supply service.

Sanitation facility	Public standpipe	Single tap	Multiple tap
Pit latrines	-	-	-
Compost toilets	D	D	D
Aqua-privies (unsewered)	-	-	-
Aqua-privies (sewered)	-	Se	Se
Conventional sewerage	-	-	Se
Nightsoil cartage	D	D	D

D : Stormwater drains

Se : Sewer

- : Combination not feasible (see Table 7.3).

CHAPTER 8

TECHNOLOGY COMPARISONS AND SELECTION

8.1 METHODS OF COMPARISON

The aim of this chapter is to compare the variety of available technologies and to propose methods for selecting amongst them. This requires some preliminary discussion of ways in which comparisons may be made.

The usual approach to technology comparisons in the field of excreta disposal is to first define criteria. Technologies are then compared in some kind of matrix which displays their putative performance according to the stated criteria. A very simple version of this approach was used by Feachem and Cairncross (1978) and is reproduced in Table 8.1. Seven criteria were adopted and seven technologies are compared in a purely descriptive way. No overall ranking or conclusions are attempted and it is presented as a guide for the non-technical reader. Its most useful function may be to exclude certain technologies in a given situation, rather than to select the best technology.

A more complex approach was used by Winblad (1972). He defined six kinds of criteria (health, ecological, nuisance, cultural, operational and cost) and produced the matrix shown in Table 8.2. Winblad points out that "none of the fifteen systems evaluated fulfils all the requirements". No overall ranking is attempted and the matrix is used to stimulate a discussion which embraces the relevant criteria. Winblad's main recommendation is that systems which emerge favourably from this discussion, especially the composting toilets, should be tried in Africa on a pilot scale. It was this recommendation which led eventually to the research project in Tanzania reported in Chapters 2 and 3.

The matrix approach to technology comparison has been taken much further by Wright (1977) who reports the findings of an expert working group which considered the relative merits of 25 technologies for rural sanitation. Twenty five weighted criteria were employed and the result is reproduced in Table 8.3. The overall ranking shown in Table 8.3 was

TABLE 8.1 Classification matrix for sanitation systems used by Feachem and Cairncross (1978)

Sanitation System	*Rural Application*	*Urban Application*	*Construction Cost*	*Operation Cost*	*Ease of Construction*	*Water Requirement*	*Hygiene*
Pit latrines	Suitable in all areas	Not in high density suburbs	Low	Low	Very easy except in wet or rocky ground	None	Moderate
Bucket and cartage	Suitable	Suitable	Low	High	Easy	None	Bad
Vault and vacuum truck	Not suitable	Suitable where vehicle maintenance available	Medium	High	Requires skilled builder	None	Moderate
Aqua privies	Suitable	Suitable	High	Low	Requires skilled builder	Water source near privy	Good
Septic tanks	Suitable	Suitable for low-density suburbs	Very high	Low	Requires skilled builder	Water piped to privy	Excellent
Pour flush and soakaway	Suitable	Not suitable	High	Low	Requires skilled builder	Water source near privy	Good
Sewerage	Not suitable	Suitable where it can be afforded	Very high	Medium	Requires experienced engineer	Water piped to privy	Excellent

TABLE 8.2 Winblad's (1972) sanitation classification matrix

SYSTEM	INPUT REQUIRED		NETWORKS REQUIRED		EQUIPMENT REQUIRED		CRITERIA SATISFIED						REMARKS
	energy	water	roads	pipes	vehicles	sludge pumps	ecological criteria	health criteria	nuisance criteria	cultural criteria	operational criteria	cost criteria	
REMOVAL													
bucket systems													
bucket latrine	−	−	+	−	+	−	+	−	−		+	−	Ecological criteria fulfilled only if composted or processed in treatment plant
freeze toilet	+	−	−	−	−	−	+	+	+		−	−	
packing toilet	+	−	−	−	−	−	+	+	+		−	−	
privy vault/vac.truck	−	−	+	−	+	+	+	+	−		+	−	
chemical toilet	−	−	+	−	+	−	−	−	−		−	−	
pipe systems													
water-borne	−	+	−	+	−	−	+	+	+		+	−	
vacuum	+	+	−	+	−	−	+	+	+		−	−	
REMOVAL/INFILTRATION													
aqua privy	−	+	−	+	+	+	−	+	+		+	−	
septic tank	−	+	−	+	+	+	−	+	+		+	−	
INFILTRATION/DESTRUCTION													
pit latrine	−	−		−	−	−	−	−	−	+	+	+	
DESTRUCTION													
incineration													
incinerator	+	−	−	−	−	−	+	+	−		−	−	
biological decomposition													
algae tank	−	+	−	−	−	−	+	+	+		−	−	
"multrum"	−	−	−	−	−	−	+	+	+	+	+	−	
"mullbänk"	+	−	−	−	−	−	+	+	+		−	−	
"saniterm"	+	−	−	−	−	−	+	+	+		−	−	

TABLE 8.3 Weighted sanitation classification matrix used by Wright (1977)

Latrine types			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	Total scores	Ranks
General attributes			Cost		Health				Technology: Operation & Maintenance							Technology: Construction							Aesthetic			Safety	Ecology			
Relative weighting			40		32				14							10							16			8	4			
			10	20	12	12	4	4	3	3	2	2	2	1	1	2	2	2	1	1	1	1	8	4	4	8	2	2		
A	1	BUCKET LATRINE	100	20	12	24	16	16	12	3	6	10	10	2	5	8	10	10	5	5	5	5	8	8	12	40	4	4	360	24
B	2	VACUUM TRUCK CARTAGE SYSTEM	60	40	48	36	12	16	3	6	6	6	2	2	2	6	8	10	5	5	4	5	24	16	16	40	4	8	410	20
B	3	WATER CARRIAGE SYSTEM	20	60	60	60	4	12	6	15	8	2	2	3	1	2	6	10	5	5	5	5	40	20	20	40	8	4	421	18
C	4	CONVENTIONAL PIT LATRINE	100	100	36	14	8	8	15	15	10	10	10	5	5	8	10	2	1	1	3	5	16	12	4	32	8	2	438	15
C	5	VENTED PIT LATRINE	60	100	48	36	8	8	15	15	10	10	10	5	5	4	10	2	1	1	3	5	32	12	4	32	8	2	468	11
C	6	OFF-SET DRY PIT LATRINE	100	100	48	36	8	16	15	12	10	10	10	4	5	6	10	8	4	4	3	5	32	12	8	40	8	4	498	3
C	7	BOREHOLE LATRINE	80	100	36	24	8	8	15	15	10	10	10	5	5	8	10	2	1	1	3	1	16	12	4	32	8	2	426	16
C	8	VIETNAMESE VAULT LATRINE	60	100	36	48	20	20	15	9	8	10	10	4	4	6	10	10	5	5	3	5	24	12	4	40	10	10	486	6
C	9	GOPURI LATRINE	60	100	36	36	12	16	15	9	6	10	10	4	4	4	10	10	1	5	3	5	24	12	4	40	10	10	456	12
C	10	MULTRUM	60	100	36	36	12	16	15	12	6	10	10	4	4	4	10	10	5	5	4	5	24	16	8	40	10	10	472	10
C	11	UTAFITI LATRINE	60	100	48	36	12	16	16	12	6	10	10	4	4	4	10	10	5	5	4	5	24	12	8	40	10	10	480	7
C	12	SINGLE COMPARTMENT UTAFITI LATRINE	60	100	48	36	12	16	15	9	6	10	10	4	4	4	10	10	5	5	4	5	24	12	8	40	10	10	477	8
C	13	SINGLE VAULT LATRINE	60	60	36	24	8	8	18	9	6	10	10	4	5	4	10	10	5	5	4	5	16	12	4	32	4	4	392	21
C	14	OFF-SET SINGLE VAULT LATRINE	60	80	48	36	16	8	15	9	10	10	10	4	5	2	10	10	5	5	4	5	32	12	8	40	4	4	452	13
C	15	OFF-SET COMPOST VAULT LATRINE	60	100	48	36	16	16	15	9	6	10	10	4	4	2	10	10	5	5	4	5	32	12	8	40	10	10	487	5
C	16	OFF-SET COMPOST PIT LATRINE	80	100	48	36	8	16	15	9	6	10	10	4	4	4	10	8	4	4	4	5	32	12	8	40	10	10	497	4
D	17	AQUA PRIVY	60	80	24	24	20	8	9	9	6	8	2	3	4	2	8	10	5	5	3	5	16	8	12	40	6	2	379	22
D	18	BOTSWANA TYPE B TOILET	40	80	48	36	20	8	9	9	8	8	2	3	4	2	8	10	5	5	3	5	32	16	12	40	6	2	421	18
D	19	SEPTIC TANK LATRINE	40	100	60	48	20	8	15	9	8	8	2	3	3	2	8	10	5	5	3	5	40	16	8	40	6	4	476	9
D	20	CHINESE-2 PARTITION-3 TANK TOILET	60	80	36	36	16	12	15	6	8	8	2	4	3	4	8	10	5	5	2	5	24	12	8	40	10	10	329	25
D	21	DUG-WELL LATRINE	80	100	60	48	16	20	15	12	8	8	2	4	3	2	10	2	1	1	4	5	40	16	4	40	8	8	517	2
D	22	AHATGHAR LATRINE	60	80	48	36	12	12	9	9	8	6	2	3	5	2	10	10	5	5	3	5	24	12	4	40	6	4	422	17
D	23	WATERGATE LATRINE	20	80	48	36	12	12	15	9	6	8	2	3	5	2	8	8	4	4	3	5	24	12	4	40	6	2	378	23
D	24	R&A LATRINE	80	100	60	48	16	20	15	12	8	6	2	4	[illegible]	2	10	10	5	5	3	5	40	16	16	40	8	8	543	1
D	25	SEPTIC TANK SYSTEM	20	80	60	60	16	8	9	12	8	2	2	3	1	2	6	10	5	5	1	5	40	20	20	40	8	4	447	14

NOTE: THE WEIGHTED ATTRIBUTE SCORE IS OBTAINED FROM THE PRODUCT OF THE UNWEIGHTED ATTRIBUTE SCORE AND THE RELATIVE WEIGHT OF THE ATTRIBUTE.

used to help select technologies suitable for use in rural Ghana. Six technologies were selected as follows:

Technology	Rank from Table 8.3
RCA latrine	1
ROEC	3
Off-set compost pit latrine	4
Vietnamese double vault latrine	6
Utafiti latrine	7
Vented pit latrine	11

This method of technology comparison and selection has major disadvantages. The ranking obtained depends on the weighting given to the criteria and this weighting contains a strong element of value judgement. The actual score assigned to each latrine under each criterion also has a strong value judgement element. A different panel of experts might produce different results and the latrine users themselves might not only give different scores and different weights but might employ different criteria.

The underlying logic of this approach is also open to question. In any given location there are basic physical and cultural attributes which will limit the technology choice considerably, irrespective of the overall scores on a matrix such as Table 8.3. A method is required which allows these attributes to guide the planner to a short-list of <u>feasible and sensible</u> technologies. The choice between these will then be based upon a combination of economic and social criteria. Basically these economic and social criteria reduce to the question: "which is the cheapest feasible technology which the users will accept and care for and which the municipal authority is institutionally capable of operating?"

This approach to technology choice should be applied to a carefully selected and limited list of alternatives. The next two sections describe and [illegible] the alternatives and Section 8.4 proposes a "shopping list" of su[illegible]e technologies for application in urban Africa. We conclude in [illegible] 8.5 by proposing a methodology which can be used in most urban areas in Africa to guide the selection of one most suitable technology from amongst the "shopping list".

8.2 SANITATION SYSTEMS

The sanitation systems we consider are the same as those discussed in Chapter 7:

(1) pit latrines;
(2) compost toilets;
(3) aqua-privies (sewered and unsewered);
(4) conventional sewerage (to serve flush toilets); and
(5) nightsoil cartage systems (buckets and vaults).

These systems can be classified in various ways. We have chosen to use initially two simple classifications:

(1) "dry or wet": the necessity to exclude or to add water (or sullage); and
(2) "on site, cartage or sewerage": whether excreta is regularly removed from the site or not, and whether the removal is discontinuous or continuous.

The five systems are classified in these two ways in the 3 x 2 matrix of Figure 8.1. This method of classification is useful as a visual summary and it tells the reader which systems require separate facilities for sullage disposal (see also Tables 7.2 and 7.4), but it does not provide any comparison of the merits or demerits of the five systems; neither does it help to choose between the systems nor prompt fundamental questions on the nature of, and the concepts behind, each system.

It is now instructive to examine in detail each sanitation system in order that we may decide whether a system is basically sensible or not, and if it is, whether it can be considered a viable sanitation option for the urban poor in Africa. We show in Figure 8.2 schematic representations of each of the different non-sewered sanitation systems. In these diagrams we indicate the removal routes for both the solid and the liquid fractions of the excreta. However, no solids removal is shown for the wet and dry pit latrines, as in these systems solids removal occurs only some years after the superstructure has been removed.

Pit latrines, unsewered aqua-privies, vaults and compost toilets are merely different receptacles for excreta. The differences are in fact really quite small, at least conceptually:

	DRY SYSTEMS	WET SYSTEMS
ON SITE	Pit latrines Composting toilets	Unsewered aqua-privies
CARTAGE	Vaults Buckets	
SEWERAGE		Conventional sewerage Sewered aqua-privies

Figure 8.1 Initial classification of unsewered sanitation systems

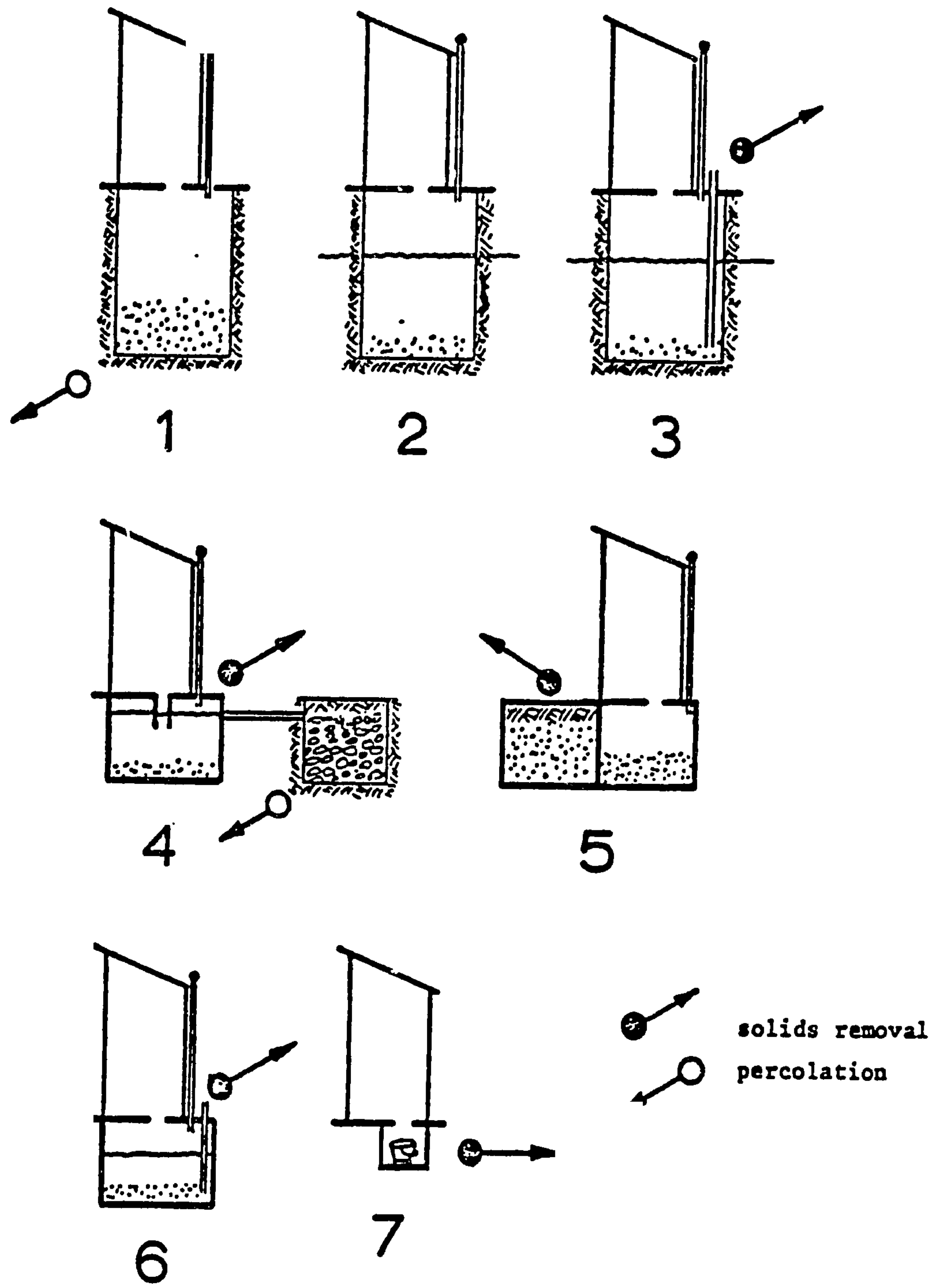


Figure 8.2 Schematic representation of non-sewered sanitation systems

1. Dry pit latrine
2. Wet pit latrine
3. Desludgeable wet pit latrine
4. Aqua-privy
5. Batch composting toilet
6. Vault toilet
7. Bucket latrine

Pit latrines: unsealed receptacles with continuous liquid removal by infiltration and percolation, and very infrequent solids removal.

Compost toilets: sealed or unsealed receptacles with liquid absorption by added organic matter, and frequent solids removal.

Aqua-privies: sealed receptacles with continuous liquid removal by infiltration and percolation in an adjacent soakaway, and infrequent solids removal.

Vaults: sealed receptacles with frequent excreta removal.

The Matero desludgeable wet pit latrines (Section 2.9.5) are basically unsealed vaults, and buckets can be considered as removeable vaults. Thus, apart from compost toilets which require the addition of absorbent and easily biodegradable organic material, the two main differences in all these sanitation systems are: (1) whether the receptacle is sealed or unsealed and (2) the frequency of solids (or excreta) removal. The size of the receptacle and the frequency of emptying are clearly inter-related: for example, pit latrines are large receptacles designed for several years of service, and vaults are small receptacles designed to store excreta for only a few weeks. Once construction and collection costs are known it is relatively straightforward to minimise costs by optimising the combination of receptacle size and its emptying frequency.

Compost toilets are a viable system only if (1) the high degree of user care required to operate the toilet satisfactorily can be reasonably guaranteed; (2) there is a readily available supply of organic refuse or ash to place in the toilet; (3) the users are willing to handle the humus produced; and (4) there is a local market or use for the humus. We do not consider it realistic, or expect it to be common, that all four of these conditions can be fulfilled concurrently in urban Africa (see Chapter 3).

Our basic premise is that properly designed and maintained ventilated pit latrines have minimum odour and substantially reduced fly nuisance (see Chapter 2), and that apart from entomological considerations (and the entomology of ventilated pit latrines is a very important subject about which there is scarcely any current knowledge), pit latrines pose no greater risks to health than do flush toilets (cf. Feachem et al., 1978, Chapter 5). We question therefore whether the unsewered aqua-privy is a sensible system: excreta are deposited into a tank of water or sullage via a drop-pipe, the lower end of which must be below the liquid level in the tank, and the effluent is led to a soakaway. When the water seal is not maintained, there is fly and odour nuisance unless the aqua-privy is provided with a 150 mm external black vent pipe. We ask therefore if it would not be more sensible to have a ventilated pit latrine instead, with a separate soakaway for sullage disposal if so desired.

Aqua-privies do however have one advantage over wet pit latrines: if the water seal is maintained, there is unlikely to be mosquito breedin in them as the exposed water surface in the drop pipe is small and constantly disturbed by excreta and flushwater. In dry pit latrines there is no mosquito breeding either, so when the choice is to install dry pit latrines or aqua-privies, we can see no advantage for aqua-privies and would recommend the installation of ventilated dry pit latrines. When the choice is between wet pit latrines and aqua-privies, we would advocate consideration of a pour-flush pit latrine as it is certain to be less expensive and it is equally good entomologically.

Cartage systems require considerable municipal organization. With vaults there must be access for the collection vehicles (of whatever size; it is not necessary to restrict one's selection to the normal large vacuum tanker), and there must be adequate and reliable maintenance and repair facilities for the vehicles. If either of these two conditions cannot be met, vaults cannot be used. Bucket latrine systems are liable to be operated very poorly, but in some situations there is no alternative (Section 8.5); under such circumstances it is essential to use as many improvements to the system as possible (Section 4.2). With both types of cartage systems separate sullage disposal facilities are required (Chapter 7).

Sewerage systems, whether of the conventional or aqua-privy type, require large quantities of water for their successful operation - at least 50 lcd. They both convey excreta and sullage but there is one key difference between them, namely that large solids are retained in the aqua-privy. This difference has two consequences of economic importance: (1) that the sewers serving the aqua-privy can be smaller and laid at flatter gradients, and (2) that infrequent but regular desludging of the aqua-privy tank is necessary. The aqua-privy system has one further economic advantage, that the flushing water requirement is only around 5 lcd rather than the 60 - 100 lcd needed for flush toilets. This not only reduces costs but it means that the finely divided excreta solids which leave the aqua-privy tank are transported almost entirely by sullage, whereas in a conventional sewerage system all the excreta and anal cleansing materials are transported not only by sullage but also by large quantities of otherwise unused drinking water. Thus the sewered aqua-privy system is the more sensible system, and since our studies in Ndola have shown that it costs at most 51% of conventional sewerage (and in a more realistic comparison we suspect that it would cost much less than this), we believe the sewered aqua-privy system to be the more appropriate sanitation system for low-income communities.

8.3 ECONOMIC COMPARISONS

We have already presented economic costings of a variety of existing excreta disposal facilities in Africa in Chapters 2 - 5. Sewerage costs have been derived previously for Ndola (Iwugo et al., 1978) and for Gaborone (El Daher, 1977). These cost data are summarised in Tables 8.4 and 8.5 and Figure 8.3. We now compare these costs first by technology and then by country.

8.3.1 Comparisons by technology

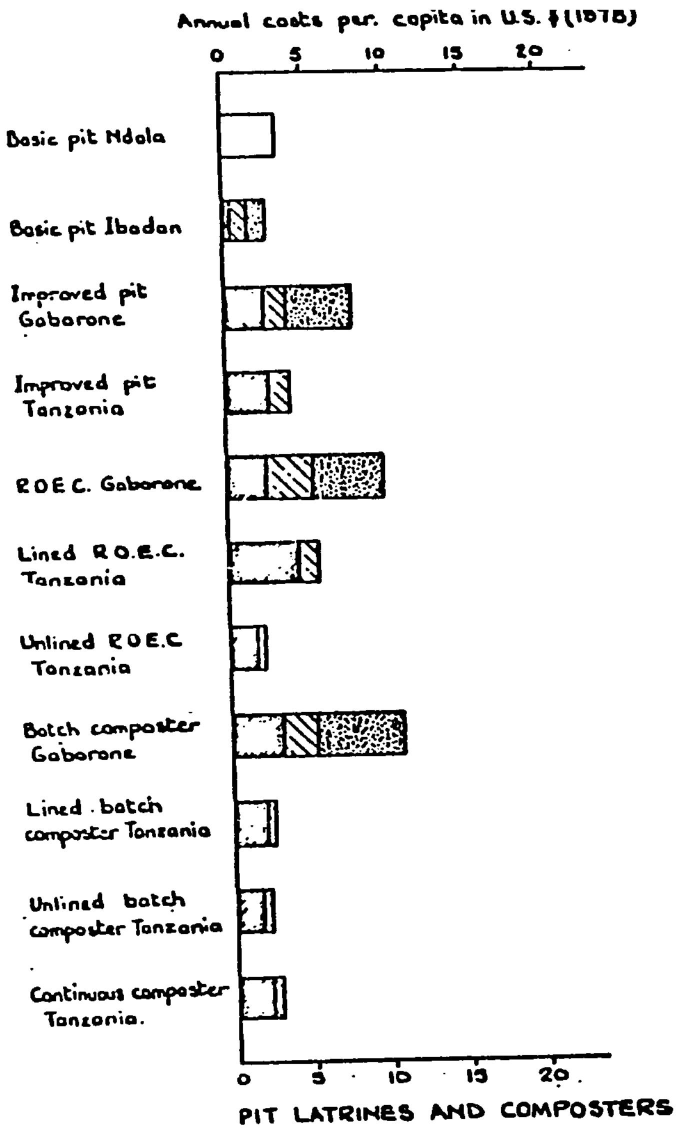
(a) Pit latrines and ROEC's. Excluding the extremely expensive pit latrines in the Sudan about which we are uncertain concerning the accuracy of the costs presented, the total annual costs of pit latrines vary between US \$19 and US \$63. Excluding superstructure costs, we find a range of US \$ 14 to US \$ 34. Pit latrines are a technology amenabl to self-help programmes and so we have also derived the costs excluding all labour components; a range of US \$ 7 to US \$ 17 per substructure per year is obtained. The number of users per latrine is not known for the Sudan and therefore per capita costs cannot be computed. Elsewhere the number of users varied between 6 (Tanzania) and 17 (Ibadan, Nigeria).

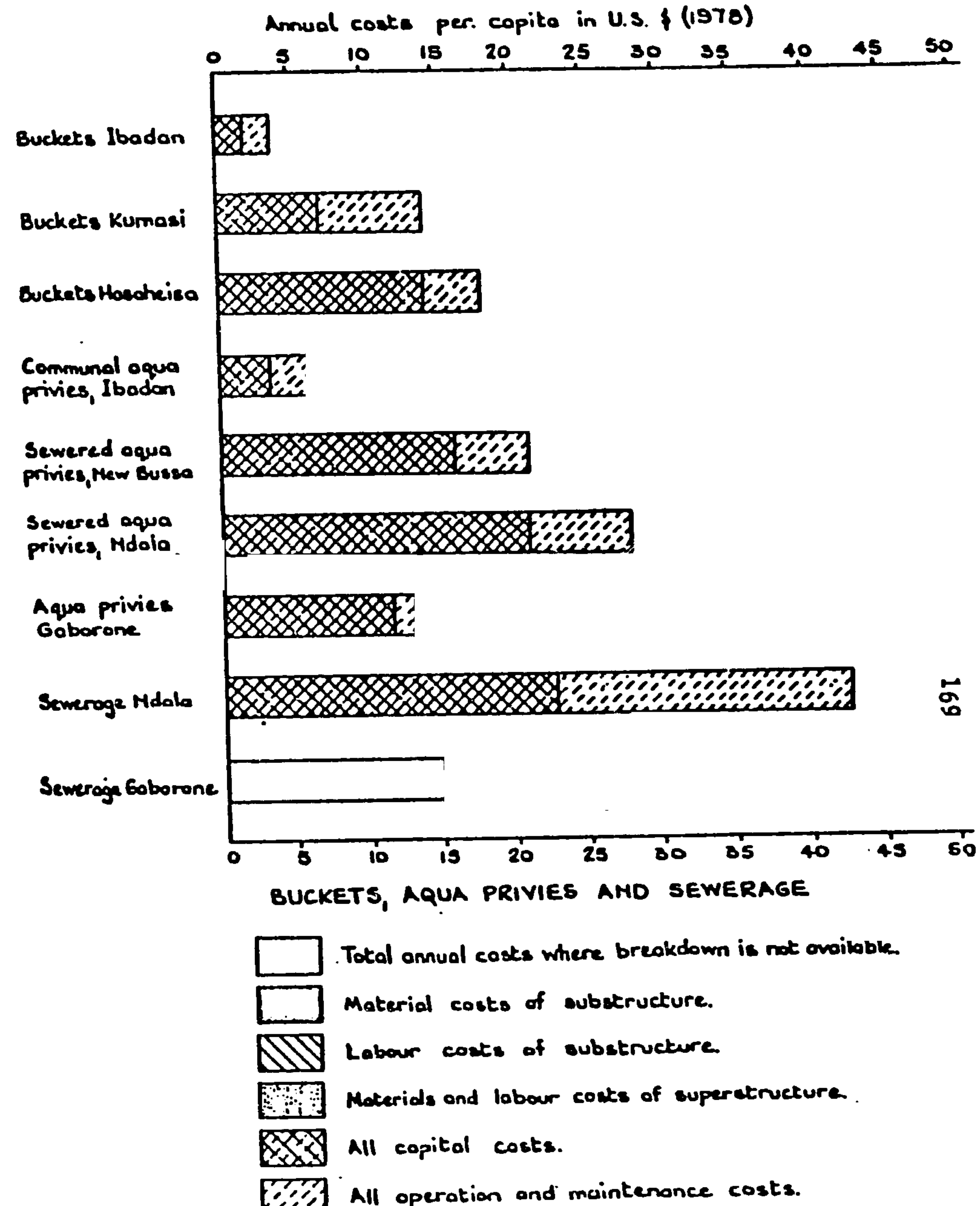
TABLE 8.4 Cost comparison of pit latrines and composters in Africa (all costs are total annual costs and are expressed in 1978 US $)

Latrine type	Location	Total cost		Substructure cost		Substructure cost with self-help labour shadowed at 0	
		Per Unit	Per capita	Per Unit	Per capita	Per Unit	Per capita
Improved pit latrines	Botswana	53	8.3	24	3.8	15	2.4
	Tanzania	N/A	N/A	20	3.3	17	2.8
Basic pit latrines	Sudan:						
	Type A	221	N/A	162	N/A	83	N/A
	Type B	151	N/A	125	N/A	44	N/A
	Type C	86	N/A	60	N/A	46	N/A
	Ndola, Zambia	19	3.2	N/A	N/A	N/A	N/A
	Ibadan, Nigeria	45	2.8	21	1.3	7	0.4
ROEC's	Botswana	63	9.9	34	5.3	15	2.4
	Tanzania						
	lined	N/A	N/A	34	5.7	27	4.5
	unlined	N/A	N/A	14	2.3	11	1.8
Batch composters	Botswana	68	11	34	5.3	20	3.1
	Tanzania						
	lined	N/A	N/A	15	2.5	13	2.2
	unlined	N/A	N/A	14	2.3	12	2.0
Continuous composters	Botswana	N/A	N/A	N/A	N/A	N/A	N/A
	Tanzania	N/A	N/A	16	2.7	14	2.3

TABLE 8.5 Cost comparison of bucket latrines, aqua-privies and sewerage in Africa (all costs are total annual costs and are expressed in 1978 US $)

Latrine type	Location	Total cost		Capital cost		O & M cost		Total costs excluding toilet superstructure	
		Per unit	Per capita	Per unit	Per capita	Per unit	Per capita	Per unit	Per capita
Bucket latrines	Ibadan, Nigeria	147	3.9	64	1.7	83	2.2	132	3.5
	Kumasi, Ghana	360	14	175	7	185	7	235	9.4
	Hasaheisa, Sudan	116	18	90	14	26	4	56	8.6
Sullage aqua-privy	Botswana	83	13	73	11	10	1.6	48	7.5
Sewered aqua-privy	New Bussa, Nigeria	524	21	408	16	116	5	420	17
	Ndola, Zambia	161	27	123	21	38	6	not available	
Communal aqua-privy	Ibadan, Nigeria	5202	6.5	2743	3.4	2459	3.1	not applicable	
Sewerage	Ndola, Zambia	318	5	135	23	183	31	not applicable	
	Gaborone, Botswana	73	15	not available				not applicable	





Note: For details of cost derivation refer to appropriate tables in Chapters 2, 3, 4 and 5.

Figure 8.3 Economic comparison of sanitation systems in Africa

The associated per capita costs are shown in Table 8.4. The lifetimes of the pit latrines studied ranged from 3 years (Ibadan, Nigeria) to 15 years (RIEC's in Botswana and Tanzania), while the very deep types A and B Sudanese pit latrines have an estimated life of 25 years. Basic pit latrines and improved (vented) pit latrines were similarly priced, while lined ROEC's were up to 40% more expensive on a substructure basis.

(b) Composting toilets. Total annual costs are only available for batch composters in Botswana, where a figure of US \$ 68 is derived. Substructure costs vary from US \$ 14 to US \$ 34 while, with self-help labour, the range is from US \$ 12 to US \$ 20. Compostors were only studied in Botswana and Tanzania and in both places the number of users per unit were about 6. Per capita costs are given in Table 8.4. Lifetimes were estimated as 15 years. The Botswana costs appear to be approximately 100% higher than those in Tanzania. Batch and continuous composters in Tanzania have very similar costs.

(c) Bucket latrines. Bucket latrines were costed in Ibadan (Nigeria), Kumasi (Ghana) and El Hasaheisa (Sudan). Total annual costs per unit were between US \$ 116 and US \$ 360. Excluding superstructures the range was US \$ 56 to US \$ 235. Operation and maintenance costs as a proportion of total costs varied from 22% to 56%. Number of users per bucket, or per unit, were found to be very high in Ibadan (38) and Kumasi (25). Bearing in mind the frequency of bucket emptying (usually less than once a day), and the volume of the buckets (15 - 40 litres) (see Chapter 4), it is certain that a considerable amount of excreta was not being deposited in the buckets. Therefore, per capita costs derived from these high figures of users per bucket are unrealistically low (Table 8.5 and Figure 8.3).

(d) Aqua-privies. Aqua-privies were costed in Botswana (sullage aqua-privies), in New Bussa, Nigeria and Ndola, Zambia (sewered aqua-privies) and in Ibadan, Nigeria (communal aqua-privies). Total annual unit costs for the private systems vary between US \$ 83 and US \$ 524, whereas the large communal blocks in Ibadan are predictably far more expensive. The proportion of total costs which are due to operation and maintenance are much higher in the communal aqua-privies (47%) than in the sewered aqua privies (23%) and in the sullage aqua-privies (12%). The high operation and maintenance costs in the Ibadan communal aqua-privies are due mainly to the heavy water use which accounts for 76% of operation and maintenance costs and 36% of total costs. On a per capita basis, the communal aqua-privies are half the price of the sullage aqua-privies which are in turn half the price of the sewered aqua-privies.

(e) Sewerage. Sewerage costs were derived for Gaborone (El Daher, 1977) and for Ndola (Iwugo et al., 1978c). It is noteworthy that in both cases very conservative assumptions were made concerning the volume of water and for flushing the toilets. El Daher (1977) assumed that only 16 lcd, or 64% of total water use, was required for flushing. Iwugo et al. (1978c) assumed that 100 lcd, or 37% of total water use was the correct figure. Data reviewed by Feachem et al. (1978) indicate that, in the USA and Europe, toilet flushing is responsible for between 22% and 65% of total water use, with a typical figure of around 40%. If a 40% figure were assumed for Botswana, it would raise the total cost of Gaborone sewerage from US $ 73 per household per year (Table 8.5) to US $ 127. Indeed sewerage costs can be very sensitive to the cost of water used for flushing. Even in Gaborone where the average incremental cost of water is only US $ 0.35/m^3, 42% of the total sewerage costs, if we adopt the 40% figure, is the cost of the flushing water.

8.3.2 Comparisons by country

The most meaningful cost comparisons are those within a single country and, preferably, within a single town. The most useful comparisons are total annual per capita costs. However, as previously mentioned, per capita costs can be misleading in situations where the putative number of users could not actually dispose of their excreta in the facilities provided. This is the case with bucket latrines in Ibadan and Kumasi and, in both cases, a more reasonable figure of 15 people per bucket will be assumed.

(a) Botswana. The annual per capita costs of the technologies studied in Botswana were as follows:

Improved pit latrine	US $ 8.3
ROEC	US $ 9.9
Batch composter	US $11

Sullage aqua-privy	US $ 13
Sewerage (assuming 16 lcd flush water)	US $ 15
Sewerage (assuming 100 lcd " ")	US $ 25

(b) Ghana. Only one system was costed in Ghana, bucket latrines in Kumasi. The annual per capita cost, assuming 15 people per bucket, is US $ 24.

(c) Nigeria. The annual per capita costs of the technologies studied in Nigeria are as follows:

Basic pit latrine	US $ 2.[illegible]
Communal aqua-privy	US $ 6.5
Bucket latrine (assuming 15 people per bucket)	US $10
Sewered aqua-privy	US $21

(d) Sudan. We have been unable to compute per capita costs of pit latrines in the Sudan. Per capita costs of buckets are US $ 18 per year.

(e) Tanzania. Substructure costs only are available from Tanzania. On a per capita annual basis these are:

Unlined ROEC	US $ 2.3
Unlined batch composter	US $ 2.3
Lined batch composter	US $ 2.5
Continuous composter	US $ 2.7
Improved pit latrine	US $ 3.3
Lined ROEC	US $ 5.7

(f) Zambia. The annual per capita costs of the technologies studied in Ndola, Zambia, are as follows:

Basic pit latrine	US $ 3.2
Sewered aqua-privy	US $27
Sewerage	US $43

8.3.3 Conclusions

Pit latrines, ROEC's and composters are similarly priced and are cheaper than all other systems. Next come communal aqua-privies, sullage aqua-privies, buckets, severed aqua-privies and sewerage in that order. Maybe the most striking and surprising finding is that, if one assumes a reasonable number of people per bucket, bucket latrines are not especially cheap on a non-communal basis.

8.4 TECHNOLOGY OPTIONS

The technologies which we believe to be worthy of consideration by municipal authorities and consultant engineers for the provision of sanitation in urban areas of Africa are the following:

(1) Vented pit latrines;
(2) batch compost toilets;
(3) vault toilets;
(4) desludgeable wet pit latrines;
(5 sewered aqua-privies;
(6, conventional sewerage;
(7) septic tanks and soakaways;
(8) bucket latrines; and
(9) communal sanitation facilities

We have excluded unsewered aqua-privies for the reasons given in Section 8.2. Bucket latrines are included as in certain circumstances there may be no alternative. Desludgeable pit latrines are listed even though we know little about their performance; however, we can see nothing wrong with them in principle as they are essentially large unlined (or incompletely lined) vaults which share with vaults the advantages associated with their superstructure being permanently located in one place - in contrast of course to pit latrines of the non-desludgeable kind which require the superstructure to be built anew each time a fresh pit is dug.

The order in which the technologies are listed above is without significance. Guidelines for the selection of the most appropriate option for any particular set of conditions in urban Africa are developed in the next section.

8.5 TECHNOLOGY SELECTION

We present in Figure 8.4 a combined algorithm and exclusion matrix to aid municipal authorities and consultant engineers to choose between the various sanitation options listed in the previous section.

Figure 8.4A Algorithm for selecting appropriate sanitation technologies in urban Africa

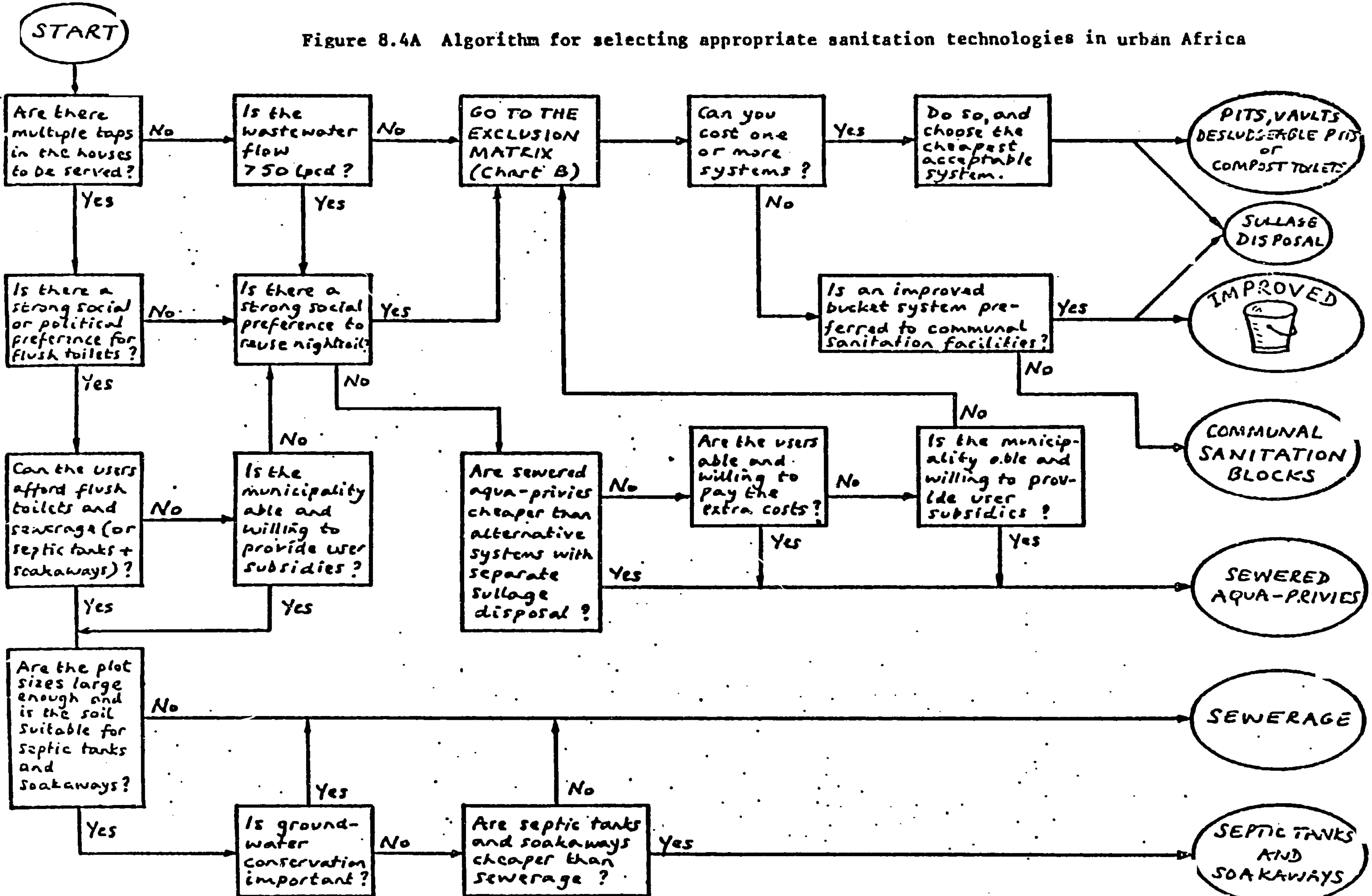


Figure 8.4B - EXCLUSION MATRIX

INSTRUCTIONS FOR USE:

1. Answer each question for the area under consideration (a cross indicates that the question is irrelevant for the technology concerned).
2. Cost each technology for which all the answers so obtained correspond to those given in the Matrix.

Question	Vault toilets	Desludgeable wet pits	Pit latrines	Compost toilets
Compost questions*	X	X	X	all yes
Is groundwater conservation important?	X	No	No	X
Is there access for collection vehicles?	Yes	Yes	X	X
Are there adequate facilities for vehicle maintenance?	Yes	Yes	X	X
Is the soil permeable?	X	No	Yes	X
Is the grounwater table within 2 m of ground surface?	X	No	No	X
Is there land available for two pit sites?	X	X	Yes	X

*Compost questions:

(1) can sufficient user care be reasonably expected?
(2) is there sufficient waste organic material available?
(3) are the users willing to handle humus?
(4) is there a local market or use for the humus?

We commence the algorithm (Figure 8.4A) by asking if there is (or if there is intended to be) a multiple tap level of water supply service to the houses under consideration. This is the key question as its answer immediately determines whether conventional sewerage is a possible option or not. If the water supply service is of the multiple tap standard, and if there is a strong desire for flush toilets, and if these can be afforded or subsidized, then we recommend conventional sewerage or, if there is land enough and the cost is less, septic tanks with soakaways. It will be apparent to the reader that communities which have multiple tap water supplies and can afford flush toilets, cannot really be considered as the urban poor; but we have included this decision stream in the algorithm to demonstrate that conventional sewerage is a realistic sanitation option in only very limited circumstances.

If a community does not have, or is not likely to have, a multiple tap water supply service, then flush toilets and conventional sewerage cannot be used. The community may have a single tap supply or it may be served by public standpipes (or water vendors). In both these cases the key question is whether the quantity of sullage generated on site is sufficient to enable a sewered aqua-privy system to function satisfactorily. We have chosen a wastewater (sullage plus flushing water) flow of 50 litres per capita per day as the safe minimum for this purpose. If the wastewater flow is >50 lcd, then we recommend a sewered aqua-privy system provided that: (1) it is cheaper than alternative systems with separate sullage disposal facilities, or if the users or the municipality are willing to pay the extra cost and (2) there is no over-riding social preference for nightsoil to be collected separately for subsequent reuse (which in Africa we believe not to be the case at present).

If neither conventional sewerage nor sewered aqua-privies is a viable option, then the choice lies between pit latrines, batch compost toilets, desludgeable wet pits and vaults, with buckets as the last resort. We consciously place buckets in the "last resort" category because our studies in Africa have indicated that they are at best only better than no sanitation at all. To choose between these remaining options (which is a mandatory choice if the wastewater flow is <50 lcd), we leave the algorithm temporarily and go to the exclusion matrix

(Figure 8.4B). Here it is necessary to determine for each system whether it is a feasible option or not. For example, if there is no access for desludging vehicles or if the vehicles cannot be reasonably expected to be maintained properly, then we exclude from further consideration vaults and desludgeable pits. The matrix gives the required answers to a set of questions pertinent to each technology. For a technology to be excluded only one of the answers need be opposite to that given in the matrix. The next stage is to cost each technology which is not excluded and the choice is then the cheapest technology which is socially (or politically) acceptable. If all four technologies in the matrix are excluded, then the choice is either an improved bucket latrine system or some form of communal sanitation facility (see Section 6.7). The choice between improved buckets and communal facilities depends on social preference, institutional capabilities, comparative costs and the availability of land for communal sanitation blocks. Provided that there are no strong social objections and that land is locally available, communal facilities are preferable to bucket latrines because they are cheaper, easier to operate and maintain, and they pose lower risks to health. Communal sanitation blocks are not common in Africa; except under peculiar social conditions as, for example, in Ibadan, Nigeria, and research is clearly needed to determine socially acceptable designs for such sanitation blocks are not yet however common in Africa. Our studies in Ibadan and Kumasi (Iwugo et al., 1978 a,b) have indicated that they work well under peculiar social conditions (Ibadan) but that under normal circumstances (Kumasi) they need considerable municipal maintenance (which in Kumasi is lacking), as well as good design, to make them a hygienic form of sanitation. Research is urgently needed to determine socially acceptable designs for communal sanitation facilities (Chapter 9).

In our algorithm - matrix chart we ask questions about municipal subsidies. We believe that if a Government or a municipality really wants and can afford to provide a subsidy for a more expensive sanitation system and if it is fully aware of the opportunity costs involved, then it should be free to do so. A constraint only arises if external funding is required and the aid or loan donor is unwilling for its funds to be used in this way.

The reader will notice that in the algorithm it is possible to go from multiple taps to pit latrines. This is a possible solution only and not one that we would necessarily expect to be common, especially if adequate facilities for sullage collection, treatment and disposal are properly costed.

The algorithm - matrix chart can also be used by town planners in situations in which the level of water supply service for a particular community is yet to be decided. The chart shows which sanitation options can be chosen for alternative levels of water supply, thus enabling the planner to arrive at total costs for various combinations of water supply services and excreta and sullage disposal facilities.

Although we have designed the algorithm - matrix chart primarily for use in urban Africa we can see no reason why it cannot be used elsewhere. For example the answer to the question "is there a strong social preference for nightsoil reuse" is likely to be "no" in most African communities; whereas in southeast Asia the answer may more commonly be "yes", and thus vaults, for example, may be socially preferred to sewered aqua-privies.

The algorithm - matrix chart should be regarded only as a guide to the decision-making process. Its main virtue is that it prompts engineers and planners to ask the right sort of questions, which perhaps they would not otherwise ask. Although we believe it to be directly applicable to most situations encountered in urban areas, there will always be the occasional combination of circumstances for which the most appropriate option is not that suggested by the chart. The chart should not therefore be used blindly in place of engineering judgement, but as a tool to facilitate the critical appraisal of the various sanitation options, especially those for the urban poor.

REFERENCES

El Daher, S. (1977) Alternative Technology for Water Supply and Waste Disposal in Botswana: Economic Analysis. Washington: World Bank.

Feachem, R.G., Bradley, D.J., Garelick, H. and Mara, D.D. (1978) Health Aspects of Excreta and Wastewater Management. Washington: World Bank.

Feachem, R.G. and Cairncross, A.M. (1978) Small Excreta Disposal Systems. Ross Bulletin No. 8. London: Ross Institute of Tropical Hygiene.

Iwugo, K.O., Mara, D.D., Feachem, R.G. (1978a) Sanitation Studies in Africa: Sanitation Site Report No. 1, Ibadan, Nigeria. Washington: World Bank.

Iwugo, K.O., Mara, D.D. and Feachem, R.G. (1978c) Sanitation Studies in Africa: Sanitation Site Report No. 3, Kumasi, Ghana. Washington: World Bank.

Iwugo, K.O., Mara, D.D. and Feachem, R.G. (1978d) Sanitation Studies in Africa: Sanitation Site Report No. 4, Zambia. Washington: World Bank.

Winblad, U. (1972) Evaluation of Waste Disposal Systems for Urban Low Income Communities in Africa. Copenhagen: Scan Plan Coordinator.

Wright, A.M. (1977) Rural Latrines: Report of a Technical Advisory Group Meeting. Kumasi: University of Science and Technology, Department of Civil Engineering.

Office of Housing
Agency for International Development

SHELTER TRAINING WORKSHOP

November 5-30, 1979

AID SHELTER TRAINING WORKSHOP

COMMUNITY ROLE IN THE DESIGN OF SHELTER

Code 38.P

Notes on the Presentation by Mr. Hjelt, AID/Housing

Selected Readings

AID SHELTER TRAINING WORKSHOP

Outline of the Session on

Community Role in the Design of Shelter
4:00-5:00 p.m., Monday, November 19, 1979

Mr. Jack Hjelt, AID Housing Officer

Objectives of the Session

This will be a one hour session directly following the site design/plot layout exercise. Its purpose will be:

--to heighten the participants' awareness of the design process simulated in the preceding exercise and,

--to relate the "dynamics" of this design process to project planning, particularly aspects of field staff training and involvement of future residents in the design of their shelter.

Outline of the Presentation

Mr. Hjelt will draw on his observations of the site design exercise to illustrate points concerning working relationships in the design process. He will engage the group in discussion on how their experience relates to situations likely to be encountered in the field, particularly the involvement and management of community participation.

He will draw attention to the eventual conflicts between need for management control of project development and need to respond to and accommodate community initiatives. Using slides of sites and services projects in Zambia and Botswana, Mr. Hjelt will describe various approaches to resolving these problems.

Selected Readings

The March 1978 issue of The Urban Edge has an article on pages 4-6 about citizen participation in urban project management. Projects in the following countries are cited: Philippines, Zambia, Jamaica, Guatemala, Upper Volta and Bolivia.

Project Management is the general subject of the October 1978 issue of The Urban Edge. The piece is included in this packet of readings for its description of mutual-help and self-help project experience in El Salvador and two Zambian projects.

Portions of Cooperative Housing and the Minimum Shelter Approach in Latin America illuminate some of the Foundation for Cooperative Housing activities in that part of the world.

The report on Chawama Self-Help Housing Project in Kafue, Zambia reviews the history and management of that self-help scheme, with many insights into the importance of citizen participation.

Botswana's SHHA cartoon presentation conveys to potential project participants how the self-help schemes work. It is a good example of a device for fostering clear understanding of roles and responsibilities in the project.

see, particularly, pp 4-6

THE Urban Edge
FACTS & IDEAS

Vol. 2, No. 3 March 1978

Strong Central and Strong Local Government?

Many developing countries have made a determined effort to establish some form of representative municipal government under which local administrators, even when appointed or approved by the central government, are responsible to popularly elected councils. Decentralization as such, however, is resisted by the countries most anxious for rapid development. But there is a debit side to the ledger of centralization. While it permits governments to move quickly on development programs considered useful, these may run into apathy or even hostility among the people most directly affected.

A number of countries are now experimenting with a new approach to development, one that *combines* centralization and decentralization. Instead of viewing the two as incompatible, it is recognized in practice that both are necessary. W. Arthur Lewis notes that developing countries need both strong central and strong local governments. This is not a contradiction because "governmental functions are now so numerous that there is plenty of room for both."* How countries are attempting to move in both these directions in an optimum way is the subject of this issue of *The Urban Edge*. Later this year we will take a look at the way governments are coping with rapid growth and the management of large-scale urban projects, how they are handling public finance and cost recovery on major housing and sites and services projects.

Inter-Governmental Cooperation

The U.N.'s Department of Economic and Social Affairs emphasizes the need for a "real partnership based on genuine intergovernmental efforts to maximize benefits from public resources at all levels."** Such a partnership serves to minimize conflicts and to improve the chances for mutually advantageous intergovernmental action.

A partnership system suggests a cooperative relationship in which political power takes more of a persuasive than a coercive form, and one that is mutually supportive rather than disruptive. Under these circumstances, interference of a disciplinary sort is possible but rare, while varying forms and degrees of supervision and guidance are common.

While formal controls are necessary, they must be balanced by informal arrangements associated with discussion, negotiation, assistance, and advice. This balance in the United States provides the foundation for the grant-in-aid programs administered by federal agencies and interpreted by the courts. In Great Britain, the system involves the use of special advisory personnel, auditing and inspection coupled with grants-in-aid, recourse to the regular courts of law together with administrative tribunals, and the power to prescribe the qualifications and tenure of certain officials. In France, the *grandes corps*, particularly the *Conseil d'Etat*, are responsible for the functioning of the system. *continued on page 2*

Urban Edge Turns Trilingual

Beginning with the April 1978 issue, *The Urban Edge* will appear also in a French and a Spanish edition to make it more directly useful to readers in francophone Africa and in Latin America. The recent reader evaluation confirmed the need for language editions. Of those who said the publication would be more useful in another language 57% preferred Spanish and 23% French. Please let us know your language preference for future mailings if you desire to change from English. The content of all three editions will be identical. Nominations of government and private sector professionals for the French and Spanish mailing lists are welcome. Our gratitude to the World Bank for making the new language editions possible.

*POLITICS IN WEST AFRICA, Oxford U. Press, 1965

**ADMINISTRATIVE ASPECTS OF URBANIZATION, ST/TAO/M/51, 1970

Inter-Governmental Cooperation *continued from page 1*

What makes these devices reasonably effective are the sets of rules, practices, and standards that are commonly shared. The duties of officials are understood and their qualifications appreciated. Moreover, the political leaders and institutions are generally respected by the administrators and the population as a whole. Consequently, delegation of authority is acceptable because, as Henry Maddick points out: "The degree to which the government is prepared to decentralize will turn upon its confidence in the unity of the country and in the ability of those in the field whose judgment will have to be relied upon."*

In addition to the local adaptations of the arrangements already mentioned, other approaches are being tried by developing countries to achieve a partnership system. These include:

- **The Government Agent**

Sri Lanka has maintained to some extent the District Officer system stemming from British colonial rule.** But, unlike his colonial predecessor, the Government Agent (G.A.) has only limited authority over local governments and officials from the central government. His job is now primarily to coordinate governmental activity in his district. In cases of emergency, he is supposed to exercise all necessary leadership. Otherwise, he is expected to be a general facilitator of development.

The importance of the G.A. depends upon a variety of intangible factors. Assuming sufficient energy and will, he can play a useful role in analyzing and communicating the needs, problems, and potentialities of his district. Under the best of circumstances, he is likely to be resented by technical specialists and by the local Member of Parliament who may be anxious to assert his leadership. Yet, he remains the convenient point of reference for the government, the people, and governmental agencies operating in the field. And insofar as the G.A. has the necessary field staff to provide detailed information on which policy can be developed the M.P. needs his assistance.

In some respects, Sri Lanka's G.A. resembles the French prefect, who represents the entire government, is responsible for the coordination of government agencies, and is the central communication link between central and local governments.

The prefect tends to have the same problems as does the G.A.: (1) conflict with local politicians and (2) loss of control over technical specialists. Often, the prefect is too busy with his overall responsibilities and lacks the technical expertise to handle quickly and carefully the problems brought to him. Under these circumstances, it may be faster and more convenient for a local leader to take an issue directly to a ministerial field agent, even if this means overlapping services, confusion, and inefficiency.

*Democracy, Decentralization, and Development (London: Asia Publishing House, 1963)

**G.R.T. Letian, "The Role of the Government Agent in Sri Lanka", Journal of Administration Overseas, XV, 1 (Jan. 76)

Despite these problems, some form of prefectoral system has been advocated in many countries to overcome the persistent difficulties of local-central relations: the lack of a central source of information; the rivalry and conflicting approaches of different agencies or ministries; the uncertainty of agency authority and responsibility; the overlap or duplication of services; and the problems associated with the approval or implementation of projects. A prefect or some such official could be expected to facilitate the coordination of decision-making and problem-solving necessary for assistance and control.

- **The Ombudsman**

Essential to a partnership system is some means of handling accusations of injustice and maladministration. This is especially important for countries with significant ethnic or racial differences. These differences (combined as they frequently are with religious, linguistic, occupational, and class differences) may generate conflict that cannot be readily resolved by legislatures, judiciaries, and other governmental institutions. Countries with such problems may find useful the "ombudsman system," which originated in Sweden and is now used in Britain, New Zealand, Switzerland, several Canadian provinces and American states.

Among developing countries, Guyana was the first to establish an ombudsman office (1965), followed by Tanzania, Mauritius, and Fiji. While originally intended in Guyana to deal with racial discrimination complaints, the Ombudsman has been primarily expected by the public to be concerned with unjust and faulty administrative practices.

Over the years, according to Leroy Jackman (Secretary to the Office of the Ombudsman in Guyana), the Ombudsman's jurisdiction has been expanded to cover public corporations and local authorities, including corruption in public affairs.* By 1971, the Ombudsman was receiving over 1,000 complaints annually, indicating the extent to which he has come to be publicly accepted. "His humane response to offbeat problems," according to one observer, "serves not only to contribute to his client's contentment, but also to remind public administrators *en masse* that human happiness is the object of government."*

In 1976, the jurisdiction of the New Zealand Ombudsman Office was extended to local government bodies. By the end of March, 1977, over 300 complaints against these organizations had been received, necessitating (according to the Chief Ombudsman) much time for traveling to local communities, investigating the particular issues involved, and interviewing the concerned parties.**

Typical was the complaint received from the owners and occupiers of residential property in the

continued on page 3

*"Ombudsman for Caribbean Government", Journal of Administration Overseas, XIII, 4 (Oct. 1974)

**Report of the Ombudsmen (Wellington, N.Z.: Government Printer, 1977)

The Ombudsman *continued from page 2*
outlying areas of *Waitemata City*. The taxes charged them, they alleged, were excessive in regard to the limited services received. While the Ombudsman's jurisdiction extends only to the mistakes of individual members of governing councils and their staffs (rather than to policy decisions), he was in this case able to persuade the city council to promulgate significant changes to its differential taxation scheme.

• The Council-Manager System

In 1973, the Western State of Nigeria introduced a series of reforms, including the consolidation of local government units. It is intended that each of the new local administrations be headed by a "Council-Manager," who will be responsible to a Management Committee.

The details of this sytem have not yet been worked out. The likelihood is, however, that the Council-Manager will be appointed by the Government on the advice of the Local Government Service Board (LGSB). As long as the Management Committee members as well as the Council-Manager are appointed by the Government, all will be involved in policy-formulation. But, based on American experience, where this system originated, it will work best if policy-making can remain the primary responsibility of the Management Committee, leaving the managers relatively unaffected by political controversies.

In the United States, over half of the cities in the 25,000-250,000 population range have appointed city managers. These are usually responsible for the selection of department heads, the preparation of the budget, and the general management of administration. As they gain in experience and expertise, they tend to move from smaller towns to larger cities. Consequently, the system makes available to cities professionally trained executives who are familiar with the technical problems of municipalities.

Since managers cannot remain isolated from matters of policy, they must work harmoniously with politicians and citizens' groups. This becomes difficult in larger, heterogeneous communities, with highly partisan controversies. This may account for the fact that only 20% of American cities over 500,000 population have managers.

• Area Management

Many countries, such as Nigeria, have had a problem with a profusion of small, autonomous, and ineffectual councils. This was the reason for the 1973 local-government reform in Western Nigeria, reducing local government councils from 114 to 39 through mergers. Another approach is the formation of federations of contiguous units. This is being planned in *Istanbul*, according to Mete Atac, the Deputy Head of Metropolitan Planning in Turkey's Ministry of Reconstruction and Resettlement and a participant in this year's urban management course given by the Economic Development Institute. Under a draft law, 35 municipalities will be sending representatives to a central council with responsibility for *Istanbul*'s development.

With the coming of independence in 1963, the *Nairobi* City Council was given the responsibility for an area of 266 square miles (instead of the original 35 square miles). The area includes a semi-rural population of about 75,000. While there have been difficulties in dealing with the special needs of those outside the confines of *Nairobi* City, urban planning for the rapidly growing population has been facilitated. At the same time, there has developed an organic sense of the community over the region as a whole. Despite their complaints about municipal regulations, *Nairobi*'s rural citizens have come to appreciate the services provided them by the City Council.

Readers Judge Urban Edge Useful

An evaluation of *The Urban Edge* by its readers early this year resulted in an 85% endorsement of the publication as *very useful* or *moderately useful*. A total of 257 respondents from 63 countries who took the time and trouble to fill out and mail in a two-page questionnaire had responded to the request by the mid-February deadline. More completed questionnaires have been arriving from all parts of the world since the cutoff date pushing the total response near the 300 mark which represents about 15% of the readership.

The readers responding to the survey nominated more than 250 additions to our mailing list. Particularly gratifying is the fact that three quarters of those responding did not wish to see any change in the publication's format. The remaining quarter opted primarily for more analysis, technical descriptions and book reviews. We will accommodate these views in future issues.

Practically all those responding (96%) wanted to keep on receiving *The Urban Edge* or to be added to the regular mailing list in cases where issues had been received irregularly. The large number who expressed a willingness to become correspondents—69%—was a pleasant surprise and we will take up the offers of 68 readers who wanted to write about specific project experiences. This readiness to share practical knowledge with fellow professionals in other countries will allow us to come closer to our objective—to serve as a network for the transnational application of experience.

See the box on page one for an important announcement of an immediate survey result that will have a direct bearing on the future of *The Urban Edge*. Our sincere thanks to all who participated in this review.

Community Participation

The efficiency of municipal administration can only be determined by its effectiveness in meeting the needs of citizens. These needs must ultimately be expressed by the people themselves. Consequently, good government must facilitate popular participation. Moreover, the effectiveness of municipal government depends on its ability to assist people in improving their own lives. Even the poorest urban residents are willing and able to improve their own living conditions. "Self-help and popular participation are increasingly viewed as key elements that must be integrated into any improvement programme for low-income urban settlements."

It is not always easy for municipal governments to facilitate popular participation, even when there is a sincere desire to do so. It is sometimes difficult to determine who the real local leaders are and what people actually want. The best organized and most vociferous groups may not reflect the concerns of the majority of residents. E . even if they do, they may not have the resources and skills to deal with them.

Despite these difficulties, community participation is a reality in a growing number of countries. Some of the forms that it takes include the following:

- **Participation in Planning**

In the Philippines, Tondo Foreshore residents have been involved in deciding how the project would be implemented (*TUE* Vol. 1 No. 1). The project authority presented three options for the realignment of houses and the layout of roads, footpaths, and waterpipes. The final choice among these options was left up to each neighborhood. When an evaluation team asked a sample of residents how they felt about the project, 87% reported satisfaction with the process used. One of the reasons for satisfaction was that the government had been receptive to their suggestions.

- **Participation in Implementation**

In Zambia, mutual help has been organized by local political party leaders. In the case of a pilot mutual-help scheme in the Chawama Complex in *Lusaka*, the main activity was the digging of trenches for water pipes.

Despite various complications and mistakes, this mutual-help effort was considered effective by the local evaluation team. Local leaders were able to get the participation of almost everyone, motivated as they were by the desire to make the project successful.

Although many residents were skeptical in the beginning, they were eventually proud of the project's success. The people have learned that they can work together, and the local leaders have demonstrated their leadership abilities.

- **The Partnership Approach**

In the George squatter settlements of *Lusaka*, party pressure was not necessary to get the cooperation of residents. Once the Government demonstrated its commitment by providing the technology and expenditure for water mains, sewerage pipes, and a road network, local communities were willing to work together and to pool savings and labor to install individual water taps, to pay for sanitary installations, and to maintain and improve access roads. The operational basis for the program was the traditional Bemba custom of beer and work parties. Because the existing forms of communal organization were utilized, the communities appeared eager to cooperate.

The relationship between governmental encouragement and local self-help has been demonstrated in various community programs in *Jakarta*, Indonesia. These programs commonly begin with a relatively small governmental investment in road-construction and drainage. This encourages the *kampung* dwellers to begin making their own improvements, beginning in the roads and eventually extending to health centers, refuse collection, sanitary facilities, schools, windmills and artesian wells for improved water supply.

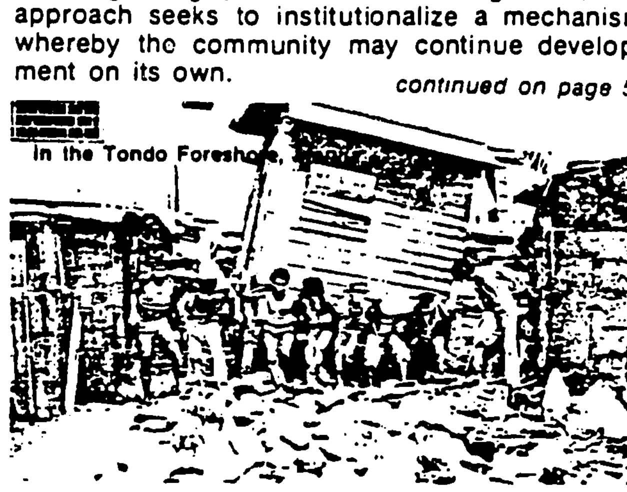
- **Community-Based Management**

Jamaica provides one of the best examples of an arrangement under which community representatives, along with public officials, have full responsibility for performing and managing preliminary upgrading tasks. In this case, participation evolved in response to problems which developed during the course of upgrading programs planned for *Kingston*, beginning at Cockburn Gardens in December, 1974.

Complications arose in laying out roads and establishing lot boundaries which caused serious delays and led to a breakdown of relations between the contractor and the community. After some unsuccessful experimentation, the Ministry of Housing's Sites and Services Unit was able to set up elected committees within Cockburn and subsequent squatter areas to handle community education about upgrading, to be responsible for the physical planning, and to manage the construction of civil works.

Based on this experience—(as described by Carleen Gardner, a project administrator)—a four-phased model has been developed by the Sites and Services Unit for community participation. In the short term, the objective is to facilitate execution of the upgrading process. In the long term, the approach seeks to institutionalize a mechanism whereby the community may continue development on its own.

continued on page 5



In the Tondo Foreshore,

COMMUNITY PARTICIPATION *continued from page 4*

During Phase I, a social planner from the Sites and Services Unit establishes contact with community leaders and local government officials. In Phase II, a survey of existing conditions and needs is conducted by local personnel. Phase III involves meetings with local residents to discuss upgrading plans and possible modifications. As a result of Phase III, residents' committees are formed.

The exact organizational structure is different from site to site; but, according to the model, there are basically two committees: the planning committee and the works committee. The planning committee's main function is to act as a liaison with the Sites and Services Unit. It usually oversees the lot subdivision process, arbitrates land disputes, fixes terms of leases and mediates with absentee landlords. The works committee is responsible for carrying out the jobs that have to be done: widening and realignment of access routes, general earthworks, site clearance, etc. However, it operates within a cost-framework established by the planning committee.

According to evaluation studies, this four-phased model has been relatively successful. Based on it, the Sites and Services Unit is working to obtain a larger staff and more funding for its program. Above all, it has gained the support of most of the residents. "The physical changes have made us feel different," observed a youth leader in a newspaper article: "People who had conflicts are now working together, the youth are beginning to respect each other, and the old people and we are going to keep working together to make our community as good as any other in Jamaica."

Despite a number of unresolved questions, particularly those having to do with resolving potential conflicts between technical experts and local leaders, there are plans to extend community participation beyond the completion of the upgrading process. The Sites and Services Unit hopes to turn some areas into housing cooperatives where the residents will be responsible for ongoing management and future improvements. Plans are also being prepared to involve the community in the development and management of an employment generation project.

• Consumers' Co-operatives

In Guatemala, an organization of consumers' co-operatives is sponsored by the Government as a semi-autonomous agency. When a consumers' co-operative was established in one of the low-income settlements of *Guatemala City*, the first means of entry by the professional organizers was the establishment of literacy classes. Through these, the organizers introduced ideas about co-operatives. Eventually, most of the small local businessmen agreed to participate when they had sensed that there would be real and continuing outside support.*

In this program, the primary achievement has been the building and operation of a consumers' store. Through the assistance of the organizers, the members of the community have become shareholders and successfully operated the store. What has also helped is the support generated by the city-wide network of co-operatives. Local enthusiasm has been maintained by the central organization's efforts to provide information about the city-wide movement, and to organize beneficial activities.

• Ethnic Associations

Migrants from a particular rural area tend to move to urban neighborhoods where they will find people similar to themselves in language and cultural background. Consequently, it is common for squatter settlements to be ethnically homogeneous with long traditions of mutual help. Insofar as ethnic associations already exist in these neighborhoods, they can form the basis for community participation in squatter upgrading projects. Indonesia, Turkey, and Zambia are among the countries where effective utilization has been made of these associations.

An example of effective cooperation between ethnic associations and government has been in Upper Volta (*TUE*, Vol. 1, No. 2). In *Ouagadougou*, the chiefs of the Mossi Tribe remain powerful. The chiefs are always the first point of contact for anyone from the outside wanting to deal with a particular neighborhood.

Because the chiefs control rights of occupancy, construction, and economic activity, their collaboration was essential in minimizing problems of displacement and relocation in the early stages of the United Nations Development Program (UNDP) pilot project here.

A committee consisting of traditional chiefs, neighborhood representatives, and outside exports examined the existing layout of plots and took decisions on changes that were eventually acceptable. Since the UNDP project was successful, the government has decided to base future urban development programs on this model. There may be times, however, when accommodations between traditional and modern needs and approaches will be difficult and require great patience and a willingness to cooperate on both sides.

---

*Community Programmes for Low-Income Populations in Urban Settlements of Developing Countries. UNO, ST/ESA/52, 1976

Community Participation in Bolivia

Bolivia is just beginning an urban development project in *La Paz*. Before its scheduled completion in 1982, the entire cost is expected to be US $22.5 million and to affect 55,000 people. Instead of relying exclusively on official agencies, the Bolivian government will make elected community representatives responsible for many aspects of ongoing administration and maintenance and for identifying and managing future improvements.

Adolfo A. Navarro Flores, the Vice-Mayor of La Paz for Technical Matters, discussed the Bolivian model of citizen participation in a recent talk with the editor. Mr. Navarro is a participant in this year's E.D.I. urban management course.

"The *Juntas Vecinales* (neighborhood associations) exist in most of the poor neighborhoods of the city. Each of them elect a president and a board of directors on a democratic basis. They have meetings in their own neighborhoods once a week to plan their activities. Afterwards, their representatives come together with the president of all the *Juntas Vecinales* for further decision-making.

"Representatives of the *Juntas Vecinales* also meet with me and other officials every Saturday morning. They then make demands of us, and we indicate what we can do for them. What they appreciate is the direct contact that we are maintaining between the local authority and the *pueblo* (the people).

"Every step in La Paz's Urban Development Plan has been undertaken in consultation with the *Juntas Vecinales*. We were always speaking with them, trying to get their needs and hopes.

"For this reason, the professionals on my staff spent 18 months on the Development Plan. After it was finished, the Mayor made certain that the neighborhood representatives were the first to see it. There were also public presentations of the plan to many different organizations. After all, we might have missed something, or they might not have told us everything. And it is essential that they understand and accept it.

"Currently, the new plan (including six detailed maps) has been on display in various parts of the city for about a month. By television, radio, and newspapers, people have been told where and when to see it. Special boxes have been set up for people to give their reactions. When I return to La Paz, I will meet with the different organizations to hear what they have to say about it. And if changes have to be made, we will not hesitate to do so.

"Because traditional associations remain strong in the country, their various forms could be readily transferred to the urban areas. So it is not too difficult for those who are literate (44% of the adult population) and with a good income (averaging US $450 a month) to present their demands very strongly.

Strengthening British-Type Local Government

Countries which have inherited the British local-government model from their colonial past have found the need to reform it in various ways, including:

• A Unified Local Government Service

For reasons of poor pay, insecurity, and limited opportunity, many highly qualified individuals are reluctant to work for local authorities. This situation has been partly overcome in Sri Lanka and Western Nigeria by the adoption of a unified local government service. Here, urban governments are able to recruit on a regional or national scale for qualified staff. This system also encourages the development of more uniform and objective criteria in appointment, promotion, and other conditions of service.

In India, the Government of West Bengal is planning to use the organizations and staff of the central government Indian Public Service, together with municipal employees, to operate local services in the Calcutta Metropolitan District. This would involve higher quality staff in the operation of municipal services and at the same time provide central government staff with direct exposure to the problems presently experienced by local authorities in this area.

• A More Powerful Chief Executive

In many countries using a British system, the town-clerk lacks the legal authority and administrative support necessary to perform his role as chief administrator. However, this need not be the case. In the Sudan, the Ministry of Local Government provides every municipality with a town clerk, who thus brings with him the prestige of being a senior civil servant. He is also provided with the necessary administrative staff. As chief administrator, he has wide discretionary powers but must work within the guidelines prescribed by the local council.

• A Special Committee

Under the British system, executive and administrative responsibilities are vested in committees of an elected council. Problems often arise because of confusion over the responsibilities of particular committees and their relationship with staff, leading to inter-committee conflict and staff demoralization.

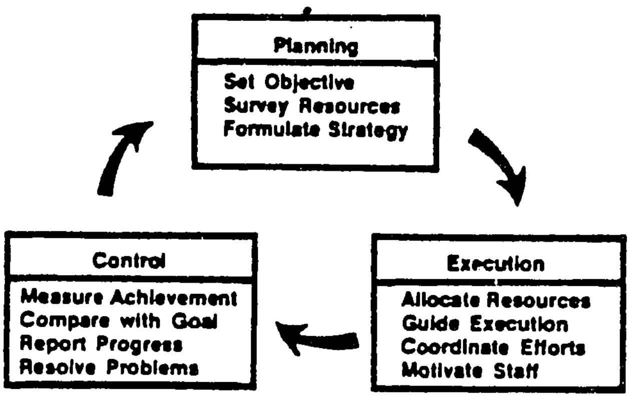
To avoid some of this confusion in its Second Urban Project, the Kenya Government is setting up Housing Development Committees in *Nairobi*, *Mombasa*, and *Kisumu*. These committees will consist of the chairmen of all standing committees and the Central Government representatives concerned with urban administration. Meetings will be called based on negotiations between local and central government officials.

THE Urban Edge FACTS & IDEAS

Vol. 2, No. 8 October, 197[illegible]

Urban Project Management: Requirements for Success

The purpose of project management is to plan and direct a project to enable it to reach most effectively the intended objectives of the project.* The following "project management cycle" suggests the requirements for the successful completion of a project:



It must be remembered that the "human" problems of a project may be even more difficult to solve than technical ones. To overcome these problems requires a constant effort to understand the behavior of participants in order to intensify their motivation. Of course, what may make this difficult is the often conflicting goals of the various parties involved. Another complicating factor is the introduction of new techniques and methods which may be disturbing to the operating staff.

While personnel must be motivated, they must also be supervised. Therefore, the key to good administration is the development of a system of supervision under which project managers increasingly delegate responsibility to functional departments and subordinates while improving their capacity to guide the project towards the goals set for it. The concept, "elasticity of control," may be a useful way of describing this sort of system.**

*From an unpublished article by John W. Huang of the World Bank's Economic Development Institute.

When demand is responsive to changing price economists speak of "elasticity of demand." Likewise, when control is responsive to variations o need, we can speak of "elasticity of control." Bu where there is excessive or inadequate control i relationship to requirements, we must conside that control to be inelastic.

Elasticity of control exists when leaders o administrators feel willing and able to delegat specific responsibility to subordinate officials o governmental units without relinquishing their supervisory accountability. The capability of th entire system thereby expands because (a) th capacity of subordinate officials and units is encouraged and enhanced; (b) the potential output o superiors also increases insofar as they are left fre to undertake additional activities, and (c) th possibilities of constructive criticism and ope confrontation of issues are introduced, as subordinates come to be respected.

The achievement of elasticity of control require the creation of ways to delegate authority and, a the same time, to supervise and guide those t whom this authority has been delegated. Both processes must go on simultaneously. Pushing down from the top as much responsiblity a possible and then judging and rewarding subordinates on their ability to handle it is likely to be successful in urban development projects to the extent that the following procedures are used:

(a) devising the project in relation to what can be achieved with the technical, financial, and human resources available;

(b) defining the functions and responsibilities o the executing units, together with those of individual staff members;

(c) establishing timetables and budgets for the project;

(d) developing reporting systems to be used by subordinates; and

(e) maintaining methods by which changes o reforms can take place in response to emerging suggestions or criticisms.

**From the editor's book, GOVERNING AN AFRICAN CITY: A STUDY OF NAIROBI (N.Y.: Africana Publishing Co., 1974).

The Organization of Urban Projects

Robert Youker, the Co-Director of the Economic Development Institute's Project Management Course, pointed out in a recent article that the typical bureaucratic organization may have difficulty carrying out certain types of projects.* Lack of motivation, inertia, competition for resources, and conflict among specialized sub-units (each more concerned with its particular needs than with the goals of the project) are among the problems cited.

There are alternatives to this type of structure: a single-purpose organization set up specially to carry out a particular objective; or, instead, a "matrix" organization, in which the coordinator or manager has the authority to borrow from the regular bureaucracy the personnel, equipment, and funds necessary to complete a project being undertaken. Each of these alternatives is likely to have certain disadvantages as well as advantages, though some of the disadvantages can be minimized in various ways. In any case, there is no approach that is perfect for all situations. The best that can be done is to develop an approach that is compatible with the key factors affecting organizational operation, including:

- the size of the project (possibly requiring a multi-departmental approach, as against an integrated single unit);
- the independence of the project manager (the degree to which he is free from ordinary bureaucratic controls);
- the relationships between project organization and the local community;
- the location of the project (in the capital or in a secondary city);
- the control exercised by the national government, as against that of a local authority;
- cost recovery techniques; and
- the country's experience with this particular type of project.

While the following examples of urban project management suggest various successful approaches to the provision of shelter, they are not the only type of urban projects currently being formulated. On the contrary, many of the projects under preparation and supervision are much broader and aim to improve the performance and efficiency of the institutions responsible for all aspects of urban development. The experience of managing more comprehensive types of projects is limited, and it has not been possible to include examples in this edition. The subject, however, will be discussed in future editions of TUE.

- *El Salvador*

In El Salvador, the Fundacion Salvadorena de Desarrollo y Vivienda Minima (FSDVM) has been primarily responsible for low-income housing, having planned, designed, and constructed more than 7,000 serviced sites throughout El Salvador since 1971. Not only has the FSDVM been able to reach a lower-income level than previous housing efforts in El Salvador, but it has also been able to do so within targeted cost levels.

The history of the FSDVM goes back to 1958 when Padre Ibanez, together with a group of concerned citizens, relocated 69 families left homeless after a flood in the eastern section of San Salvador. FSDVM's second project, preparing serviced sites for 520 families in Santa Tecla (a suburb of San Salvador), was completed at the end of 1973, an impressive 12 months after first groundbreaking. Since receiving its first World Bank loan in 1974, it has been expanding its production capacity to more than 2,000 units annually. In 1976 the FSDVM received a second World Bank loan for an additional 8,000 serviced plots; and, as part of this loan, it is now planning new projects, including one for 35,000 families outside San Salvador, making this suburb the country's fifth largest city.

The success of the FSDVM is due largely to the high quality and intense motivation of its staff. Also important have been the enlightened policies determined by a twelve-member Board of Directors, consisting of eminent Salvadoreans from a broad range of occupations. Members of the Board are elected by a General Assembly of subscriber members, including residents of squatter settlements and participating households. The Assembly, which meets once a year, is also responsible for approving the annual financial statement.

The current FSDVM staff now totals about 120, nearly half of whom are professionals. The technical capability of the staff has enabled it to design, engineer, and supervise the construction of all the units within its projects. This in-house capacity for handling all aspects of the work has resulted in the valuable accumulation of experience, accounting for the increasing sophistication of layout designs and implementation flexibility.

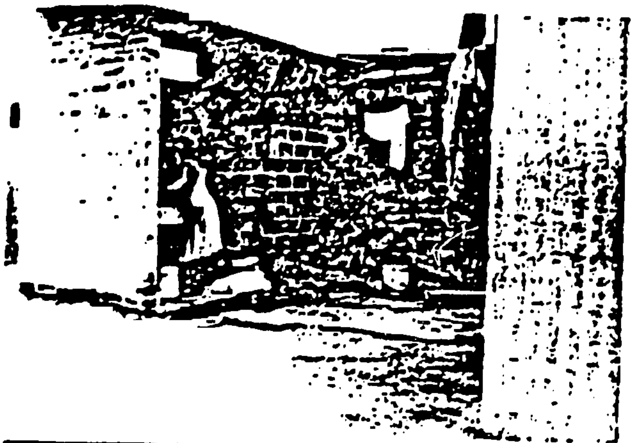
The FSDVM has been remarkably successful in recovering costs from beneficiaries, using accumulated surpluses to finance additional housing projects.* As of August 31, 1977, the default rate amounted to only 1.9% of the nearly $1.5 million in loans granted for housing. While ultimately the Legal Division has responsibility for obtaining from the courts judicial sanctions against delinquents, it seldom needs to do so because of the work of the Delinquency Section of the Credit and Collection Department in the Finance Division, which is a good example of how the organization functions.

The fundamental objective of the Delinquency Section is to get beneficiaries to recognize the importance of punctual mortgage payments. However, when families do get behind in their payments by more than a month, it does an investigation. Based on this, it attempts to reach an agreement with the families on some sort of repayment program or schedule. These families are then periodicially revisited by social workers until the problem is resolved.

To cover possible defaults, a 5% charge is added to mortgage obligations. However, to encourage punctual payments, some of this risk reserve is

*MANAGEMENT REVIEW, November 1977

*From a communication to the editor by Marco Tulio of FSDVM.



Scenes from a site and service project—El Salvador.

returned to those who maintain their payments up-to-date via a lottery, which also boosts morale.

• *Zambia*

In Lusaka, there was a strong possibility that the National Housing Authority would be primarily responsible for the urban development project proposed in 1973. However, because of the importance of gaining popular support, it was decided to keep the project under City Council jurisdiction.* What was eventually accepted was a Housing Project Unit (HPU) which, while a department of the Council, would have more freedom and flexibility to get things done.

HPU matters are dealt with exclusively by the Finance and General Purposes Committee, the policy-making committee of the Council. Because this committee has been given decision-making powers on HPU matters, it can act without waiting for the monthly Council meeting.

Councillors are kept informed about the progress of the project through very comprehensive monthly reports. The close working relationship between the Project Director (who has the status of a department head) and other Chief Officers, has facilitated cooperation.

HPU's success has been facilitated not only by its freedom from the procedures of the committee system but also by its freedom from some of the other institutional constraints that affect the Lusaka City Council, particularly the financial controls exercised by the Ministry and the personnel controls exercised by the Local Government Service Commission. Especially useful has been the Project Director's discretion over appointments and salaries, allowing him to freely draw staff from Central Government, the Lusaka City Council, and international organizations and to provide them with attractive salaries and privileges.

The fact that the HPU staff comes from a variety of backgrounds has helped create a climate conducive to change. Innovation has been further stimulated by a Monitoring Section, led by an active and competent sociologist, and by a seminar/workshop system under the leadership of a communications specialist, who is also responsible for weekly progress meetings. Also important has been the shifting of operational responsibility from headquarters to field teams. The status of these teams and their leaders has been enhanced over time as their roles and relationships have come to be more clearly defined.

• *Kenya*

For its first World Bank-supported site and service project (Dandora), the Nairobi City Council set up a special project department under a director, who carried chief officer status. Instead of reporting to a series of council committees, the Dandora Project Department (DPD) was responsible to a single committee consisting of members from the City Council (ordinarily chairmen of the standing committees) and co-opted members from the Ministries of Finance, Local Government, Housing and Social Services, and from the National Housing Corporation and the Provincial Commissioner for Nairobi. The Town Clerk served as the secretary and the principal administrative link between the DPD and the Council as a whole. The composition of this committee was such that it could quickly reach decisions which had the support of both City Council and Central Government.

The success of DPD has encouraged the Kenya government to pattern after it Housing Development Departments (HHDs) in Nairobi, Kisumu, and Mombasa for its Second Urban Project (see TUE, Vol. 1, No. 7). In Nairobi, the DPD has been absorbed into the new HDD, which will now be the principal agency for the design and implementation of low-income housing. The staffing and structure of HDDs will be tailored to meet the specific needs of each city.

The basic work unit with the HDD is a multidisciplinary project team assigned to a single site. Skills are drawn from each of the major HHD divisions (Finance, Technical, and Community Development) as well as from other departments as needed. The Community Development Division has a special responsibility to facilitate communication between citizens and local authorities and among voluntary and Central Government agencies concerned with all aspects of urban development. In the case of site and service areas, the community development workers publicize the project, solicit and process applications, orient and

*Based on a report by David Pasteur of the University of Birmingham, England.

train allottees prior to settlement, and work with families during construction. In upgrading areas, where strong communities already exist, a separate section of the Community Development Division deals with their special needs, starting well before the beginning of implementation.

• *Brazil*

In Brazil, as in certain other Latin American countries, the National Housing Bank (BNH) has been primarily responsible for financing and administering low-income housing projects. BNH's operations are managed by an Executive Committee made up of a president and six directors, all appointed by the President of the country with the approval of the federal senate. Since 1973, the bulk of loan appraisals and approvals, as well as all supervision of works, are carried out by the eleven regional offices.

To actually prepare, execute, and manage low-income housing programs, BNH has promoted the establishment of Low-Income Housing Companies (COHABs). Although the majority shareholders of the COHABs are the states or municipalities (and, as such, appoint top management), BNH continues to provide practically all of COHAB's financing. Therefore, it determines the fees that may be charged by COHABs, their interest rates, and the amortization periods. On the other hand, COHABs depend on their shareholders for political support and, particularly, for help in acquiring land and in developing infrastructure and community facilities.

Since 1973, COHABs have become increasingly interested in helping the residents of squatter settlements and those suffering from inadequate living conditions. Many of them have made impressive progress in this regard, with a rapid expansion of productive capacity and program implementation. What has facilitated progress has been the development of flexible guidelines by the Division of Production and Financing (PLANHAP) covering such things as site layout, unit design, infrastructure, access to jobs, and other activities. The guidelines represent a welcome move away from the rigid layout and design standards COHABs were required to follow earlier. Also facilitating progress has been the development of special lines of credit for infrastructure and community facilities to complement other sources of funds.

COHABs are increasingly relying on community development programs to support their housing projects. The primary objective of these programs is to form residents' associations so that communities are able to solve many problems on their own and to deal directly with the appropriate municipal agency without having to rely on COHAB staff. Associated with these programs have been the courses organized by the state vocational training agency (SENAC), with close to 9,000 students. Many of these courses are oriented for women working in their homes.

Challenge and Response

In 1967, Albert O. Hirschman, a leading analyst of economic development problems, noted in his study of a dozen World Bank projects, that some of the more successful were those that had experienced substantial uncertainties and difficulties.* What was significant was not so much the existence of uncertainties and difficulties as the ability of project managers to overcome them. This ability came from recognizing existing or possible problems, taking an experimental approach, examining alternatives, and being prepared for new methods or procedures.

• *Mutual help and self-help in El Salvador*

The FSDVM relies to a large extent on mutual help for trench-digging, pipe-laying, and construction of core units. Potential participants are required to work as long as a year during weekends before being allotted individual plots and homes for completion or expansion by self-help. The practice has been to organize those selected for plots into groups of 15-30 persons, which are then trained by technical foremen and social workers.

While the mutual-help approach has been estimated to reduce house costs by about 10% below the contractor price, the FSDVM's own Socio-economic Evaluation Unit revealed, in the case of one project, that a high percentage of the families selected dropped out because of the mutual-help requirements. Since mutual help is largely carried out on weekends, those who had to work on weekends were obviously disadvantaged by this requirement.

To reduce the mutual-help requirements is not easy. Hiring contractors to do more of the work would probably increase monthly charges and make the project somewhat less accessible to low income families. Moreover, mutual help is an essential part of the FSDVM's approach to social awareness and community cohesion. Nevertheless, the following options are being considered:

(a) organizing some mutual-help workdays during the week to relieve some of the pressure on those families who must work on weekends;

(b) allowing the use of substitutes or higher payment charges in lieu of work requirements;

(c) making available rented rooms or completed units to those for whom mutual help and self-help are difficult or impractical.

In the older projects, the FSDVM offered only two service levels. Half the lots contained an enclosed sanitary unit consisting of a toilet, shower, and wash basin. On the rest were built basic 17 m^2 dwellings, including, in addition to the sanitary unit, asbestos cement roofs, wooden frame doors and windows, and concrete floors. The experience of the FSDVM has been that many low-income families lack the funds or experience for extensive self-help building. In newer projects, therefore, "condominiums" (including the possibility of two-story extensions) are being offered in which families can live on a lot using centrally located individual sanitary cores.

*DEVELOPMENT PROJECTS OBSERVED, The Brookings Institution, Washington, D.C.

Challenge and Response *from page 4*

On the other hand, it has been found that many higher-income or more skilled families prefer to design and build for themselves, often utilizing small contractors or paid unskilled labor. For these families, a lot with infrastructure only is offered. Because so many families (40% in one project) employ contractors or labor, credit has become available for this as well as for materials.

In other ways, the FSDVM is responding to monitoring and evaluations carried out. There is now a greater emphasis on training during the mutual-help phase of the project. The importance of generating employment and income, particularly for female-headed households, is being increasingly recognized, with the establishment by Fedcredito of a credit and technical assistance program (see TUE, Vol. 1, No. 2). Another innovative feature is the provision of small open spaces, around which 12-20 plots are clustered. These plazas or "miniparks" are being well-maintained by the surrounding families, and provide opportunities for social interaction. In addition, they permit smaller lot sizes, thereby cutting down on costs.

• *Project implementation in Zambia*

Zambia's site and service scheme in Kafue, a growing industrial center 26 miles from Lusaka (the nation's capital), encountered numerous problems after its 1967 inception. Even after five years of effort, many of those who had been allotted plots had not completed their houses. People were fearful of investing in a scheme that might not develop as promised. This fear was intensified by confusion about conditions of ownership, particularly the right to sell or transfer property. The mutual-help arrangements were poorly worked out; and in the absence of mutual help, many residents lacked the skills, resources, and time to attempt self-help construction. Those that needed technical and financial help were often unaware of what was actually available. Added to these difficulties was the absence of public transportation.

Because of the problems of this project, the Zambian government requested the assistance of the American Friends Service Committee prior to the 1969 implementation of the Kafue Township Council's Self-Help Housing Project at Chawama.* Based on this experience, the following procedures have come to be widely accepted:

(1) Preparative study sessions. Prior to the start of construction, the project's community development staff assists each group of would-be home-builders to organize study sessions. At Chawama, the groups were led in part by elected chairmen and secretaries, and they met twice a week for a total of 14 sessions. Among the subjects covered were the procedures of housebuilding, the organization of a building group, and the costs and financing of home ownership.

(2) Budget analysis. In addition to the preparative study sessions, community development staff have a number of discussions with each family regarding the added burden of owning a house. At Chawama, the practice was to go over each family's budget in detail, thereby helping the family to determine whether or not it could meet the financial obligations of home ownership.

(3) Work exchange agreements. During the course of the study sessions, contracts are developed setting out each family's rights and obligations regarding cooperative work. The purpose of this is to establish a formal reference point by which groups of families can develop unity and maintain morale over a long construction period.

At Chawama, each family pledged 1,000 work hours to the group, plus additional hours if necessary. No distinction was drawn between the requirements of men and women, but the work of children under 16 was counted as either two-thirds or one-half that of an adult. A timekeeper elected by each group was expected to keep the Time Record Sheet and to enforce the accepted arrangements.

In theory, any family unable to contribute its full share was penalized a certain amount for every hour not worked before being allowed to move into its house. In practice, group leaders never called on families to pay the penalty charged for hours missed, nor did they ever expel anyone. The effect of such penalization on morale and unity was found to be too harmful. Moreover, the effort made was recognized to be more important than the number of hours worked. Therefore, each family's share of work was judged in terms of variable circumstances, abilities, and attitudes. Only those who were clearly avoiding work were admonished and, otherwise, pressured into cooperation.

(4) Participation. For mutual-help to succeed, families must be organized into construction groups. (At Chawama, the medium number of families in a group was nine.) Once a group is established, the leaders of a group are given primary responsibility for project implementation under the guidance of community development workers. At Chawama, families soon recognized the value and pleasure of working as a group, even when the group lacked the traditional reinforcement of kinship or common language.

At Chawama, it was also found useful to organize a central committee to facilitate inter-group cooperation, communication between groups and staff, and representation of all the groups to the Kafue Township Council. The Group Coordinating Committee, composed of the chairman and two delegates from each building group, averaged at least one meeting a month. It proved to be very useful in solving such problems as violations of work exchange agreements, delays in repaying government loans, and excessive cutting down of trees. Among the positive accomplishments of the Committee was the supplying of residents with fruit tree seedlings, the construction of a primary school, and the petitioning of the Township Council for a number of needed facilities.

*American Friends Service Committee (1501 Cherry St., Philadelphia, Pa. 19102), CHAWAMA SELF-HELP HOUSING PROJECT, 1975.

The Urban Edge: Articles and Ideas

The following is a list of the more important articles and ideas published in the previous ten issues of *The Urban Edge* (i.e. from October, 1977 to July, 1978). Copies (including sources of information used) can be obtained from the editor. Code numbers indicate how they are filed. Requests for copies should be by code number. (Note: The numbers/letters in parenthesis refer to the specific item. When added to the topic code, they form the item code. For example, the code number for industrial parks is: BD 133d.) An asterisk (*) indicates availability in French and in Spanish, as well as in English. The ideas are available individually or grouped according to the following topics:

Administration—Community Participation AC23
Effective forms of community participation: planning (4a), implementation (4b), partnership approach (4c), community-based management (4,5), cooperatives (5a), ethnic associations (5b)

Administration—Local Government AL23
Approaches to achieve better local government administration: the government agent (2), ombusdman (2,3) the Council-Manager system (3), area management (3a), a unified local government service (6), a chief executive (6a), a special committee (6b)

Business Development BD13
Methods used to facilitate the development of small business: access to raw materials (3), exclusive purchase arrangements (3a), technical assistance (3b), work sheds and core shops (3c), industrial parks (3d), covered markets (3,4)

Business Loans BL13
Some innovative credit delivery programs: integrated support (6), group liability (6a), hire-purchase (6b)

Business Training BT13
Approaches to upgrading technical competence: the combining of training and financial assistance (4), training and production centers (4,5), pedogogic enterprises (5)

Business-Women BW24*
Ways of helping self-employed women: women's clubs (3), sub-contracting arrangements (3a), a self-employed women's bank (3,4)

Education-Women EW24*
Education approaches to increasing female employment: social centers (a), vocational centers (b), training production centers (c)

Family Planning FP24
Some programs that have proved to be effective in urban areas, use of messengers (a), publicity campaigns (b), use of shopkeepers (c)

Health Delivery HD21
Useful approaches to health care delivery: volunteer workers (2,3) use of community health workers (3), small health centers (3a) training, architectural and administrative innovations are also discussed (4)

Health Nutrition HN21
Suggestions for alleviating malnutrition: use of mass media (5), nutrient-dense foods (5), on-site and take-home feeding (5b), food processing and fortification (5c), ration shops and coupon programs (5d)

Land Tenure and Control LT11
Various arrangements to provide security of tenure while controlling land use: variable leases to encourage property improvements (4), restrictions on resale (4a), tenure in improvements (5), neighborhood ownership (5a)

Site-Service Innovations SS12
Procedures used to facilitate the success of site and service projects: market surveys (3), size, cost, and service level options (3a); cross-subsidization (3b); combining sites and services with squatter upgrading projects (5); gradual improvement of services (5a); computerized allocation (5b); credit and technical assistance (5c); cost/mortgage collection (6)

Taxation-Betterment TaB26*
Systems for recovering improvement costs: advance land acquisition (3,4), land readjustment (4), valorization charges (4,6)

Taxation—Property TaP26*
Useful approaches to capturing the value of land: annual value estimates (3), a dual assessment system (3a), penalty taxes (3b), incentive systems (3c)

Taxation—Urban Project Cost Recovery TaCR26*
Various approaches to recovery of costs for urban development projects: direct payment from beneficiaries (5), utility sur-charge (5a), and general tax (5,6)

Technology—Foreign Assistance TFA25*
Organizations assisting craftsmen and entrepreneurs in developing countries: ITDG (2,3), VITA (3,6), the Brace Institute (3), and A.T. International (3a)

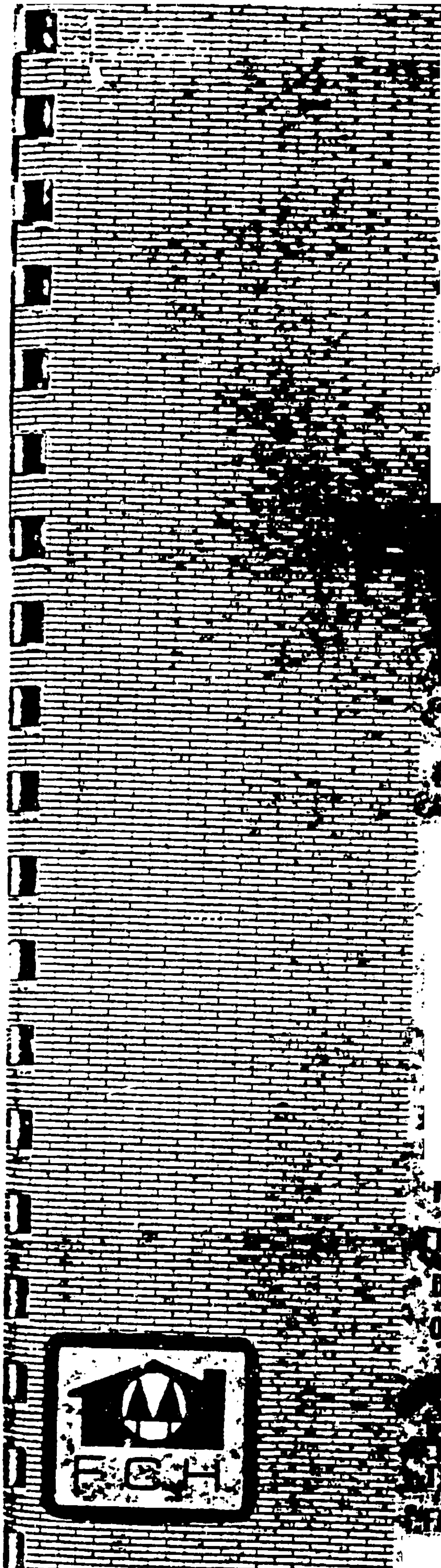
Technology—Waste Disposal TWD25*
Ideas for facilitating the work of scavengers, including a proposal for Egypt

Technology, Sanitation TS12
Intermediate sanitation alternatives discussed: septic tanks (4,6), stabilization ponds (6), the water hyacinth (6a)*

Transportation, Buses TrB22
Innovative management measures, including an effective system of financial and management controls

Transportation, Roads TrR22
Ideas for making better use of roads: better organization of traffic flows (3); inexpensive road upgrading (3a), staggered work hours (3b), area licenses (3,5), parking coupon system (6), bicycle movement (6a)

Transportation, Paratransit TrP22
Suggestions for maximizing the use of various forms of privately owned, low-cost transportation services: minibuses (2); jitneys (4), pedicabs (4,6), motorized rickshaws (6)



COOPERATIVE HOUSING AND THE MINIMUM SHELTER APPROACH IN LATIN AMERICA

VOLUME 1

PREPARED FOR

THE AGENCY FOR INTERNATIONAL DEVELOPMENT, U.S. DEPARTMENT OF STATE

BY

THE FOUNDATION FOR COOPERATIVE HOUSING

COOPERATIVE HOUSING AND THE MINIMUM SHELTER APPROACH IN LATIN AMERICA

I. PURPOSE AND BACKGROUND

The Latin American Bureau of AID has suggested that cooperative housing activities funded by AID should be directed toward the lowest income groups for which home ownership is feasible. The purpose of this report is to analyze the problem of reaching low income families with AID supported housing programs and to make specific recommendations on how cooperative housing techniques can be applied to help solve this problem.

During 1971, the Latin American Bureau of AID assigned a task force of AID officials to prepare a written evaluation of the work of all U. S. cooperative organizations working in Latin America under contract with AID. Regarding FCH work with AID, the task force report stated:

> "The task force concludes that future cooperative housing programs should focus rigorously on the lowest income groups for which home ownership is feasible."

The task force went on to say that the target groups for AID-supported FCH activities under Task Order #3 (Latin American and Caribbean Regions) should be "the lowest income group with earning capacity sufficient to make some form of mortgage payments to purchase shelter." They suggested that the cost to the home buyer should range from $600 to $1,500 per unit.

As a first step toward implementation of the AID task force recommendations, the Latin American Bureau requested FCH to conduct research and prepare a report outlining a new approach to the problem. The approaches proposed by FCH can legitimately lay claim to being new and innovative; at the same time, they are rooted in past experience and some have been tried before in various forms. Principally, FCH is urging a new approach and a new model for minimum housing.

The new approach involves the use of cooperative techniques through which individuals may join together to produce a common goal, namely, better houses in better communities. Cooperatives are uniquely designed to mobilize self-help efforts in producing housing, so that poorer families can join together to use their resources more effectively. Cooperative techniques can provide ready-made vehicles to organize a constituency of people who will continue to focus on their own housing problems. Cooperatives can also provide a necessary buffer between state operated programs and the housing consumer.

Housing cooperatives have been successfully implemented by means of a device known as a technical service organization (TSO). An examination of the housing experiences of private sector groups in many countries, including the United States has shown that even well-intentioned, well-financed groups often fail unless there is a competent, experienced technical body to assist them.

Over the last decade, FCH has worked closely with AID to develop TSO's that could provide the critical skills and advice necessary to successfully implement cooperative housing programs. TSO's have been created in Colombia (PROVICOOP); Panama (FUNDAVICO); Honduras (FEHCOVIL); Jamaica (Mutual Housing Services); and Venezuela (INVICA). These TSO's could expand their efforts and develop minimum shelter programs using cooperative techniques.

The new model for AID supported housing that FCH proposes is a "minimum shelter" form of housing. This can be provided in many ways. One is a "shell" house consisting of only a roof and a floor; another is a "core" house, which is an enclosed structure that includes basic fixtures. These options can range in cost from $700 to $1,500 and can be completed and expanded by the occupant himself as his income permits. Another alternative for very poor families is the "site and service" approach. Here, the bare plot and minimum services, such as water and waste disposal, are provided and the resident develops the type of shelter he can afford himself.

There are two elements that set the "minimum shelter" model apart from other models. In the first place, it provides a unit that is designated to match the ability to pay of the occupant. In the traditional approach to housing, planners have designed a house and then estimated how many people could afford it. The minimum shelter approach works differently. Here, an architect begins with the fact that a family perhaps could afford six to ten dollars a month for shelter; he is then faced with designing a housing solution that will be possible within that monthly payment constraint.

The second way that this model differs from the traditional is that it provides a range of shelter solutions that can be produced by the occupant himself with a minimum of outside help, once the framework has been established. Thus, occupants can build up an equity of independence and freedom from constant government assistance. The minimum shelter approach has already been tested with AID and FCH help in Panama and experience shows that tenants do not let their plots remain barren for very long. They make continual improvements on their dwelling units, bringing them up to a standard level on their own, over a period of time.

It may seem that the cooperative approach, in which people band together, and the unaided self-help, minimum shelter model for housing, in which residents operate individually, are contradictory, even mutually exclusive. This is not so. Cooperatives can work to further the minimum shelter model through cooperative land tenure, construction, savings and credit, and production. A cooperative system will provide far more resources than the individual could ever put together on his own; at the same time, lets the individual produce his own home.

Both cooperatives and the minimum shelter approach have been used before. Cooperatives have enjoyed success in Latin America but they have primarily served middle- and upper-income families. The standard cooperative housing program has been designed for families just above those served by government programs and just below those served by local private housing finance institutions, such as savings and loans.

Minimum shelter has been produced in many countries through aided self-help programs, often with AID support for "pilot" projects. However, aided self-help programs which require a great deal of government administrative support have not been successful on a large scale in developing countries (with the possible exception of Puerto Rico).

The minimum shelter approach proposed by FCH differs from traditional aided self-help. In the new approach, the government provides a framework of land, utilities and credit and leaves the housing solution to the individual and the private sector TSO.

In recent years, this approach has become more accepted by international agencies concerned with housing. IDB, OAS, and the UN endorse versions of the minimum shelter model in their current policy statements. The World Bank is now providing financing for "site and service" programs. AID, as an institution, also accepts this minimum shelter approach. During the past two years, FCH has assisted AID in preparing feasibility studies in a number of countries that recommended the minimum shelter approach with various combinations of site and services, shell housing, and expandable core houses. In three countries, Peru, Colombia and Panama, AID has recently approved development loans to support housing programs that use this concept.

Unaided self-help has been taking place in Latin America for years. The 1972 World Bank sector working paper Urbanization comments on "the extent to which dwellings, albeit of 'substandard' quality and subject to great overcrowding, have in fact been provided by the unaided self-help efforts of migrants .... The migrants appear at least as much to be providing a solution as to be creating a problem."

Cooperatives can play an important role in institutionalizing the unaided self-help approach. The tendency, in providing housing, has been to evaluate the ability of families to pay for a house on the basis of their cash incomes. When labor and contribution of materials are calculated, however, a family's income can grow by as much as five times. A cooperative framework can help to harness this elusive but valuable "income" and turn it into a new housing unit.

The second way in which FCH's approach differs is that it attempts to bring to bear the substantial resources of the private sector. So far, the government has provided most of the funds to build low-income housing. This has been singularly unsuccessful. It has not been possible to secure adequate funds from public revenues for the production of sufficient housing for the low-income consumer. Further, government programs have produced a "standard" house, one that is much too expensive for most low-income families. The delivery of government housing programs has been laden down by red tape and the attitudes of many government officials have been unresponsive to the needs of the low-income recipient.

At the same time, there is a substantial amount of local money available in Latin American countries through banks, savings and loans, and other private sources. So far, most of this money has gone to finance upper-income housing. Several countries are now experimenting with new laws and regulations that would channel this money to lower-income housing. It should be pointed out, however, that the ability of the private sector to produce low-cost housing has been tested on only the smallest scale; nevertheless, the potential is promising.

TSO's could play a prominent role in making use of rechannelled private sector money. Perhaps the most important contribution of cooperative housing in Latin America and the Caribbean would be to show that housing for low-income residents can be a good investment and that poor families will be responsible in repaying loans under the right conditions. This in turn would cause local financial institutions to have more confidence and therefore provide credit at this level.

Over the years, FCH has been involved in laying the groundwork for many of these approaches. FCH has assisted in the creation of cooperative housing TSO's in several countries. These TSO's have successfully completed cooperative housing demonstration projects, mostly with financial support from AID. Several TSO's have also developed important locally financed housing programs especially in Chile, Brazil and Colombia.

However, FCH has assisted AID in other housing activities that were not strictly "cooperative housing." For example, FCH worked with AID to pioneer a "minimum shelter" program in Panama starting in 1966. Under this program, existing squatter areas were improved with new streets, water systems and home improvement loans of less than $1,000 per family. New communities were developed for very low-income families providing several alternative solutions, ranging from simply a lot with basic utilities to "shell" houses and "core" houses in the $700 to $1,000 range which were completed by the participants self-help. Also in Panama, FCH assisted AID and IVU in developing a new rural cooperative housing program that produced houses ranging from $300 to $1,000 each.

FCH has also assisted AID and host governments in preparing feasibility reports and/or loan implementation plans for minimum shelter programs in Colombia, Peru, Ecuador, Honduras, Morocco, Chad, and Vietnam.

MISSING PAGE

NO. 9-31

IV. TWO CONTRASTING APPROACHES TO THE PROBLEM OF PROVIDING HOUSING FOR LOW-INCOME FAMILIES

A great deal has been written on the problem of providing adequate housing for low-income families in Latin America. FCH has produced several studies and reports analyzing the problem in specific countries and recommended ways to approach the problem. The reports consistently call for attempts to match incomes to house costs rather than trying to match home costs to income.

Traditional Approach

The traditional approach to the problem of low-cost housing in Latin America has been to attempt to provide "standard housing units" to eliminate or reduce the "housing deficit." This approach requires rather arbitrary definitions by technicians and officials of what constitutes a "standard unit." Any house below standard is then considered in the deficit category. Under this concept, the housing deficit in Latin America in 1970 can be estimated at about 25 million units and can be projected to reach about 100 million units by the year 2,000. To eliminate this gap, it would be necessary to construct more than three million new units each year. The cost of a "standard unit" varies greatly from country to country. If $3,000 is assumed as the cost of an average standard unit, it would be necessary to invest about 9.0 billion dollars a year to eliminate the deficit. Obviously, this amount of money will not be available.

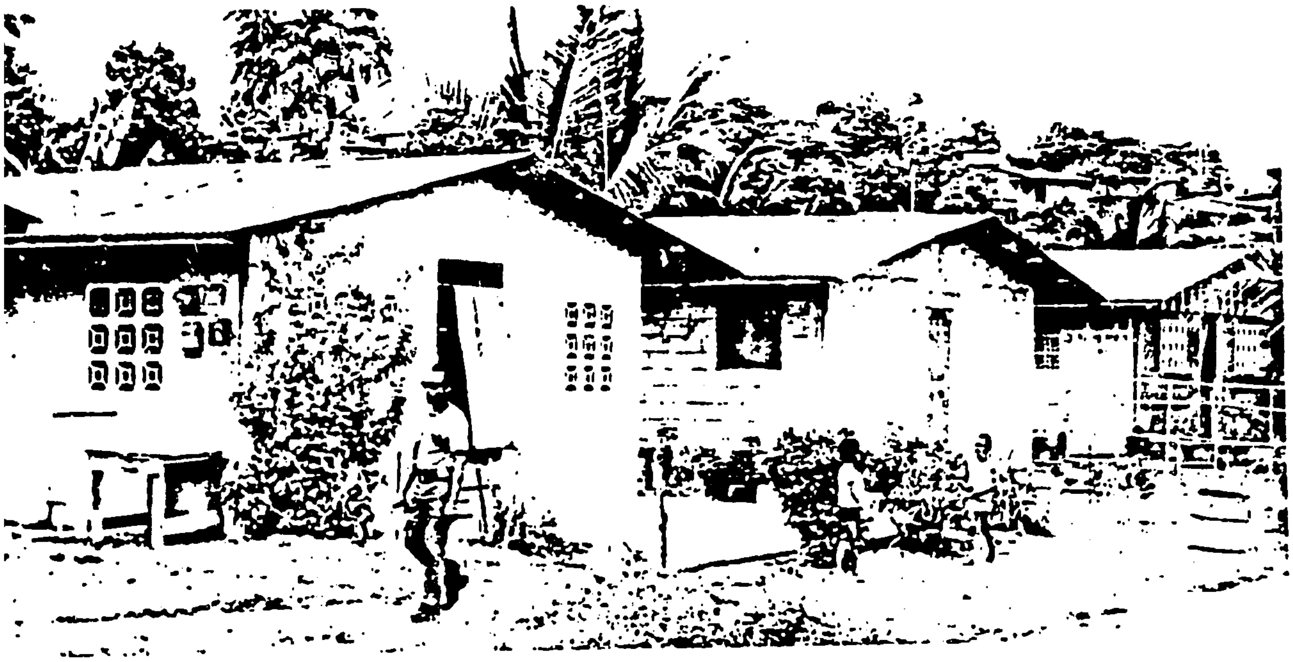
Another example of the futility of the traditional approach can be found in the November 1970 report titled: "Final Report, Site and Service and Minimum Shelter Study", prepared for USAID/Ecuador with assistance from FCH. Under Section V, "Use of Resources", the report states:

> "Using the traditional approach and the lowest standard unit produced by BEV (US$2,500), some 4,500,000,000 sucres (US$180,000,000) would be required to meet this existing need. Present estimates indicate that the 'tugurios' of Guayaquil will double within the next 10 years necessitating investment far beyond the capacity of any government. Therefore, new approaches are needed that will encourage better use of the resources of the people living in the 'tugurios' and recognize the limited repayment capacity of the participating families."

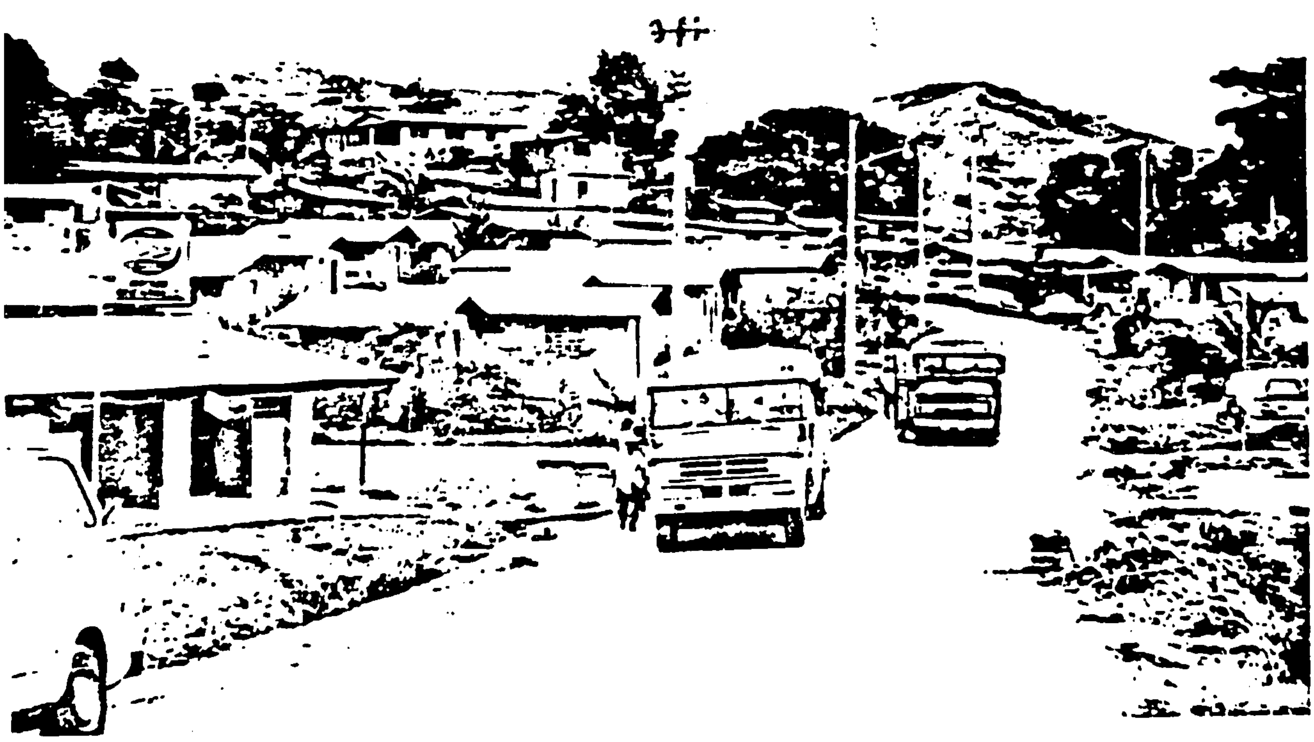
Minimum Shelter Approach

In contrast to the traditional approach, several countries are now experimenting with a minimum shelter or "environmental approach" to the problem. FCH assisted AID and the Panamanian housing institute (IVU) in a pilot program to demonstrate this approach under a 3 million dollar AID loan made in 1966. The basic idea behind this model is that the housing "solution" must fit the economic capacity of the participants. In the Panama pilot program, the target group had incomes ranging from $60 to $150 per month, allowing a monthly payment for housing of between $7 and $15. Several alternate solutions were offered to participants, ranging from only a lot with utilities at about $400 to an expandable core house at $1,000. The emphasis was not on what participants built but instead on where they built. The goal was to provide secure land tenure as well as job training and jobs so that as the family income increased, the occupants would be able to improve their homes over a period of time.

"CORE" AND "SHELL" HOUSES IN PANAMA



Good maintenance on these completed Shell houses
indicates pride of ownership - Panama, 1972.



Completed Shell and Core houses, Nuevo Veranillo, Panama, 1972.

The initial appearance of the new communities constructed under the loan was not attractive. However, there has been dramatic steady improvement over the years as shown in the photos.

The Government of Panama and IVU recognized the validity of this minimum shelter approach and developed new areas with their own funds using similar techniques. More recently, they have applied for a second AID loan that will allow a greatly expanded program of this type.

Other institutions interested in housing having adopted the minimum shelter or environmental approach as evidenced by papers presented at the United Nations World Wide Seminar on "Improvement of Slums and Uncontrolled Settlements," in Medellin, Colombia in 1970.

A Working Paper prepared by ICT, The Colombian Housing Agency, describes their "site and services" program as follows:

> Sale of Plots with Services
>
> This system is intended to create a mechanism that may operate as a 'prevention of slums', or in other words, to prepare districts with progressive development urbanization where the specifications are minimal, particularly in quantity.
>
> These urbanized plots have a water supply, sewers, power services, one or more completely paved penetration roads, suitable for truck and bus traffic, and other streets for pedestrian use.
>
> The beneficiary might build a provisional dwelling on the back of the plot, so that little by little he may build his own house on the front end, with technical and social assistance from the ICT.

> Interest rates will not be over 9% per year with maximum mortgage terms of 20 years, granting, in some special cases, a grace period during the first two years of the debt.
>
> With this system it will be possible to reach the lowest income families and to fulfill the conditions of a planned 'slum' which can be improved in a progressive and orderly manner, without land tenure problems and with the possibility of installing community services."

The paper on construction, presented by the Organization of American States, forcefully lays out both the problems and the prospects of the minimum shelter approach, OAS says:

> "The specific remedial measures to be adopted in each case — whether eradication, rehabilitation or renewal — depend on the socio-economic and physical features of the settlement. Among these are its patterns of tenure and land use, time of formation, its relationship to the city and to urban services, and the quality and quantity of structures and facilities — which must be known and considered before deciding on the appropriate solution and setting of priorities. The feasibility of any solution depends on the resources available, the operational capacity of the agencies in charge, and the degree of participation of the inhabitants."

The paper goes on to outline the special importance of technical supervision. It is optimistic in its belief that low-income families can take an active part in building not only their homes but their communities. In fact, through self-help programs, many families have worked together to build vital community facilities. None of this can work at present, the report warns, without technical supervision.

A key factor in the success of the minimum shelter approach is the role of the government. By promulgating standards and regulations better adapted to local conditions and resources, the construction of minimum shelter can be greatly assisted. In addition, the structure of housing and urban development agencies must be streamlined to improve coordination among government institutions, research centers and private groups.

It is likely that major strides will be made in the minimum shelter approach, the report points out, as progress is made in dimensional and modular construction. These new materials and methods of building will not only speed up construction but make it much easier for unskilled workers to participate unassisted in the completion of their homes.

In the _traditional approach_ to housing, effective demand is defined as the housing market. Analysis begins with the design for a standard house, sets firm cost estimates and then tries to estimate how many people can afford that unit. For example if 10,000 families in the market area can afford a $5,000 standard unit, a 1,000 unit project might be considered. In other words, planners begin with the house and then look for people who can afford to buy it.

In the _minimum shelter approach_ programs start with the people and then design several alternative housing solutions to fit their economic situation.

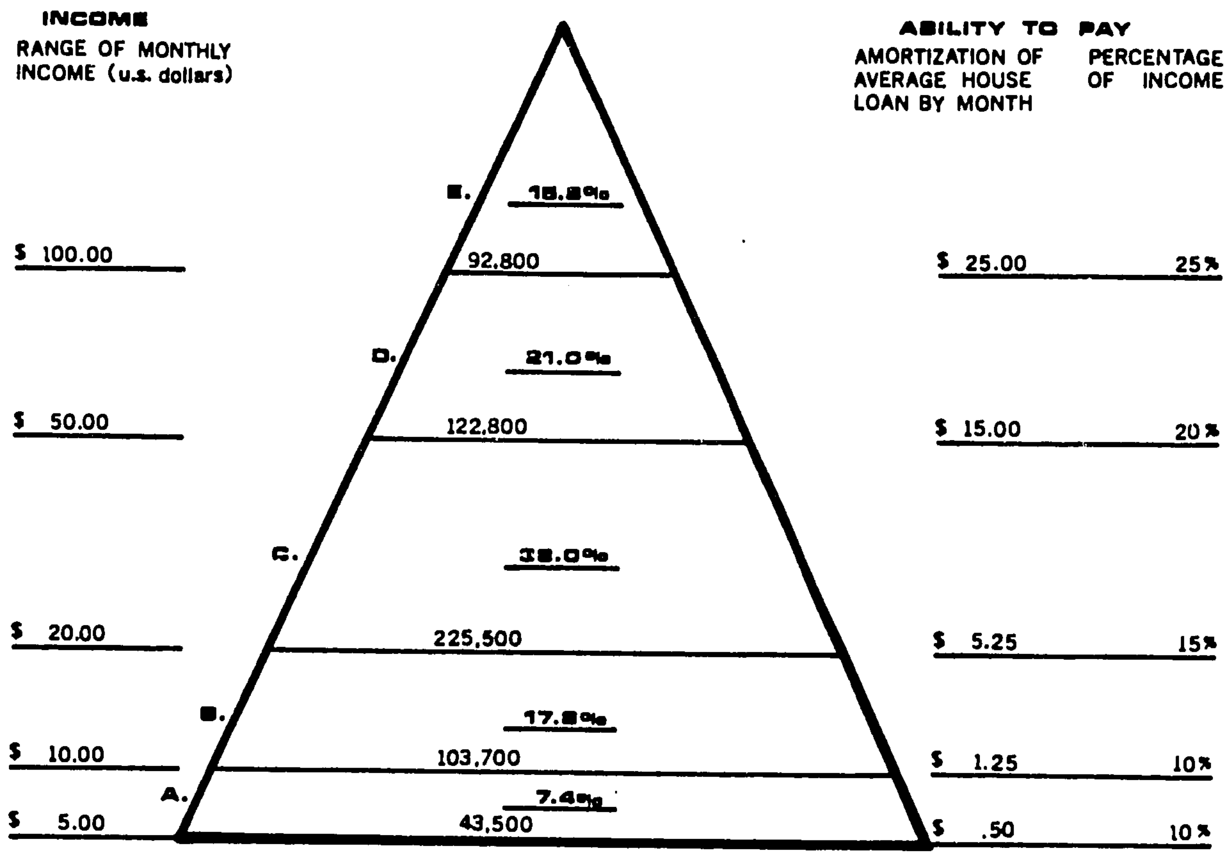
The 1970 report on Ecuador titled "Site and Service and Minimum Shelter Study," prepared with FCH assistance, included the chart, shown in Figure 1, which related the capacity to pay for a house to the distribution of income among the urban population.

The Figure 1 chart shows that more than 63 percent of the urban population in Ecuador make less than 1,000 sucres (about 60 U.S. dollars) per month and 38 percent (level three) earn between 400 and 1,000 sucres. These latter families can afford to pay a small amount for shelter. On the basis of these figures, FCH recommended that the government provide lots with utilities, costing about 75 sucres or five dollars per month, for level three families. Other alternatives, such as expandable core houses, were designed to fit people in the level four category.

DISTRIBUTION OF INCOME RELATED TO ABILITY TO PAY FOR SHELTER

ECUADOR

URBAN POPULATION



Gainfully employed urban population of Ecuador, total: 588,300
Source: Encuesta de Hogares, National Planning Board, 1968

The effective demand in each country must be determined after a careful analysis of the income distribution, the cost of construction and family budgets. For example, existing programs producing standard houses at the minimum of U.S. $2,500 are beyond the ability to pay of most citizens in Ecuador. If present programs cannot reach large segments of the population with "standard houses", minimum shelter should be de: ;ed to fit the ability to pay of the target groups. In most countries there will still be many families at the very lowest level (levels one and two) who cannot pay anything for housing and only a charitable program can reach them.

Land Problems

It is clear that governments cannot provide decent houses for most urban families. However, they could do much more in providing a place for people to build their own houses. At present, it is difficult to find good centrally located land , and available for low-income housing in most large urban areas in Latin America. Land surrounding many large metropolitan areas is often held by wealthy families who are speculating that it will be sold at some future date for huge profits. This, in turn, increases the competition for isolated parcels that are available within the metropolitan area and the price goes up accordingly. Very few governments in Latin America have taken the necessary steps to solve this problem. These would include:

(a) a firm land reform policy including tax reforms and use of expropriation;

(b) creation of "land banks"; and

(c) better regional planning.

Much of this could be accomplished without outside assistance from international agencies and would fall into the category of national self-help.

Local action is especially important in this area because it has been demonstrated in several countries that when a poor family has secure land tenure they can solve their own housing problem over a period of years if they are able to find employment.

Housing Finance Problems

Almost every country in Latin America has several local institutions that provide money for upper-middle- and upper-income housing. The amount of money available in many countries for housing at this level is substantial. Social security funds are used for upper income housing finance in many countries, normally for housing of $16,000 per unit and above. Many countries also have housing banks or housing finance institutions providing millions of dollars for higher income apartments and condominiums often costing more than $15,000. Private banks and savings and loan institutions in many countries also have considerable sums being channelled to what is often called "middle-income" housing. If one considers the income distribution charts shown in Section III, it is clear that the local money is being used for upper-income housing with very little flowing to low- or even low-middle-income housing.

The marginal population does not have access to credit for housing from the sources mentioned above. They are forced to go to neighborhood money lenders and borrow at incredibly high interest rates in order to buy materials, a little at a time, which they in turn use to build fairly substantial housing in what may appear to be a "squatter area." Housing of this type has been termed "unaided progressive self-help housing" in several FCH reports. The end product is often a very adequate home that meets the minimum requirements of its occupants. Some governments are beginning to view this process in a positive way and are looking for ways to control and encourage production of housing through this system.

Problem of Linkage

Quite often government housing programs designed for very low income families fail because there is no adequate link between the government institutions and the individuals living in a given marginal area. Programs are designed by officials and technicians who are not fully aware of the needs and desires of the potential participants. Even when a program is well planned, it can often falter during execution because of the breakdown of communication between the government and the individual. There is a need for intermediate organizations such as community associations and cooperatives to serve as direct links between the program administrator and the program client. Most marginal areas in Latin America have a variety of community organizations with overlapping interests, authority and projects. However, they are very rarely incorporated into housing programs in a meaningful way.

The "Patron" Attitude and Housing

The "Patron" attitude is still evident in some government-sponsored housing programs in Latin America. In these programs, government officials and political leaders promise to provide a decent home to all poor families, who, as a result, come to feel that the government (as "Patron") is obligated to give them a house. Traditional housing programs for low-income families have been carried out against this background, with government housing institutions producing several thousand new "standard" units (often with AID or IDB loans) and then selecting the lucky occupants. In many cases the new homeowner is either "over-income" (could afford more expensive housing financed from other sources) or "under-income" (cannot afford monthly payments). In projects with a high percentage of over-income families, the "standard" house is immediately improved to include a carport, maids quarters and other frills.The new homeowner's monthly car payment can equal or exceed his home payment!

In projects with a high percentage of under-income families, it is not uncommon to have 60 percent or more of the tenants delinquent in making their monthly payments to the government housing institution; overall project maintenance and appearance are poor. The delinquent homeowners feel they really should not have to pay the government for housing at all: their priorities for spending monthly income are higher for food, medicine, school expenses and consumer goods. Because they are poor, evictions for non-payment are an extremely rare occurrence. However, in the few instances where sound management does call for evictions, and there are fewer delinquent residents, the collected rents are available to finance additional units.

The saddest feature of programs of this type is that only a small number of low-income families actually receive a house, while the vast majority of poor families continue to live in miserable conditions.

Private non-profit housing programs can help to break the chain of "patron" thinking. They can provide a continuous financing system for new units, one that is more efficient in both production and management than public sector housing efforts. Whereas government housing programs have a high rate of default, the repayment experience for private non-profit sponsors has been very promising.

Decapitalization of Government Housing Institutions

It is very difficult to obtain accurate information on the collection problem in government sponsored housing programs in Latin America. In several countries it is estimated that more than 75 percent of the homebuyers are behind in their payments. This causes a decapitalization of the housing institutions and prevents relending to build new homes for other families. Many AID and IDB loans have been made for housing that could have produced a greater "multiplier" effect if the monthly collections were more effective. When the unhoused are made aware of this, a firm collection policy is accepted.

Another more important problem created by the poor collection record in some countries is the local financial community's lack of confidence in low-income housing programs. Thus, local money (mentioned under III) goes into upper income housing and is not available to low-income families because there is a feeling that they will not meet their mortgage payments. This is not necessarily true. There are private sector and cooperative projects throughout Latin America where the repayment record of poor families is excellent.

Population Control, Employment and Housing

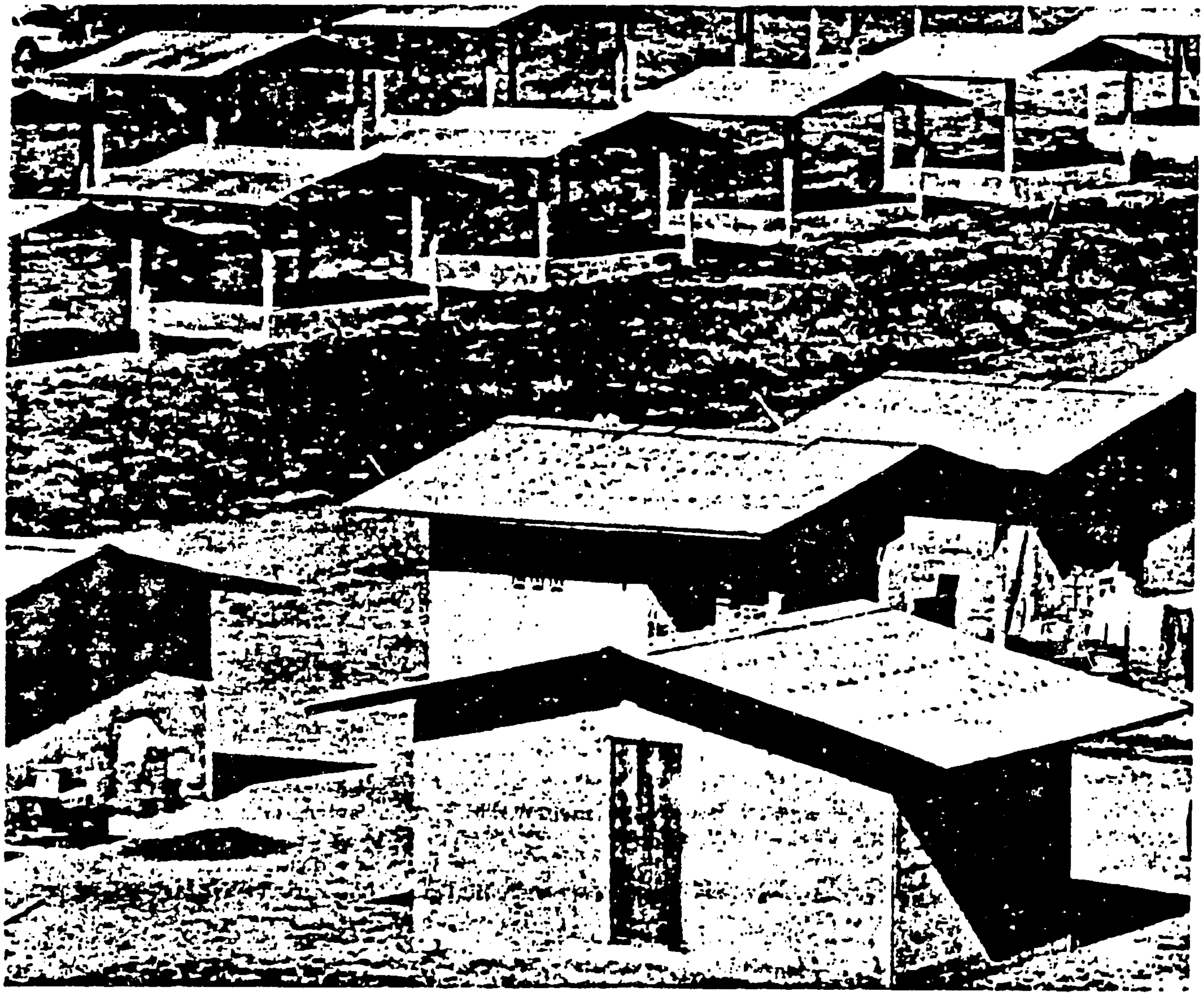
The jurisdiction of housing experts has been confined, often by public opinion, to narrow areas of building codes, master plans and urban infrastructure. Although others have criticized housing specialists when they venture forth to address themselves to the broader issues of population and employment, it is becoming more and more clear that the long range answer to the housing problem for low-income families in Latin America and the Caribbean lies in the areas of land control, employment and family planning.

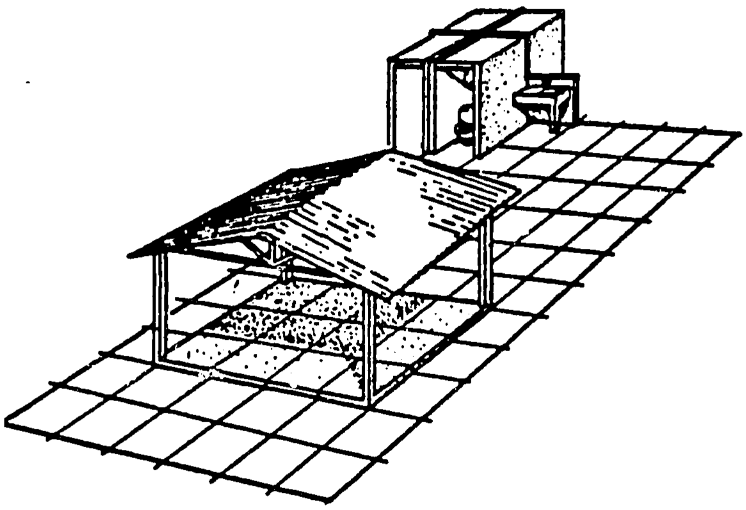
No amount of outside financial aid will solve the housing problem of these countries until they initiate national programs to control population expansion and relate it to economic growth. The sheer futility of present efforts is well demonstrated by the fact that, in the past ten years, AID and IDB have invested almost one billion dollars in housing in Latin America and met only one percent of the need.

The arithmetic would not be nearly so staggering if zero or near zero population growth could be achieved. In a "typical" small Latin American country with a population of two million, at least 40 percent, or 800,000 persons, desperately need better housing. Estimating a family size of five members, this would indicate a need for 160,000 units. With a significantly decreased population growth, the housing problem in these countries could realistically be solved by providing lots, utilities and expandable core houses at a cost of about $1,500 per family over a 20 year period. This would only require an investment of about 8.5 million dollars per year for an annual production of 8,000 units. This level of investment and production is within the capacity of most countries. At the end of a five year period, the national housing program could shift from production of new units into a mixed program of providing credit for home improvement.

Housing production could also help channel the population into productive jobs. Unemployment estimates range from 12 to 25 percent throughout Latin America and the age characteristics of the population indicate that this problem will get worse in the coming years. Some small-scale efforts have been made to relate the unemployment problem to housing low-income families. More could be accomplished in this area because housing production has a great potential as a major employer of these poorer urban dwellers. One attempt at doing this occurred in the FCH-assisted AID loan program in Panama in 1966. Where efforts were made to incorporate job training and job producing activities into the "housing loan."

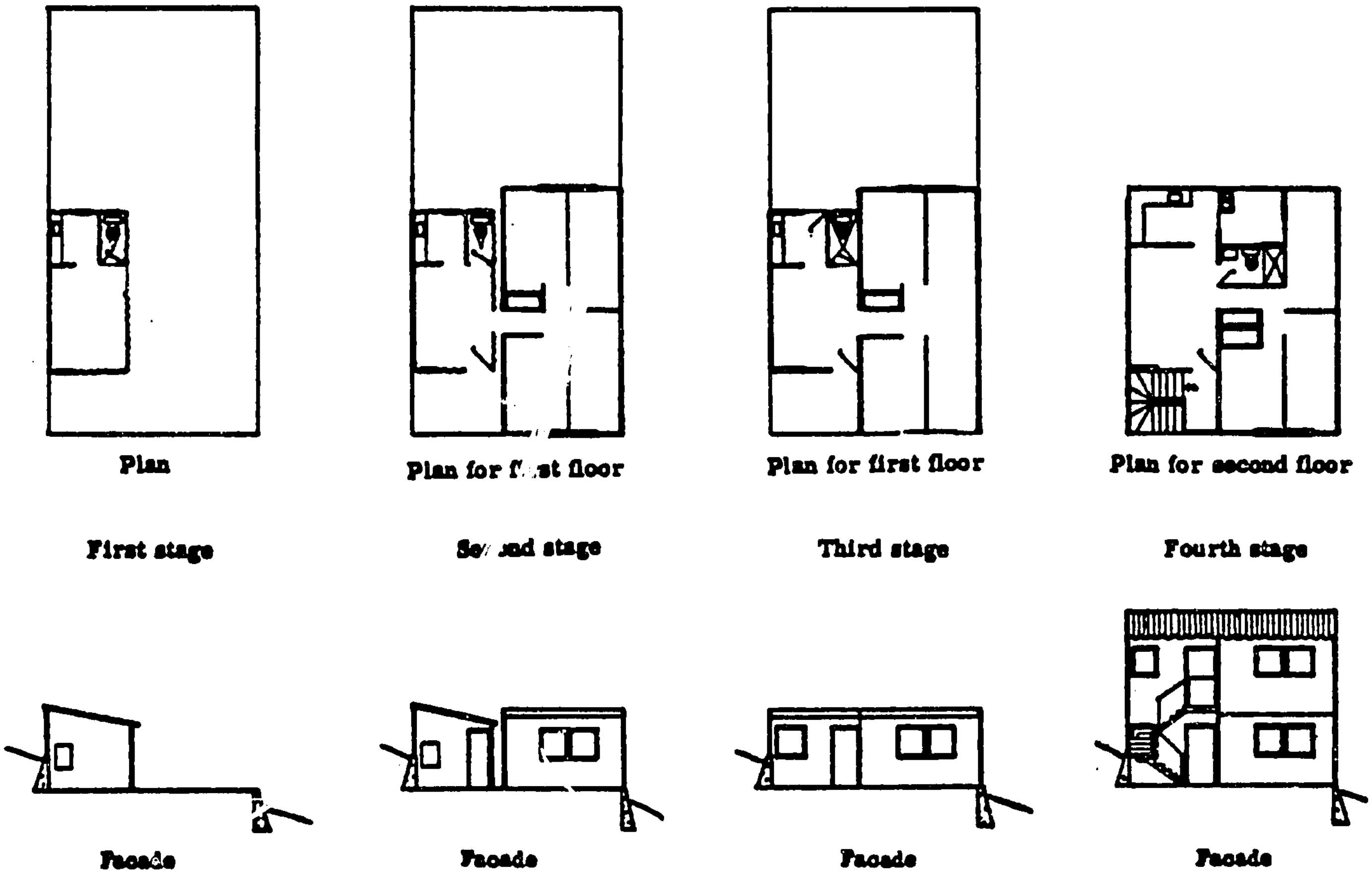
"SHELL" HOUSES





Shell houses consisting of floor, columns and roof are completed by the family's own efforts.

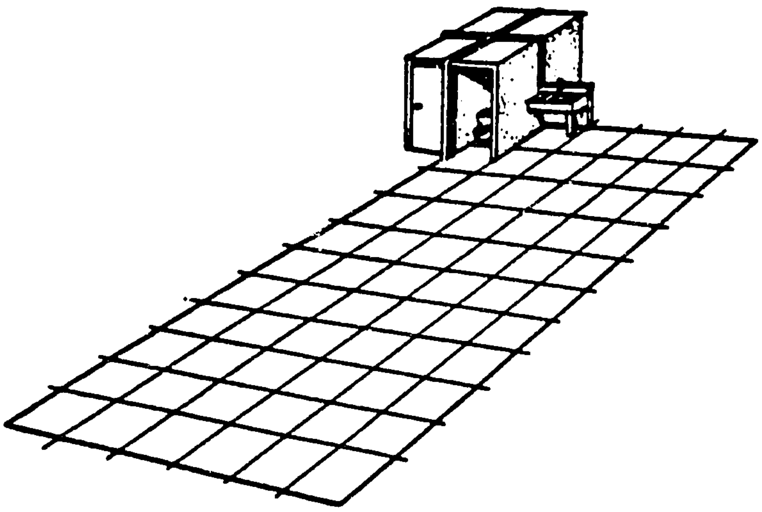
"CORE" HOUSE



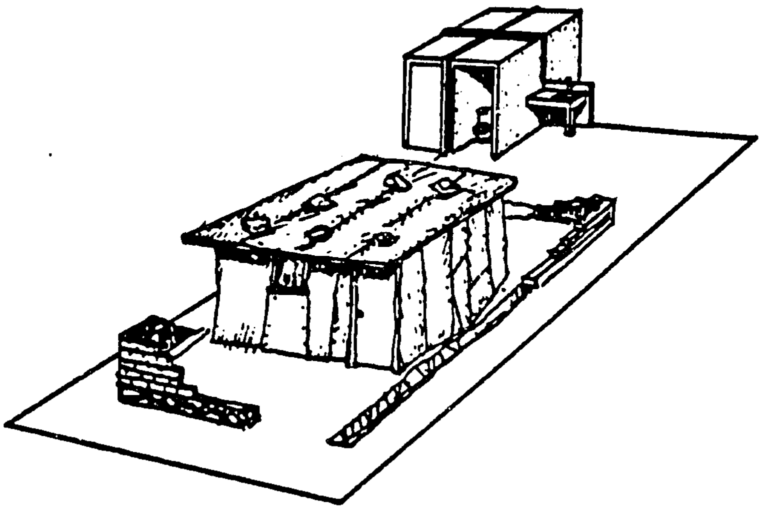
Progressive building plan for CORE houses developed by the ICT in Medellin, Colombia, 1970.

CORE houses, Medellin, photo credit ICT.

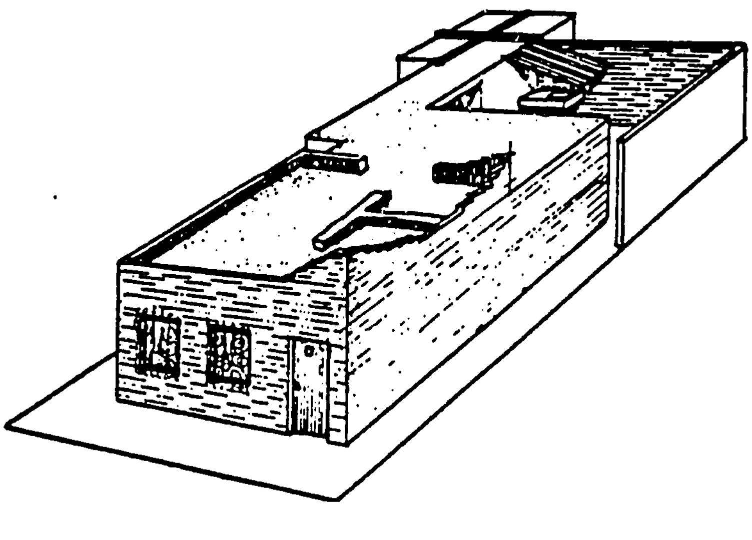
"SITE AND SERVICE" ALTERNATIVE



STEP I - Family is provided with a lot in a planned community with minimum sanitary services. In this plan 4 sanitary units are joined at the intersection of 4 lots, minimizing costs.



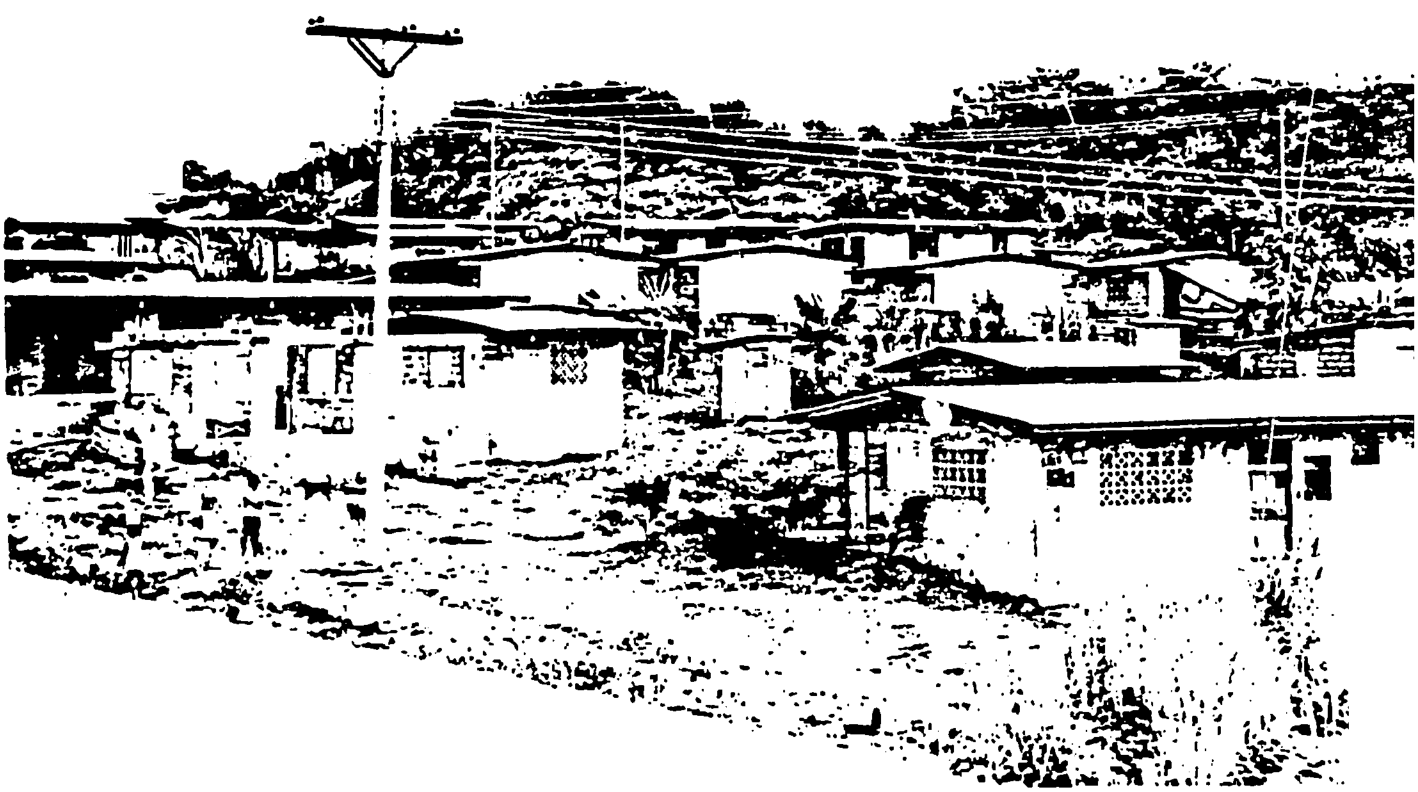
STEP II - Family may initially erect a shack from whatever materials are available.



STEP III - As family income permits a permanent house of better materials is constructed by unaided self help. The site and service alternative seeks to control and legalize what otherwise would occur in an uncontrolled settlement.

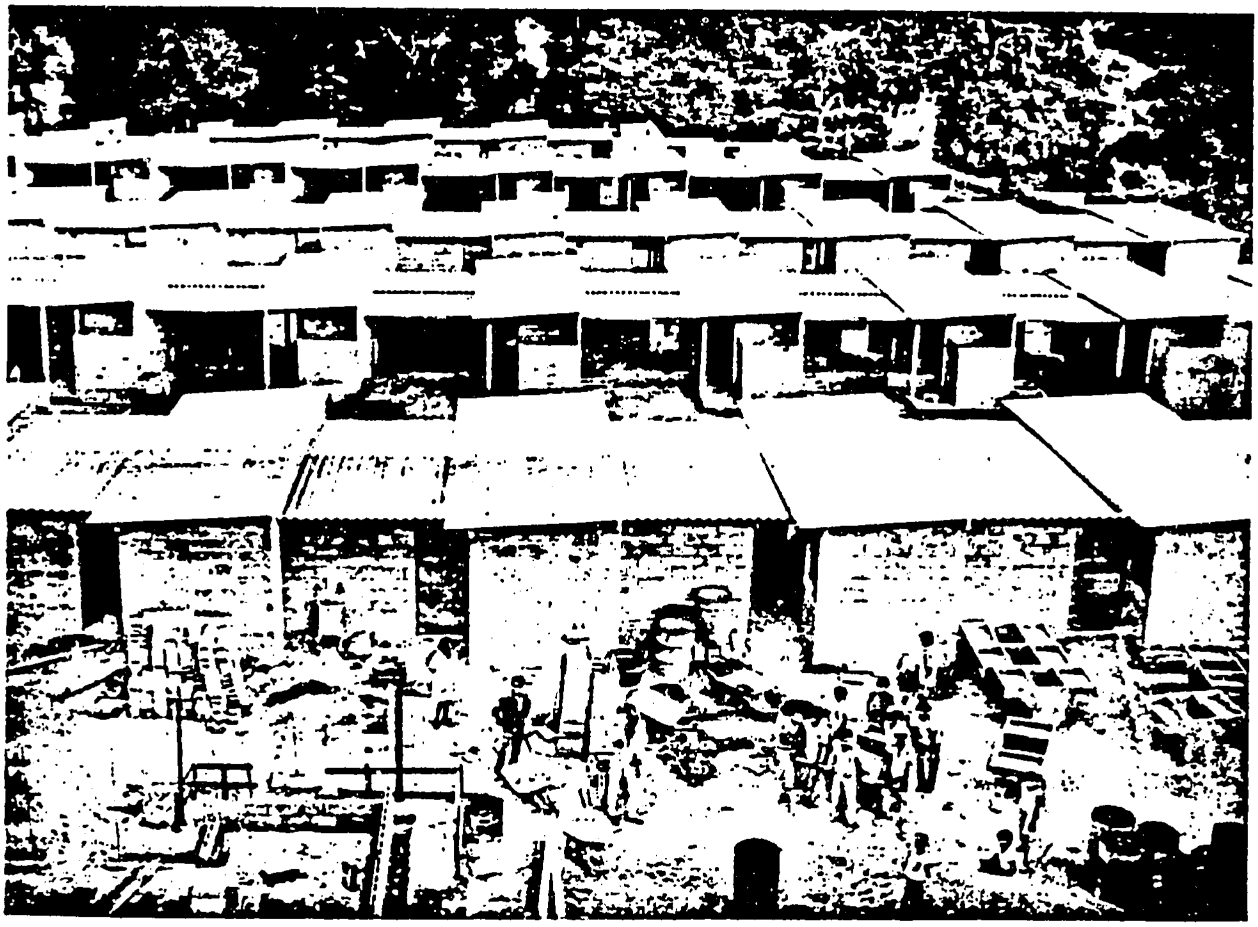
CREDIT FOR HOME IMPROVEMENT

Materials are delivered to participants lot.



CORE Houses are expanded and completed by owner's self help.

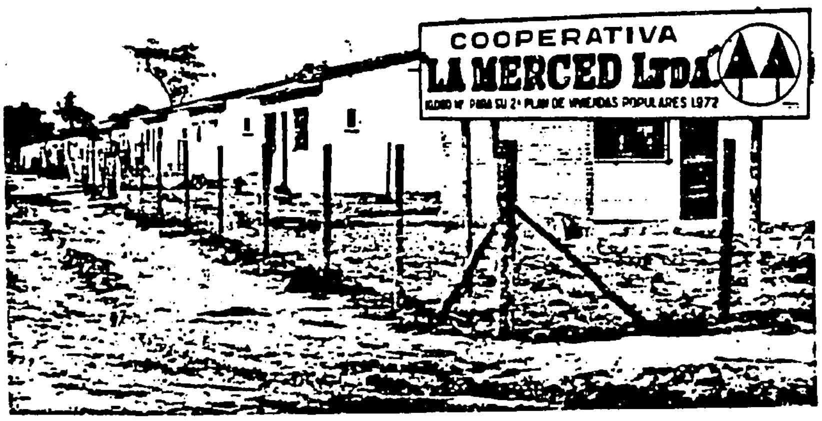
EL SALVADOR



The Foundation for Development and Minimum Housing (La Fundacion de Desarrollo y Vivienda Minima) has developed two successful programs in El Salvador consisting of CORE houses in the $700 to $1,000 range.

BOLIVIA

Jncontrolled settlement
in La Paz, Bolivia, 1972

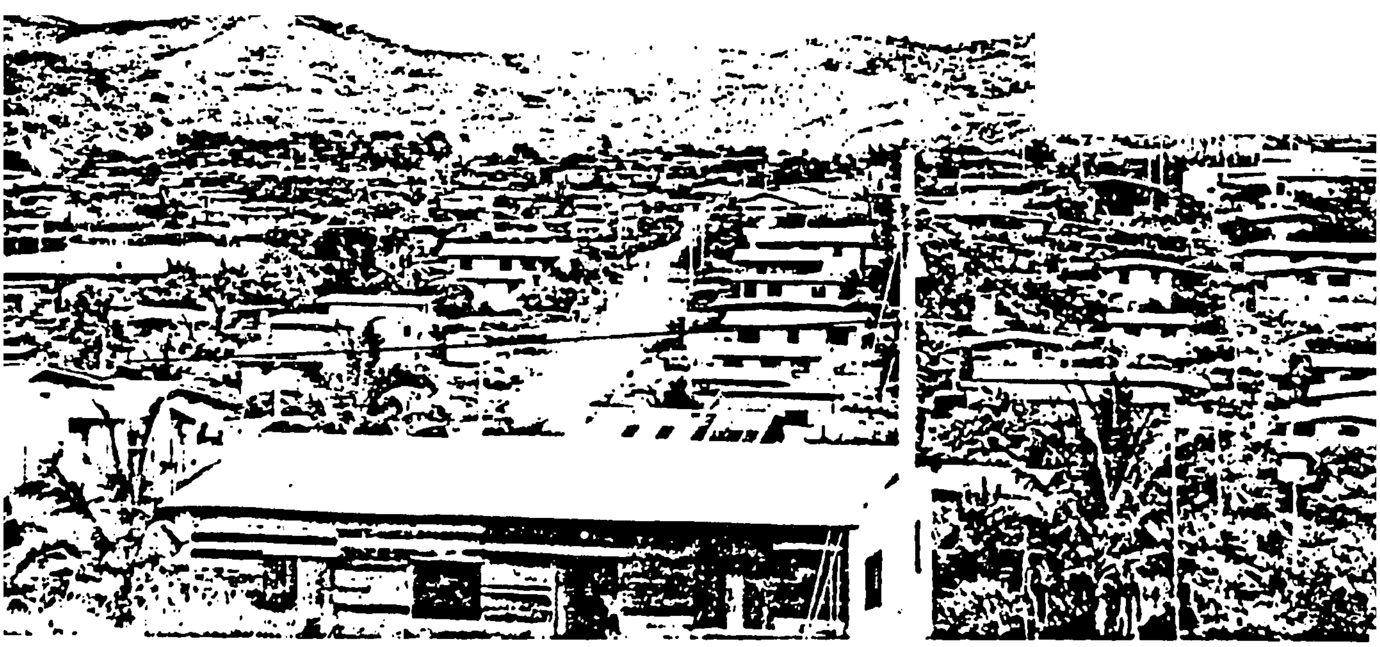


The Cooperative La Merced
constructed these houses i
Santa Cruz, Bolivia.

IPO, a Bolivian
SO recently com-
leted these houses
n Cochabamba.

THE MINIMUM SHELTER APPROACH IN PANAMA

Nuevo Veranillo, 1966
First residents arrive.



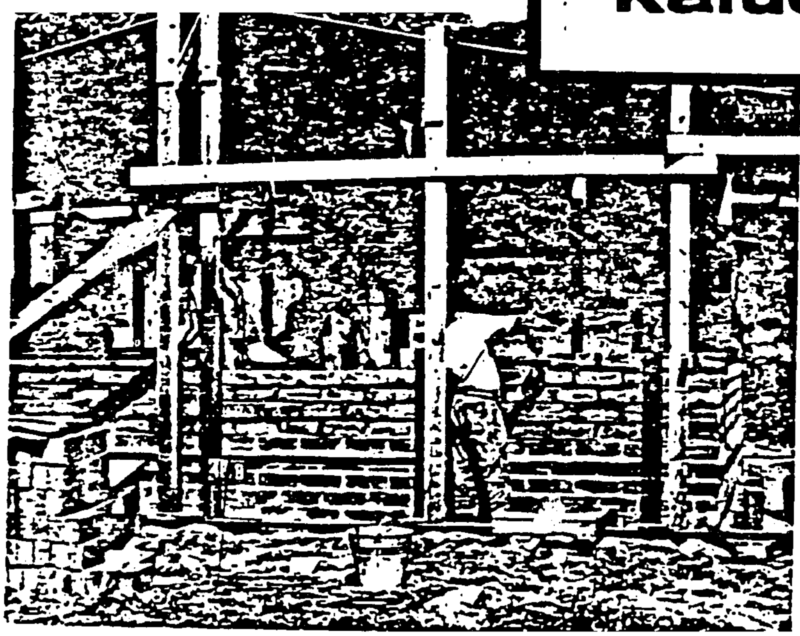
Nuevo Veranillo, 1972. Same street showing improvements, mostly through self help efforts of residents.

UNAIDED PROGRESSIVE SELF HELP

Many low income families in Guayaquil are solving their housing problems by unaided self help. This house in Guayaquil, Ecuador was completed by the family's own efforts.

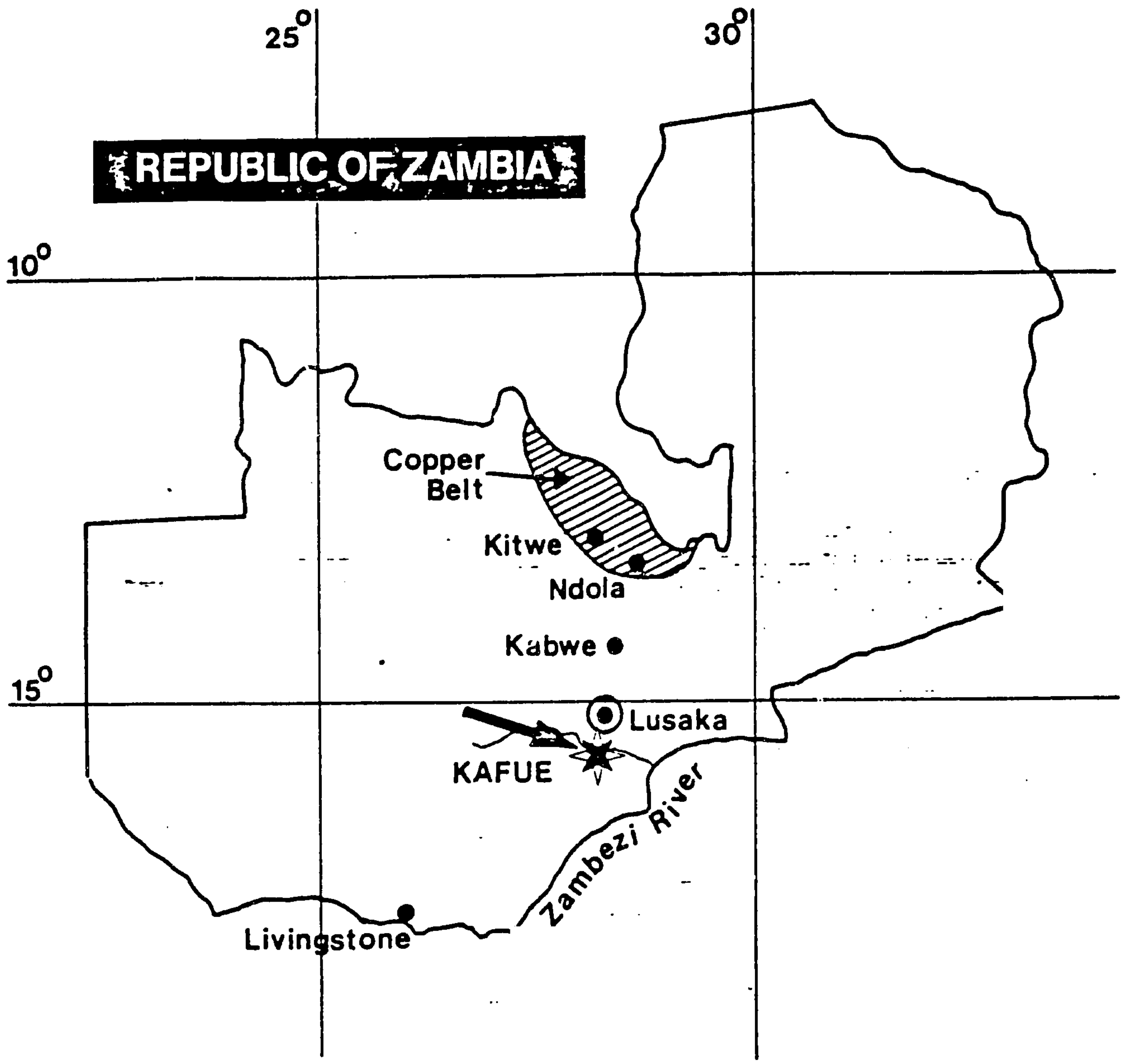
Chawama Self-help Housing Project

Kafue, Zambia



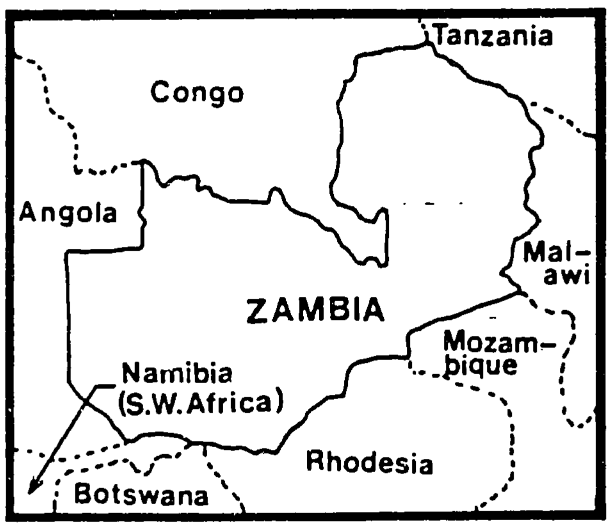
AMERICAN FRIENDS SERVICE COMMITTEE
1501 CHERRY STREET, PHILADELPHIA, PA. 19102

In cooperation with Kafue Township Council and the Republic of Zambia



REPUBLIC OF ZAMBIA
25°
30°
10°
15°
Copper Belt
Kitwe
Ndola
Kabwe
Lusaka
KAFUE
Zambezi River
Livingstone

ONE ZAMBIA ONE NATION



Tanzania
Congo
Angola
Mal-awi
ZAMBIA
Mozam-bique
Namibia (S.W. Africa)
Rhodesia
Botswana

SUMMARY

Under an agreement with the Government of Zambia concluded in October 1968 and in cooperation with the Kafue Township Council, the American Friends Service Committee carried out a project of self-help housing for squatter residents of Kafue. This was a rapidly industrializing city with a growing shanty-town population, located 26 miles south of Lusaka, Zambia's capital. The AFSC's aim was to help the Government of Zambia carry out what it had chosen to do. Through careful attention to self-help organizing principles, the project demonstrated the value of the Government's own "Aided Self-Help Site and Service Scheme."

In 1969 a survey of some 1200 households in Kafue's chief squatter areas was conducted by the AFSC staff. This revealed that most families had resources to improve their dwellings, but would not do so owing to fear of eviction and lack of necessary knowledge and skills. On the basis of this survey, the AFSC and municipal staffs drew up a program emphasizing the involvement of homebuilders in all phases of planning and construction. Government and municipal engineers also drew up plans for providing water and sewerage to the new neighborhood, thus responding to the most pressing needs for improved living conditions.

The AFSC staff, including the Zambian community development workers, recruited squatters of varying backgrounds and brought them together in groups composed of seven to 19 families. Prior to beginning construction, each of the 20 groups held sessions over a period of two months to plan for the building of their houses, to learn the requirements of the $200 Government loan which each received for building materials, and to establish their mutual obligations for work, normally set at 1000 hours per family. After this preparatory period the actual construction began, progressing from the pressing of bricks through the tying down of the galvanized iron roofs.

The first construction groups began work in January 1970 and number 20, the last group, finished most of its houses in August 1973. Altogether 228 houses were built. Out of this cooperative effort in facing construction problems and group disharmonies, a sense of community emerged. This was reflected most visibly in a community committee, various clubs, and a school and playground built cooperatively by the local residents. This community spirit in so diverse a group of residents stands as one of the project's fundamental results.

The AFSC's contribution was the provision of American and Zambian staff who had the supervisory, technical and community development skills required. The Service Committee also furnished some materials and services, chiefly special tools and storage. The AFSC's contribution amounted to 61% of the project's $351,500 monetary costs. Zambia's private sector contributed 10% of the total, chiefly in cash for construction materials and for some of the transport costs. For water, sewerage and road construction, the Zambian Government and the Kafue Township Council contributed 25% of the total at the beginning of the project. The homebuilders themselves initially contributed out-of-pocket approximately 4% of the costs. By 1977, however, when the homebuilders will have paid off their loans from the Government, their share will have become fully 19% of the total; approximately 10% will then be the amount of the Government's share.

This demonstration of community effort stimulated considerable interest among and frequent visits by Zambian officials and leaders from other towns, as well as visitors from other African countries and abroad. The Kafue project represents one model of self-help and some of the Zambians who served on the staff have already been called upon by the Government to help with other housing projects. The success of the training methods and community organization patterns instituted by the American Friends Service Committee have led the Government of Zambia to invite AFSC to provide similar orientation and training of social development and technical staff for a large squatter upgrading project in Lusaka. Thus, the experience gained at Kafue is continuing to influence the development of housing policy in Zambia; and the Zambians who received training there are having a continuing influence on housing and community development programs and practices.

Chapter I

THE NEED FOR SELF-HELP HOUSING IN ZAMBIA

A. Urbanization in Zambia[1]

Zambia's urban population exceeds a quarter of its total national population, thereby placing it among the most urbanized of black African states. The Government's Second Five Year National Development Plan, prepared in 1971, states that the yearly urban population increase during the period of 1963 to 1969 was 7.6% for males and 10.1% for females. This compares with an overall national population increase for the same period of 2.7% per year, rate at which the nation's population will double every 27 years.

A factor contributing to this urban increase was the removal, following independence in 1964, of legal barriers to rural-urban migration. At that time the ordinances limiting urban residence to job-holders were struck from the statute books. The termination of this "stay on the land" police power of the colonial government was as much a factor in urbanization as the deteriorating conditions of the villages.

Economic conditions in the rural areas markedly declined during the immediate post colonial period. On the other hand, between 1964 and 1970 real incomes in urban areas rose by about fifty percent. A massive inflation took place, estimated at about 40% for the period, and with it a steep decline in the peasant farmer's purchasing power. The ratio of the urban dweller's average real earnings to those of the peasant farmer increased from 13 to 1 in 1964 to 18 to 1 in 1969. Added to this was an overall decline in milk and cattle sales and in output of maize (the staple crop) and tobacco. At the same time there was only a moderate increase in the number of schools, clinics and roads useful to villagers. With these generally dwindling prospects on the land and the brighter prospects in the cities, rural Zambians were both pushed and pulled to the cities.

In the middle and late 1960's the Zambian Government undertook many creative and extensive projects to provide employment and services for rural people in order to encourage them to remain in the rural areas. In spite of these efforts squatter neighborhoods continued to grow in ever widening circles around Zambia's major towns and cities. Lusaka, the capital city, is the principal example. The population of Lusaka grew from 55,000 in 1954 to 258,000 in 1969 and then to an estimated 381,000 by 1973. Of this 1973 population about 150,000, or close to one half of the city's inhabitants, were squatters living in sub-standard housing without water, sewerage, streets, schools and other such amenities. It is estimated that in 1976 the population of Lusaka is likely to be between 435,000 and 487,000, and between 751,300 and 810,500 by 1985. Thus at current rates of population growth and influx from rural areas, one-half to three-quarters of Lusaka citizens could be living for years to come in sub-standard houses without amenities. These projections lend great urgency to the Government's Site and Service Scheme for the urban centers of the nation.

---

1. Lusaka Sites and Services Project - Request to the International Bank for Reconstruction and Development, July 1973.

B. Profiles of Squatter Settlements in Zambia

Squatter settlements in Zambia are not urban catchments for vast numbers of unemployed. They represent, rather, a transitional stage for the rural migrants to the cities. Various studies disclose that up to one-third of the residents of Zambian squatter settlements have lived in them for several years, although most had been born or raised elsewhere.[1] Many have migrated from other towns, having left their home villages long ago. However, the squatters are not social castaways mired in a culture of poverty. Many are people of initiative possessing a strong desire to improve their lot. That they took the risk of forsaking the security of their villages to seek a livelihood in a crowded, complex and disordered city is evidence of their motivation.

The typical squatter is an unskilled laborer or service employee such as a watchman or servant; but his neighbor may be a skilled construction, service or maintenance worker, or a small entrepreneur.

Income of the squatter household may come not only from wages but also from small enterprises, the sale of surplus garden produce, piece work, handicrafts and so on. For example, the median income of households in Kafue's squatter settlements in 1968 fell in the Kwacha 30 to 40 ($42 to $56) per month range.[2] The majority of squatter families bring in enough money to be able to make modest improvements to their homes, which they have usually built themselves with negligible cost outlay.[3] Yet they continue to live in rudimentary dwellings lacking adequate sanitation, subject to the perils of windstorms, fire, chronic dysentery or more deadly contagions.

Why do they not seek a change in their living situations? First, no squatter owns the land on which his dwelling stands; there is no security of tenure. Squatters hear persistent rumors that their settlement areas are illegal and will be visited by government demolition squads and bulldozers. They see no purpose in spending money on maintenance or improvement of a house which may at any time be demolished. Second, because job opportunities materialize or evaporate in any given city over the years, a good proportion of the squatters are relatively mobile and prefer freedom of movement with little financial loss that a cheap dwelling confers. Furthermore, for those who do plan to stay a long time, there is a third factor, namely lack of knowledge and skills to improve a house or add amenities. Fourth, the traditional solidarity and security of the home village, in which everyone has rights and responsibilities in relation to his neighbor, are diminished in the city.

In a new urban setting families can only occasionally develop a sense of belonging to a larger community. Thus, squatters are often powerless to change their conditions through corporate action or to speak with one voice to municipal or national authorities.

---

1. J. H. van Doorne, "Social Integration of Migrants to Kafue Town," University of Zambia, 1970; Bard McAllister, "A View of the Kafue Squatter," AFSC 1970 (See Appendix B); Research Unit of Department of Community Development (Government of Zambia), "Ground Floor to Development: A Survey of Nguluwe Compound," 1967, mimeo.

Appendix B, "A View of the Kafue Squatter," pages 29-30.

Appendix B, page 37.

As a general proposition it can be said that there is no lack of shelter in Zambia. A place to sleep and to keep one's belongings can be fabricated from whatever materials come to hand. The newcomer to the city will somehow get by in a marginal fashion. The real shortage lies in urban amenities, such as water, sewerage, roads and schools. These can be provided only through the assistance of municipal or national government.

C. Housing Patterns and Planning in Zambia

Under the pattern instituted by the colonial administration, housing for the town dweller was usually job-related. When a person took a job, a house was provided for him by the employer, who charged rent as a percentage cut from the worker's monthly wage. The mining companies on the Copperbelt, railways and the Government in its hiring of civil servants all operated in this way. In the 1950's and 1960's, however, a major change took place, and employers no longer built houses to accommodate their increasing labor forces. Instead, they generally provided each unhoused worker with a housing allowance of about K 5.50 ($7.70) per month, obliging him to find his housing for himself. If he was patient enough to remain for months or even years on a government housing waiting list, he might with luck rent a small house from the local township, which built housing by means of a central government subsidy. Otherwise he joined the many others like him in one of the squatter compounds on the outskirts of the city, where he might build a house of mud and wattle, poles and thatch in the traditional manner or occasionally improvise from cast off materials.

Government rent subsidies for municipally owned houses ended in 1958. Then responsibilities for housing were dispersed among several different bodies. Government agencies built chiefly for their own workers; building societies made loans for house construction available to a strictly limited clientele; the Government's African Housing Board provided some loans and expertise to municipalities. None of these agencies proved equal to the immense and mounting need.

Following Zambia's national independence in 1964, the new Ministry of Housing and Social Development was given responsibility for mapping out an overall housing and urban development policy. Subsequently the Ministry of Provincial and Local Government was assigned responsibility for housing policy throughout Zambia. Within that Ministry, the Department of Town and Country Planning determined land use; and the Zambian Housing Board provided site plans, house plans and technical services for house construction. In addition, the Housing Board maintained control over the Direct Building Organization which built access roads, water supply systems and sewers for government house construction only. Thus, the Government continued to provide medium density housing for the middle classes. Yet one of the standing instructions to the Ministry of Provincial and Local Government was "particularly to foster home ownership schemes through self-help for people of modest means."

Schemes for low-cost housing which the colonial administration had instituted did not prove adequate to the need. Private industry was no longer interested in taking on low-income housing projects. Public funds, building skills and supervisory talent were not sufficient. Pressed increasingly for a solution that was potentially equal to the problem and consistent with the ideal of Zambian Humanism which emphasized the dignity of each human being, government planners turned toward finding ways to encourage Zambian town dwellers to construct their own houses.

Thus, in 1967 the Government launched a new program called the "Aided Self-Help Site and Service Scheme" to run parallel with its other efforts in low-cost housing. The Scheme's first year goal of 2000 new units was not met, although the planning and intentions behind it were sound. Other schemes, one of them drawn up by an international consulting firm on town planning, were proposed. At the same time many officials, including Zambia's President, felt that the idea of cooperative self-help housing in urban areas deserved an adequate chance to display its strengths.

Chapter II

ZAMBIA'S SITE AND SERVICE SCHEME

A. Examples of Early Urban Housing Projects

Various approaches to meeting urban housing problems were considered by the Zambian Government in the initial stages of developing the Site and Service programs. Some were initiated prior to independence in 1964. The following excerpts from a study of urban housing policies in Zambia give some background.[1]

> The Zambian Government inherited a traditional British colonial housing institutional framework at the time of independence. It was organized to serve the needs of the Europeans and had little relevance to Africans, who in fact were forcefully encouraged to live outside the town. Initial government efforts were aimed at raising housing standards and providing housing for all Africans. The impossibility of implementing these policies soon became obvious and increased attention was given to the concept of sites and services as a means of meeting housing needs for the lowest income people. As Collins (the author of the study) pointed out, the underlying reason for the sites and services program was primarily a negative reaction to the impossibility of controlling unauthorized settlements...The result was to think of sites and services not as a positive program but as a temporary measure to be used until such time as it would be possible to provide a standard housing unit for each household.

Several projects were undertaken in the early and mid-1960's, aimed at providing such basic services as water, sewerage and roads to plots on which people would build their own houses. They had only limited success. Three examples, each from the Lusaka area, may suffice to show this.

> 1. New Kanyama This project was started in 1963 in order to provide a "temporary resettlement area" in which people could build their own houses until permanent government housing became available. The site selected was unsuitable for permanent housing because it contained rock outcroppings on flat terrain...Minimum services were provided...structures were to be kept temporary, yet 69% of the houses were built of burnt brick or concrete blocks. Later. water supply was increased, markets allowed, roads

1. All quotations in section A of this chapter are from Alfred P. Van Huyck, Planning for Sites and Services Programs, Ideas and Methods, Exchange No. 68, USAID/HUD Office of International Affairs, Washington, D.C., July, 1971. Van Huyck's chief source is John Collins, The Evolution of Urban Housing Policies in Zambia with Particular Reference to Lusaka (unpublished thesis, Columbia University, 1970).

> improved. It was generally recognized that New Kanyama was to be permanent. ...by starting New Kanyama as a "temporary" settlement, a great deal of confusion was caused among the residents, probably retarding natural improvement of the area. The site was poorly chosen...

2. Marrapodi-Mandevu This project was concerned with improvement of an existing unauthorized settlement area... The program floundered for several years because of a constant series of administrative and planning errors...failure of coordination...delayed action. It did not have a well worked out, simplified administrative and financial plan. Cooperation and support of the people was not obtained in advance.

3. Chainama Hills This was an attempt to provide amenities to 3000 new plots on which residents could build, as in New Kanyama, but on a permanent rather than temporary basis. After a crash effort by which within nine months 90% of the plots were ready, the project was terminated. This was because, among other things, its general appearance was too much like unauthorized settlements.

B. The New Government Plan and Its Provisions

The Government's Aided Self-Help Site and Service Scheme was initiated as a major means of attacking the squatter housing problem. The First National Development Plan, 1966-1970, states:

> It will be seen that much emphasis is placed on site and service schemes which will provide plots with adequate services where people in the lower income groups or self-employed can, by their own efforts in cooperation with others, build accommodation suited to their needs. The efforts and resources of our people are here harnessed in schemes which will play a major part in the solution of our housing problem. The greatest possible assistance and guidance will be afforded to these schemes.

Under this national program a local government body, such as a township council, in cooperation with other government bodies on the national level, makes plots of land (40' by 90') available to would-be homebuilders on a ten-year renewable lease basis.[1] These plots are of two types, basic and standard. The basic plot plan provides for a water tap for every four houses and a sanitary pit privy for each plot. The standard plot plan provides for running water for each house and water-borne sewage. All sites are serviced by government roads and municipal trash collection. The township council is responsible for administration of all housing tracts and the technical supervision necessary for construction. Site plans must be approved by each local council; and all financing is carried out through them.

1. See Appendix C, Exhibit 7, Land Record Card Form.

C. Financing During 1966-1970 Plan

The Government assists the local councils in financing these schemes by providing 50% of the capital costs as a grant. The other 50% comes from the national Government as a loan to the local council which must be repaid by the council over a ten-year period. Development costs borne by the Government include site design, survey work, construction of access roads, and water and sewer networks. Each homebuilder is entitled to a loan of K 144 ($200 at the 1969 exchange rate) for building materials, to be repaid at 5% interest over a 48-month period. Half of this loan to the homebuilder is provided by the national Government and half by the local administration. Repayment by the homebuilder takes the form of a monthly service charge, which also includes taxes, municipal services and a portion of site development costs. Exclusive of loan payments, these range as follows: basic plot, K .82 per month ($1.23); standard plot, K 2.12 per month ($3.00). Such service charges vary from project to project, but including the loan repayment they cannot exceed K 5.50 per month, the statutory housing allowance.

D. Changes in Original Plan

Over the years changes have been made in some provisions of the original Site and Service Scheme which opened it to many more low income people. Initially, only one category of plot was designated, namely the standard plot. The addition of the basic plot concept was one of the most significant changes. To qualify for a basic plot, a family no longer had to make a deposit of K 20 or to give proof of employment. The other change which has been of great benefit to low income people was in the building materials approved. The introduction of sun-dried bricks, in lieu of more expensive materials, markedly reduced the cost to the homebuilder.

E. Government Site and Service Scheme in Kafue

Hopes had run high that the Government's site and service scheme begun in Kafue in 1967 would offer a workable solution to the squatter problems of many cities; but new construction was far slower than anticipated. At the Kafue Government Site and Service Scheme, for example, applications were made for 36 of the 38 original plots; but two years later only half of the houses were completed. After five years, the other houses were still not complete, although all were occupied.

The reasons for this slow progress were numerous. In the first place, "site and service" was a new idea. People were wary and slow to invest in a scheme that might not develop as promised. A precondition for obtaining a standard plot was a K 20 ($28) deposit which could be used to buy construction materials. Only those prospective homebuilders with assured incomes initially had the confidence to accept the risk. Another condition for participating was the obligation to work together and help all other families build their homes. No systematic way was provided for this to take place; therefore, no construction groups really jelled.

Few people thought they had sufficient skill to build a brick and metal-roof house. Little was done to alert people to the technical help actually available. Moreover, working people felt that they could not afford the time necessary to build a house. Those who did participate usually hired construction workers to do the building for them, thus removing any aspect of self-help that might have been present.

Few squatters fully understood the conditions of ownership under the Scheme or were persuaded that the house and the investment would be theirs and that they could sell the house if for any reason, such as a job transfer, they had to move.[1] Some people were not completely satisfied with the house plans provided by the Zambian Housing Board, and did not understand the procedure for getting alternate plans approved. Moreover, the sites offered were no closer to the town and jobs than the squatter areas were; indeed many were farther out. Public transportation to these outlying areas was nonexistent.

These circumstances formed part of the background for the Government's proposal to AFSC to assist in a self-help housing project in Kafue.

1. See Appendix C, Exhibit 7, Land Record Card Form.

Chapter III

THE KAFUE PROJECT - GOALS, METHODS AND ORGANIZATION

Given the problems which hampered general acceptance of the Aided Self-Help Site and Service Scheme, the Government of Zambia was concerned to find ways to overcome them. Knowing of the American Friends Service Committee's experience in this field, it invited AFSC to help implement the Scheme for urban squatter settlements in Zambia.

A. Squatter Housing in Kafue

The city of Kafue is located 26 miles from Lusaka on the railway and on the main north-south road. Zambia's policies of geographic dispersal of industry fostered a tremendous surge of construction and development of new industry in the city. Already under construction when the AFSC project was launched were a fertilizer factory, a textile mill, and a plastic boat factory. In operation were a fishnet manufacturing plant and a brewery, and plans had been laid for construction of an iron and steel complex. This expansion meant many new jobs and resulted in a doubling of the population every year from 1964 to 1969. Kafue's population in December 1970 topped twenty-eight thousand.

House building for new industrial and construction workers, however, by no means kept pace with demand. Moreover, no provision was made for those employed or self-employed in jobs such as service, maintenance and small business. These residents of Kafue followed the only course open to them to provide shelter for themselves and their families; they occupied small plots of land on the edges of the city and built in traditional or improvised ways.

Late in 1968 and early in 1969 the AFSC Field Director, with the assistance of students from the University of Zambia and its Research Unit in the Department of Community Development, conducted a detailed study of the squatter areas of Kafue.[1] The Government's estimate of 200 squatter families proved to be an underestimate by over one thousand. (In the year following the survey the number of squatter families was thought to have nearly doubled.) The survey identified the squatters' origins, resources and aspirations, especially their desires for better housing and neighborhood amenities. The information obtained provided useful background for planning the pilot project at Kafue.

By establishing a project in an area where the squatter situation was serious, but still within manageable proportions, the AFSC and the cooperating government departments hoped to demonstrate methods of group organization which could assist the Government in implementing housing plans for this and other towns. The AFSC thus undertook to help the Government do what it had already chosen to do in respect to the housing needs of squatters, and to demonstrate the effectiveness of joint effort and cooperative spirit, thereby aiding the development of a sense of community.

---

1. See Appendix B, "A View of the Kafue Squatter."

B. The Project Plan

Under an agreement signed in October 1968 with the Government of Zambia, the American Friends Service Committee agreed to provide social and technical assistance for the Kafue Township Council's Self-Help Housing Project. This was located in Chawama, part of Shillinga Kaseba which was one of the eight areas of the town occupied by squatters.[1] The project plan was designed to involve the homebuilders in all phases of planning and construction of their houses. It was designed also to develop a sense of community by means of the cooperative activity of homebuilding.

C. Goals

The underlying goals of the project were:

1. to cooperate with the Zambian Government in experimenting with new approaches to the organization of construction efforts along self-help lines which could be duplicated elsewhere;

2. to encourage the development among the diverse residents of the squatter compounds of a sense of community through the cooperative activity of self-help construction.

D. Methods

In addition to the preliminary survey of the squatter population, a series of basic steps was carefully planned:

1. recruiting and organizing groups of squatter residents interested in working together, with Zambian leadership and under Zambian instruction;

2. training Zambian staff in construction techniques and group organizing methods, as well as basic instruction in nutrition, cooperative principles, and literacy;

3. recording project experiences for use by other interested groups and individuals.

E. Organization

1. Project Management Team The Kafue project was a site and service program of the Kafue Township Council (KTC). The Council delegated its authority on all matters concerning the project to the Project Management Team. Members of the Team were the Chairman of the Township Council who chaired Management Team meetings, the housing officer, the treasurer, the engineer, the community development officer, and the site and service technician. The AFSC Field Director and other project staff met regularly with the Project Management Team which carried out the following responsibilities:

a. approval of all plans and handling of all financial arrangements;
b. approval of applications by homebuilders for building material loans;

---

1. See Appendices A and B, Project Agreement and "A View of the Kafue Squatter."

c. establishment of policies for allocation of plots;
d. approval of the ten-year renewable lease agreement with each homebuilder;
e. establishment and collection from the homebuilders of the monthly service charge.

2. <u>Field Management Team</u> Members of the Field Management Team were the AFSC Field Director, the AFSC Construction Supervisor, the housing officer of the Kafue Township Council, the site and service technician, community development officers of the KTC, and three members of the AFSC community development staff. The Field Management Team had the following responsibilities:

a. to interpret the aims of the project to potential homebuilders;
b. to assist in the organization of building groups;
c. to teach necessary building skills and provide technical supervision;
d. to maintain building standards;
e. to encourage group initiative in fields of interest such as nutrition, literacy and small economic enterprises.

3. <u>AFSC Staffing Pattern</u> The AFSC Field Director in Zambia served as Field Manager of the Kafue project. He was responsible for overall supervision and for the technical assistance provided by AFSC. Working in close association with the Field Manager was the Construction Supervisor, an AFSC staff member who was responsible for the building aspects of the project, including selection and supervision of construction teachers and assistants.

Nine Zambians completed the staff: three community development workers who assisted in the formation and ongoing work of the building groups and community-wide organization; six construction teachers who trained homebuilders in construction techniques and maintained construction standards. At any one time no more than five construction teachers were on duty.

4. <u>Recruitment of Zambian Staff</u>[1] Qualified applicants responding to newspaper notices and other publicity were interviewed and selected by the Field Manager. The bases of selection were:

a. demonstrated interest in the philosophy and objectives of the project;
b. respect for people and a demonstrated capacity to work effectively with others;
c. skill and knowledge as they related to the needs of the project;
d. past experience appropriate to the job description;
e. educational experience and qualifications adequate for the work;
f. demonstrated willingness to accept the discipline required by community work;
g. willingness to work as a member of the staff team, assuming a responsible role in the planning and execution of program;
h. working knowledge of the English language and an appropriate local language.

1. See Appendix F, Text of Pamphlet Used to Recruit Project Participants.

F. Staff Development and Training

A central element of staff development was in-service training to strengthen individual skills and understanding of the basic concepts and approaches of the Kafue project. Aside from the informal, day-to-day guidance by the Field Manager and Construction Supervisor, in-service training took two forms: Field Management Team meetings and special training sessions involving outside resource persons.

Field Management Team meetings took place each Monday morning, beginning in September 1969 and continuing throughout the duration of the project. At these sessions the staff reported on their efforts in recruiting, orienting and encouraging construction groups. Announcements were made; special events planned; problems of morale, modifications of routine and unforeseen developments discussed and responses formulated.

Six special training sessions took place during the project's first two years. Because of the importance of group processes and leadership, arrangements were made with the University of Zambia's Oppenheimer School of Social Service in Lusaka to provide a series of in-service training sessions on group dynamics techniques for the entire project staff. These sessions, led by university instructors in Sociology and Social Services, began in April 1970, scheduled for three hours every other Monday afternoon over a period of several months. Topics included:

1. ways of producing better understanding of society and the social organization of participants, pointing up some contrasts in cultural differences in Zambia;
2. use of groups in a self-help housing project and ways to stimulate participation;
3. the staff person's role in regard to task-oriented groups;
4. ways to improve group participation; communication, group process.

In addition, in August 1970 a series of five training sessions employing specialized techniques for group interaction began under the guidance of a professional on the subject who had considerable experience in Zambia. These sessions allowed construction staff and community development staff a chance to appreciate better each other's specific work situation. For example, during the third session the dimensions of discord between the community development and construction staffs were brought out into the open; each staff listed the things the other staff did or did not do that made its own work more difficult. Discussion of these points of irritation followed. A series of follow-up sessions later in the year focussed on communication.

Another series of in-service training sessions began in October 1970 under the direction of an educationist from the Office of Civil Service Training in the Office of the President. These sessions dealt with work organization, analysis and efficiency.

In late April 1971, still another series of sessions was held, led by an architect, which dealt with house plans and living space.

In 1972 all staff, including community development members, took part in four sessions on plumbing techniques at David Kaunda Technical School in Lusaka.

Finally, the full staff met with members of the Zambian Architects Institute at the Zambia Housing Board for a thorough discussion of the planning of a house and the use of materials.

All of these planning, organizational and training methods and procedures, as well as the dual emphasis on providing housing and on building a sense of community, gave distinctive aspects to the Kafue project as compared to other self-help housing undertakings.

MISSING PAGE
NO. 16

Chapter IV

KAFUE SITE, PLOTS, HOUSE DESIGN AND COSTS

A. Site Selection

In mid-1967, AFSC and Zambian Government representatives began exploration of the need for an experimental effort in low-cost housing in Zambia. During the year that followed, through visits, enquiries and reports by the AFSC Field Director in Zambia, the town of Kafue emerged as a most suitable locale for such a project. The reasons were plain. Shantytowns were spreading around Kafue at an unprecedented rate. The Government's effort at self-help housing there was faltering and slow. Kafue's municipal councilmen and national government officials were increasingly concerned to deal with the city's growing squatter problem and were eager to try new approaches. The AFSC's proposal to promote cooperation and participation on the part of residents before beginning construction had won the special interest of Zambia's leadership. In a new and growing town like Kafue the project's potential impact as a model for future self-help housing efforts was seen to be considerable.

With the approval of the Ministry of Local Government, the Kafue Township Council set aside a 175-acre site in the Shillinga Kaseba squatter area about one mile from the center of the city on the main road leading from Lusaka to Livingstone.[1] This site was on government land and was at that time the one site closest to town on flat land which had not been set aside for other uses by the Department of Town and Country Planning. It is in a shallow valley bounded on three sides by hills. Compared to the other squatter areas, this site was sparsely settled with only 48 families living there.[2] Some local residents knew it as "the place of the lions." Shortly after beginning construction work, the residents renamed it "Chawama," meaning in the Chinyanja language "A Good Place."

B. Plots

The plan for the use of the site called for 228 housing plots, 40' by 90' each, a pattern of primary and secondary roadways, three and a half acres reserved for a school, one and a half acres for a sports ground, one and a half acres for a market, and smaller plots for a bus stop, clinic, shops and a tavern. This is shown on the site layout, page 19.

Each house, 290 square feet in area, is located on its plot so as to allow maximum family use of the land. Each is set back 20' from the front boundary, usually an access road, and five feet from one of the side boundaries. Thus out of each plot's 3600 total square footage, approximately 3300' remain for a garden or fruit trees, for customary outdoor living and privacy, and for possible future enlargement of the house. The plots were laid out to allow a minimum of road frontage, with only a small space between cleared

---

1. See Appendix B, "A View of the Kafue Squatter," map on page 3.
2. Of the 48 squatter families on the site, 47 joined the project and built new houses for themselves.

plots. This lay-out makes it impossible for squatter shacks to be built in the future between the brick houses.

Assuming that an average 1300 square feet of each plot is reserved for outdoor living, which is the high average for the squatter communities surveyed in 1969, 2000 square feet remain for the average Chawama resident's garden. This contrasted with the average 10,000 square feet of garden space of most established families. Thus it was the lucky Chawama resident whose plot lay on the periphery of the site, since that family could begin a garden adjacent to the house on land outside the leased territory. About half of the residents of the Chawama project maintain gardens, but few are able to raise enough maize, groundnuts or pumpkins to meet their needs. At best, gardening families are only able to raise a small surplus of vegetables for sale as a means of supplementing their incomes.

Disadvantages to those residents not able to start gardens directly adjacent to their houses were offset by numerous other advantages, chief among them being the on-site access to water. Each family paid a flat rate for 3000 gallons per month of piped water for laundering, bathing and cooking.

C. House Design

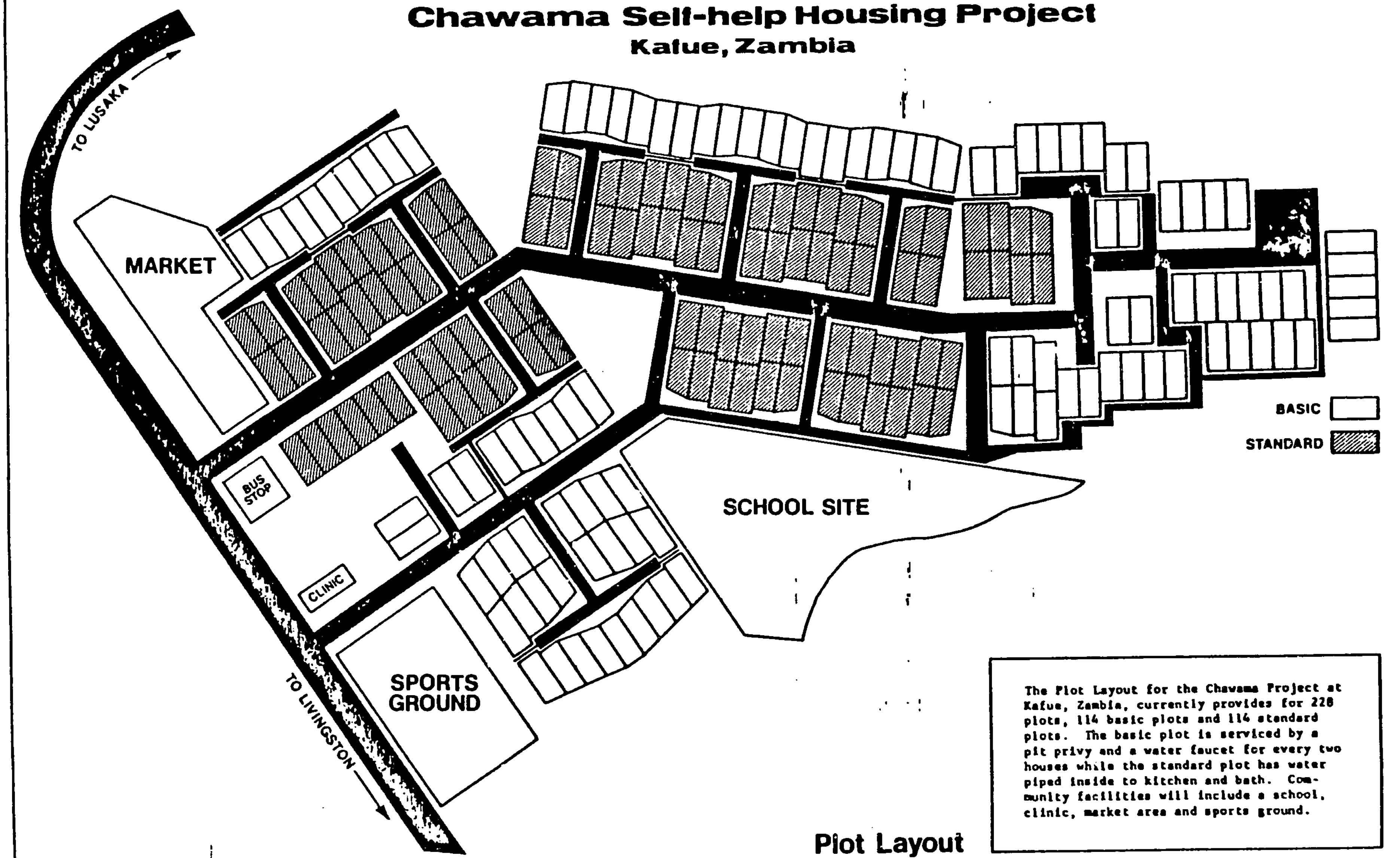
The Government's loan of K 144 ($200) for building materials fell far short of the total costs of a core house on a basic plot when everything was included. The cost of the house as originally designed, however, would have been even higher. To bring costs down as close as possible to the loan, the AFSC Construction Supervisor designed a modified Type D core house. (See illustration of house plan on page 20.) The modifications included the elimination from the original plans of

1. two interior doors, plus locks and frames,
2. a jog in an exterior wall,
3. paint,
4. stucco and plaster,
5. concrete floor,
6. concrete blocks, replaced subsequently by Cinva-Ram blocks

These modifications brought the cost down from K 330 to K 173.

1. Cinva-Ram Blocks Without the development of a way to make inexpensive earth-cement building blocks, the cost of a self-help house in the Government's Site and Service Scheme would have been beyond the means of the participants. Instead of substituting the use of adobe blocks, known in Zambia as "Kimberly bricks," for the cement blocks, the Chawama project emphasized the advantages of earth-stabilized bricks. Using cement and laterite in a ratio of 1 to 20, these were made in the Cinva-Ram machine. The Cinva-Ram is a hand operated block-making machine developed in 1952 by the Inter-American Housing and Planning Center (CINVA) in Bogota, Colombia. Use of the Cinva-Ram machine requires a level of technical knowledge which is not beyond the ability of the local Site and Service technician. However, local technicians needed a certain amount of assistance; and this help was available from the University of Zambia.

Chawama Self-help Housing Project
Kafue, Zambia



The Plot Layout for the Chawama Project at Kafue, Zambia, currently provides for 228 plots, 114 basic plots and 114 standard plots. The basic plot is serviced by a pit privy and a water faucet for every two houses while the standard plot has water piped inside to kitchen and bath. Community facilities will include a school, clinic, market area and sports ground.

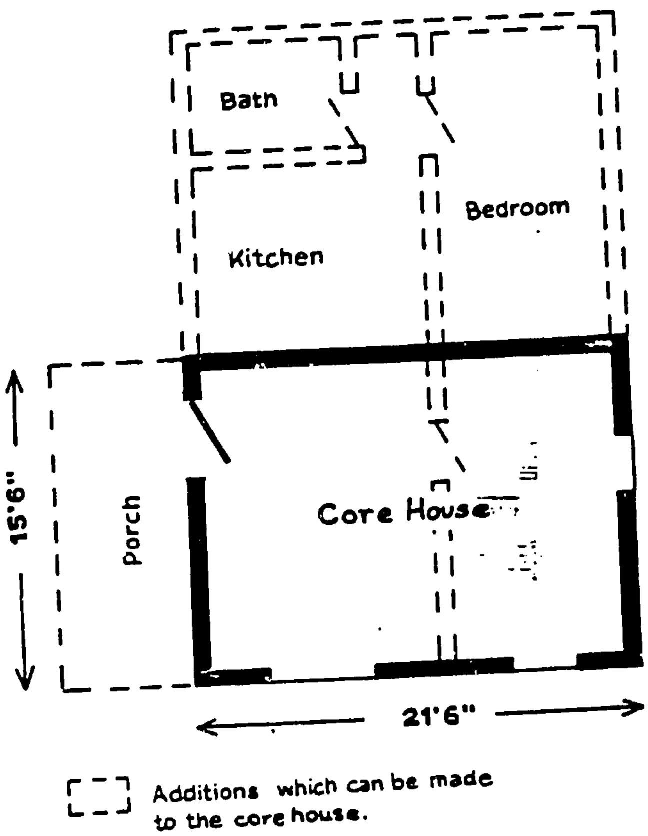
Plot Layout

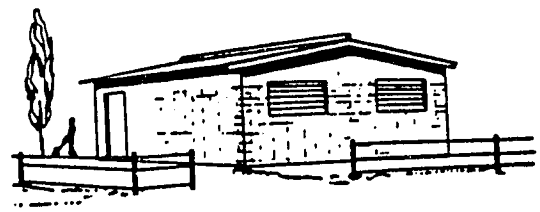
August 1970

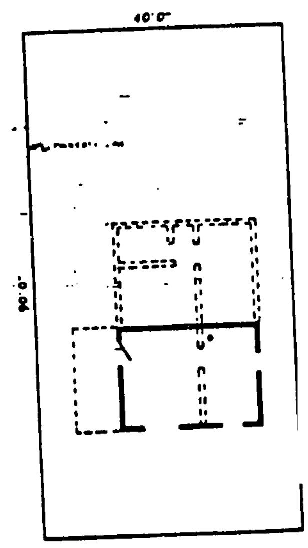
Chawama Self-help Housing Project

Kafue, Zambia

(house plan)







This design, drawn up by the Zambian Housing Board for the Government Site and Service Program, is of a modified "type D" core house with additions outlined.

Specifications

Floor dimensions inside: 14'6" x 20'6" (297 square feet)
Maximum indoor height: 9'
Minimum indoor height: 6'7"
Height of floor above ground level: 1'

Walls: earth-cement bricks 4" x 6" x 12"

Roofing: galvanized corrugated sheet metal nailed to 3" x 4½" wooden purlins with 2½" screw nails with neoprene washers. Purlins were wired to the masonry.

Windows: 24" maximum width. Option of glass in metal casements or movable sheet metal louvres fixed to metal rods.

Staff attempted to find an alternative to the galvanized sheet metal roof which accounts for slightly over 60% of the total loan amount. However, no other material was acceptable to the Zambian Housing Board, which itself was looking for cheaper alternatives in roofing. Grass thatch, the traditional roofing in Zambia, is cheap and provides good insulation against heat and rain. Its drawbacks are that it is combustible, can harbor vermin and must be periodically replaced. Moreover, it connotes low prestige for the house-dweller. Asbestos sheeting, the third alternative, is more difficult to handle. Therefore, the conventional, if hotter, metal roofing was adopted.

D. Costs

1. Economies Expenditures during construction were carefully watched. In theory the Government loan to the housebuilder was to pay for basic essentials - roofing material, wood purlins, metal door and window frames. Therefore, housebuilders were not supposed to have other building supplies charged against their total loan allocation if such charges left too little money for purchase of roof, window frames and door frames. However, with the loan available from the start of construction, participants did often use the loan money for cement for the Cinva-Ram blocks, for foundations and mortar. As a result, the typical builder had to pay very little out of pocket by the time the house was nearly complete. When the walls and roof were up, the family could move in even without windowglass and doors in place. In traditional Zambian housing windowglass is not considered necessary and doors fitted into door frames are the exception rather than the rule. Homeowners customarily covered their doorways and windows with sheet iron, burlap bags or cardboard, just to keep out the rain. These substitutes reduced the initial costs of the house.

2. Initial Costs to Participants[1] Building material costs at 1969 prices for each Type D core house were as follows:

Core House

roof		K 88	U.S. $123[2]
metal roofing	K 53		
wood purlins	30		
wire, nails, etc.	5		
foundation cement		7	10
door frame		7	10
window frames (3 - metal)		21	30
bricks		27	38
miscellaneous		8	11
privy		15	21
roof	8		
bricks	7		
Total cost for core house		K 173	$243

1. Costs rose approximately 15% during the period 1969-1973, the dates of the Kafue project. Therefore, the same core house in 1973 would cost approximately K 199 without additions in contrast to K 173 at 1969 rate of exchange. The last five construction groups at the project in fact found that their K 144 loan did not buy as much as the first groups had been able to purchase. They therefore had to dig into their own pockets to make up the difference.
2. All dollar figures in this chapter are at the 1969 exchange rate of K 1.00 to U.S. $1.40.

<u>Extras</u>

door and hardware	K 9	U.S. $ 12
windowglass	9	12
concrete floor	14	20
concrete porch	22	31
door #2	16	22
plaster	24	34
paint	10	14
Total cost of building materials for extras	K 104	$145
Total costs, complete Type D house	K 277	$388

In order to complete the core house on the basic plot, the housebuilders had to contribute K 29 out of pocket, the amount needed in excess of the K 144 loan. Estimated costs of putting on the finishing touches increased the total costs to a point where personal outlay above the loan amount came to K 133.

In addition, it should be noted that the housebuilder on the standard plot is subsidized by a K 135 grant from the Government to cover the costs of installing plumbing within the house, for kitchen sink, shower and toilet. The basic plot housebuilder, on the other hand, received a subsidy of K 3.50 for concrete, costs of the concrete ring, riser and seat, and costs of pit digging for his privy. (See the illustration of the plot lay-out on page 19, with the legend describing the differences in services between basic and standard plots.)

3. <u>Long-term Costs to Participants</u> In addition to initial costs, participants were obligated to meet other costs by means of monthly payments.

These long-term costs are as shown on page 23.

	Standard Plot[1]		Basic Plot	
	Kwacha	U.S. Dollar Equivalent	Kwacha	U.S. Dollar Equivalent
Repayment of K 144 loan[2]	K 3.38	$4.73	K 3.38	$4.73
Service charge[3]	2.12	2.97	.82	1.15
Average rate (tax) on house value[4]	.52	.73	.37	.52
Monthly average	K 6.02	$8.43	K 4.57	$6.40

These charges are payable to Kafue Township Council (KTC); which has the power to repossess the plot if payments are not made.

1. Standard plot housebuilders were obliged to pay a deposit of K 20 on their loan before beginning construction, payable in four monthly installments. The deposit was used to purchase building materials.
2. The loan must be paid back within four years after the completion of the house. "Completion" is ambiguously defined; so a family may not begin its loan repayments until months after moving into its house. The interest charge is five percent on remaining balance; thus the total repayment cost after 48 months is K 162.24.
3. a) This charge covers initial costs of site planning, road construction, water and sewerage (estimated to be K 90 per basic plot and K 340 per standard plot), as well as ongoing costs of services provided by the KTC such as trash collection, fire protection, police and water.
   b) The KTC estimates that it subsidizes this charge for services by K 2.03 per plot per month.
   c) The charge for water, included in this figure, is estimated to be K .50 per 1000 gallons; each plot is assessed for use of 3000 gallons per month, or K 1.50.
   d) This charge falls due beginning 30 days after the Project Management Team approves the family's application; thus people are expected to pay virtually from the start of their association with the project.
4. The rates (taxes) levied are based on an index of K 1.47 per annum for every K 100 of assessed value. The assessed value of the average basic plot house is K 300, annual rate K 4.41; average standard plot house assessed value is K 425, annual rate K 6.25.

Chapter V

CONSTRUCTION GROUPS

A. Recruitment[1]

At an assembly held in Shillinga Kaseba in September 1969, the Government's Regional Secretary for Kafue outlined the project's aims.

In October 1969 recruitment of the first of 20 building groups began. In order to complete the planned 228 houses, optimal size for a group was reckoned at 20 families. The Zambian community development workers played a primary role in recruiting. Under their leadership, staff members went from house to house on the Chawama site, eventually reaching all 48 families who were then living there. Initially, only those families were considered; by mid-1970 all but one of them had joined a construction group. Once the original 48 had been reached, invitations to join were extended to those living in other parts of the Shillinga Kaseba neighborhood who had been resident there for at least a year. When all of the people of Shillinga Kaseba had been given an opportunity to join, applications from residents of other squatter neighborhoods in the Kafue Estates area were considered. The number of non-Zambians, namely migrants from Rhodesia and South Africa, who were allowed to participate was limited to 25% of the total of 228 families in the project.

The recruitment drive got off to a fast start. After the first and second construction groups had begun building, one Sunday morning a group of 25 families came to the project site, asking to be enrolled and to start work immediately. Out of this gathering a third construction group composed of 18 families began work some weeks later. During the project's first five months, from January to May 1970, 85 families forming five separate construction groups joined together to build each other's houses.[2]

B. Composition of Construction Groups

The families in these first construction groups were bound together by a similarity in means of livelihood and the common experience of eviction from land on which they had been squatting for at least two years. (Construction of a sewage treatment plant had forced the move.)

The first four construction groups built their homes on contiguous plots and became in many ways models for later groups. Household heads in the first four groups were for the most part self-employed and earned meager incomes. The majority of those in later groups held regular contractual jobs, and therefore included among their numbers more affluent workers, a few of whom even owned cars. The first four groups, composed of 16, 16, 18 and 19 families respectively, were larger than the 16 groups that followed, in which the median number of families was nine.

---

1. See Appendix F, text of recruiting pamphlet, "Do You Want a Modern House?"
2. Approximately half of the families put together and occupied temporary shelters adjacent to their house sites during construction.

MISSING PAGE
NO. 24

Staff could discern only a few direct family ties among all of the families involved: two brothers working in two different groups; an uncle and his niece in two different groups, and so on. Exceptional in this regard was a patriarchal clan of several families of South African origin, all members of a religious sect and artisans in basket-making. They formed half of group number four. Tribally, every building group was quite heterogeneous; members of the Tonga, Bemba, Lozi, Nyanja and other Zambian tribes appeared in almost all groups. Communication was facilitated by a wide use of Chinyanja, the language of the Nyanjas, and on occasion of English. Political feelings run strong in Kafue; so the recruiting staff had to make careful explanations and give assurances to the community that the project was open to all, regardless of party, religion or tribal affiliation.

Thus, most of the participating families had only squatter status in common. In consequence, a family's rights and responsibilities vis à vis other families did not interlock according to village patterns; and people were relative strangers to each other. Therefore, it is not surprising that among the foremost objections to the project by these squatter families were the prospect of having to work together and the special activities required by the plan to make this a cooperative undertaking.

The families' common status as squatters, however, had important consequences for their motivation. They wanted security comparable to that which they had enjoyed in their traditional milieu. In the villages the communal use of land, mutual aid, sharing of hardships and pleasures, and the fact that one's house would not be bulldozed had given substance to that security; and their memory of this heightened their desire to see it restored in the urban setting. This objective encouraged the participants to set aside personal resistance and to cooperate in a group effort which did not have the traditional reinforcements of kinship or common language.

These semi-urbanized squatter families needed continuing encouragement. They needed help not only in learning the procedures of housebuilding and of borrowing money at interest but also in organizing cooperatively. In this process the community development staff played a central role.

C. Preparative Study Sessions

To accomplish these ends, the project's community development staff assisted each group of would-be homebuilders to organize study sessions, prior to the start of construction. They were led, in part, by a temporary chairman and secretary elected by each group. During this period of organization each group met about twice a week, for a total of 14 sessions. The subject matter of these sessions was roughly as follows.

Session 1. Outline of Project Plan

Roles of the Zambian Government, the Kafue Township Council and the American Friends Service Committee in the project

The ways each agency participates in financing the project

Advantages of working in groups

The necessity for groups to make their own decisions

The help to be provided by the AFSC staff

Session 2. Organization of a Building Group, Part A

Role of the group in making decisions

Duties and responsibilities of group members

Duties and responsibilities of the chairman, secretary, treasurer, timekeeper, work coordinator

Session 3. Organization of a Building Group, Part B

Characteristics of good leadership in a self-help housing group

Election of temporary officers

Drafting a constitution

Session 4. Costs and Financing

What is a loan? What is interest? How is interest figured?

Conditions of the Council loan for self-help housing and how repayment is made

What are rates (taxes)? How much must the participant pay each month?

What do service charges cover? How much are the service charges?

Explanation of differences between the basic plot and the standard plot

Session 5. Implications of Home Ownership

The eleven conditions of ownership on the Land Record Card, the official record of the ten-year renewable lease agreement[1]

What one can and cannot do with a house

The procedure to follow if one must sell the house

Methods of allocating plots

Visit to the site and selection by each family of the plot for which it will apply to the Project Management Team

Session 6. Work Exchange Agreement, Part A

Ways families can share their labor in the building of houses

Possible areas of conflict between families and possible solutions considered by the group

---

1. See Appendix C, Exhibit #7 - Land Record Card Form.

Sample Work Exchange Agreement read aloud and discussed paragraph by paragraph[1]

Session 7. Work Exchange Agreement, Part B

Continuation of the discussion begun in session 6

Session 8. House Plans

Arrangement of rooms in relation to their use

How traffic will flow through the house

How much space the house must have to allow for the family's expected use

Session 9. Selection of Materials

House materials put on display and relative merits of each explained and discussed

Special attention to Kimberly bricks (sun dried), stabilized bricks (soil-cement), galvanized roofs, plaster and block; doors, windows, floors

Material costs compared

Session 10. Purchasing of Materials

Project store procedures

Ways in which materials are charged against the loan

Way in which cash sales are handled

Economizing on purchases by using project store rather than commercial outlet

Session 11. Landscaping, Kitchen Gardens

Reasons for landscaping

Use of shade trees

How a well planned irrigated garden can produce enough food to more than pay the monthly loan charges and service fees

Session 12. Construction Methods

How a house is built, using a model

Organization of work crews to get laterite from the pit for brick-making, sieving the laterite, mixing with cement and

---

1. See Appendix C, Exhibit #6 - Work Exchange Agreement Form.

brick-making, digging foundations, laying brick, setting doors and windows, installing plumbing, roof construction

Session 13. Final Organization, Part A

Adoption of constitution by individual construction group

Signing of Membership Agreement in construction group

Election of permanent group officers

Session 14. Final Organization, Part B

Finalizing details of the Work Exchange Agreement

Signing of Work Exchange Agreement by all families

Many consultants from the Township Council, private business and the construction staff of the AFSC were invited to participate in these sessions. They shared their knowledge with the group, and their presence gave members of the group the opportunity of getting to know them. Most consultants came at the expense of their employers.

D. Budget Analysis

During the course of these study sessions the community development staff had a number of discussions with each family, individually, regarding the added burden to the family budget of owning a house. Each family was helped to analyze its own budget in light of these new demands and to face squarely whether or not it could meet the financial obligations of home ownership. For people who have always received their shelter free, it is a major adjustment both psychologically and financially to have to make payments for mortgage and taxes. One of the steps in the adjustment is to go over the family budget in detail.

Without exception this budget analysis[1] was the first time the families had ever thought about their expenditures in an organized way. Just how close the budgeting must be is illustrated by the income spread of Kafue squatters questioned in the AFSC survey[2] which shows a median income of K 30 to 40 per month. Families building on basic plots had to have a minimum K 5 per month to spend on housing. Using the Western rule of thumb of 20% of income for shelter, 86% of the families could afford a self-help built house costing no more than the loan for materials from the Council. In fact, all interested families were able to participate, since even those without sufficient income were able to draw on resources of other family members. In a number of cases, project staff helped families develop or discover additional sources of income so that they could participate. In one family the community development worker encouraged the man to spend two hours a day as a vendor. In another case contact was made with relatives able to help. The benefits of the Zambian extended family system came into play. When on several occasions community development workers sought out the grown sons and daughters of people who would be regarded as extreme hardship cases in Western society, the children readily assumed the financial burden for their parents.

1. See Appendix C, Exhibit #2, Family Budget Analysis Form.
2. See Appendix B, "A View of the Kafue Squatter," page 30.

E. Continued Guidance

At the completion of the 14 study sessions and the preliminary personal meetings, the construction staff assumed major responsibility for guiding each construction group. They usually began by dividing the group into work crews.

Throughout the construction process the community development worker continued to maintain a personal interest in each family. During the actual building, innumerable problems arose involving relationships among group members and the families' need for encouragement. The community development workers held weekly group meetings during this period so that problems could be discussed. Special effort centered on individual families whose morale sagged or who were thinking of dropping out.

Chapter VI

CONSTRUCTION GROUPS IN ACTION

A. Work Exchange Agreement

The Work Exchange Agreement formulated for the Chawama Self-Help Housing Project in Kafue, modelled on similar agreements used in other self-help housing projects, was an innovation in the Site and Service Scheme as originally conceived in the Government plan.[1] In essence a contract, it sets out each family's rights and obligations regarding cooperative work. It was a key means of keeping costs low, and of including people who could not build on their own, such as those in full-time employment. It also served the purpose of establishing a formal reference point by which groups of families could develop unity and maintain morale over a drawn-out construction period.

In signing the Work Exchange Agreement, each family pledged 1000 work hours to the group, plus additional hours if necessary, as the family's share in the total construction effort. The group itself was supposed to sanction and enforce the Agreement. Any family unable to contribute its full share agreed to pay the group a 40 ngwee (56¢) penalty for every hour not worked before being allowed to move into its house. No distinction was drawn between the work of an adult woman and the work of an adult man. The work of children under 16 was counted as either two thirds or one half that of an adult. The key to the enforcement of the Work Agreement was the Time Record Sheet kept by the timekeeper who was elected by each group.

All participants signed the Agreement. However, none of the building groups enforced its provisions fully, preferring to rely on norms and codes prevailing in their own culture rather than on a formal mode of contract put forward by foreign staff. The adjustments this required of both staff and the Zambian homebuilders deserve some attention, since the staff had to adapt its expectations to the cultural pattern. The modifications of procedure demonstrate some of the lessons learned in the Kafue project.

B. Work Requirements

Each family was obligated to work on the following tasks, presented here approximately in the order in which they were carried out.

1. Clearing plots, which entailed cutting grass, removing stones, et cetera.

2. Shovelling laterite soil into a truck and unloading the soil at the building site.[2]

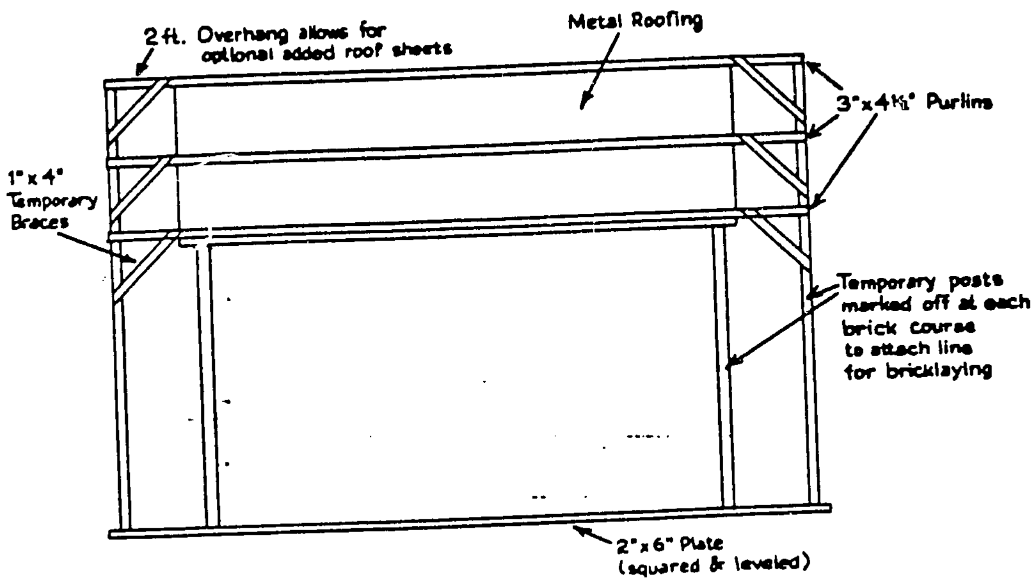
3. Separating fine and coarse particles of laterite using a quarter inch mesh sieve.

---

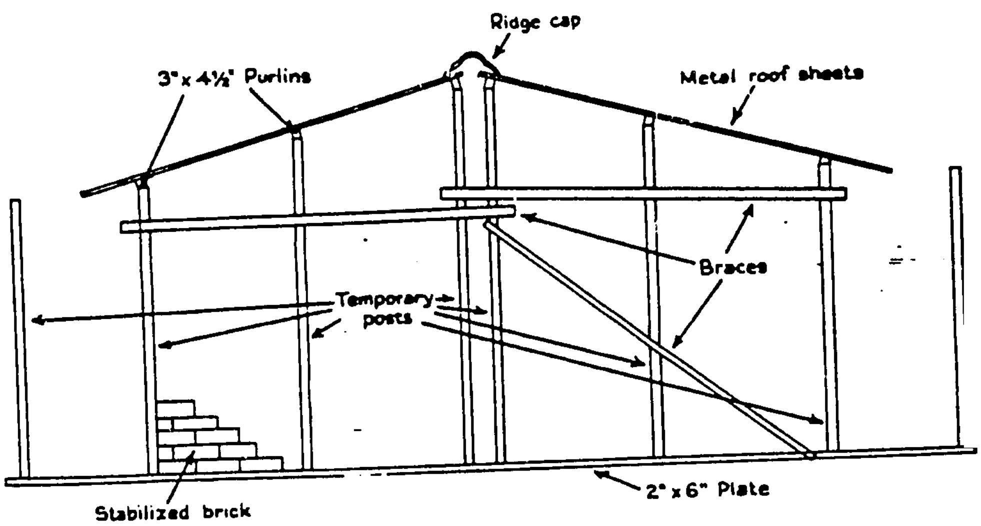
1. See sample Agreement, Appendix C, Exhibit #6.
2. One truckload of soil was required for 400 bricks. This task applied to the first four building groups only. Laterite for the remaining 16 groups was loaded by a machine owned by Nitrogen Chemicals of Zambia.

Chawama Self-help Housing Rroject
Kafue, Zambia

Construction Method
1970



END ELEVATION



SIDE ELEVATION

CONSTRUCTION METHOD

The method of construction is first to lay down a 2"x6" plate 3 feet outside the perimeter of the building line, square and level. Temporary posts are erected on the plates to support the roof members or purlins and to attach bricklaying strings. The corrugated galvanized iron roof is put in place, the footings are dug and poured and the bricklaying begun. When the brickwork is completed to the purlins, the temporary posts and plates are removed for use on another house.

4. Setting up galvanized iron roof with a temporary supporting frame which was done during the four-month rainy season.

5. Filling in house foundation with larger pieces of stone.

6. Mixing fine particles with water and cement to make bricks, one house requiring approximately 2500 bricks.

7. Pressing bricks with Cinva-Ram machine and setting bricks aside for two weeks of curing.

8. Pouring concrete footings for the walls of the house.

9. Putting up corner posts for bricklaying guides.

10. Laying bricks and keeping them plumb.

11. Setting window and door frames as bricks are laid.

12. Installing roof sheets and purlins, then tying down roofs with wire.

13. Digging pit privy, building privy walls, et cetera.

14. Installing plumbing on the standard plots.

Thus the Work Agreement required of the homebuilders both more labor than is customarily invested in a house and a willingness to learn new construction techniques. For most groups it was 12 to 20 months after the beginning of construction before their houses were occupied.

C. The Beginning of Construction

Despite many delays, the last bureaucratic hurdles were overcome on January 19, 1970. At that time the Kafue Township Council and the Chawama project staff worked out the final details for obtaining and maintaining a flow of necessary inputs, such as soil, timber, cement, equipment, labor and transportation. Some three weeks prior to this date the members of the first building group had signed their Agreements and, unwilling to accept further delays, had cleared their building plots and the working area. Thus, the workers and the plots were ready for building at daybreak on January 20th. The AFSC Field Director described the scene as follows.

> The day started off overcast - heavy rains in the wee hours of the morning - with a fine mist falling until mid-morning. It had been arranged that seven women and a few men would show up at 7:00 a.m.... and it wasn't long until at least one representative from 15 of the 16 families in group number one were busy at work. Some measured out their plot... some levelled the land for the roof frame, some carried stone to support the frame, some sawed timbers, some nailed roofing to the purlins. By mid-afternoon... the roof of the first house was in place.

The next day the group erected the roofs of the second and third houses; and the day after that two more roofs went up. After one week, eight roofs were in place. Members of the first construction group wanted to erect roofs on all 16 plots immediately. However, project staff were anticipating the commencement of work by other groups, and so explained that there were not enough temporary wooden posts, used to support the roofs until the bricks reached roof level, to allow all 16 roofs to go up.[1] Very soon those families without roofs over their plots began to grumble; and the first of many instances of internal group tension appeared.

D. Differences in Staff and Homebuilders' Expectations

Beyond fulfillment of the requirements for work and other obligations spelled out in the Work Exchange Agreement, staff expected adherence to certain patterns of organization and procedure. These expectations were oriented toward accomplishing the tasks of building the houses. They therefore entailed planning coordination, punctuality, rational use of materials, purposeful employment of human resources and a system of fairness.

The Zambian homebuilders had slightly different ideas. All wanted to finish the tasks before them; but few wanted to ignore the social protocols and human interchange necessary to keep the group working harmoniously. In other words, the process of their labors was just as important to them as the end product.

Reconciling these two orientations meant adjustments that annulled, in effect, many of the provisions of the Work Exchange Agreement and therefore required a revision of staff expectations. This demonstrates the need for Western staff in such projects to be highly sensitive to the insights of the local people in applying foreign technology.

Some instances of adjustment are described below.

E. Adjustments in Procedure

Keeping up morale had been a major concern of staff from the outset, since the momentum and spirit of the first building group could shape the prospects for groups that followed. Before the project got under way, it had been decided to eliminate the element of competition, as a means of avoiding morale problems. Construction contests have been used in other self-help housing projects, such as a government-sponsored project in rural Uganda in the early 1960's. However, the AFSC staff felt that such contests would serve chiefly to introduce conflict into a situation where there was already a high potential for it. Thus, group morale took precedence over the staff's desire to complete houses as rapidly as possible.

1. Construction Schedule Unhappiness grew when it appeared that, at the established pace of brickmaking and bricklaying, houses of some first group members would be complete even before the building of some other members' houses was under way. Initially, the following building procedures had been established. House number one, with just posts and a roof standing, was reserved as a shelter for making bricks, house number two as a shelter for lumber storage and cutting. Brickmaking began on the fourth day of construction. Ten days later, with enough bricks made for three houses, the group poured footings for the third house. However, as bricklaying progressed for house number three past windowsill height, group

---

1. In June 1971 the use of temporary wooden posts was replaced by metal cornerposts.

members began grumbling once again, saying that the house should not be finished so far ahead of the others. The construction supervisor tried to ease the unhappiness by shifting work to pouring footings for two more houses; but the people were no more happy to finish five houses before all of the others than they had been to finish only one house. Therefore, the first group altered the construction timetables in order to deal with the internal tension which had been growing from the time when eight of its members had discovered that their houses would have to wait to be roofed. The construction supervisor described how this tension was eased, as follows.

> Group 1 had a meeting in the evening. After much discussion, they decided that they wanted to stop building and just make bricks until there were enough for all 16 houses. It's now apparent to me that erecting so many roofs at the start was a mistake - except insofar as the appearance of getting a lot done boosted morale and encouraged recruitment. The unfortunate thing about the evening's decision is that at present rates of brick production it will take at least two months for Group 1 to make all of their bricks. Also a disappointment from the point of view of getting some houses finished to work out the bugs in the erection system, and having something to help future groups work out plans. But if Group 1 loses heart, it could ruin the whole project, so we go along with their wishes.

The first group's decision to complete all brickmaking before beginning house construction established the building pattern which all the other groups followed. It slowed down the completion of some houses; but it enabled groups to stay together throughout the building process.

2. Work Crew Shifts and Workers As construction got underway, the community development staff interviewed individual families to find out what time they had available to work. Based on this information, the staff planned a three-shift day: 7:00 a.m. to 12 noon; 2:00 p.m. to 5:00 p.m.; and 5:00 p.m. to 7:00 p.m. The first group altered this schedule, creating two five-hour shifts: 7:00 a.m. to 12 noon, and 1:00 p.m. to 6:00 p.m. This worked moderately well for the first two construction groups, whose male members were farmers, small entrepreneurs, firewood collectors and fishermen who could govern their own work schedules. During weekdays these men could contribute time equal to or greater than that of the women. Thus, as the first two groups worked they did not have to struggle with a major problem common to self-help housing projects, namely how those with full-time jobs can put in the necessary work hours for reasonably speedy construction.

But as the composition of building groups shifted to include more full-time wage earners, the work schedules had to be altered to accommodate them. Early evening work crew shifts were tried briefly, but with little success. Then weekend shifts for the wage-earning men were tried, but these also were poorly attended. Men who had worked all week long and the wives and children who had served as their surrogate construction group members wanted time to relax. Thus, a pattern developed whereby the greater part of the construction work was carried on by the self-employed men and the wives of regularly employed men. The burden of work fell by default to women who put in a six-hour day, 7:00 a.m. to 1:00 p.m., Monday through Saturday, for a total of 30 hours per week. Roughly 60% of all the construction work in the project was done by women.

3. <u>Means of Measuring Work Contributions</u> To the Western way of thinking, records of hours worked are a concrete, easy means of keeping track of contributions to overall group effort, and a convenient scale for meting out penalties to slackers. The Zambian approach diverged from this type of measure, however, toward one that made allowances for particular circumstances, nuances of behavior and the attitudes of each group member. The result was a significant shift; Western expectations yielded to Zambian norms.

The first building groups went through the motions of keeping track of hours on the time record sheet kept by the timekeeper; but they generally passed responsibility for timekeeping to the construction teachers. The first group experienced tensions over work hours within two weeks after building began. Some members were, according to the record at least, not pulling their weight; but the group deferred imposing sanctions against the slackers and decided to use the time record sheet merely as a public record of what each family was contributing. After ten weeks the first group was so dissatisfied with this method of accounting for family contributions that it asked for the recording of man-hours to be stopped. Despite staff requests that they continue recording hours, the first group eliminated this procedure and with it the basic premise of the Work Exchange Agreement. Nevertheless construction teachers did continue to record aggregate group hours.

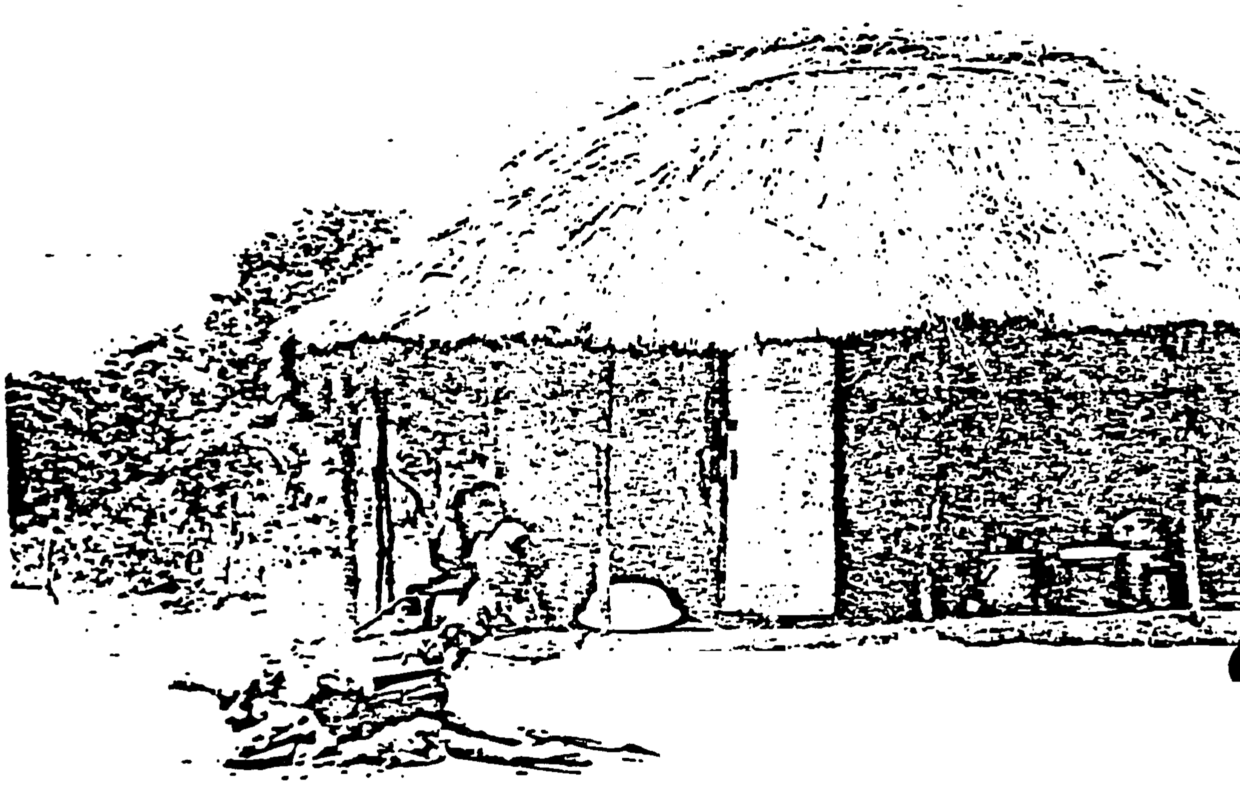
After abandoning the man-hour concept, families continued to work together despite differences in family contribution as great as 500 hours, and despite the fact that groups never called on slackers to pay the penalty charged for hours not worked. Moreover, the earliest project participants advised later building groups not to expel lazy members and not to worry about the actual number of hours contributed.

Why was this so? The reasons probably stemmed from the homebuilders' own social values and norms. According to their view a participant's attitude, not the number of hours worked, was the important consideration. A share of the work cannot be quantified. If one is trying, the hours worked are secondary. Attitude toward the group and its goal was paramount, as shown by the following occurrence. A group was scheduled to begin work on the house of a member whose total hours contributed were among the highest in the group. When they came to his plot he was not there. Someone went to find him and reported that he was in a beer hall. At this the group went away, refusing to work on his house until all others had been finished. His attitude, they reasoned, was wrong. Participants with legitimate reasons for absence, such as illness or attendance at a funeral, were not penalized. However, the groups did penalize those whose absence was judged irresponsible.

The means of dealing with chronic slackers were gradually worked out, although not in ways that the staff had expected or that the Work Exchange Agreement prescribed. In mid-August 1970, the third and fourth building groups were considering how soon to expel their slackers, something they never did. At the same time the second group was discussing ways to encourage participants who were slacking. By this time the first group, which had worked together the longest, had completely abandoned the measurement of hours worked. Thus by accepting each member family's share of work in terms of variable circumstances, ability and attitude, the building groups were able to maintain morale and strengthen their unity.

Traditional squatter housing. In background a half finished house. Wattle will be tied to the poles and the wall plastered with mud. In foreground a woman carrying thatch for a roof.

One of the more substantial pole and dagga houses of Shillinga Kaseba which was replaced with a stabilized earth brick structure.

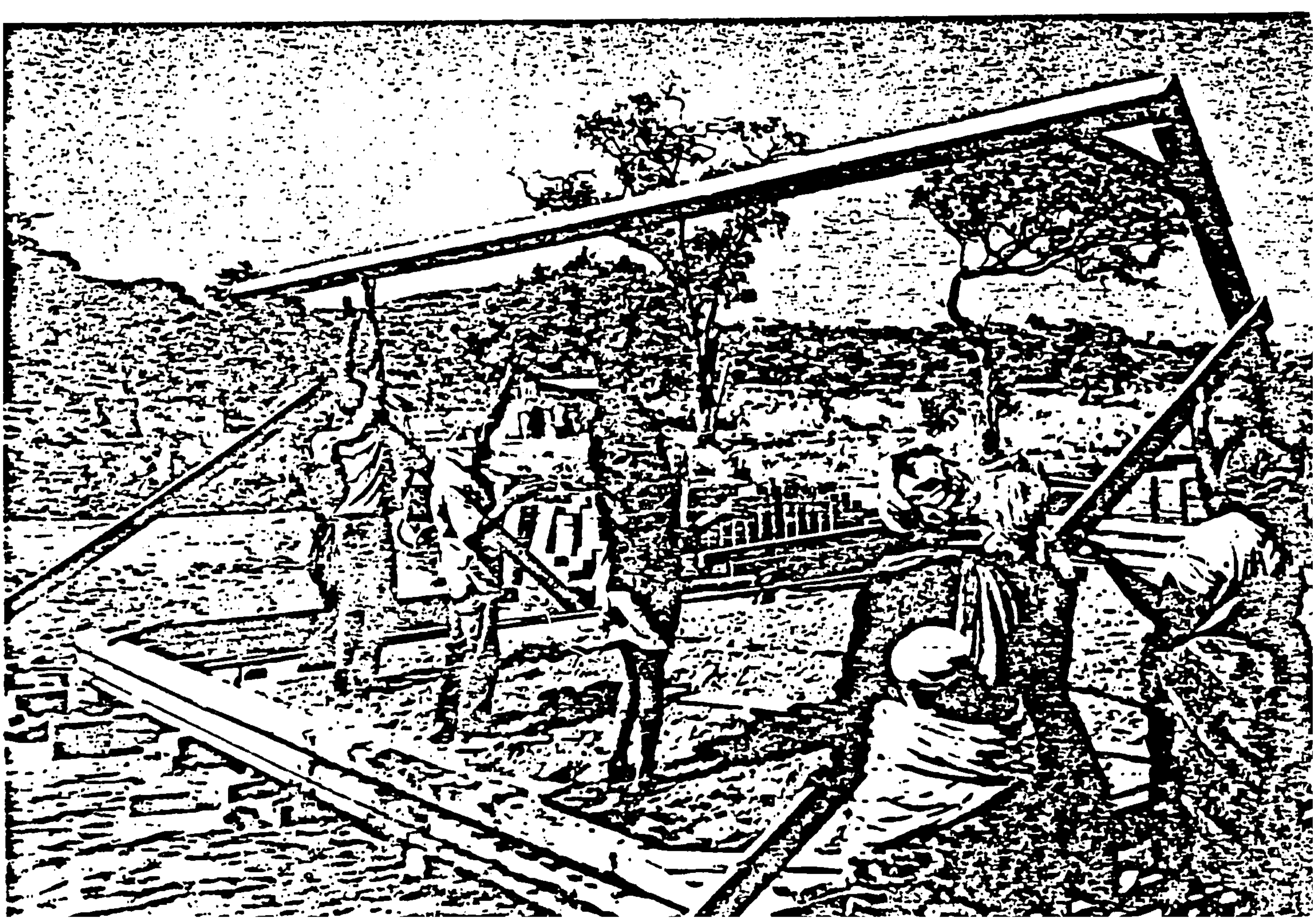


Sieving separated the fine earth for brick-making from the coarse material that was used to fill in under the floor.

Pressed bricks were allowed to cure for two weeks before going into the walls.

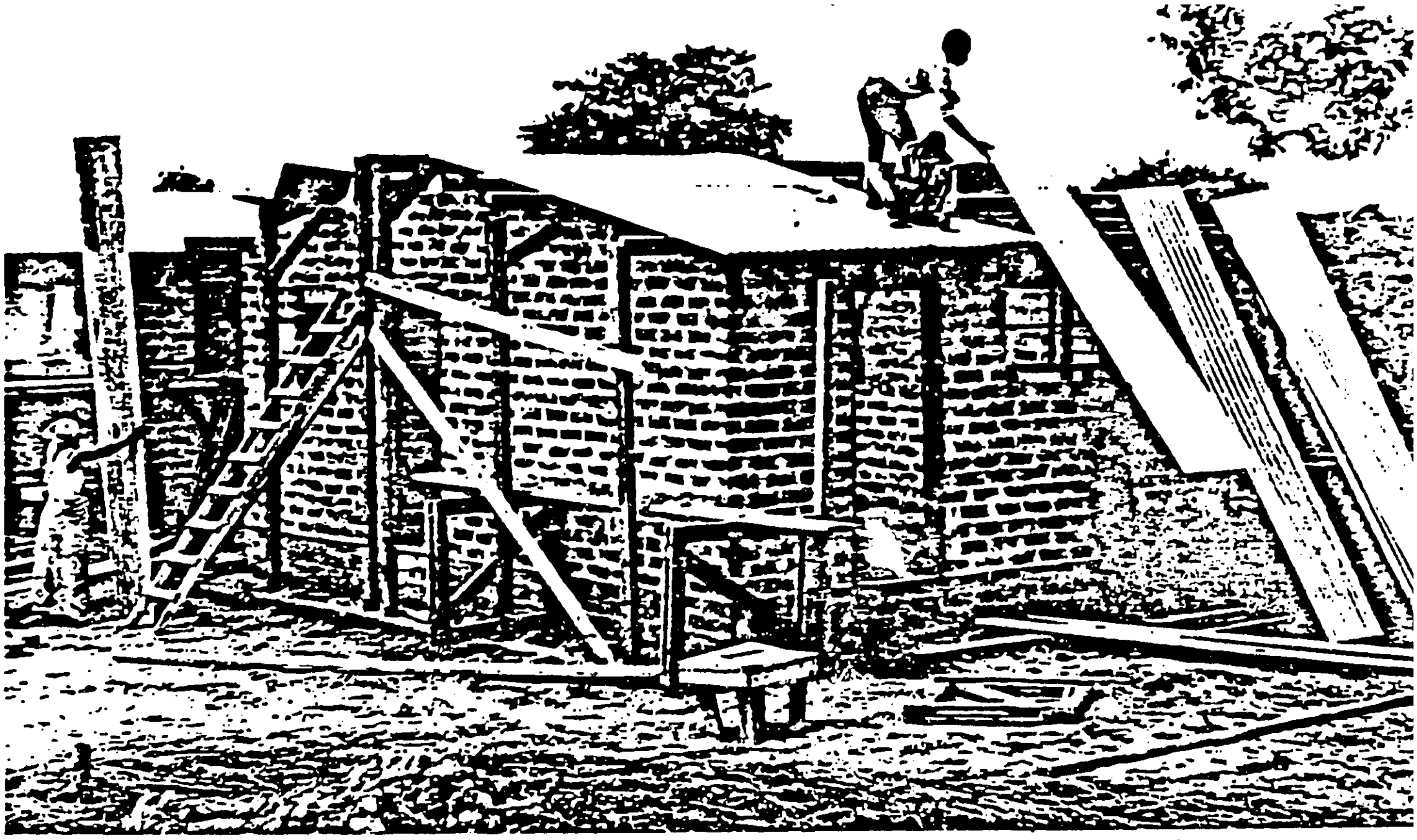
Pressing the earth and cement mixture in the Cinva-Ram which produced the bricks.

Raising the frame that will support the roof so that work can progress through the rainy season. The frame also aided in keeping the walls square and plumb.



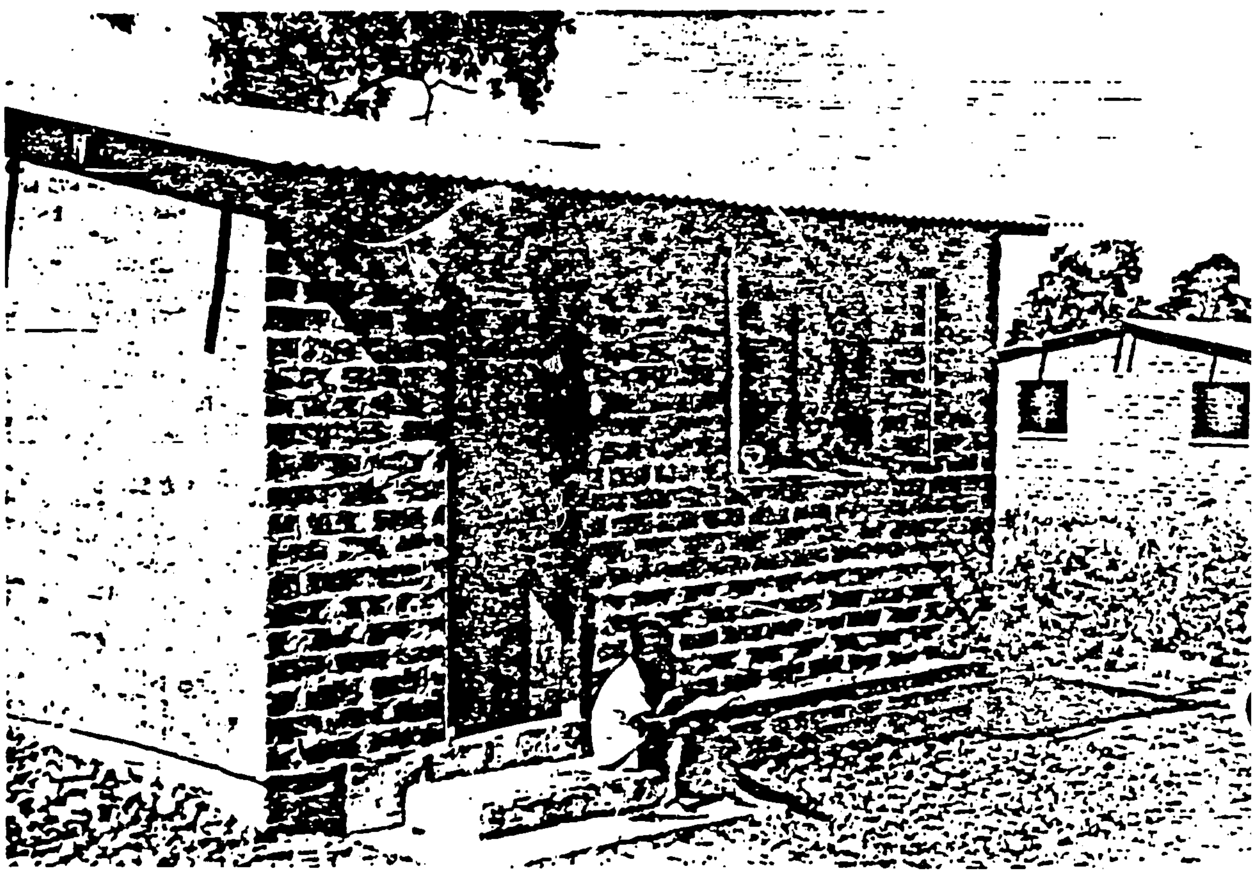
New skills were quickly learned. This lady was a competent bricklayer by the time the 16 families of her group were in their new houses.

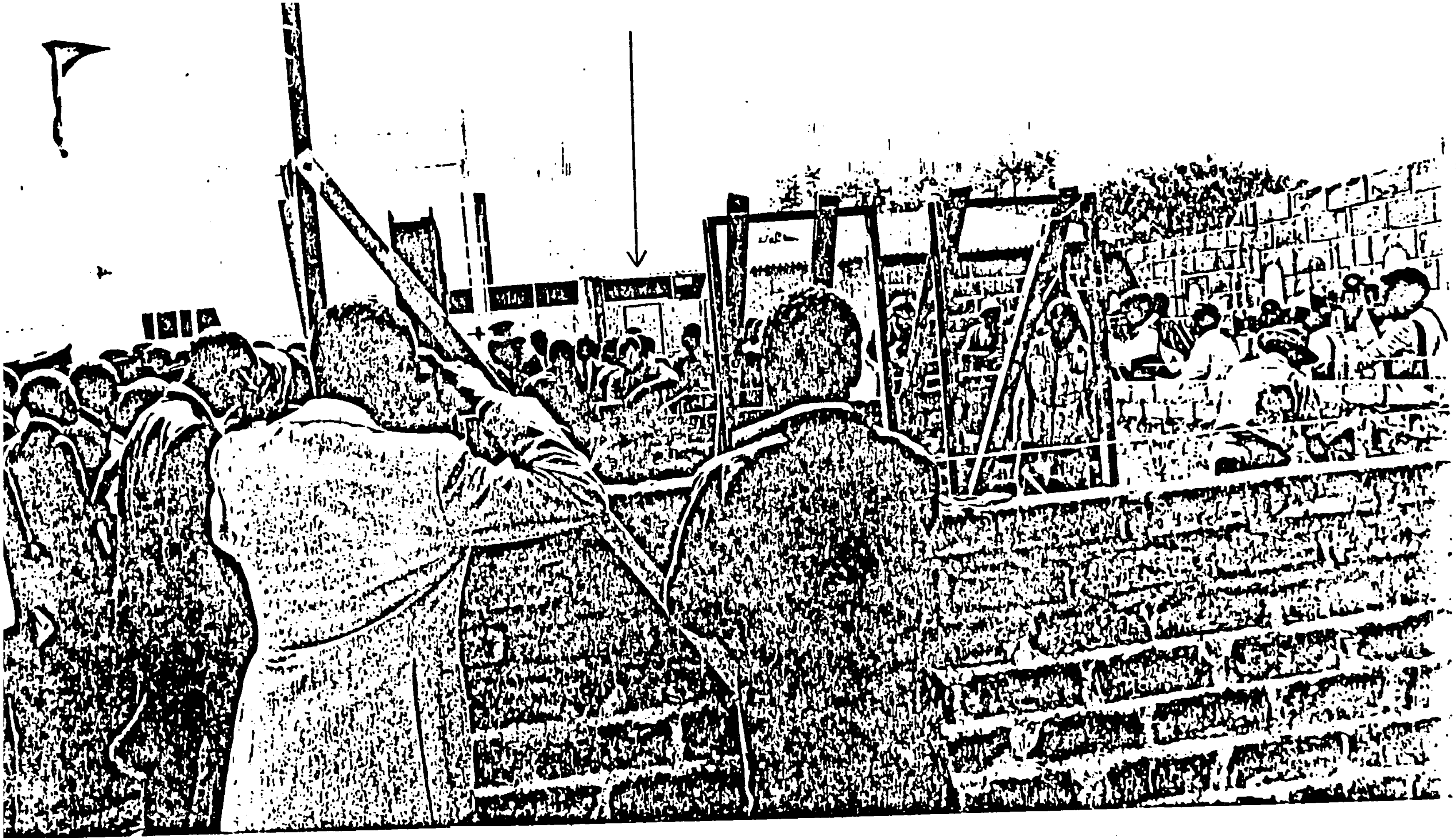
This proficient lady bricklayer puts the last course of bricks on her bathroom. It will have a shower and commode.



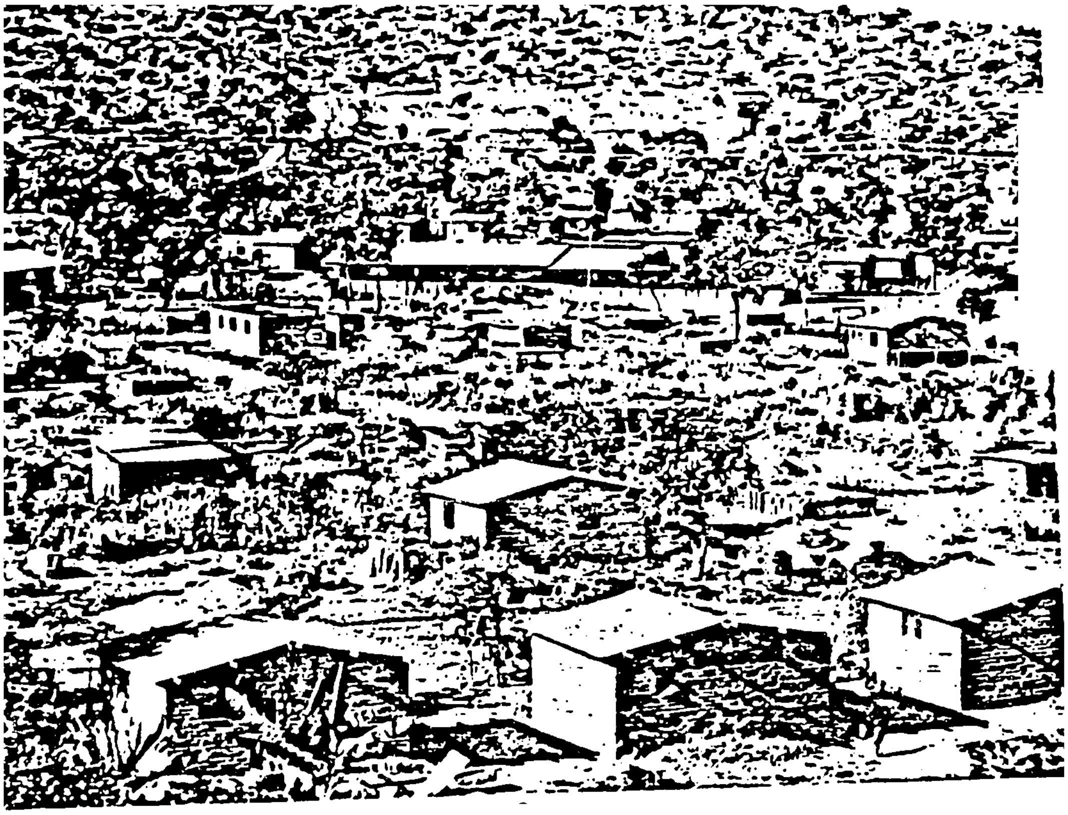
During the dry season the roof went on last in the conventional way.

Completed core house consists of three rooms.
Stuccoed house in background shows individual adaptations.



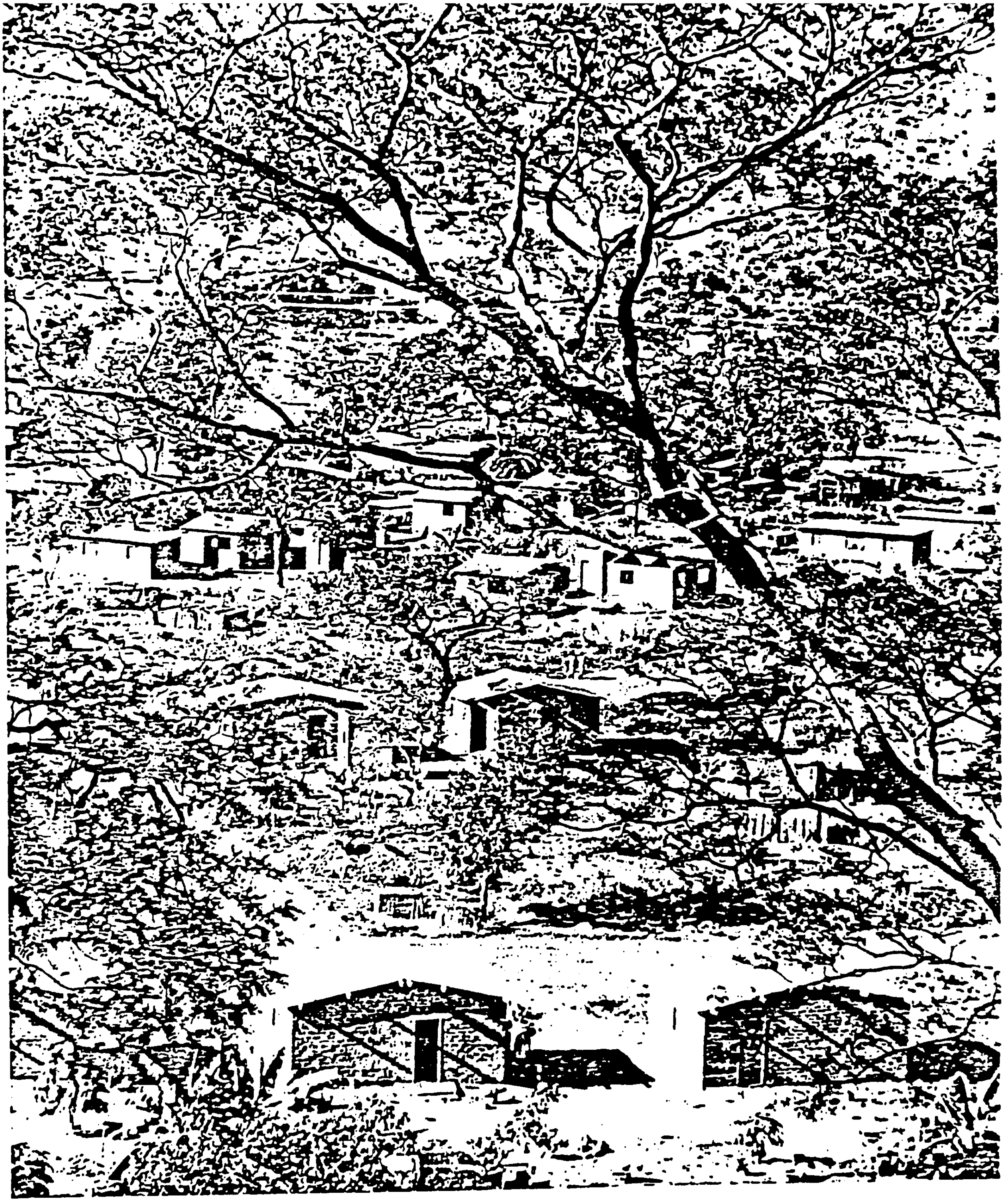


The refined Kafue project method of construction was exhibited at the Zambia Agricultural Fair in 1971. Note string to ensure even bricklaying. President Kenneth Kaunda (in center background) is laying a brick in this demonstration house.



Project is about 50% completed. Nakatete school in center background is ready to open for classes.

About 120 families have finished their houses. Note the construction group in the center of picture making bricks.



Chawama, meaning "A Good Place" in Chinyanja language. It is beautiful.
A true expression of the feelings of the families who toiled together
to produce this new community.

Chapter VII

GROUP LEADERSHIP, DECISION-MAKING AND INITIATIVES

At Kafue, group cooperation proved to be possible even among people who were strangers at the project's beginning. Cooperation within each group seemed to depend on three people: the chairman, the construction teacher and the community development worker. Too much importance cannot be attached to their continuous, daily encouragement of the construction groups. Their work was central to the progress and successful completion of the project.

A. Group Leadership

1. Role of the Chairman Each construction group selected its chairman during the orientation period. In all cases the group's choice was a man, a woman being most frequently chosen for the post of group treasurer. Leadership ability of the chairmen varied. The most obvious indicator of the chairman's effectiveness was the group's ability to maintain a good pace in meeting construction goals such as the brickmaking deadline or building the houses to roof level by a certain date. The group's ability to deal with problems before they became serious depended on the chairman's interest in holding meetings frequently and on his strengths in leading group discussions. Chairmen were frequently called on to ease group tensions and some of them rose to the occasion. For example, one group was split by a participant's complaint that others had done an injustice to his wife and that the construction teacher had not adequately defended her. The group's chairman, showing great patience and sensitivity, helped the group solve the problem without breaking stride in the work effort. In another case, however, a factionalized group continued to suffer tension and poor work performance because the chairman condoned the disrespectful treatment which the majority faction meted out to the minority. In all cases the community development staff was on hand to furnish support to the whole group and to the chairman. In any extremely difficult situations the AFSC staff intervened to settle a dispute.

2. Role of the Construction Teacher The construction teacher was as important to group unity as the group chairman but in a quite different way. He was the staff member closest to the housebuilders in their work. His forethought, for example in seeing that construction materials were always on hand for the homebuilders and his adroitness in solving work problems, was central to his success with the group. Many groups were initially surprised that their construction teacher was not a boss, but rather a considerate teacher and helper who listened to them. During the construction period responsibilities, usually those of community development staff, frequently rested on the construction teacher. He was encouraged to help the group work out its own problems on the job and to refer only the intractable problems to the community development staff. A certain amount of rivalry existed at first between the construction teachers and the community development staff. For example, the construction teachers felt that the community development staff did not adequately explain to participants the difference between the Government loan and total construction cost. On the other hand, the community development staff were tempted to blame the construction staff for their recruiting difficulties when

prospective homebuilders resisted becoming involved because they thought self-help construction too time-consuming. In the course of time, however, mutual respect for individual capabilities grew and rivalries dwindled. Also gradually the staff became more mutually supportive.

3. Role of the Community Development Worker Mobilizing and sustaining the families' interest and energy from the time of recruitment through to house completion were the community development workers' tasks. These three persons, each with experience in working closely with people, were essential to the project's momentum and smooth operation. Their roles in recruitment and orientation of families and their part in later adjustments in work routine have been previously described. But their group leadership role was of central importance to the morale of the workers and to the progress of the project. Family and group self-confidence and participation grew under their guidance. The community development workers achieved this through the convening of meetings, mediation of conflict, liaison with other institutions and dissemination of information about the project.

B. Decision-Making in Construction Groups

Groups coalesced not only under inspired leadership from the community development staff, construction teachers and chairmen, but also through joint decision-making. Questions most often before a construction group were: Whose house should we build next, an oblique way of asking: Whose behavior and attitude does the group approve of? Which families may move into their houses? Should we admit or expel this or that family?

That the order in which houses were built reflected the group's opinion of member families was shown by the visible lag in effort before work began on the last two or three houses of each group. Each time a group had to decide whose house should be built next, it would put off building the houses of laggard members. In this manner, groups would even single out a laggard husband in spite of the fact that the wife was hardworking. Nonconformity was sometimes punished in this way also. For example, a man who had dropped out of a group because it had refused his request to alter the brickmaking procedure later asked to rejoin. The group did readmit him on condition that his house be built last. The original decision not to alter the brickmaking procedure as suggested by the nonconforming member took up three days of group discussion.

Under the terms of the Work Exchange Agreement, construction group members could invoke sanctions against laggard members. In practice they quietly ignored this option, rarely using a formal, conscious procedure to discipline a member. Each case of readmission of dropouts was treated individually. Much depended on how far a group's work had progressed and on the group's opinion of the individual and of his or her character. One woman had to suspend work owing to poor health. By the time she felt well enough to rejoin, her group's work had progressed too far to accommodate her easily. Therefore she was not readmitted. Rather, she was encouraged to join another group at an earlier stage of its development. This she did and with their help was able to complete her house. The same situation occurred when one family was obliged to drop out for the prescribed period of mourning following the death of a family member. This family rejoined the project but in a later construction group. Thus, the system of organizing groups in a staggered sequence enhanced the latitude of the groups in decision-making, especially on questions of expulsion or readmission.

Group solidarity was evident in the practice of allowing families to move into their homes only when the group gave its permission. In effect this meant that ten families might walk past their own finished houses to help four other families complete their homes. Participants gave a flexible interpretation to what might be considered a completed house. With the essential shell complete, meaning the foundation laid, walls built and the roof on, a family already had something better than their original makeshift squatter dwelling and usually wanted to occupy it then and there. However, to permit families to move into their houses as they became complete and before all of the group's tasks were finished would have jeopardized cooperative group work. Recognizing this, most groups did not allow occupancy until the work on all of the houses was more or less complete, except for doors and windowglass which were considered individual concerns.

C. Group Coordinating Committee

Late in 1970, after nine construction groups had been formed, the project staff asked the groups if they wanted to form a central committee to represent all the groups. The staff saw a clear need for this type of body as the scale of the project increased. By that time about 140 families were involved, and matters requiring everybody's attention were arising. As the Field Director described it, the project participants' response was immediate.

> They grabbed at the idea. Not only did the staff want a committee but the groups also felt the need. Four reasons for a community-wide grouping were outlined by one of the members: (1) so the groups can talk to each other; (2) so the staff can talk to all of the groups; (3) so the groups can talk to the staff; and (4) so the people of Chawama can speak with one voice to the Kafue Township Council.

Thus the Group Coordinating Committee came into existence. It was composed of the chairman and two delegates from each building group. Usually, one delegate was a woman and the other a man. Group treasurers, usually women, were frequently chosen as delegates. Half the members had to be present to transact business. However, if a quorum was not present the delegates would often proceed to discuss issues on the agenda even though they could not take official action. The agenda was decided upon by the Committee chairman and secretary with the help of the project community development worker. Decisions were usually made by consensus.

This Committee was a means by which groups could share their experiences and gain advice and support. For example, the eighth building group sought help in dealing with three laggard members. The Committee recommended that they not be expelled from the project. It went further by sending a delegation of members of other building groups to counsel these families. Similarly, the Committee responded to staff requests that it emphasize, to individual families if need be, the importance of paying back the Government loans. In 1972 the Committee had to deal with an ecological concern. Kafue residents in need of firewood had been cutting down trees on the hillside adjacent to the site, thus unknowingly increasing the chances of erosion as well as disfiguring the landscape. At the behest of the Kafue Township Council the Committee reviewed the problem and ruled that no more trees should be cut, thus airing the reasons for such a rule in the course of the Committee discussions.

The Group Coordinating Committee was also involved in supplying Chawama residents with fruit tree seedlings. Under this scheme, pawpaw, mango, guava and banana plantings were moved from the countryside to individual gardens. In mid-1971 the project ordered 100 citrus trees from the Zambian Agricultural Experiment Station near Kasomai. Participants themselves paid for these at cost, as well as for fertilizer.

For the participants, the Committee's major function came to be that of a public interest group, weighty enough to be listened to by the Township Council. The Committee petitioned the Township Council on behalf of the project residents for a number of needed facilities. These included the upkeep of roads in the community, shopkeeper's licenses for those who wanted to establish small stores, the lack of sufficient water taps and refuse bins, an adequately cleared, marked and scheduled bus stop on the main road, and a health clinic for children under five.

Furthermore, the Group Coordinating Committee carried forward the initiative of several of the first building groups in constructing a primary school on the site. Finishing the school remained one of its chief functions well into 1973. It solicited and received a contribution from the United States Embassy, mobilized and coordinated the construction of the building, petitioned the educational authorities for certification and the placement of teachers, and undertook to acquire and look after school supplies.

In the two years after its founding in 1970, the Group Coordinating Committee met as frequently as twice a month, averaging at least one meeting a month. By 1973 these meetings were infrequent at best, being called only for special purposes. With the dissolution of the construction groups as well as the rise of other task oriented groupings, the Committee's reason for being was progressively lessened.

D. Functional Changes in Construction Groups and Group Coordinating Committee

The Work Exchange Agreements of most of the construction groups stipulated that they should be dissolved and membership cease when the terms of the Agreement were fulfilled. The first four construction groups were relatively unified even before their recruitment, and their plots lay generally in one corner of the Chawama site. Therefore, they maintained their relationships after construction was completed. But most construction groups dissolved on completion of their houses since members were scattered throughout the project site.

The functions of the Group Coordinating Committee were largely superseded in 1973 by other community institutions. For example, the United National Independence Party (UNIP) became a major channel of communication and a force for unity within the community. Likewise, the Ward Development Committee, led by the local Councillor elected to the Kafue Township Council, became a primary link to the town government. Although the Ward includes neighborhoods outside Chawama, some Chawama residents became vigorous participants in the Ward Development Committee's meetings to the point where they now exert strong citizen leadership in this area of Kafue town. A Parents' Committee for the community school assumed much of the role that the Group Coordinating Committee had played and, in effect, absorbed those Committee members whose main focus of interest in the community had been the school.

E. Other Cooperative Initiatives

In a number of ways the participants elected to invest their labor and sometimes their meager financial resources in special construction projects, some of which should normally have been provided to Site and Service Schemes by the Zambian Housing Board.

1. Roads As the third building group was about to begin its work, they discovered that no access road had been built for their plots. After waiting several days without success for the Kafue Township Council's grader to do the job, some women from the building group took hoes in hand and built the road themselves.

2. Privies The Zambian Housing Board had too many other demands to dig pits for privies for the project residents, as was customary for Site and Service Schemes. The participants, therefore, did this work themselves. Each group took on the task of digging all pits for its member families, making the extra bricks and constructing the privies. The AFSC subsidized these operations by purchasing a form for molding concrete privy slabs and by hiring a drilling machine for digging pits where the ground was too rocky for hand digging.

3. House Improvements Other cooperative efforts sprang directly out of community needs. Some of these brought together only a few families. Improvements to core houses were encouraged by providing transport, tools and supervision to any four families that would agree to work together to help build another room, a concrete floor or some other addition. As of June 1973 homeowners had built extensions on 30 houses.

4. Demonstration House In 1971 the Zambian Housing Board asked the project participants to build a demonstration house for the Lusaka Agricultural Fair, held in August of that year. A crew of nine participants made the required 2500 bricks on a contract basis. Seven of the construction groups then volunteered a member or members to build the demonstration house. This all-star construction group represented the Chawama-- community at the Fair. Thousands of visitors to the Fair saw the house go up in a record three days, although four days had been allowed to the group to do the job.

MISSING PAGE
NO. 42

Chapter VIII

THE GROWTH OF COMMUNITY

A. Meeting a Community Need - The Nakatete School

Nakatete means "reed." It figures in the Zambian saying "from a single reed a great field will grow." Chawama residents point out that one reed is weak and easily broken, but banded together a bundle of reeds has great strength. The cooperative effort to build the Nakatete School demonstrated the truth of this saying.

In 1970 there was no local primary school for Chawama children, a fact that spurred the parents to act. The first to announce their interest were the parents in the first four building groups. They were joined by parents from later groups who, for fear their children might be refused places in a school which they had not helped to build, pledged their labor to the undertaking.

As the one organization spanning all families in the project, the Group Co-ordinating Committee took responsibility for mobilizing the community in the school-building effort. Though the enthusiasm was great, many meetings were necessary to encourage active participation in the construction. As a result of this promotion, the community turn-out for the building of the school was exceptional, at some times being so numerous as to impede adequate coordination and efficiency. Toward the end of 1971, when the deadline for school opening was approaching, every homebuilder dropped work on the houses for a week in order to complete the school. The Coordinating Committee also furthered the project by petitioning the Ministry of Education to apply, on their behalf, to the American Ambassador for financial help from his discretionary fund. As a result the Embassy provided 90% of the funds needed for materials and equipment which covered the costs for roofing, timbers, windows and doors. These funds were supplemented by the American Friends Service Committee.

While the local residents actually built the school, all the bricks were made by secondary school students from Kafue and Lusaka. A workcamp was organized during school holidays in July and August of 1971; and 100 boys and girls, ranging in age from 15 to 20, took part. The Township Council housed them in Kafue schools. They were divided into groups, and in two weeks' time they made all the bricks needed, which proved a highly satisfying experience for them.

By the beginning of the school year, January 15, 1972, the Chawama residents had completed a four-room structure with privies and two additional rooms for teachers. Each room was equipped to accommodate 40 children. Since most schools in Zambia operate on double sessions, the Nakatete School could provide for upward of 300 children.

Since very high value is placed on schooling in Zambia, virtually all Chawama parents entered their children in the Nakatete School. People from outside the Chawama community have also been able to gain admission for their children despite the priority given to those of Chawama. The result has been major over-enrollment by nearly half again the projected number. Extra teachers have been found, including a headmaster. The Group Coordinating

Committee initially served as the main channel between the headmaster, the community and higher authorities in the educational administration, a role subsequently assumed by a Parent Teachers Association. The Ministry of Education commissioned four more rooms, which were completed by January 1975.

B. Construction of a Playground

Zambian young people like to play soccer; and there are a great many young people in the Chawama community in Kafue. A piece of ground had been set aside for a soccer field and government money was supposed to pay the cost of construction. However, funds proved not to be available from either national or local sources. So the young people took matters into their own hands. One Saturday they got together and started clearing away the bushes. A week later they cleared some more; and the work went much faster because about three times as many young people came out to help. In about one month's time they had a beautiful playing field, right in the middle of the community. In preparation for a game with a visiting team, they got paint from the housing project and painted lines; they also put up goal posts.

As a result, these young people not only provided themselves with a playing field, but also learned that they could do things for themselves without waiting for the government to do things for them.

C. Community Life for Chawama Residents

1. Community Organization By 1973 the Chawama residents were becoming an active community. With the dissolution of the construction groups and shifts in the responsibilities of the Coordinating Committee, new networks of relationships and institutions arose. People hitherto unknown to one another became neighbors and became active in the daily life of the community. Cooperative groups and clubs developed; the local branch of the United National Independence Party took on community responsibilities; and a community-wide committee was formed. In such ways and with changes in societal patterns, the process of community formation began to take place among the people of the project area.

2. Economy Small entrepreneurs among Chawama residents established businesses, for example a tailor who used a foot-operated sewing machine, a baker and several brewers of maize meal beer. Maize meal, vegetables and other local products were sold in an adjacent market area. Nearby three small shops owned by residents sold cigarettes, soap, kerosene, matches, tinned margarine and other manufactured domestic products. Virtually all the household heads in the project were earning money regularly as either full-time wage employees or self-employed traders or service workers. Supplemental monies also come into Chawama from the sale of surplus garden produce, part-time skilled service work such as production of concrete privy slabs, and rental of rooms. In 1973 three households rented rooms for K 5 to 7 per month; and one person sublet his entire house for K 12 per month.

3. Services After the Government decided to build a hospital in Kafue, plans for a clinic in the Chawama area were dropped. Residents of the project normally walk about a mile into Kafue city for health care at a clinic there; but a nurse does visit Chawama once a week to provide medical services. Police and fire protection services are likewise based in Kafue city and are therefore distant from the project and are not easily summoned. However, there has been little call for either. Water

service is good. With occasional prodding by the Chawama community through its leadership, trash collection proceeds fairly regularly. Sewerage connections exist for the 114 standard plots; and roads are graded and gravelled periodically.

4. Social Life Church membership of project residents is relatively high. Up to half of the households are believed to belong to the United Church of Zambia, with Catholics and several smaller denominations accounting for up to a quarter of the households. The community development workers have noted, however, that beliefs in traditional superstitions persist and have played a part in some inter-family tensions. Convivial traditional practices also continue. Eating, drinking and passing the evenings in conversation are hallowed pastimes. Families in the neighborhood, often regardless of clan or tribe, do the cooking and other household tasks for a family which has gone into mourning. Funerals and wakes are public events to a greater extent than is the custom in Western countries.

5. Land Use Some tensions in the community have hinged on questions of land use. For example, disputes over plot boundaries sometimes arose when a member of one of the later building groups began to lay out his plot between the plots of two longer established residents, both of whom may have encroached on the middle property by planting trees or part of a garden. This was not an on-going problem, however, although the school's need for more space poses a new source of community tension over land use.

D. Participation by Women

Zambian tradition severely limits women's voice in public decision-making; but a notable aspect of the Group Coordinating Committee was the prominent role given to women. At a preliminary meeting when this Committee was first being discussed, project participants took a crucial step. Someone suggested that two people should represent each construction group on the Committee and that at least one of the representatives of each group should be a woman. This idea carried. The reason for this was that the women did more than half of all the work on the project. However, when the women participants first came to Coordinating Committee meetings, they would sit with their backs at right angles to those of the men, so that they did not face the speaker in front. A first step toward women's participation in decision-making was to convince both men and women that both sexes should face front. Although they continued to sit separately at meetings, women henceforth faced the speakers.

There are traditional taboos for women on some house-building tasks such as putting up the roof. However, since in the majority of families husbands worked full time during the day, the women, and in some cases children, had to fulfill the families' work contributions. As a result the taboos had to give way, and distinctions between women's work and men's work diminished.

In Zambia a woman's role is traditionally only that of wife and mother; therefore widows suffer discrimination and even ostracism. The example of how one widow was encouraged to take part in the project and how she eventually reinstated herself as an active member of the community is particularly interesting. This woman attended 12 preliminary study sessions with a group of families planning to build houses. However, when the Work Exchange Agreement was about to be signed with each family guaranteeing a thousand hours of work to build 16 houses, she said that she was too old and too sick to do her share. Nevertheless, a member of the group persuaded her to sign up on the theory that she deserved to have one of the 16 houses as much as any other member of the community, and that the actual number of hours worked was not the major criterion for participation. During the 18 months of construction she was not sick a single day and was a consistent member of the building group. Thereby she gained acceptance and was no longer an outcast. However, she had no cash income with which to meet the monthly water payments and repayment of the Government loan. Her one occupation was pounding tobacco for snuff for herself. With the help and advice of one of the community development workers on the project staff, she began peddling snuff in small amounts, thereby gradually increasing the amount of tobacco she could buy from her earnings. By May 1972, she had her own house, had remarried and was purchasing tobacco by the truck-load. She had become an independent and respected member of society and a substantial entrepreneur.

Thus, in a number of ways the project enabled women in Chawama to alter their roles significantly.

E. Authority Roles in Community Life

Beyond the example of cooperative work set by the Chawama residents, they gained additional repute for their vigor and assertiveness in local public affairs in support of their needs and rights. For example, they participated in the administration of the Ward Development Committee and took an active part in the administration of the local school since it represented the chief vehicle of upward social mobility for their children. Public functionaries and municipal councils in Zambia are not accustomed to dealing with a high degree of active interest and participation on the part of the general citizenry in public affairs. Thus, the Chawama residents are unique. However, this has not always been the case.

According to the AFSC Field Director, in 1969 when prospective homebuilders were being invited to take part in the project at its inception, no one seemed to be interested in making choices or decisions. "They just wanted someone to tell them what to do. Size of house, cost, facilities in the house - all of these things are of seemingly no concern." The lack of assertiveness of squatter residents confronted with a chance to take part in a cooperative endeavor may be explained by a variety of historical causes. Not the least important was the heritage of the colonial system of subordination of the illiterate to the literate, the pupils to the schoolmaster, the African subject to the colonial authority. Thus squatters had long since been initiated into their subservient roles. Subservience had been for them one of the chief means of getting by as newcomers in the city.

Participation in the Kafue project encouraged squatters to alter this attitude and to gain self-confidence. For some the exposure to group action oriented toward specific tasks, to planning and to demands that they speak up and take part stimulated bolder thinking. It produced in them a sense that their lives were theirs to control to an extent greater than they had ever imagined. An important part of developing capacities for critical thinking as a means of reaching consensus lay in the study sessions held for participants before construction began. Here in most cases for the first time they had to confront ordered thinking about budgeting their own incomes, about contractual obligations, about adhering to schedules and commitments over a long period of time - in a word about planning. Most important, they were obliged to make choices and to assume responsibility for those choices themselves; no bosses were going to give the orders. Many found this an unsettling experience at first and were baffled when it was announced that no one was going to tell them what to do. But as trust developed within the group and as participation grew, group self-confidence took shape. After construction began, the groups sometimes challenged staff suggestions. Within less than a year's time they had developed the courage and solidarity to question the provisions of the building loan each family had received and to assert collective dissatisfaction with some of the construction teaching methods, with project vehicle malfunctions and with the slowness of construction. When the construction groups were dissolved, the tradition of speaking out and standing up for individual or collective rights was continued through the Group Coordinating Committee.

Thus, new patterns of authority and expression were established and became an integral part of community life.

F. Chawama Participants Tell Their Story

Chawama residents have frequently been called on to talk about their homes, their community and their cooperative building efforts in an informal way to people representing the general public from other towns and cities, to officials and to foreign visitors. They have been ever ready to oblige the visitors with answers to questions.

For example, in 1972 radio listeners in Zambia were told about the Kafue self-help housing and community development project, related by participants themselves in their own words. Radio Zambia, as part of a series called "Self Help in Action," recorded interviews with Kafue homebuilders for broadcast in three national languages. The community development staff was primarily responsible for promoting and coordinating these interviews.

In these ways Kafue's story has become widely known in Zambia and abroad.

MISSING PAGE
NO. 48

Chapter IX

SOME DISTINCTIVE ASPECTS OF THE KAFUE PROJECT

The Kafue housing project was a pilot self-help, community development scheme, not just a house construction project. As a vehicle for experimentation, it was hoped that methods and guidelines could be developed which could be used in other programs dealing with human problems related to the growth of cities, both in Zambia and elsewhere. One of the aims of a self-help project is the development among the participants of a reservoir of knowledge and experience which can become a long term contribution to the country's development. Thus this project was a learning experience for all taking part in it - the Zambian Government, the Kafue Township Council, the Zambian and American Friends Service Committee staff, and especially the people of the Chawama community.

A. Some Basic Lessons

The Kafue project demonstrated a number of requirements basic to the successful completion of site and service projects wherever they may be undertaken. Of primary importance to any organized self-help scheme is skilled leadership. A large measure of success depends upon the on-going planning and organization. With instruction, guidance and encouragement, unskilled people can learn to perform skilled tasks of homebuilding. Daily adjustments and adaptations of methods and procedures produce new solutions.

B. Keys to Effective Implementation

A number of basic principles in planning and administration which tipped the balance toward the success of the Kafue project can be identified, as follows:

1. thorough advance investigation of the housing situation in Kafue and of the desires and capabilities of the people of the community in regard to improved housing;
2. careful alignment of the project's plan with national objectives and consonance with the existing legal/administrative/financial program of the national Government;
3. close consultation with Zambian officials at all levels before initiating the project, thus building bridges and assuring co-operation from all sides;
4. carefully planned selection and training of Zambian staff, drawing on resource people locally available to assist with the training;

involvement of local people, with decisions taken at the basic level, utilizing a community decision-making process;

daily provision of needed materials and transportation to avoid delays and inconvenience and discouragement to the workers;

sustained and flexible follow-through on all aspects of the project by Field Director and other staff;

continuity of field supervision; the Field Director for the Kafue project remained the same from inception to very near completion;

strong participation throughout the construction phase by Zambian staff and Township Council officers in the promotion of community services and organization;

10. utilization of local resources and creation of a broad constituency of interest.

C. Finances

The project enjoyed substantial inputs of money, material, technical and organizational expertise, time and high level attention. Its primary objective was to help squatters in a sub-standard urban settlement develop self-respect and confidence in their ability to improve their lot. Better housing and amenities were the basic needs, and providing them was the focus of the work in the project. But that focus was a means for developing a cooperative and self-reliant community structure which would enable the participants to become responsible citizens. House construction costs per se were only a portion of the total. Initial research and training, including literacy courses, organization of community groups, analysis and continuous study of economical building methods and materials,—as well as other administrative and supervisory functions were centrally important cost factors. Additional by-products of the project were the construction of the school and playground at minimal cost. These features limit the degree to which the Kafue project can be duplicated and used as a model for site and service undertakings which are designed solely to increase the supply of housing.

1. Costs As set out in more detail in Appendix H,[1] the Kafue project required a cash outlay of $351,500, figured at the 1969 exchange rate. Of this amount the homebuilders themselves paid approximately $15,000 out of pocket. In addition to this outlay, they will have repaid the Zambian Government over a period of four years approximately $51,787, including interest on their loans. That amount accounts for about 60% of the Government's contribution of $90,000. Thus, each of the 228 families will have paid about $293 for their houses over a period of about four years.

Roughly 20% of the project's total costs were for provision of water and sewer lines, layout and roads, all requiring hired municipal labor. Costs might have been reduced somewhat if self-help techniques had been applied here too, although that would have meant more demands on the homebuilders' time and therefore probably a far longer construction period. Owing to inflation, revaluation and the cutting off of supplies from South Africa and Rhodesia, the total outlay at 1973 prices might have been as much as 25% or approximately $88,000 more.

2. Manpower At any given time the American staff consisted only of the field director and the construction supervisor and their families. During the course of the project there were shifts in personnel. Over the full period there were altogether two American field directors and three American construction supervisors. Families accompanied all of these staff members with the exception of one short-term construction supervisor. They were paid allowances for living expenses, rather than fixed salaries, according to the usual AFSC practice for workers overseas. In all, their contribution amounted to about nine and a half man years over the five year period from the negotiation stage to completion of construction. Total costs for these overseas workers and their families, including their maintenance, travel and other expenses, came to about $115,000, or about one third of the

1. Project Finances.

project's total costs. Three Zambian community development workers and six construction teachers were paid fixed salaries amounting to a total of $65,000, or about one sixth of the total outlay.

It should be noted that the number of construction teachers usually assigned to site and service projects is in a ratio of one to 50 houses; at Kafue the ratio was one to twenty-five. This difference reflected the additional responsibilities which the construction teachers in the Kafue project carried. These included planning, continuous study and adjustment of methods and procedures, training, and day by day supervision and personalized encouragement.

This concentration of skilled manpower ensured that no homebuilder lacked attention and encouragement. Most homebuilders had no knowledge of techniques needed in building a brick house and, moreover, no experience in planning and budgeting or in working within the new type of organizational structure demanded by this self-help pattern. Therefore greater than usual investment of teaching and supervisory manpower was considered warranted. Staff had responsibilities for providing leadership to stimulate homebuilder interest, for developing group cohesion, for maintaining morale, for acting as intermediary with the bureaucracy and for continuous follow-through in order to ensure progress on the building schedule.

D. <u>Benefits and Outreach</u>

The Kafue project was a practical demonstration of urban self-help and of the ability of people of diverse backgrounds to unite effectively to perform specific tasks. It showed the value of involving people in a program, both legally and financially sound, to promote self-help housing. It also demonstrated that the national Government, the municipal Government, industry and a foreign private agency could cooperate with relative ease and efficiency. It has benefitted all involved as well as others who have come to know about the project and its methods.

1. <u>Homebuilders</u> Those who contributed the most in work, planning and out-of-pocket expenses were the homebuilders themselves. They also benefitted the most in gaining solid and easy-to-maintain houses, adequate outdoor space, water and sanitary facilities close at hand, a neighborhood near jobs, transportation, markets, schools and the security of permanent and legal settlement. More importantly, the families built their houses themselves and thus gained basic knowledge and skills to maintain their homes, to add on to them or to build again should they move. The accomplishment that the Kafue project represents is evident in the pride its residents take in their new community. Many families had dreamed of improving their circumstances by building their own brick houses with water, sewerage and other services close at hand. Accomplishing that dream by creating this better neighborhood was definitely a step up for them.

The homebuilders also benefitted from the learning experience provided by the construction groups. Not only did families learn to overcome a reluctance to work with strangers but they also learned how to make choices for themselves by using new organizational methods. For example, the idea of family budgeting, of sharing costs and of paying off loans on a regular schedule were unfamiliar to most families before they joined a brickmaking group. Moreover, resident families learned the benefits of acting in concert when presenting a case to officialdom and some of the means of exercising their rights as Zambian citizens. Accordingly, many Chawama residents have become vigorous and purposeful participants in public forums and new organizations.

The major benefit to the participants as a result of their experience in the project was learning how to re-order the way they think about their family futures, their community interests and their roles as urban citizens. These Kafue families presently live together in a mutually considerate way, having created a sound and harmonious community.

2. Zambian Staff Zambian staff, as well as the families participating in the project, gained valuable experience in urban community development techniques. Their skills and services have already been put to use in other communities. For example, in 1972 one community development worker on the Kafue project staff was released, at Government request, to work in a squatter project in the town of Livingstone. On the basis of the experience gained in Kafue, the construction teachers can now teach others basic housebuilding skills. Also, understanding of new methods of project management and logistics gained by the Site and Service technician of the Kafue Township Council will continue to be useful as the Council expands its housing role.

On the basis of the practical training and experience gained in the Kafue project, many of these workers will be able to serve as effective leaders and trainers of others This development of an experienced cadre is very important since the Zambian Government is continuing to plan means of improving the condition of its shantytown populations.

3. The Government More than 80 Zambian officials, including President Kaunda and his aides, visited the Kafue site following the beginning of construction. The significance of this project for the Government is that it helped to demonstrate the workability of a specific program, namely the Site and Service Low-Cost Housing Scheme, and of a specific principle, namely self-reliance. An important condition for a Site and Service project, however, is that steps need to be taken to ensure the fullest possible participation and mutual aid by the homebuilders themselves. With the Kafue experience as an example, the Government has sought to generate similar cooperative, self-reliant efforts in other communities in order to improve conditions for squatter settlements.[1]

4. Other Observers Approximately 30[illegible] people, most of them from outside Zambia, have visited Kafue to learn about the project. Groups from neighboring Malawi and Tanzania have sought information about the project to incorporate into their own housing experiments. Several groups of Zambian, European and American young people took part in short term workcamps at the Kafue site. Untold others within and without the country have heard of the new community and the processes used to build it.

5. AFSC The American Friends Service Committee also benefitted greatly from the project. The AFSC field staff and their families became more knowledgeable and open to adjustments in methods as a result of this experience. From their Zambian colleagues they learned a great deal about the people, the nation and the problems of squatters. They can now serve more effectively to help educate Americans to understand the problems and needs of developing countries.

---

1. Lusaka Sites and Services Project, Public Housing Sector 11, pages 2.41 to 2.45. Request to the International Bank for Reconstruction and Development, July 1973.

E. Housing Policy at Kafue

The specific plan of action chosen for the Kafue project was based on careful study of Zambian urban housing policies and of the results of approaches taken in other site and service projects both in Zambia[1] and in other parts of the world.

It was important that the AFSC program conform to national policies concerned with decent housing for all and to the type of housing called for by those policies. Traditional village or rural houses were considered unsatisfactory for urban Zambia. Furthermore, the Government policies recognized that squatter settlements were undesirable eyesores and places where the lack of a sense of community among residents in these settlements precluded any feelings of security, stability and general wellbeing.

Evaluation of existing settlements and the lack of success in the upgrading approach of other housing projects[2] gave strong impetus to the policy adopted for Kafue, namely to build modest dwellings from the ground up, in a carefully spaced pattern less dense than in the squatter areas.[3] Furthermore, given the high priority attached to the development of a sense of cooperation and community, the planners believed this could best be achieved in a new, rather than upgraded, neighborhood. In Kafue, additional reasons for rejecting the upgrading approach were based on the fact that the ground on which the squatter settlements stood was either too marshy or too rocky. Digging sewer and water lines and building roads there would have been prohibitively expensive and unwise from an engineering point of view. Thus, although access to water was the single most pressing housing need of Kafue squatters surveyed in 1969,[4] provision only of water and other amenities was not deemed a wise approach to meeting the needs of squatters at Kafue at that time.

F. The Kafue Project as a Model

If the same amount of resources used for the Kafue project had been applied merely to provide amenities to existing housing in squatter areas, some 1000 dwellings might have been served. Thus a somewhat greater impact on the housing problem would have resulted. The Kafue project's net addition to housing stock, albeit of high and enduring quality with water, sewerage, a school and other community facilities, was relatively small.

However, this tells only the quantitative, not the qualitative story. The Kafue project was not intended merely to add to the housing stock. A major benefit derived from it is its effects on people's conceptions of themselves and their roles in society. Such effects may alter the quality of life for large numbers of Kafue residents and urban Zambians in the years ahead. The project demonstrated one among several possible methods of housing improvement. But more important than demonstrating an acceptable type of housing, it showed that cooperative self-help can work when careful planning is

---

1. See Chapter II, Section D.
2. See Chapter II, Section A.
3. An element of upgrading was present in the Kafue project in relation to the fact that 47 of the 48 families living on the selected site chose to participate and thus gained improved housing and amenities. See Chapter IV, Section A and footnote #2.
4. See Appendix B, "A View of the Kafue Squatter," page 51.

directed to stimulating the energies and spirit of the people and to supporting them as they work together.

G. The Kafue Experience at Work

On the basis of the Kafue experiment, the American Friends Service Committee was invited by the Zambian Government to participate in a large urban housing project in Lusaka, the capital of the country. The AFSC has played an active role in preparation of project plans. It has provided a staff composed of community involvement specialists, community development training personnel, and a construction trainer who are now engaged in training Zambians who will be assigned to the project. Many of the methods used at Kafue for promoting cooperative self-help and for creating a sense of community are being applied again to improve the conditions of life for residents in a large urban squatter area. Thus the Service Committee is playing a supporting and facilitating service in this project as it did in Kafue.

Appendix C

PROJECT DOCUMENTS

APPLICATION FORM FOR PROJECT PARTICIPATION

Chawama Self-Help Housing Project
Kafue, Zambia

Details of Applicant

____
Surname as per Nat. Reg. Card

____
(Forenames as per Nat. Reg. Card)

National Registration Card No. ________________

Date of Birth ______________________________

Place of Birth ______________________________

Full Details of Present Accommodation:

____

____

____

Family Details

Name	Relationship	Age

Employer:

Name ____

Address ____

Weekly/Monthly Wage ____

Have you previously applied for a Council house
State YES/NO __________

If 'Yes', number on Waiting List ________________

I hereby apply to participate in the Scheme.

Date ____________________

____
Signature of Applicant

FAMILY BUDGET ANALYSIS FORM

Chawama Self-Help Housing Project
Kafue, Zambia

Income Per Month

Wages	1. ______________________		K ________
	2. ______________________		________
	3. ______________________		________
	4. ______________________		________
		Total	________
Source of Support (Estimated	1. ______________________		________
	2. ______________________		________
	3. ______________________		________
	4. ______________________		________
		Total	________
Other Income	1. ______________________		________
	2. ______________________		________
	3. ______________________		________
	4. ______________________		________
		Total	________
		TOTAL INCOME PER MONTH	________

Family Expenses per Month

Mealie Meal	K ________	Balance Forwarded	K ________
Relish	________	Education	________
Salad Oil	________	Transport	________
Vegetables	________	Rates	________
Milk	________	Licenses	________
Soap	________	Personal Levy	________
Recreation, Chibuku, Etc.	________	Z.N.P.F. Payments	________
Clothing	________	Debts	________
Medical	________	Savings per Month	________
Subtotal	________	TOTAL EXPENSES	________

TOTAL DIFFERENCE OF EXPENSES & INCOME ________

Financing the House

Savings

Total Savings K ____________

Amount Allocated for House ____________

Current Savings per Month ____________

Savings Allocated for House Each Month ____________

Estimated Cost of House

House Plan Designation ____________________

Cost of Core House K ____________

Cost of Expansion ____________

Total K ____________

Furnishings

1. ________________________ K ____________
2. ________________________ ____________
3. ________________________ ____________

Total Furnishings K ____________

TOTAL COST OF HOUSE K ____________

Funds Available

Council Loan K ____________

From "Other Sources"

1. ________________________ ____________
2. ________________________ ____________
3. ________________________ ____________

Lump Sum from Savings ____________

TOTAL AVAILABLE K ____________

BALANCE NEEDED (OR SURPLUS) K ____________

How Balance Will Be Covered

Current Savings: at K____________ per month

for ________ Months K ____________

Other: ________________________________ ____________

________________________________ ____________

NOTES:

AFSC Form II, 27/11/69

LOAN AUTHORIZATION FORM

Chawama Self-Help Housing Project
Kafue, Zambia

Ref: Plot J

To:

Date..................

From: Kafue Township Council
P.O. Box 21 - Kafue

Dear Sir,

re: SITE AND SERVICE SELF-AIDED HOUSING: ISSUE OF GOVERNMENT AND COUNCIL LOAN

I refer to your application for a Government/Council Loan of K144.00 re-payable over 4 years @ 5% interest and advise that the Loan has now been authorized as from ______________________ 19___.

The rate of repayment is K3.38 per month and the first instalment is due and payable to the Housing Officer in Beit Hall by not later than ______________ ______________. There-after, instalments are due and payable monthly in advance.

The effect of granting this Loan is that the total amount indicated is placed to your credit and may be drawn on for the supply of building materials in the following order of priority from the Site and Service Stores on Plot J.6.

Roofing Materials
Metal Door Frames
Metal Window
Cement
Sand
Stone

Your attention is invited to the penalties prescribed in the Land Record Card should you fail to maintain these monthly payments.

The Schedule of repayments is as follows:-

1st Payment ....
Last Payment ....
i.e. 48 instalments @ K3.38 per month.

Yours faithfully,

WF/EHCM

Secretary.

OFFICE USE ONLY

Approved by Finance and General Purposes Committee at its .... Meeting.

---

cc. Accountant.
Housing Officer.
Site and Service Technician.
Community Development Officer.

MEMBERSHIP AGREEMENT FORM

Chawama Self-Help Housing Project
Kafue, Zambia

____________________ HOUSING GROUP

By virtue of having been assigned Plot No. _______ in the Chawama Self-Help Housing Project, and having received a loan of K 144 worth of building materials from the Kafue Township Council, we are eligible for membership in, and do agree to join with the group of families detailed on the attached Work Exchange Agreement, to be known as ____, for the purpose of building our own houses.

To this end it is agreed that at least one adult member of the family will participate in all scheduled and called meetings.

We agree to abide by the Constitution and By-Laws, and all decisions arrived at by the group, whether or not a member of the family was in attendance at the meeting at which the decision was made.

We assume all liability for accident or injury to members of the family sustained during the course of construction.

We agree to work for the group as requested by the technical staff and/or appropriate elected member of the group, within the terms of the Work Exchange Agreement.

IN WITNESS of this voluntary action for the development of our family, and our nation. we do set our hands:

Signed: _________________________ Husband

_________________________ Wife

Date: _________________________

CONSTITUTION AND BY-LAWS FOR CONSTRUCTION GROUPS

Chawama Self-Help Housing Project
Kafue, Zambia

HOUSING GROUP ________________

NAME: The name of this group shall be: ____________________________

PURPOSE: This group is formed to further the development of Zambia, to put the Philosophy of Humanism into tangible practice by helping ourselves to build modern houses.

MEMBERSHIP: Only those persons being granted a lease to a plot in the Chawama Self-Help Housing Project by the Kafue Township Council, and signing the Work Exchange Agreement for said group are eligible for membership. The group shall be dissolved and membership cease when the terms of the Work Exchange Agreement are fulfilled.

OFFICERS & DUTIES: The officers shall be Chairman, Vice Chairman, Secretary, Treasurer, Work Coordinator, and Timekeeper.

The duties of the first four named shall be those customarily performed by said officers. The duty of the Work Coordinator shall be to provide liaison with the technical staff to see that work crews are formed and function for the mutual advantage of the group.

It shall be the duty of the Timekeeper to keep written records of the time each member family puts in on the project. A weekly report is to be made to the group.

ELECTIONS: Officers shall be elected by secret ballot at the first called meeting after action by the Project Management Team on applications for plots and loans.

Officers may be recalled by action of 2/3 of the group membership present at any scheduled or called meeting.

MEETINGS: The group shall determine a regular time each month for scheduled meetings. Called meetings shall be whenever the Chairman deems it essential and verbal notice has been given to the membership.

At the request of five members of the group the Chairman must call a meeting.

BY-LAWS: By laws to this Constitution may be made by concensus of the group and minuted by the Secretary. Where concensus cannot be reached and time is of the essence, by-laws may be adopted by motion duly seconded and carried by the majority of those present at any scheduled or called meeting.

AMENDMENTS: Amendments may be made in the same manner as By-laws.

B Y L A W S

TIME OF SCHEDULED MEETINGS:

QUORUM:

WORK EXCHANGE AGREEMENT FORM

Chawama Self-Help Housing Project
Kafue, Zambia

IN ORDER to fulfill the purposes stated in the Constitution of Housing Group __________ of the Chawama Self-Help Housing Project:

IT IS MUTUALLY AGREED THAT each family engaged in the Construction of a house will contribute a total of 1000 man-hours to the group for the construction of a house for each member family.

IT IS MUTUALLY AGREED THAT should unforeseen difficulties arise my family will contribute such additional hours of labour as are required to meet the average number of hours per family necessary to meet the purpose of this agreement.

IT IS MUTUALLY AGREED THAT a man-hour is the work of one healthy adult working for one hour. One hour of work by a mature woman shall be deemed one man-hour. The work done by children between the ages of __________ to _________ shall be credited at _______, the rate of adults. The work of younger children, while encouraged, shall not be counted in the fulfillment of this agreement. The work of the handicapped and aged shall be credited at a rate mutually determined by the group in each instance, and noted in the by-laws.

IT IS MUTUALLY AGREED THAT only work done under the direction of and supervised by the Technical Staff shall be counted toward the fulfillment of the agreement.

IT IS MUTUALLY AGREED THAT hours worked will be reported to the group Time-keeper at least once each calendar week (Sunday a.m. through Saturday p.m.). Only those hours so reported shall be counted toward fulfillment of this agreement. It is understood to be the responsibility of each worker to report his time to the Time-keeper and that the Time-keeper may ask for proof of work performed.

IT IS MUTUALLY AGREED THAT each family will attempt to keep the hours worked each week in line with the average number of hours worked by other member families.

IT IS MUTUALLY AGREED THAT no family shall move into its new house until the conditions of this agreement are met to the satisfaction of the group and permission has been given by the group.

IT IS MUTUALLY AGREED THAT only the voluntary labour by members of the family shall be counted in the fulfillment of this agreement and that no hired labour, whether to work for the group or on one's own house shall be counted toward the fulfillment of this agreement.

IT IS MUTUALLY AGREED THAT there shall be no premium placed on any skill exercised in the fulfillment of this agreement, and that one man-hour is one man-hour, regardless of the duties performed.

(over)

IT IS MUTUALLY AGREED THAT any controversy between a worker and the Time-keeper or a worker and the technical staff or another worker shall be brought before a meeting of the group and that the decision of the group shall be final and binding.

IT IS MUTUALLY AGREED THAT should the work pledged by this Agreement not be performed during the time and under the conditions agreed upon, that we the undersigned will pay to the group the sum of ____________ for each hour owed to the group. These funds may be used by the group for such purposes as benefit the group as a whole.

AS TESTAMENT to this Agreement, we the MEMBERS OF GROUP _______ set our hands.

HUSBAND	WIFE	PLOT NO.
1. ____________________		
2. ____________________	____________________	
3. ____________________	____________________	________
4. ____________________	____________________	________
5. ____________________	____________________	________
6. ____________________	____________________	________
7. ____________________	____________________	________
8. ____________________	____________________	________

REPUBLIC OF ZAMBIA

LAND RECORD CARD

................................LOCAL AUTHORITY

...........................RESETTLEMENT AREA

HOLDING No...................

AREA OF HOLDING.................................
(SQ. FT.)

10r—R798 2-67 T

CONDITIONS OF OWNERSHIP

Memorandum of oral agreement entered into between the

Local Authority of...

and ....

this........................day of .... 19.....

1. The owner paying the rent and observing the covenants hereinafter contained shall be entitled to occupy the within holding for a minimum period of TEN YEARS commencing on .... as monthly tenant pursuant to the said oral agreement.
2. The rent shall be the sum of .... payable monthly in advance on the first day of every month and may be revised from time to time by the local authority upon giving notice to the owner.
3. All rent and other charges (including rates and loan charges) must be paid within .... days of becoming due whether demanded or not.
4. The owner must not permit the holding to be occupied by anyone except his own family and may not sell, transfer or sublet the holding without the consent of the local authority.
5. An owner wishing to sell or transfer the holding must have paid all outstanding rent and other charges and must have repaid in full the loan from the local authority for roofing materials or the intending purchaser must agree to continue repayment of the loan.
6. The "new owner" shall be the person to whom the ownership has been transferred with the consent of the local authority.
7. No sale or transfer of ownership will take place until the name of the new owner has been endorsed on this card by the Registry Office of the local authority and the card stamped by such authority.
8. No building or building work may be erected or carried out without a written permit from the local authority.
9. When a building permit has been granted the building work permitted must be completed within six months from the date of the permit, or the permit renewed.
10. All buildings must be kept in repair to the satisfaction of the local authority, and, if necessary, any part that requires re-building must be re-built.
11. If the owner or new owner fails to pay his rent or other charges within the time stated or fails to observe any of these conditions the local authority may re-possess the

(continued on reverse side)

OWNERSHIP	
1 Owner's Name..	
Owner's Signature Nat. Reg. No.	Successor on death .... Relationship ....
Land Record entry	Local Authority Stamp
2 Transferred to	
New Owner's Signature Nat. Reg. No.	Successor on death .... Relationship ....
Land Record entry	Local Authority Stamp
3 Transferred to..	
New Owner's Signature Nat. Reg. No.	Successor on death .... Relationship ....
Land Record entry	Local Authority stamp

NOTE: No entry on this card is valid unless made by the

....Local Authority Stamp

LOANS
Date.............................Made to................................. By .... Amount £.......................... Repayable .... Entered........./........./.......... Recording Officer................. Discharged........./........./......... Recording Officer..
Date............................. Made to................................. By .... Amount £.......................... Repayable .... Entered........./........./.......... Recording Officer................. Discharged........./........./......... Recording Officer..
Date............................. Made to................................. By .... Amount £.......................... Repayable .... Entered........./........./............Recording Officer................. Discharged........./........./......... Recording Officer..
Date.............................Made to................................. By .... Amount £.......................... Repayable .... Entered........./........./............Recording Officer................. Discharged........./........./......... Recording Officer..

NOTE: When a loan is made this card must be retained by the Lender until discharged. The card must be presented to the Local Authority when the loan is made and when discharged for noting in the Land Record.

TIME RECORD SHEET

Showing hours worked each week and the cumulative total

Chawama Self-Help Housing Project
Kafue, Zambia

GROUP ______________

Family Name	Plot Number	Week:		Week:		Week:		Week:	
		This Week	Total	This Week	Total	This Week	Total	This Week	Total

Appendix D

ANALYSIS OF SOILS IN THE KAFUE AREA FOR USE IN THE MANUFACTURE OF SOIL-CEMENT BLOCKS

Prepared by the National Council for Scientific Research
Lusaka, Zambia
January 1970

ANALYSIS OF SOILS IN THE KAFUE AREA FOR USE IN THE MANUFACTURE OF SOIL-CEMENT BLOCKS

Prepared by the National Council for Scientific Research
Lusaka, Zambia

7th January, 1970

INTRODUCTION

This paper describes tests which were carried out to determine the suitability of certain soils, chiefly in the Kafue area, for the manufacture of soil-cement blocks. The work was carried out as a part of a long-term investigation of soil-cement, in the Building Materials Research Programme of the NCSR. The work was conducted at the University of Zambia Civil Engineering Laboratory.

The programme of tests described was also carried out to assist the American Friends Service Committee, who are currently planning a self-help housing scheme at Kafue. The object of the tests was therefore to find the soil best suited to the purposes of that housing scheme.

The site for the Kafue self-help scheme is a shallow valley, bounded on 3 sides by hills, and lying immediately to the east of the Great North Road, about one mile south of the Kafue Township. Two hundred houses are to be built under the supervision of the American Friends Service Committee; plans for the scheme have been drawn up by the Zambia Housing Board, who will also provide the roads and services for the site.

To make substantial savings in the cost of materials, it is proposed to use soil-cement blocks for walling. The blocks would be made on site using a CINVA-ram machine. It was agreed that tests would be carried out at the University to find the suitability of the soil, and the proportions of soil, cement, and water for best results.

The results given in this paper are preliminary only, since lab. tests are not yet complete, and further production tests will be needed. Its purpose is to give preliminary conclusions, to enable work to begin on site.

THE SOILS

The soil on the site is classified elsewhere as a silt, but is in fact a very well-graded soil containing sand, silt, and clay sizes. From samples taken in 3 locations it would be classified as a silty sand. Such a soil contains a little too much fine grained material to be ideal for soil-cement blocks, as it might be expected to require a substantial amount of cement for stabilization.

(over)

For this reason, and because the geographical restrictions of the site limit the amount of soil available there, it was decided to investigate the suitability of a soil obtainable from a borrow-pit near the Kafue river, some 3 miles south of the site. The 2 soils described above are referred to here as soils 1 and 2 respectively.

A further soil, consisting of soil 1 mixed with a sand from the Kafue river in the proportions of one part sand to 2 parts soil was also tested. This soil is referred to as soil 3.

Finally, for purposes of comparison, a soil which was being used as a road base on the School of Engineering site was tested. This soil is referred to as soil 4.

TESTS ON SOILS

For each of the basic soils, a number of tests was performed to obtain a first estimate of the likely cement and water contents required for satisfactory stabilisation.

In these tests the grading, the plasticity, and the compaction properties of the material were determined. The results are given in Table 1. The results were interpreted to choose a likely cement content and water content. Blocks were then manufactured using a CINVA-ram, using one or more cement contents. Mixing was by hand, and the blocks were moulded as near to the optimum water content as could be judged.

TESTS ON BLOCKS

The completed blocks were weighed on moulding, cured wet for 3 days, and then stored up to a total age of 28 days. They were then immersed in water for 24 hrs, after which some were immediately tested for compressive strength, and others were subjected to a durability test.

The compressive strength test was carried out on the laboratory's 10 ton Amsler Universal testing machine, with the blocks standing on end. The results of this test are therefore lower than they would have been had the standard compressive strength test, between bedding faces, been carried out. The difference is probably a factor of 2 or 3. The failure stress is recorded in pounds per square inch, (see Table 2.).

The durability test involved a number of successive cycles of wetting and then drying in an oven, the block being wire-brushed after each cycle to remove any loose material. The total weight loss after the test is recorded as a percentage of the initial dry weight, and is used as a measure of the durability of the block. If the block has been properly stabilised the weight loss should be very small, about 5% or less. As these tests are not at present complete, the stability of the blocks is gauged from the compressive strength test; 100 psi being regarded as the minimum strength for stability. These results together with figures for water absorption are shown in Table 2.

CONCLUSION

The soil on the site itself varies considerably. Soil from location 2 was stabilised in the laboratory with a soil-cement ratio of 14:1. But the ratio should certainly not exceed 12:1 in practice, as blocks made on site with this ratio did not appear to be adequately stabilised; though the major reason for this was that the cement used was an old bag which had been exposed and could not properly be mixed. The use of such cement must be carefully avoided in practice.

Soil from location 3 on the site had much more clay, and would have been uneconomic without the addition of sand. It is likely that the mixture of this soil with sand will stabilise with 16:1, though the blocks made up with this soil have not yet been tested.

If soil from a wide range of different points on the site is to be used, more comprehensive soil tests must be carried out. Without such tests, the soil-cement ratio to be used should not exceed 10:1, and soils with a similar appearance to those tested should only be used.

The soil from the borrow-pit (soil 2) stabilised well at 16:1, and its use would ensure greater uniformity of properties. If it could be obtained free, the cost of transport would probably be offset by savings in digging and cement.

The major factor controlling the quality of the bricks produced is the mixing. Every attempt should be made to obtain a small pan- or paddle-type mixer. Drum mixers are not satisfactory. It is intended to build a prototype of such a mixer at the Engineering laboratory.

The water content is best judged by the feel of the soil, rather than measured; the optimum is reached when the soil will just bind together when squeezed in the hand. The amount of water which should be added depends to a large extent on the water content of the soil at the start.

Finally, it must again be emphasised that the tests so far carried out are not conclusive; they give an indication of likely results, but it is vital that they be supplemented by regular production tests. From each new area where soil is to be used, and at least weekly thereafter, blocks should be set aside for testing. Some samples should be sent to a laboratory for testing. Others may be tested on site, as described below. Inadequate control of the material has had disastrous results in the past, as a result of which some authorities will not provide loans for soil-cement houses. Only by demonstrating that proper control can produce good results will it be possible to make progress in the use of soil-cement in building.

(over)

A Simple Site Durability Test for Soil-Cement Blocks

Make and cure blocks in the normal way, i.e. 3 days wet curing, then store dry.

At an age of 7 days, immerse in water for 48 hours, and then remove.

For blocks which are WELL STABILISED, the surface will remain hard so that the finger-nail cannot penetrate.

For blocks that are POORLY STABILISED, the surface will soften but the block will retain its shape and not disintegrate.

For blocks which are UNSTABILISED, the block will show signs of disintegration.

If blocks are either poorly stabilised or unstabilised, they should not be used externally. The fault may lie either with the mixing, the compaction, or the cement content.

A quick indication of whether compaction is at fault may be got by finding the moulded density of well stabilised blocks, or their moulded weight. Any block whose weight falls more than about 5% below this is likely to be poorly compacted. Well compacted blocks should have a density of at least 120 lb/ft, and may be as high as 130 lb/ft.

Table 1 Results of tests on soils

Soil	Location of Sample	Grading % Sand	Silt	Clay	Plasticity P.L.	L.L.	P.I.	Compaction Opt moisture	Dry Density	Loose Density	Remarks
1.	Loc. 1	50	25	25	16	29	13	12.0	120	83	Loc. 2 gives best soil
	Loc. 2	50	33	17	15	25	10	11.5	121	85	Quality varies substantially.
	Loc. 3	27	44	28	15	24	10	13.5	113	78	
2.	Borrow-pit	55	26	19	12	31	19	13.0	121	86	Properties indicate good for bricks
4.	Lab. Site	53	24	23	15	33	18	14.0	114	74	Clay content too high for economy
3.	Loc. 3 + sand	51	30	19	—	—	—	—	—	—	Similar to soil from Loc. 2

Table 2 — Results of tests on bricks to 22/12/69

Soil	Sample	Soil/Cement	Moulded density (lb/ft^3)	Water abs.(%)	Crushing strength (psi)	Stabilised	Remarks
1. Soil from Kafue site (Location 2)	13/10/1-5	12:1	___	___	220	YES	
	14/10/1-2	12:1	130	11.5	300	YES	
	14/10/3-4	14:1	127	12.8	750	YES	
	20/10/1	12:1	N.R.	17.5	40	NO	Made on site: cement exposed
2 Soil from borrow pit near Kafue river	7/11/1-2	12:1	130	7.4	270	YES	
	14/11/2-4	16:1	123	8.8	220	YES	
3 2/3 x soil 1 + 1/3 x river sand		NOT YET TESTED					
4 Soil from Lab. site	18/10/1-2	12:1	129	___	345	YES	

Appendix F

TEXT OF PAMPHLET USED TO RECRUIT PROJECT PARTICIPANTS

"DO YOU WANT A MODERN HOUSE?"
Facts about the Chawama Self-Help Housing Project
of the Kafue Township Council

Prepared by Robert Abner Manda,
Student, Department of Social Service, University of Zambia,
who did field work with AFSC in Kafue, May 1970

What Is A Modern House?

A modern house is constructed of durable materials so that it will not have to be repaired after every rainy season. A modern house is fireproof so that the owner is safe from the destructions of fire. A modern house is dry and warm so that the owner is protected from the rain and cold. A modern house is well ventilated so that the occupants can be cool during the hot weather and the risks of respiratory diseases are lessened. A modern house is served with water, sewerage, electricity, and other conveniences of contemporary society.

What Type Of House Do You Have?

Are the walls built of flattened tins, or cardboard, or pole and dagga? Is the roof made of flattened tins or cardboard? Does your house keep you dry during the rainy season, warm in the cold season, and cool during the hot weather?

Do you have water at your house? Do you have a sanitary means of disposing of human waste? Is your rubbish removed from the vicinity of your house? Is there a good road to your house? Are you proud of where you are living?

Your Council Will Help You

If you would like to have a modern house, the Kafue Township Council will help you. With the assistance of the Government of the Republic of Zambia in providing the capital improvements such as roads, water and sewerage, and the American Friends Service Committee providing social and technical assistance, the Council is making the Chawama Self-help Site and Service Project available to 228 families who want a modern house.

The Chawama Self-help Housing Project

In the Chawama Self-help Project other families like yours are organized into groups of about twenty families to share the labour of building their own houses. Through this group action the families put into practice the nation's ideology: Humanism.

Families share labour as they work in groups, making the construction work run faster. Group work makes it possible to share the provided equipment more reasonably than if the families worked individually. What more -- brick making machines, picks, shovels, sieves, wheelbarrows and other tools are used freely by the groups.

Working Together

By working in groups the teaching of building skills and the technical supervision to prevent errors in construction can be done more efficiently. To the participant's advantage, the group is helped to beat the problem of high costs in purchasing and transporting building materials. These materials are purchased by the Council in bulk and sold to the participants at low cost from the project store.

Before construction begins the family groups have a series of meetings under the guidance of the community development staff. The various topics pertaining to home ownership and building are discussed at these meetings. The groups decide how they will govern themselves and work out solutions to the problems they will face during construction. It is through these meetings that the family can make up its mind about participation in the project. It is during the group meetings that member families get to know one another.

Choose Your Plot

When the families are sure they want to be part of the Chawama Self-help Site and Service Project, they make application to the Kafue Township Council for a plot. The plots are of two types.

The Basic Plots share a water tap with one to three other plots, and are provided with the concrete for making a sanitary pit latrine. No deposit is required for Basic Plots. The monthly service charge is K 0.82, which includes payment for 3,000 gallons of water.

The Standard Plot is provided with a street in front, water is piped to the plot, there is a sewerage connection on the plot, the home builder will be provided with the fixtures for an inside toilet and shower. When applying for a Standard Plot a deposit of K 20 must be made. The monthly service charge for a Standard Plot is K 2.12, which pays for 4,000 gallons of water.

What It Will Cost

The tenure on both types of plots is the same. The renewable lease is for a period of ten years. With the permission of the Council the leaseholder may sell, transfer or sublet his house. Permission must also be secured from the Council before alterations are made to the house.

All plots are served by a road, dust bin collection, police and fire protection, and usual care by the Council. All plots are 40 feet wide and 90 feet deep.

In addition to the plots the Council will grant to each participant family a loan of K 144 worth of materials. This loan bears 5% interest per year, and is repayable in 48 monthly installments of K 3.38 each. Therefore the total monthly cost on the Basic Plots is K 4.20, and on the Standard Plots it is K 5.50, until the loans are repaid.

What Is More ---

Building a modern house in Chawama will give you certain additional services. As you will be living in a legal settlement you will receive the advantages that the Council and Government provide.

There are plans for a school, a clinic, bus stop, shops and markets at Chawama.

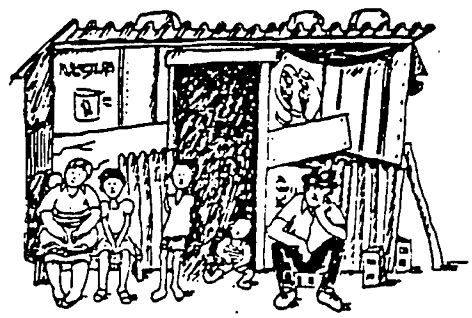
Act Now!

If you like the idea of building a modern house in Chawama you should contact the staff at the Chawama site office. The staff will invite you to a group meeting so that you will have an opportunity to learn more about the project and to meet other participants.

Act now. It is easy to participate. BUILD A MODERN HOME NOW AND HELP DEVELOP YOURSELF, YOUR COMMUNITY, AND YOUR NATION.

FAMILY MOLEFI'S HOUSING PROBLEMS AND HOW THEY WERE SOLVED

Prepared with the Assistance of the
Foundation for Cooperative Housing



THIS IS THE STORY OF MR. MOLEFI WHO LIVED WITH HIS FAMILY IN OLD NALEDI ON HIS BROTHERS SMALL PLOT AND HOW HE MANAGED TO GET A PROPER HOUSE FOR HIMSELF...

PRODUCED BY SHHA SELF HELP HOUSING AGENCY
ILLUSTRATED BY PETRA RÖHR-ROUENDAAL

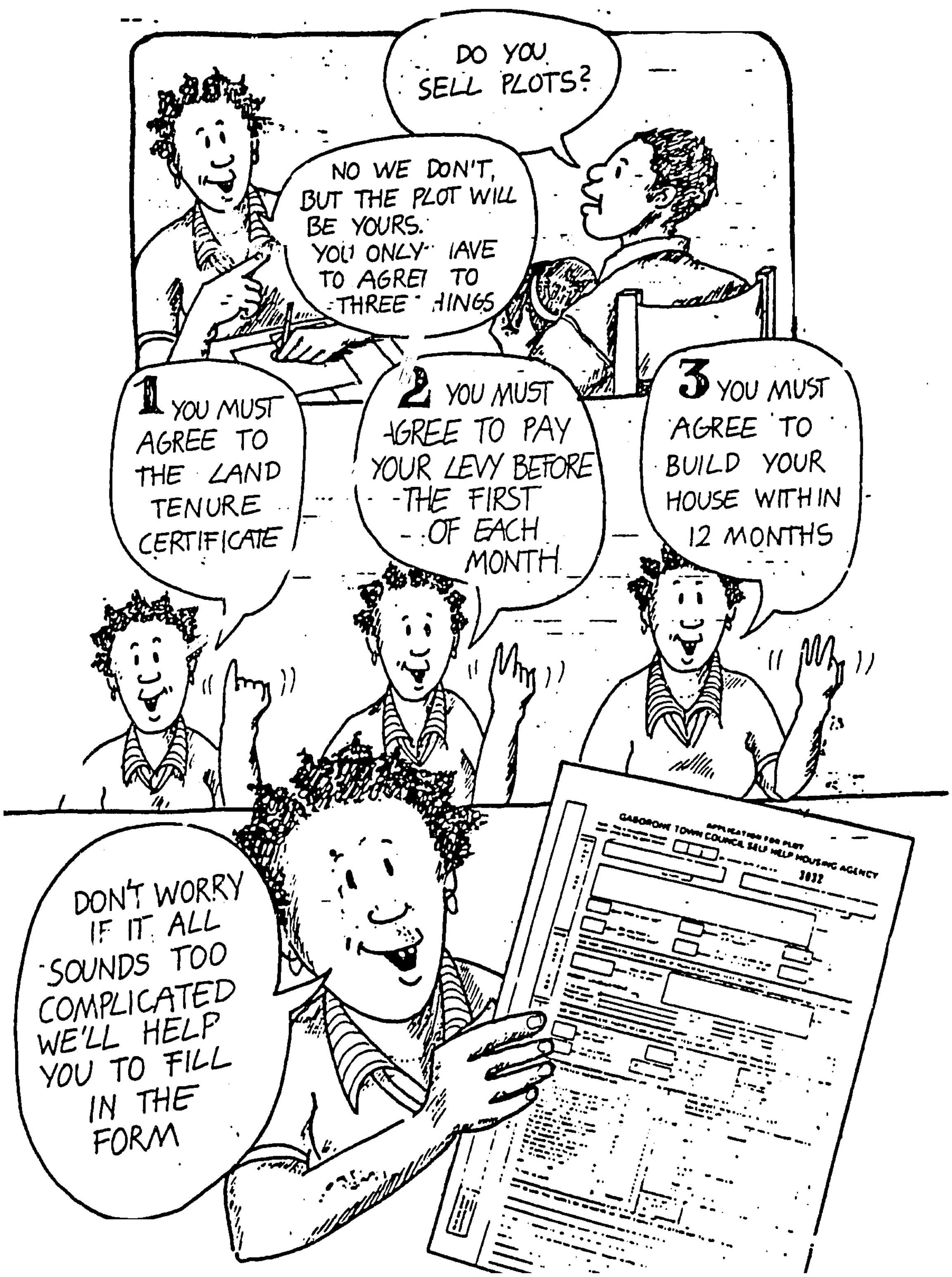
SAMPLE COPIES AVAILABLE IN USA FROM
FOUNDATION FOR COOPERATIVE HOUSING
2101 'L' STREET, N.W., WASHINGTON, D.C. 20037 U.SA

BUKA ENA E KWADILWE LE KA SEKGOWA
GABORONE, DECEMBER 1978


THE RAIN CAME IN AGAIN LAST NIGHT
THE BABY IS GETTING SICK BECAUSE OF THE HOUSE
YES, WE NEED TO BUILD A PROPER HOUSE
WE CAN'T BUILD HERE, YOUR BROTHER'S PLOT IS TOO SMALL
I WILL ASK MY BROTHER WHAT TO DO


LOOK BROTHER WE HAVE A PROBLEM. WE LIKE OLD NALEDI BUT HAVE NO PLOT AND YOUR PLOT IS TOO SMALL FOR ALL OF US..
YES, EVEN MY HOUSE IS TOO-SMALL FOR MY FAMILY, THAT'S WHY I'M BUILDING ON. I APPLIED FOR A LOAN FROM SHHA THERE ARE NO MORE PLOTS HERE IN OLD NALEDI, BUT SHHA HAS GOT PLOTS IN BROAD-HURST. YOU SHOULD ASK FOR ONE
I KNOW WHAT SHHA MEANS. SHHA MEANS SELF HELP HOUSING AGENCY
COME ON, LET'S GO NOW. THERE IS A WARD OFFICE IN BROADHURST, ONE IN EXTENSION 14, BUT WE CAN GO TO THE ONE HERE IN OLD NALEDI
IS SHHA PART OF THE GABORONE TOWN COUNCIL?
YES, BUT YOU MUST FILL IN AN APPLICATION FORM AT THE WARD OFFICE
HERE WE ARE. THIS IS THE WARD OFFICE


HELLO, I'M IN CHARGE OF THIS WARD OFFICE
I WOULD LIKE A PLOT IN BROADHURST
YES, YOU CAN APPLY. PLEASE BRING TWO PHOTOGRAPHS AND SOME IDENTIFICATION. PLEASE COME IN
BEFORE YOU APPLY LET ME TELL YOU THAT YOU MUST BE A CITIZEN OF BOTSWANA, YOU MUST BE OVER 21 YEARS OLD, A RESIDENT OF GABORONE, THAT MEANS YOU MUST HAVE LIVED HERE OVER SIX MONTHS. YOU CAN ONLY APPLY IF YOU HAVE NO OTHER HOUSE IN AN URBAN AREA AND HAVE NO ADEQUATE HOUSING
YES, I UNDERSTAND ALL THAT


DO YOU SELL PLOTS?
NO WE DON'T, BUT THE PLOT WILL BE YOURS. YOU ONLY HAVE TO AGREE TO THREE THINGS
1 YOU MUST AGREE TO THE LAND TENURE CERTIFICATE
2 YOU MUST AGREE TO PAY YOUR LEVY BEFORE THE FIRST OF EACH MONTH
3 YOU MUST AGREE TO BUILD YOUR HOUSE WITHIN 12 MONTHS
GABORONE TOWN COUNCIL SELF HELP HOUSING AGENCY
DON'T WORRY IF IT ALL SOUNDS TOO COMPLICATED WE'LL HELP YOU TO FILL IN THE FORM

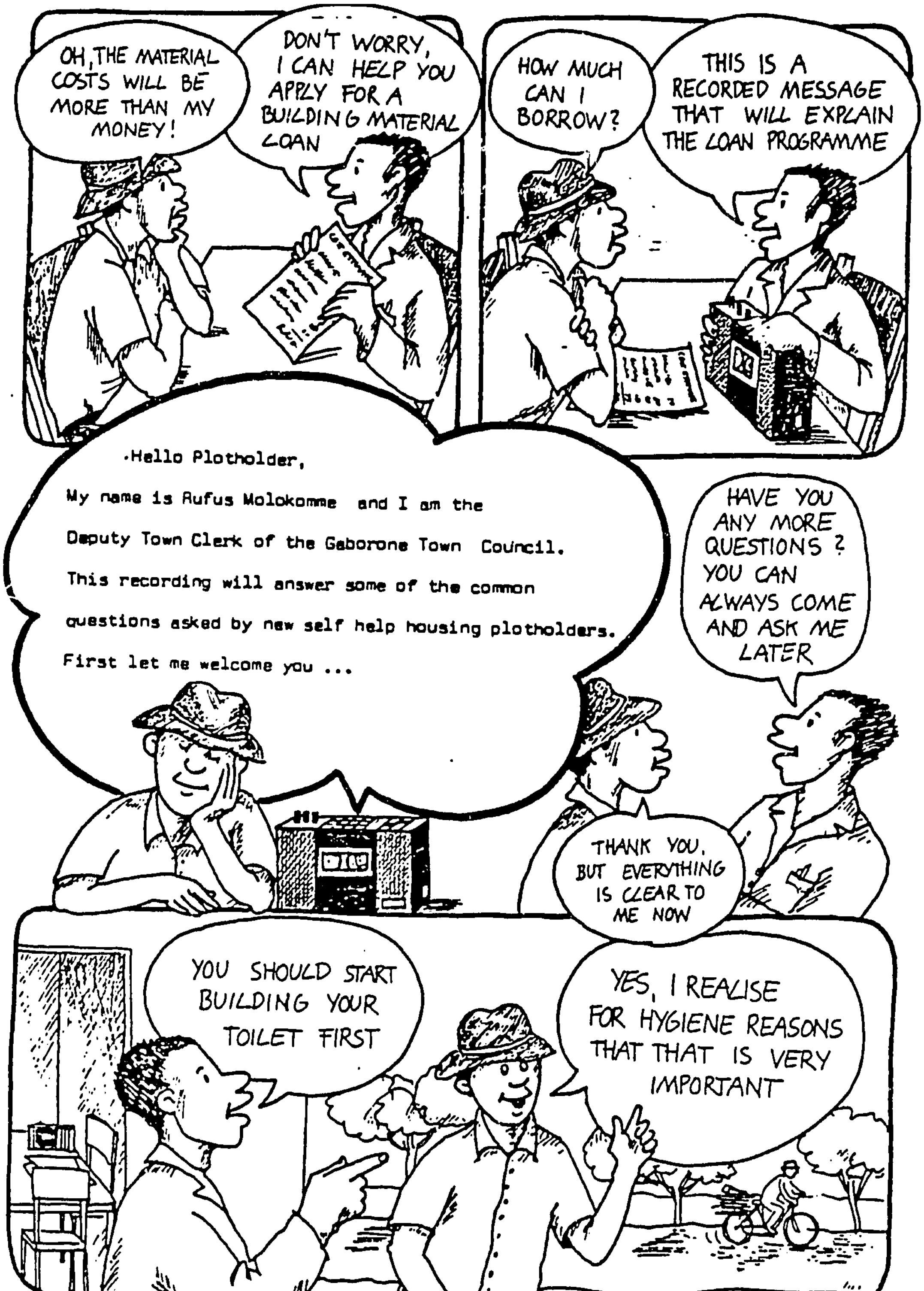

WHAT HAPPENED?
I FILLED IN THE FORMS AND THEY SENT THEM TO AN ALLOCATION COMMITTEE FOR INVESTIGATION AND APPROVAL ...
A FEW DAYS LATER AT THE COUNCIL CHAMBER
WE INVESTIGATED MR. MOLEFI'S APPLICATION AND HE QUALIFIES FOR A PLOT
HE WILL BE HAPPY, BUT ARE YOU SURE HE UNDERSTANDS THAT HE HAS TO PAY THE LEVY BEFORE THE FIRST OF EACH MONTH?
YES, HE KNOWS AND HE IS EAGER TO BUILD
OK, WE APPROVE YOU MAY ALLOCATE HIM A PLOT AFTER HE SIGNS THE CERTIFICATE OF RIGHT

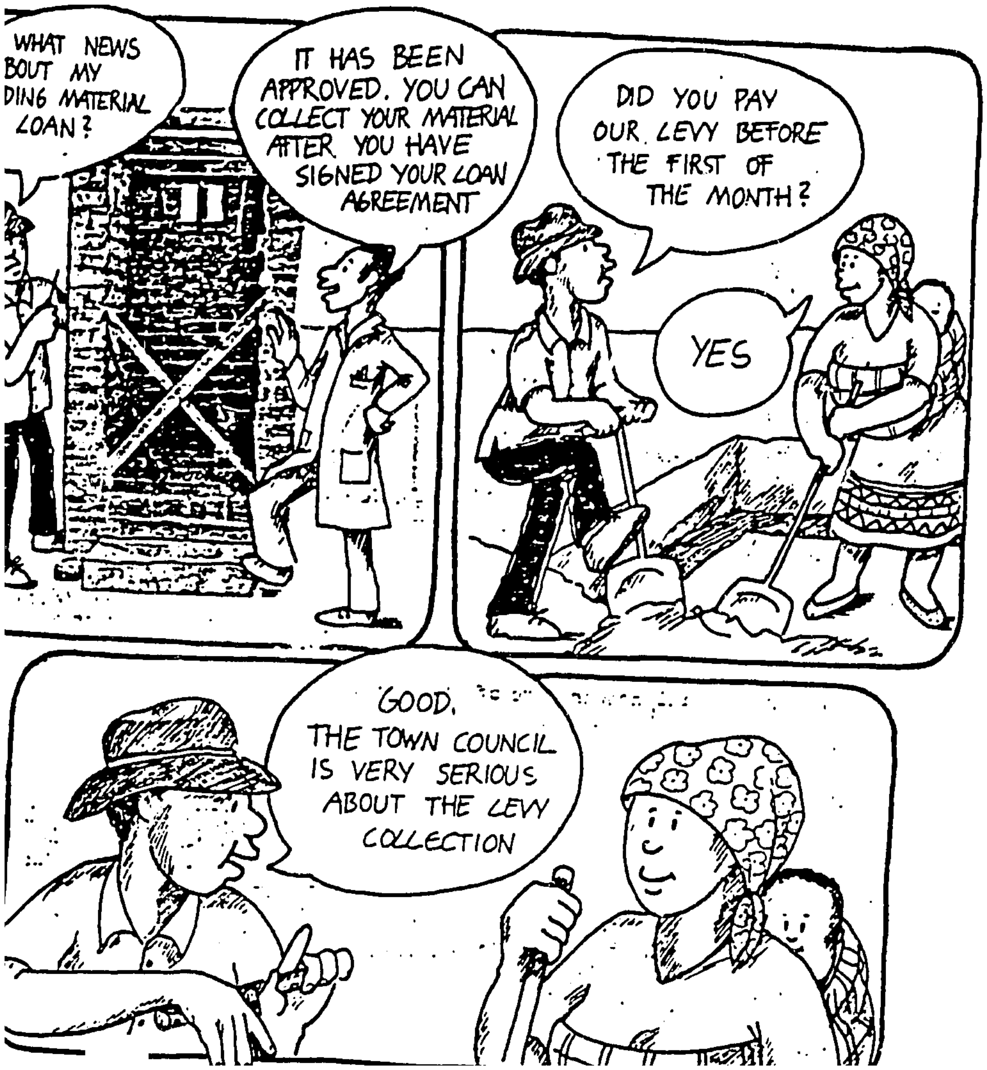

GREAT! THE LETTER SAYS THAT THE PLOT IS MINE
NOW I HAVE TO GO TO THE BROADHURST WARD OFFICE TO SIGN THE PAPERS
WHERE IS THE BROADHURST WARD OFFICE?
IT IS THERE
HELLO, I'M THE WARD OFFICER HERE, MAY I HELP YOU?
YES PLEASE; I CAME ABOUT MY PLOT


FINE, BUT FIRST I WILL SHOW YOU THE WARD OFFICE. THIS IS WHERE YOU PAY YOUR LEVY
WHAT DOES THE LEVY PAY FOR?
YOU JUST LOOK AT THESE PHOTOGRAPHS AND YOU'LL SEE!

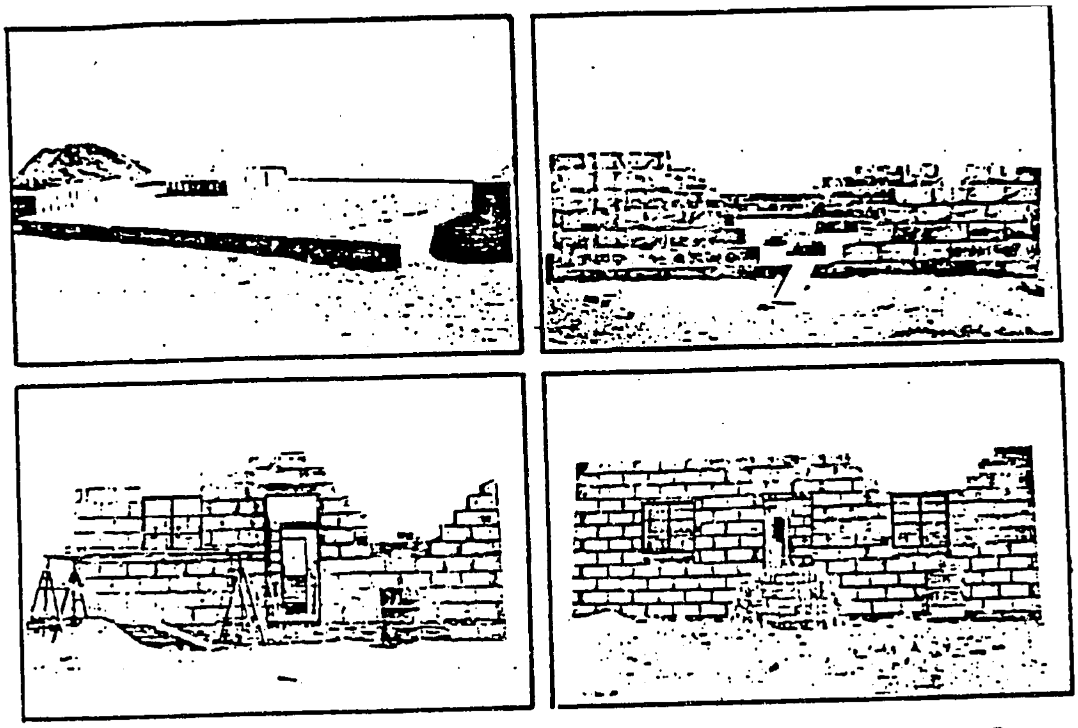

SELF HELP HOUSING AGENCY
WE ALSO HAVE BUILDING MATERIALS AND CAN HELP YOU WITH THE TRANSPORT
THIS IS THE ASSISTANT WORKS FOREMAN .HE WILL SHOW YOU YOUR PLOT AND SHOW YOU HOW TO BUILD
YOU CAN NOT HAVE YOUR PLOT UNTIL YOU AGREE TO AND SIGN THIS CERTIFICATE OF RIGHT


HERE ARE YOUR PLOT BOUNDARIES AND HERE IS THE FOUNDATION FOR YOUR TOILET
MAY I START BUILDING NOW?
AFTER WE APPROVE YOUR BUILDING PLANS. MEET ME AT THE OFFICE TOMORROW AND I'LL HELP YOU WITH YOUR PLANS
I'VE SEEN OUR PLOT!
LET'S MOVE TO THE PLOT, WE CAN BE CLOSE TO WORK ON THE HOUSE
THE NEXT DAY
I WANT TO BUILD A TWO ROOMED HOUSE
I WILL HELP YOU TO LIST THE MATERIALS AND DO A COST ESTIMATE

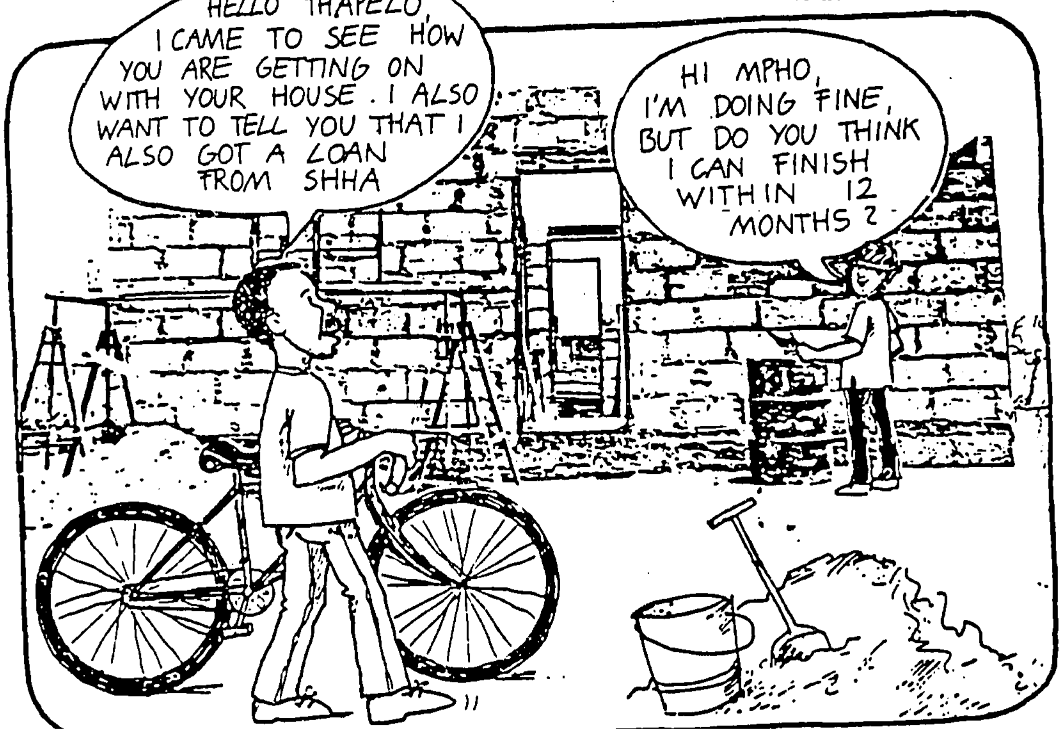

OH, THE MATERIAL COSTS WILL BE MORE THAN MY MONEY!
DON'T WORRY, I CAN HELP YOU APPLY FOR A BUILDING MATERIAL LOAN
HOW MUCH CAN I BORROW?
THIS IS A RECORDED MESSAGE THAT WILL EXPLAIN THE LOAN PROGRAMME
·Hello Plotholder, My name is Rufus Molokomme and I am the Deputy Town Clerk of the Gaborone Town Council. This recording will answer some of the common questions asked by new self help housing plotholders. First let me welcome you ...
HAVE YOU ANY MORE QUESTIONS ? YOU CAN ALWAYS COME AND ASK ME LATER
THANK YOU, BUT EVERYTHING IS CLEAR TO ME NOW
YOU SHOULD START BUILDING YOUR TOILET FIRST
YES, I REALISE FOR HYGIENE REASONS THAT THAT IS VERY IMPORTANT

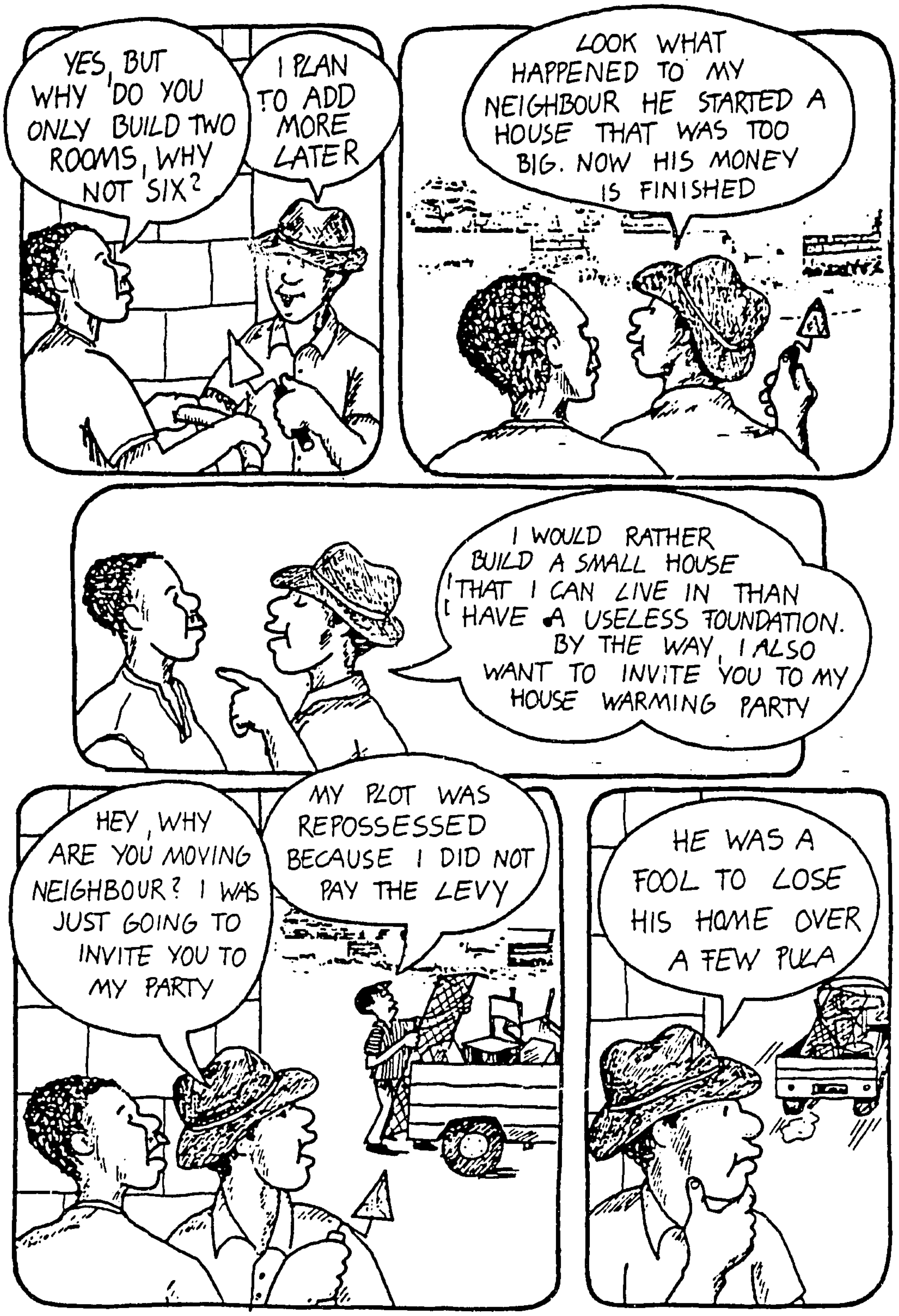


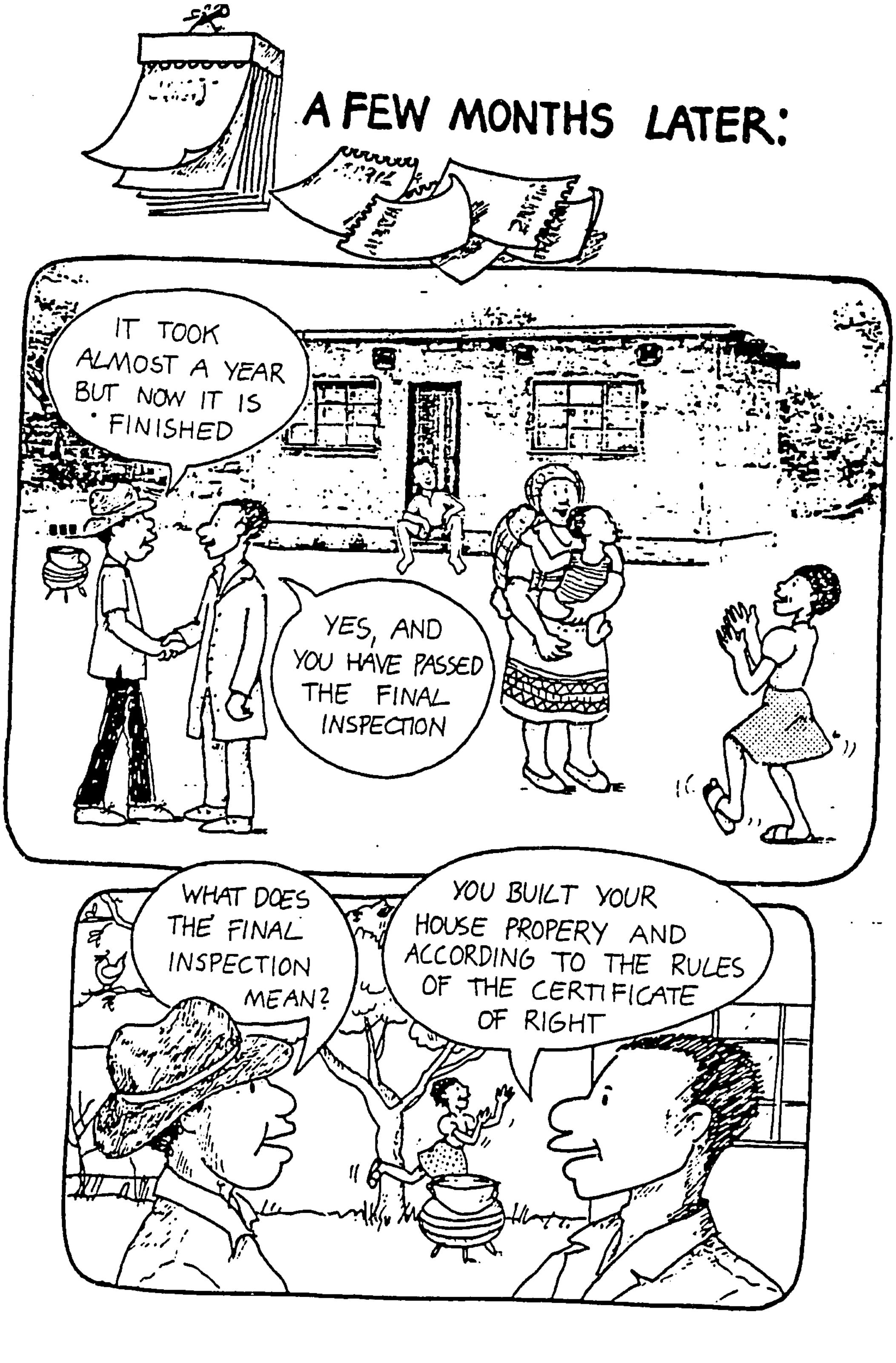
AND SO MR. MOLEFI PAYS HIS LEVY EVERY MONTH AND WITH HIS WIFE HE SPENDS EVERY SPARE MINUTE BUILDING THE HOUSE



A FEW MONTHS LATER




YES, BUT WHY DO YOU ONLY BUILD TWO ROOMS, WHY NOT SIX?
I PLAN TO ADD MORE LATER
LOOK WHAT HAPPENED TO MY NEIGHBOUR HE STARTED A HOUSE THAT WAS TOO BIG. NOW HIS MONEY IS FINISHED
I WOULD RATHER BUILD A SMALL HOUSE THAT I CAN LIVE IN THAN HAVE A USELESS FOUNDATION. BY THE WAY, I ALSO WANT TO INVITE YOU TO MY HOUSE WARMING PARTY
HEY, WHY ARE YOU MOVING NEIGHBOUR? I WAS JUST GOING TO INVITE YOU TO MY PARTY
MY PLOT WAS REPOSSESSED BECAUSE I DID NOT PAY THE LEVY
HE WAS A FOOL TO LOSE HIS HOME OVER A FEW PULA


A FEW MONTHS LATER:
IT TOOK ALMOST A YEAR BUT NOW IT IS FINISHED
YES, AND YOU HAVE PASSED THE FINAL INSPECTION
WHAT DOES THE FINAL INSPECTION MEAN?
YOU BUILT YOUR HOUSE PROPERY AND ACCORDING TO THE RULES OF THE CERTIFICATE OF RIGHT


THE
END

GABORONE TOWN COUNCIL

SHHA

Self Help Housing Agency

Office of Housing for International Development

SHELTER TRAINING WORKSHOP

November 5-30, 1979

FINANCIAL PLAN PREPARATION

Monday, November 19, 1979

2:00-5:00 p.m. Code 39.P

Presented by:

Edward H. Robbins

CONTENTS

I

INTRODUCTION

A. DEFINITION AND PURPOSE OF A FINANCIAL PLAN

A financial plan for a housing development is an organized collection of projections in the form of records that provides a correlation of projected construction work, costs, and cash flow with financing over time. The composition and format of the various categories of construction work, disbursements, receipts, and financing should parallel the composition and format of the project monitoring and tracking system.

The financial plan provides the benchmarks to which the project monitoring and tracking reports can be compared--i.e., budgeted vs. actual.

B. INFORMATION BASE REQUIREMENTS

Four distinct data bases are required to develop project costs and cash flows cumulatively and at specific intervals in time: construction schedule, cost element estimates, sales plan, and financing schedule. Each data base is described in this section. These four categories comprise the information base around which the financial plan is organized.

C. FORMAT AND ORGANIZATION

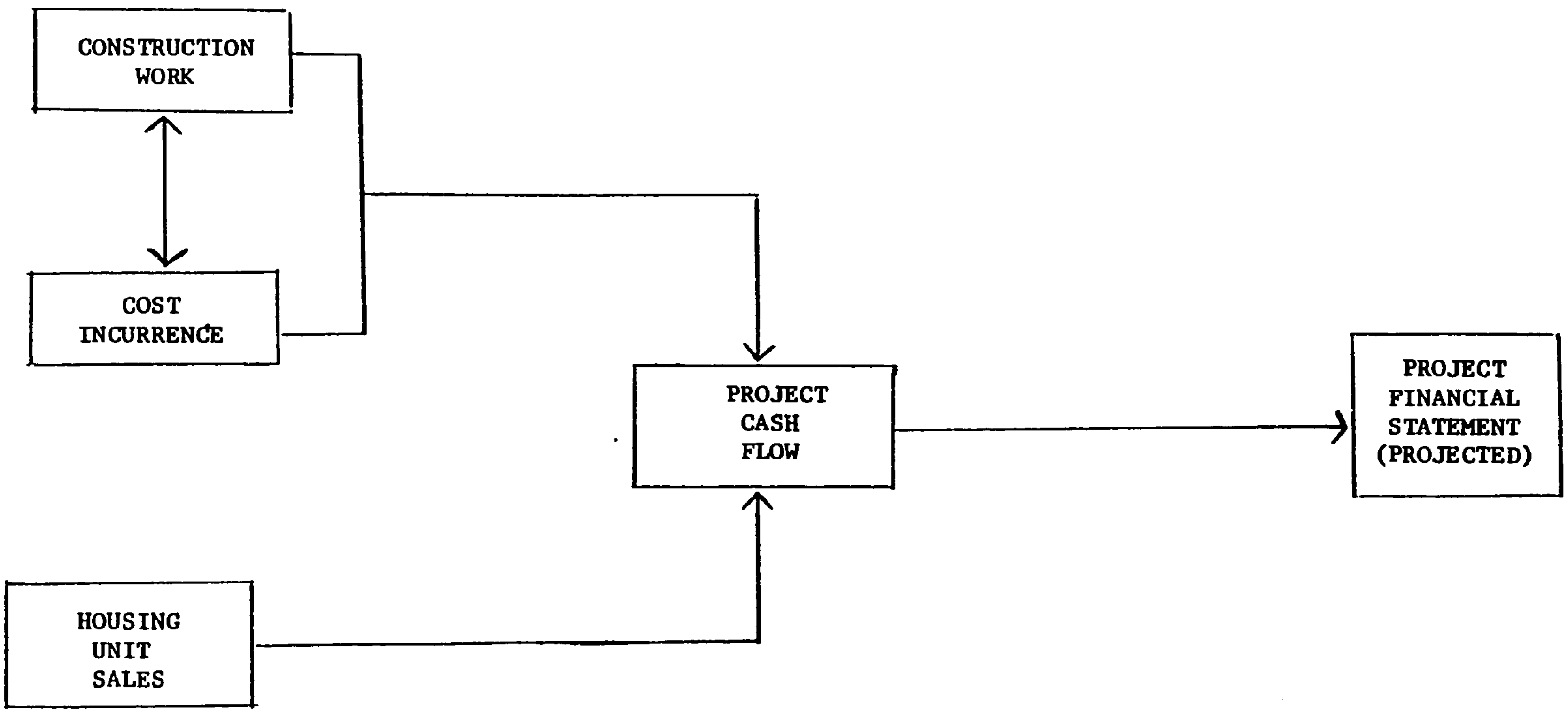
The financial plan presented in this report is a standardized planning package that includes the key pieces of information required by the developer not only to plan a housing project but to manage its construction and operation. The financial plan's composition consists of the following:

1. Construction Work
2. Financial Management Organization Charts
3. Cost Incurrence
4. Housing Unit Sales
5. Project Cash Flow
6. Project Financial Statement

This report presents the general composition and format of a housing development financial plan--i.e., the plan for a one-sponsor, one-product housing unit development in which all financing is between the developer and the investor. This plan's composition and format would vary somewhat with different housing, construction, and financing schemes.

Given the variety of conditions, while the overall financial planning composition and format will apply to most

EXHIBIT I: COMPONENTS OF A HOUSING DEVELOPMENT FINANCIAL PLAN AND THEIR RELATIONSHIPS



FINANCIAL MANAGEMENT ORGANIZATION CHARTS projects, the actual components and categories to be integrated into the overall framework will have to be developed individually for each project to properly reflect its specifics.

D. ORGANIZATION AND OBJECTIVES OF PRESENTATION

The core of this report, Section II, presents the generic financial plan reports that should be assembled as early as possible in the preparation of a housing development plan. Section III examines the steps required to analyze the feasibility of partially assembling a housing development financial plan on the computer.

II

FINANCIAL PLAN FRAMEWORK AND METHODOLOGY

This section presents and analyzes the pro forma exhibits that are the technical core of the housing financial plan.

A. CONSTRUCTION WORK

The Construction Work Plan specifies the timing and duration of each construction work task. It graphically indicates the length of time required to complete each task and the sequence of tasks (i.e., to obtain the correct phasing of work).

This form is used to develop the proper timing of tasks as well as to specify a reasonable time frame for each task. Overlaying this construction plan is the financing information in order to assure that construction is not delayed by cash flow problems, and if this type of delay does occur, what financial institution should be consulted.

EXHIBIT II: PRO FORMA CONSTRUCTION WORK PLAN AND FINANCING AVAILABILITY SCHEDULE

WORK #	Description of Land Development, House Construction or Public Facility Development Task	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.
1	e.g., 1. Land Develop. Claring/Grubbing													
2	Design/Permits													
3	2. House Constr. - Concrete Footings													
4	- Frame Installation													
5	- Dry Wall													
6	- Roofing													
7	Etc.													
8														
9														
10														
11														
12														

	1	2	3	4	5	6	7	8	9	10	11	TOTAL
1 - Financing (8)												
Source												
2 - Financing												
Source												

KEY:

________: General, Overall Tasks

[ ]: Components of General, Overall Tasks

B. FINANCIAL MANAGEMENT ORGANIZATION CHARTS

The Construction Work Plan should be supplemented by an organization chart specifying the relationships of the various interests (and groups within the participating organizations) involved.

Below each organization chart should be a detailed listing of the responsibilities of each interest. Supplementing this listing should be a project procedures manual for each organization, company, or government agency involved in the housing development.

C. COST INCURRENCE

A detailed cost estimation exercise should be performed for three levels of detail:

- Entire housing development
- Per housing units
- Per square meter of house constructed

Exhibit 3 contains the composition and format of such a cost estimation effort. A cost line item should be developed for each specific component of the housing development project work. A partial listing of such components is presented below as an attempt to better define housing project costs:

EXHIBIT III: COST INCURRENCE PLAN-PRO FORMA SCHEMATIC

COST CATEGORY	SIZE OR AMOUNT REQUIRED	UNIT PARAMETERS			ESTIMATED PURCHASE DATE		ESTIMATED COST (INSTALLED)		FINANCING		TOTAL COST	CONTRACTOR RESPONSIBLE	
		COSTS/ UNIT	UNITS PER HOUSE OR APT.	UNITS PER SQUARE METER	LABOR	MATERIALS	LABOR	MATERIALS	AMOUNT	COST		MATERIALS	LABOR (INST.)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
					TOTAL:								

Land and Site Preparation

- -Clearing and grubbing
- -Rough grading
- -Soil compaction and field supervision
- -Backfilling
- -Landscaping
- -Sod and hydroseed

On/Off Site Infrastructure

- -Sewer (underground facilities
- -Water
- -Storm drain
- -Underdrain
- -Roads, walks, paving
- -Area connection charges: sewer
- -Area connection charges: water
- -Gas and electric underground service
- -Right-of-way acquisition

On-plot Housing and Community Development Costs

- -Architecture
- -Prints
- -Soil poisoning
- -Concrete slab
- -Concrete patios
- -Concrete areaways
- -Masonry: labor, materials
- -Waterproofing
- -Wrought iron rails
- -Rough lumber
- -Lumber: exterior trim
- -Weatherstripping
- -Carpentry
- -Roofing
- -Doors and shutters: exterior
- -Windows
- -Screens
- -Basement windows
- -Drywall
- -Carpet
- -Parquet flooring
- -Ceramic tile
- -Toilet accessories (medicine cabinet, etc.)
- -Shades
- -Disposals
- -Stoves
- -Dishwashers
- -Heating and air conditioning
- -Labor
- -Equipment rental
- -Maintenance
- -Discounts earned
- -Engineering
- -Building permits
- -Concrete footings
- -Concrete stoops and front porches
- -Drain tile, sump pump, pit
- -Stucco
- -Metals
- -Wrought iron porches (standard only)
- -Lumber: interior trim
- -Stairs
- -Labor
- -Insulation
- -Doors: interior
- -Trusses
- -Nails
- -Basement vents
- -Kitchen floors
- -Resilient tile (other than kitchen)
- -Paint
- -Vanities
- -Hardware
- -Kitchen cabinets
- -Refrigerators
- -Washers and dryers
- -Plumbing
- -Electrical (including fixtures)
- -Cleaning
- -Small tools
- -Miscellaneous materials

Sales and Promotion Costs

-Advertising
-Advertising refunds
-Furniture
-Sales sundries
-Cleaning sample houses
-Sales salaries
-Sales commissions
-Insurance for models
-Interest on construction of models

Mortgage Processing and Closing Costs (Paid by (Developer)

Land Purchase and Finance Costs

Housing/Community Facility Construction Finance Costs

Developer's/Project Monitor's General and Administrative Costs

-Rent
-Fee
-Management insurance
-Office salaries

Developer's Direct Project and Overhead Costs

-Auto expense
-Insurance: builder's risk
-Insurance: workman's compensation
-Insurance: fire and theft on office
-Office expense
-Telephone and telegraph
-Temporary gas and electricity
-Superintendent
-Job Trailers
-Credits to overhead
-Gas, electricity, heat
-Insurance: liability
-Insurance: performance bonds
-Insurance: position bond
-Miscellaneous expense
-Postage expense
-Water
-General conditions
-Legal and accounting
-Depreciation
-Taxes and licenses
-Travel expenses

Each of the major cost categories should be documented in the composition and format outlined in Exhibit 3. For each cost category should be an estimate of the size and amount required so that the planner can be sure that various items are being consumed in the right proportion for the size of the housing development. Another check for this concern is columns 4 and 5, where the labor and material units consumed per house or apartment and per square meter would be determined.

Column 3 is intended to enable the planner to be sure that the developer is getting economical prices for the work being performed given the local economy. This price is partially dependent on columns 6 and 7: estimated purchase date for labor and materials. With prices for labor and building materials increasing at a fast pace, the estimated date of purchase is significant in terms of estimated unit costs.

Columns 10 and 11 provide financing information for each cost category. If a particular cost is being financed, the planner can make sure that the interest rate (financing costs) on the loan is not excessive.

The sum of columns 8 through 11 provides the total cost for each cost item. All items related to cost incurrence (i.e., columns 8 through 12) should be totaled (see foot of Exhibit 3), thereby providing the planner with total project cost data.

Columns 13 and 14 indicate the contractor responsible for each cost category (labor as well as materials). The planner then will know whom to consult with for explanation in the case of actual cost variances. Each contractor listed should essentially sign off on all of the data on the cost category line in which his name appears.

The cost incurrence form developed in Exhibit 3 not only provides the financial plan with a plethora of cross-tabulated cost data from which total costs for the project can be derived but provides the foundation for tight cost control monitoring throughout the development of the housing project.

D. <u>HOUSING UNIT SALES</u>

The anticipated housing unit sales component of the financial plan (Exhibit 4) is designed to give on one page an anticipated schedule of sales by model and a calculation of the estimated profits accruing to the developer by a particular date from total housing sales as well as sales by housing unit type. Totals are tabulated at the foot of this exhibit.

From this exhibit, the planner is not only able to project the progress of sales but is able to see how sales prices are expected to be affected by the passage of time. He is also able to control the prices of the various models so that demand does not significantly change the relationship of the different model unit prices to one another. Based on what the developer reports, housing models that might be difficult to sell can be identified. In addition, this exhibit permits comparison of profitability between different housing models over time.

EXHIBIT IV: PROJECTED HOUSING UNIT SALES; GAIN OR LOSS TO DEVELOPER - PRO FORMA SCHEMATIC

HOUSING UNIT SALES												IMPACT ON DEVELOPER														
ESTIMATED SALES DATE	# OF UNITS SOLD					UNIT SALES PRICE 1/ (ESTIMATED)					TOTAL SALES (BY DATE)	$ EXPENDED				TOTAL	SALES REVENUE					NET GAIN OR LOSS				
	MODELS					MODELS				AVERAGE PRICE		MODELS					MODELS				TOTAL	MODELS				TOTAL
	A	B	C	D	TOTAL	A	B	C	D			A	B	C	D		A	B	C	D		A	B	C	D	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)
TOTAL:										TOTAL:																

1/ Include anticipated model variation costs

Columns 1 through 6 would indicate the number and types of housing units expected to be sold during a particular week in the future. Columns 7 through 11 would provide the projected unit sales price for these houses by week sold. With prices fluctuating, the projected unit sales prices posted on each line should vary. For each week, the total sales anticipated would be computed in column 12. Total housing units sold and sales generated during the entire period that sales are expected to be occurring (partially based on the construction schedule and partially based on market demand) would be tabulated at the end of the appropriate columns. The total house unit figures should clearly approximate or be equal to the total number of housing units to be constructed.

The "Impact on Developer" component of this exhibit compares total expenditures for housing units sold on a particular date with sales revenue generated by the houses sold. The comparison would be made on a total basis as well as on a housing model basis. Total expenditures on total revenue generated by the houses sold throughout the projected sales period would be computed at the foot of columns 13-27. This schematic indicates the developer's projected profit from this housing project. The impact of time on his profit picture can also be seen in this same exhibit. Excess or insufficient profit points of the project can therefore be identified and the appropriate corrections made.

E. PROJECT CASH FLOW

The key document of the financial plan is the projected cash flow statement--Exhibit 5. It provides an overview of the developer's project-related financial condition during the project's development and construction, including any anticipated cash flow problems. If negative cash flows are anticipated in the projected cash flow schematic, plans should be made to avoid such an incurrence--i.e., either plan to accelerate the cash coming in or postpone some expenditures. This report includes all the costs in the cost incurrence plan but not on such a detailed basis.

The projections for each category of this cash flow plan should be made on at least a quarterly basis for the first year of the project. However, since these projections cannot be made with any accuracy after the first year, the projections during the rest of the project should be made on an annual basis. To date, tabulations are also computed so that work completed and cost incurred/receipts are kept on line with one another. It should be reemphasized here that the developer and financial institution involved in the project should play an especially significant role in generating these cash flow projections.

EXHIBIT V: PRO FORMA PROJECT CASH FLOW

	1st Year					2nd Year		3rd Year		4th Year
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	To Date		To Date		To Date	
A. CASH DISBURSEMENTS										
Landlord and Interest	A									
Land Improvements	B									
Construction	C									
Option & Other Costs	D									
Overhead	E									
Financing	F									
Marketing	G									
Total	A+B+....G									
B. CASH RECEIPTS	H									
Equity	I									
Landlord Proceeds	J									
Construction Loan Proceeds	K									
Other Loan Proceeds	L									
Base Sales	M									
Options & Other Sales	ZH+I.....M=Y									
Total Cash Receipts										
Landlord Payments	N									
Construction Loan Payments	O									
Other Loan Payments	P									
Net Cash Receipts	Y-(N+O+P)=Z									
C. CASH FLOW	Z - X									
Equity Return	H									
Profit	Z-(X+H)=Q									
Total Capital	Z - X									
Transactions										
UNIT DATA										
Starts										
Sales										
Settlements										

This is the type of planning that the developer and the housing development manager need. It provides information as to where a housing project will stand financially in its various stages of development and facilitates a comparison of expenditures incurred with construction work completed. It also provides the base for a cost control system once the project is underway.

F. PROJECT FINANCIAL STATEMENT

Exhibit 6 is an extension of the preceding cash flow exhibit. Its format is easier to follow than the cash flow statement when the planner or developer is interested in focusing on a specified period of time (e.g., one year) as far as the housing project's projected financial performance is concerned. In addition, financial projections are integrated with work-completed estimates so that the two categories of data are kept in line with one another.

A financial statement projection should be prepared for every six-month period during the housing development period. It provides a series of six-month snapshots regarding the expected financial condition of the developer as far as this particular housing project is concerned.

The data for this statement are worked up directly from the preceding components of the financial plan. If the "bottom line" numbers displayed in this exhibit are not acceptable, the numbers in the preceding components of the financial plan from which the financial statement is derived should be modified.

III

CONCLUSION: MANAGEMENT INFORMATION SYSTEM APPLICATIONS FOR THE FINANCIAL PLAN

This section presents the procedures required to determine the feasibility of mechanizing the financial plan system for housing projects. The computerization consideration is key to the above material because of the direct benefits that can accrue to large housing developments:

1. The ability to generate information previously unavailable.
2. The generation of information on a more timely, cost-effective basis.
3. The ability to perform large volumes of calculations not possible before (due to staff and time limitations).
4. Reduction of clerical activity and overhead costs.
5. Improvements in decision making.
6. Improvements in image, client relations, and service.

This analysis's bottom line for each financial plan computer system alternative (i.e, the evaluation criteria) being evaluated would be the following:

1. Time to implement the system--what is the estimated time required to implement this alternative?
2. Savings--what are the tangible and intangible savings?
3. Percentage of user needs met--what proportion of the needs expressed by the users for a system does this alternative meet?
4. Total and incremental costs.
5. Impact on existing operations--what effect will this system have on existing operations?
6. Operating and maintenance costs.
7. Risk level--what is the chance of failure in developing this system?

From the answers to these questions, one of the alternative systems is selected. The design specifications for the software and hardware systems would then be performed.

The information systems aspects of a financial plan is considered a central element in future financial plan preparation. This subject is therefore the focus of this conclusion, which is intended to introduce housing development financial planners to a faster, more automated system of assembling and managing the barrage of data required by the financial plan components outlined in this report.

EXHIBIT VI: PRO FORMA FINANCIAL STATEMENT

6 Month Period Covered: ___

	Item	Per Unit	Total	of Total Income	Per Unit	Units Total	of Total Income
1	Gross, Income				A	A.	
2	Land Cost & Attendant Costs						
3	Land Purchase Financing Cost						
4	Land Development Cost						
5	Land Development Cost Financing Cost						
6	Total Land and Development Cost						
7	House Construction Cost						
8	House Construction Financing Cost						
9	Total House Construction Cost						
10	Recreation & Other Building Cost						
11	Rec. & Other Bldg. Financing Cost						
12	Total Rec. & Other Bldg. Cost						
13	Sales and Promotion Cost						
14	Mortgate Processing & Closing Cost Paid by Builder						
15	Bdrs. Direct Project & Overhead Cost						
16	Total Sales & Direct Overhead Costs						
17	Total Operating Cost			B.	Elines 6+9 12+16	B. →	$\frac{B.}{A.}$
18	Gross Profit				A - B	A. - B.	$\frac{A. - B.}{A.}$
19	Builders Gen. & Adm. Cost				C	C.	$\frac{C.}{A.}$
20	Total Profit				(A-B)-C	(A.-B.)-C.	$\frac{(A. - B.) - C}{A.}$

Office of Housing
Agency for International Development

SHELTER TRAINING WORKSHOP
November 5-30, 1979

AGENCY FOR INTERNATIONAL DEVELOPMENT
SHELTER TRAINING WORKSHOP

PROGRAM PACKET ON UPGRADING OF EXISTING SETTLEMENTS

Code 42.P

Wednesday, November 21, 1979
9:00 a.m.-Noon

Presented by David Leibson
AID Office of Housing

and

Panelists from World Bank Staff

Donna Haldane
Braz Menezies
Adrian Nassau
Anthony Pellegrini

Contents

Agency for International Development
Shelter Training Workshop

Session on Squatter or "Informal" Settlement Upgrading
9:00 a.m. - noon, Wednesday, November 21, 1979

Presentation by David Leibson, AID Office of Housing; and members of the World Bank, Urban Projects Department:
Anthony Pellegrini, Deputy Chief for Region 2;
Braz Menezies, Project Officer for Calcutta and Cairo;
Donna Haldane, Project Leader (financial planning specialist) for projects in a number of African countries;
Adrian Nassau, Project Officer for a proposed project in Bahamas.

Objectives of the Session

To introduce workshop participants to a variety of shelter upgrading project experiences in different regions of the developing world;

To enable participants to relate the lessons learned through this experience to squatter area conditions in their own countries;

To distinguish special issues of upgrading from those of sites and services projects.

Description of the Session

Overview of the Subject - David Leibson, AID Office of Housing.

Where does upgrading as a class of urban projects fit into the overall shelter policy picture? What are the components of an upgrading program? What types of approaches and technical tools have been developed through experience to date? What are some of the emerging issues he sees as important?

Lessons from the experience of the panelists in different regions of the world.

Panelists will discuss important lessons, issues, or features of the projects they know best. The following subject areas will be addressed, each in turn: Community participation, tenure, institutional and management arrangements and cost recovery.

Participants will be asked to contribute their own observations from experience and to raise questions related to their respective country situations.

Outline for Profile of Existing Informal (or Squatter) Settlements for Workshop Session on Upgrading

I. Densities

A. Typical density of the informal settlements, families or households per hectare.

B. Land area or "plot" occupied by a typical household.

C. Number of people in household (and profile of household monthly income and sources).

D. Description of the typical dwelling (dimensions, space enclosed, materials, design, amount of land, number and function of rooms).

E. If typical household unit (e.g. for an extended family) includes multiple structures, number of structures in the grouping.

F. Number of hectares covered by the settlement and estimated total population.

G. How long the settlement has been in existence. Estimated rate of growth.

H. Are there distinct neighborhoods or social groupings within the settlement?

II. Status of Tenure and Structure

A. Is land occupied by the household--

1. owned (freehold) by the family
2. owned by government or freeholder and under a long term leasehold to the household
3. traditional community-held land subject to some other form of tenure (describe)
4. under a temporary occupancy permit from government
5. unlawfully squatted.

B. What percentage of the households rent out rooms to non-family members? What proportion of the area residents do such rental tenants comprise?

C. Are the typical dwelling units classified substandard under existing building and housing codes? (In what respects?)

III. Shelter Production

A. Who decides when and where the shelter unit will be established?

B. Does the design follow some standard prototype? Does it evolve over time?

C. What site preparation is done and by whom (e.g. clearing of trees, grading, footpath or latrine provision)?

D. Who builds the dwelling (family members, informal sector contractors--from within the settlement or from outside--some combination of these)?

E. What are the costs per unit?

1. total initial cost and estimated over time
2. land
3. materials component
4. labor component
5. monthly cost over time.

F. What maintenance and/or replacement is required? How is it done? How frequently? At what cost?

G. Source of the building materials--local on-site (e.g. wood, mud), commercial supplier -- new materials, salvage, used materials.

IV. Infrastructure

A. Water supply: source and quality, how obtained--e.g. truck delivery to cistern, carried from river or other natural source by family (how far), local standpipe or well (how far from dwelling, how many dwellings served), tap in individual dwelling, monthly cost to the household.

B. Household waste disposal:

1. domestic water (how disposed of)
2. human wastes (water closet, sanitary latrine, other)
3. garbage and trash

C. Fuel (what is used, source, monthly cost?)

1. for cooking
2. for lighting
3. for heating

D. Roads within settlement: is there vehicular access, dimensions, type of surface; are there footpaths; what access to public transportation?

V. <u>Community Facilities</u>

A. Distance (in km) from settlement to major centers of employment opportunity.

B. Estimated percentage of households earning some income from activity conducted within the settlement and nature of the activity (e.g. services, sales of produce or meat grown on dwelling lot, crafts, etc.).

C. Markets and shops: within the settlement or if outside, distance from settlement in km.

D. Health facilities: within the settlement or if outside, distance from settlement in km? What type?

E. Recreation facilities: what is there within the settlement? If none, how far in km to some facilities.

F. Religious facilities: in settlement? If not, how far?

AID Shelter Training Workshop

Readings for the Session on Squatter Settlement Upgrading

These supplementary readings have been selected to reflect a variety of perspectives on the subject of squatter settlements.

John Turner's paper raised issues twelve years ago about the paradoxical role of high standards for urban development and housing in the formation of informal or squatter shelter areas. He argues for incremental improvements in shelter and infrastructure conditions and he stresses the importance of secure tenure (i.e. plot ownership) for the urban poor.

Lawrence Salmen's paper for the United Nations Center for Housing, Building and Planning distinguishes two types of urban upgrading approaches--tenement rehabilitation and squatter area amelioration.

Upgrading of Slums is an outline prepared for discussion of upgrading project issues by L. Menezes and K.C. Sivaramakrishnan of the World Bank. Arguments pro and con the upgrading approach are presented along with brief notes on a range of concerns important in project planning, and some statistics on squatter conditions worldwide.

Project notes highlight slum upgrading experience in Jakarta (Leonie Menezes), Lima and Lusaka (Margaret Myers).

Tanzania's experience in squatter upgrading is described in the paper by Joram M.L. Mghweno. The concluding section points up some significant problems to be addressed in subsequent planning of upgrading projects.

K.C. Sivaramakrishnan's account of Indian efforts toward urban improvement underscore, among other matters, the importance of techniques that address the problem of slums at the appropriate scale.

The World Bank's report on status of the Tondo Foreshore Project in Manila illustrates the need for working--from early stages of planning--with the residents already established in the project area and their crucial role in the success of a project.

Naledi upgrading has been a project of the Botswana Government assisted by the Canadian CIDA group. The relationship of the project design to its social-cultural context is a particularly interesting aspect brought out in the outline of this project.

BARRIERS AND CHANNELS FOR HOUSING DEVELOPMENT IN MODERNIZING COUNTRIES

John C. Turner

Many of the squatter communities of Latin America offer uniquely satisfactory opportunities for low income settlers. They are characterized by "progressive development," by which families build their housing and their community in stages as their resources permit, the more important elements first. The procedures followed by these self-selecting occupant-builder communities, free to act in accordance with their own needs, enable them to synchronize investment in buildings and community facilities with the rhythm of social and economic change. Official housing policies and projects, on the other hand, attempt to telescope the development process by requiring minimum modern standard structures and installations prior to settlement. Such "instant development" procedures aggravate the housing problem by disregarding the economic and social needs of the mass of urban settlers in modernizing countries.

To suggest that planning and building codes designed to improve and maintain modern housing standards have the opposite effect in many parts of the world may seem heretical. While preparing a paper for the United Nations on the subject,[1] however, I found that experience in many developing countries indicates that they do. The planning concepts derived from the experience of modernized countries are frequently inapplicable under circumstances typical in the modernizing countries. It thus is clear that the question should be discussed widely and openly.

The argument, briefly, is that the principle of "minimum modern standards" is based on three assumptions: that high structural and equipment standards take precedence over high space standards; that households can and should move when their socioeconomic status has changed so that they can afford to have a larger (above minimum) standard dwelling; and that the function of the house is, above all, to provide a hygienic and comfortable shelter. While these assumptions are valid in the United States, Europe, and the USSR, they do not hold true for such countries as Peru, Turkey, and the Philippines.

Observations of what ordinary families in urbanizing countries do, when they are free to act as they will, show that they prefer to live in large unfinished houses—or even large shacks—rather than in small finished ones. As Patrick Geddes wrote half a century ago in India: "I have to remind all concerned 1) that the essential need of a house and family is *room* and 2) that the essential improvement of a house and family is *more room*."[2] The typical family, earning an uncertain wage in an unstable economy which provides little or no social security, depends heavily on property for security—especially while undergoing transition from the status of recently to fully urbanized.[3] For such families, the vast majority in the cities of urbanizing countries, housing is a "vehicle of social change."[4] Geographic stability is thus often the agent of social mobility than the reverse, which is more generally true in the fully participating sectors of modern society. I have never come across a home-building family in *barriadas* of the kind described in this article that was not building for their children and that did not also hope and expect their children to achieve a higher social status. Charles Abrams, who has observed squatters in every continent, notes that "when tenure seems secure the foundations are made firmer."[5] Thus squatters are "less worried about what they

John C. Turner is a research associate of the M.I.T. and Harvard Joint Center for Urban Studies, and a consultant to the United Nations on urban development and housing in underdeveloped countries. His research activities are based on his work for the Peruvian government on urban housing and community development problems from 1957 to 1965 will build than where they will build it and less concerned about initial standards than about initial layout. *Rancho* houses (squatter houses) will improve with time and with better economic conditions if the *rancheros* are given a stake."[6] Few planners and administrators agree with Abrams yet, but even fewer of the ordinary people would disagree. Secure possession of land where they can live *now* is far more important to them than the promise of a modern house that may never materialize. But given the land and the right circumstances—that is, adequately located, properly planned, and with secure title—experience has shown that development to contemporary standards will surely take place, even if slowly.

The imposition of modern minimum standards on popular urban housing in a transitional economy is an assault on the traditional function of housing as a source of social and economic security and mobility. By requiring a heavy financial outlay initially and by leaving little room for the investment of nonmonetary resources, modern standards delay the processes of urban settlement and resettlement and aid slumlords and land speculators. Unattainable standards increase the demand for and the cost of slum housing and worsen slum conditions. By eliminating all low income and many middle income groups from the market, such standards encourage the tendency to invest in unused building land rather than in housing construction.

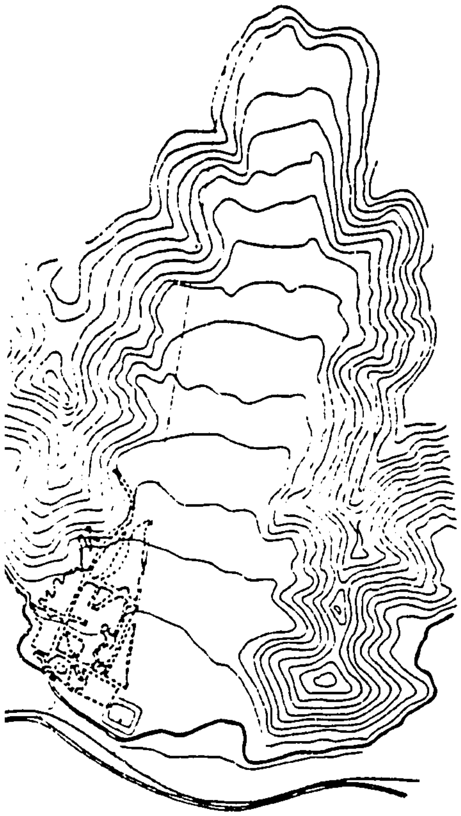
In cities where the majority of the population live in slums and cannot build needed houses because they cannot afford the costs of land and construction, it is hardly surprising to find that a great deal of urban settlement and resettlement takes place independently of the legislative and commercial systems. The experiences of certain Peruvian cities are typical of urbanizing countries. During the past 25 years the population of Lima has trebled from less than 700,000 in 1940 to an estimated 2,100,000 today. In the same period, the squatter population has grown from an unrecorded and relatively insignificant number in 1940 to a conservative current estimate of 25 percent. As in other urbanizing countries, the situation in provincial cities is even more alarming. In Arequipa, the second largest city of Peru with a population of approximately 200,000, 50 percent are reported to be living in the *urbanizaciones populares*, clandestine lower-middle and working-class subdivisions, almost entirely on marginal desert land belonging to the State. In 1960, on the basis of a fairly thorough analysis of a previous census and a sample survey, I estimated that only 22 to 23 percent of the urban population at that time was then resident in this kind of settlement.

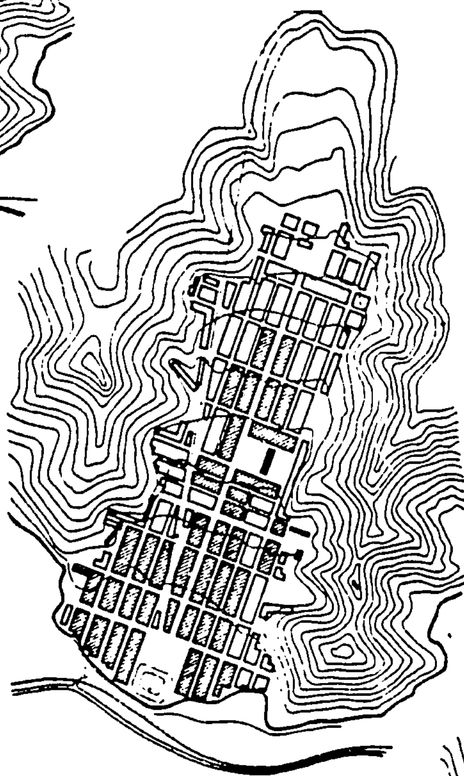
With squatter settlement growth rates of 12 percent or more per annum in Mexico, Turkey, and the Philippines as well as in Peru and many other countries—double that of city growth as a whole—it is hardly exaggerating to say that city development is out of control. During the past two decades the major towns and cities of Peru have trebled in area and population; they now represent approximately 30 percent of the country's total population. Two-thirds of this recent growth, (about 10 percent of the population or 1,000,000 people) is composed of squatters who have done more city building in terms of settlement than has been achieved during the previous 400 years.[7] So, in spite of the increasing realization of the necessity for urban planning, and the great need for an orderly infrastructure for economic development, city growth in the urbanizing two-thirds of the world is becoming increasingly chaotic.

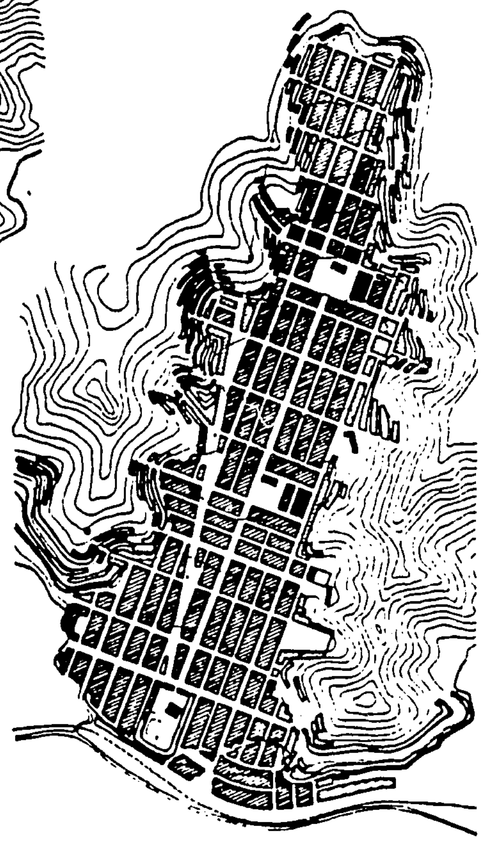
> This absence of a central concern for the city's role is related to the deepening crisis that cities in all parts of the world are facing: massive unemployment, squatting and squalor in the developing preindustrial countries; . . . . Consequently, the city is a poor habitat, not only for man but for industry and trade. Chaotic in form and destructive socially, the mushrooming urban disarray creates a new impediment to economic growth.[8]

The hypothesis on which the arguments in this article are based is implicit in the claim that the standards required by the authorities (and practiced by institutional and capitalist enterprise) conflict with the demands of the mass of urban settlers. The loss of administrative control over urban settlement and the frequently chaotic conglomerations of inadequate structures which make up the greater part of contemporary city growth in the modernizing countries are a product of the gap between the values and norms required by the governing

The development of Cuevas from 1961 to 1966.







institutions and those imposed on the people by the circumstances in which they live. The greater the gap between the nature of the officially recognized supply of housing and the nature of the popular demand, and the greater the demand in relation to the police power exercised by the authorities, the greater is the proportion of uncontrolled settlement.[9]

CASE STUDY OF A BARRIADA

THE INVASION

The best and perhaps the only way to illustrate these principles is to describe the situations which have lead to their formulation. The following description is a composite case study very largely based on one particular squatter settlement on the outskirts of Lima. Pampa de Cuevas is perhaps the nearest thing to a model *barriada* of its type. Established fairly recently (in 1960), in a more than usually favorable, but otherwise typical location, the settlement has a population of approximately 12,000. Cuevas is one of the type of *barriadas* populated by families moving out of the city slums, where the adults have lived about ten years before moving. Many of them are of recent previous provincial origin, but are not in the lowest income groups and are not without some urban experience.[10] This contrasts with another basic *barriada* type, formed by people with very low incomes and living standards, whether the urban-born poor or rural immigrants, and the commercially established tenement slums which have much higher densities and are almost always located near employment centers. Settlements of these latter types serve as "bridgeheads" or urban toe-holds, enabling the very poor to live cheaply and to obtain work more easily by living within walking distance of principal markets and employment areas. Cuevas, which is not within walking distance of either, is an unsatisfactory location for down-and-outs or for ambitious but still very poor migrants. The great majority of its inhabitants are young families with more or less steady incomes. They are poor but represent the average rather than the below average wage-earning sectors and, as the rate of physical improvement of the average dwelling indicates, they have maintained an appreciable rate of upward mobility.[11] I am not, therefore, about to describe a version of the classic shantytown: ". . . the rudest kind of slum, clustering like a dirty beehive around the edges of any principal city in Latin America" where "living almost like animals, the *tugurio's* residents are overwhelmed by animality. Religion, social control, education, domestic life are warped and disfigured."[12] Cuevas, along with at least two thirds of the *barriadas* of Peru, the majority of the *colonias proletarias* of Mexico City, or of the *Gecekondu* of Ankara, can be more appropriately described as self-improving suburbs than as "slums."[13]

The history of a settlement must begin with a description of the original settlers and their motives for settlement. As is now clear, the necessity of squatting may occur in quite different circumstances in the same city or at different stages in the life of the same family: The recently arrived migrant may be forced to squat if unable to find or afford other accommodation or, on the other hand, the wage-earning family that cannot afford tolerable accommodation or that desperately needs the security of home-ownership may also be forced to squat if there is no alternative.[14] The great majority of Cuevas settlers were motivated by the desire to escape the tyranny and insecurity of paying high rents for miserably poor conditions. For the average family of five or six with an average monthly income of about $90 (United States dollars) there are only two legal alternatives: to wait until the family's income has risen sufficiently (or until it has accumulated sufficient savings) to buy and build in the lowest-priced subdivisions, or to wait for the chance to get a subsidized government project house. Many families, for reasons explained below, reject the latter alternative, even when they are among the small minority to whom the opportunity is presented. The great majority prefer the illegal alternative of squatting if the prospects of obtaining de facto possession are good, even if very considerable sacrifices must be made to get a plot and to build.

The original Cuevas settlers, about 500 adults from different parts of Lima, formed the "Asociación de Padres de Familia Pro-Vivienda," a community association for housing, in December, 1959. Just how this particular group was formed I do not yet know,[15] but the case of El Ermitaño, adjacent to Cuevas, is typical. The Ermitaño association was organized by a self-appointed committee in 1962

Squatter invaders waiting to enter Pampa de Cuevas during negotiations between their leaders and the police. The banner reads "Union de Madres Necesitadas." Credit: *Caretas Magazine*, Lima.

which claimed to be the successors of an earlier association that in 1945 had applied to the ministry of Public Works for permission to develop the land the new association intended to invade. Having received no answer, the organizing committee maintained a certain claim to the land, even though it was somewhat tenuous and of a moral rather than legal character. It was enough, however, to guarantee the support of the "Frente Unico de las Barriadas del Peru,"—a confederation of *barriada* associations which commanded some political support and lobbying influence. With moral reinforcement and the probability of some political support, a group with access to a good site and with enough members to provide sufficient funds (to defray expenses and to compensate the organizers for their efforts) will be ready and prepared to invade if no other course is open to them.

The Cuevas invasion took place the night of November 17, 1960. The police forced them off the land and the invaders, several hundred men, women, and children, camped along a nearby railway embankment while their leaders negotiated with the authorities. The government was particularly anxious to avoid further invasion at that time because it was about to promulgate a law designed to prevent further invasions and squatting by providing low-cost building land.[18] The owner of the adjacent land, a wealthy man with political influence, was also strongly opposed to the invasion which he saw as a threat to his property. Future events justified his fears. The invaders were allowed, however, as a "temporary measure" to set up an encampment on a part of the land on Christmas Eve, five weeks later.

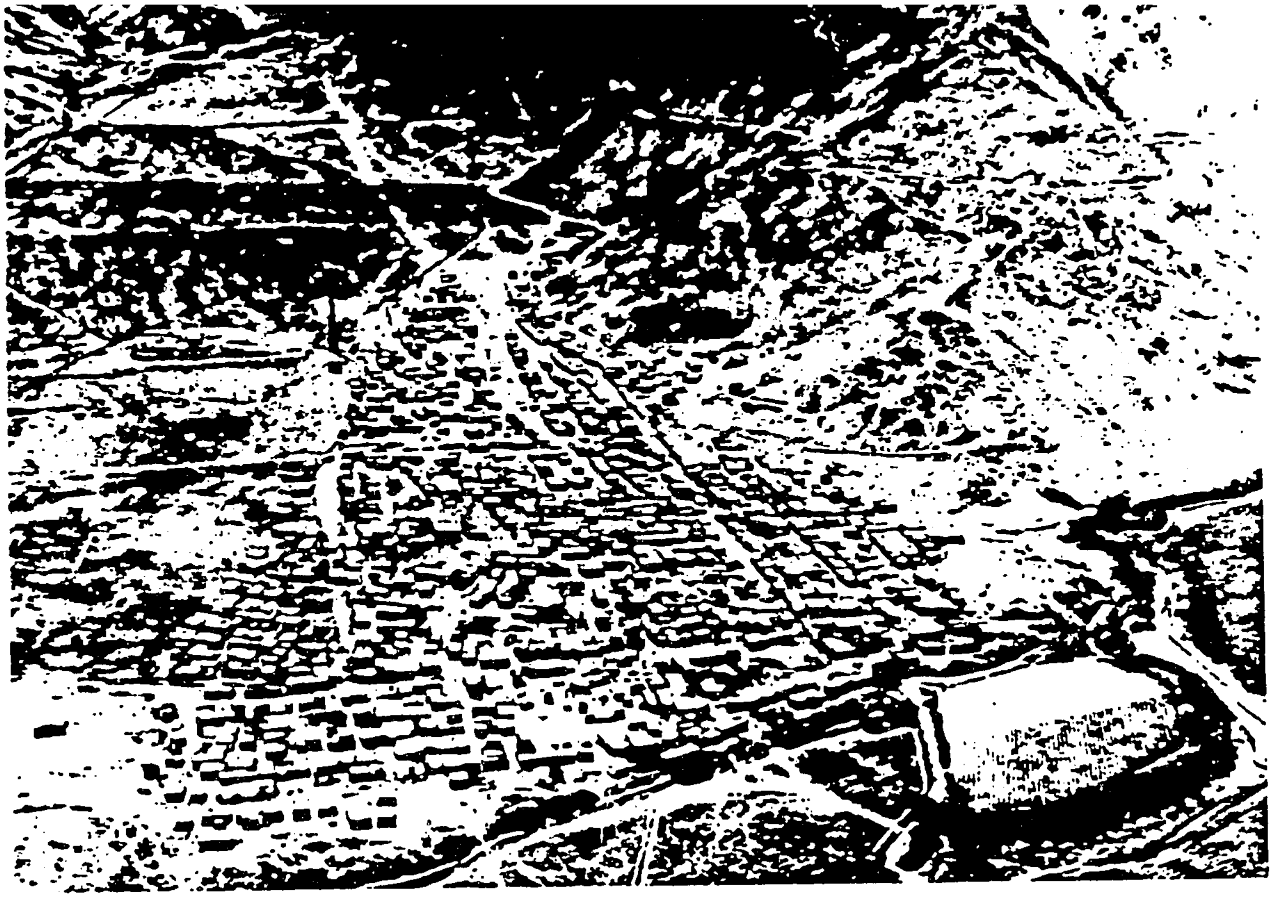
Either unknown to the authorities, or disregarded by them, the association contracted five topographers (elsewhere reported to have been students of civil engineering) to set out the blocks and individual plots. The plots were to have been 10 by 20 meters (about 2000 square feet), but the majority were in fact only 8 by 16.5 meters. The association paid about $1,000 for the work, which took two months to complete. Ostensibly, the permission granted to the invaders to camp on the land was strictly temporary and was to allow time for the allocation of an alternative site. Over Christmas it was hardly humane—or even politic—to let so many apparently desperately poor families continue to live in the open. The families themselves, or their leaders, had timed the operation well and had correctly calculated that, once on the land, they would have de facto possession. The invaders, therefore, were prepared to risk their funds for the layout plan and, as soon as it was completed each family transferred its temporary shack (made from woven cane mats wired to a light bamboo frame) to the plot allocated to it by the organizers.

During the first five weeks, the squatters had lived, literally, in the open. Although it was during the summer, when there is no precipitation in the Lima area, camping with no equipment to speak of was a considerable hardship. But, given the hope of a building plot of acceptable size on level land reasonably near the city and adjacent to a public transport route, a large number of people were prepared to sit it out indefinitely, rather than return, defeated and demoralized, to the city slums and high rents from which they had escaped. As soon as the encampment on the site was established, the association organized a school which provided primary education to adults as well as to children, and many set up shops for vermicelli, candles, inca-cola, and other essentials. At first everything, including water, had to be carried up a footpath, but once the families had moved to their own plots an access road was made through the cultivated land which separated the site from the main road in spite of the landowners' protests. Shortly after the invasion many certainly felt themselves to be far better situated than they had been in the slums. Even with such primitive beginnings, a major part of their housing needs were satisfied. In the first place, each family had a fair sized plot of land rent free and with little or no fear of eviction. In terms of space, sunlight, and unpolluted air their shacks were a vast improvement over the dark, unventilated, and crowded rooms on narrow, smelly, and noisy slum courts. There are hardships and expenses in Cuevas, such as having to buy water from doubtful sources at exorbitant rates (usually about 15 U.S. cents per gallon drum). The lack of electric light reduces the opportunity for social life and study and increases a sense of physical insecurity (although there seems to be far less violence in the *barriadas* than in the city itself). On the other hand, the absence of the extremely inadequate number of poorly maintained communal toilets with which the slum courts are equipped is little or no disadvantage when there is plenty of space for individual pit latrines. Transportation cost for the family as a whole is generally greater than before but the extra cost rarely surpasses the saving made on rent as long as there are primary schools and basic shopping facilities in or near the settlement itself. So, even for the minority of families whose cash expenditures are slightly greater than before (through having to buy water or spending more on fares) the net gain in improved conditions is generally appreciable and with regard to personal security it is invariably considerable.

TENURE AND COMMUNITY DEVELOPMENT

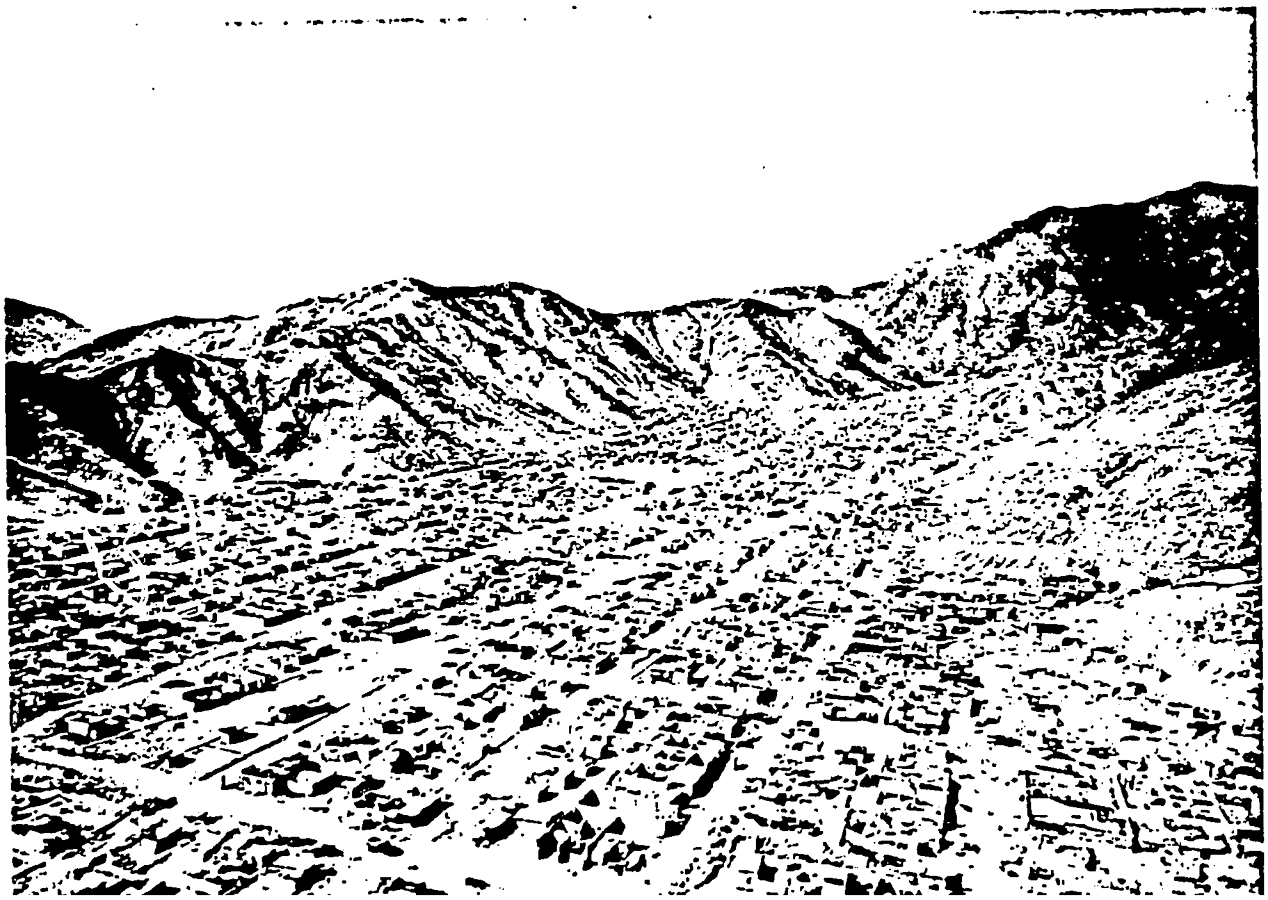
As the security provided by the possession of a homesite is the settlers' first concern, top priority is given to action that will consolidate tenure. If there is no way of obtaining title legally and at short notice, and if the precedents show that once settled land of low value is rarely reclaimed, then the surest way of ensuring permanent tenancy is to settle firmly on the land. The squatter associations therefore demand that their members build as soon as they take possession of their allocated plots, so all who can do so, even if it is only to place some foundations. A current anecdote in Lima tells how the government sent bulldozers to clear an invasion of cane matting shacks. The first flimsy shack approached, however, stopped the bulldozer dead in its tracks. It concealed a solidly built structure of reinforced concrete. Though probably no more than a fable, the moral is nonetheless clear.

Apart from building to consolidate tenure—and invest savings before there are further increases in the cost of building materials—there is, of course, the need for a permanent house. The possible sequences of operations and orders of priority between the components of the dwelling structure [17] will be largely determined by the climate and the economic situation or expectations of the settler. Where there is little or no rainfall, as in Lima, it may be more appropriate to enclose the plot with a perimeter wall than to build two or three rooms with permanent roofs. The perimeter wall provides privacy and an improved microclimate in which the discomforts of a shack are greatly reduced; the family is no longer pestered by neighbors' dogs and children, they are more secure against



Top: *Cuevas in 1961, shortly after the invasion.*
Credit: Servicio Aereofotografico Nacional of Peru.

Bottom: *Cuevas approximately one year after invasion.*
Credit: A. Rojas, Junta Nacional de la Vivienda, Lima.



pilfering, and have, in effect, a spacious living area, even if the rooms are temporary shacks.

During a discussion of priorities of services and structures, one of the leaders of the Cuevas *barriada* argued forcefully for first maintaining perimeter walls until public utilities were installed, then building a bathroom unit, and only after that, beginning the rest of the structure.[18] This man, the secretary of the *barriada* association, felt that it was important to invest first in the improvement and installation of community facilities, then in public utilities, and finally in individual structures. Most *barriada* settlers, however, would give the dwelling structure—the first few rooms anyway—a higher priority than the installation of public utilities. But judging from the results of a series of conversations held in Cuevas, most settlers evidently place as high or even a higher priority on the provision of community facilities or services such as schools, markets, meeting rooms, medical facilities, a parochial center, and a police post than they do on the completion of their own dwelling. These facilities and services, even more than public utilities (with the possible exception of electricity), are a greater asset than a finished house. Observations of what settlers do in fact agitate for and attempt to install, support the statement of the United Nations Ad Hoc Committee on Housing in its report of February 21, 1962: "From the family's perspective, . . . housing is not 'shelter' or 'household facilities' alone, but comprises a number of facilities, services and utilities which link the individual and his family to the community."[19]

While the order in which community services and public utilities have been installed—or attempted—has been partly determined by economic, technical, or administrative practicality, there is a close correspondence between the actual program of operations and the "practical ideal" formulated by the community housing group mentioned above. The indispensible components were provided, albeit crudely, at the very start. Even before the settlers moved onto their own plots they had a water supply, public transportation (at the main road), an elementary school, retail facilities, and basic shelter (in the encampment). In 1962, about 18 months after the invasion, a permanent primary school, a medical post, a police post, and a chapel had been built. (The latter guaranteed regular visits from priests of a particularly active and highly regarded foreign missionary order.) In the following year a secondary school was established and the area became a separate parish with resident clergy. In 1963 the association also contracted with a private entrepreneur for the installation of electricity. The system was installed and put into operation for a short time with generators powered by a second-hand diesel ship's engine. Unfortunately there was a disagreement with the contractor who eventually withdrew his equipment at considerable loss to himself as well as to the inhabitants of Cuevas. Since then the only electricity available has been from small generators installed by individuals who supply current (at about $2.00 per 50 watt lamp per month) to their immediate neighbors. In 1964 the government installed a provisional water supply but this had not yet been put into operation by the fall of 1965. During 1964 and 1965 the government built several additional schools and a private clinic. A land use survey made in June, 1965[20] revealed a total of 218 retail shops (mostly very modest businesses of more social than economic value) and 14 artisan workshops. Dressmakers', dentists', and electricians' signs, among others, can be seen today. A sample of the dwelling structures surveyed showed that permanent construction had been started on 80 percent of the plots and 42 percent had walls completed to roof height. Only 9 percent, however, had a finished first floor structure and only 2 percent had started second floor structures.

In 1965 Cuevas became the center of a new municipality incorporating two adjacent settlement areas. In November, 1966 municipal elections were held and, administratively, Cuevas became a fully incorporated part of the city.[21] Physically, however, much remains to be done. No public utilities are operating yet, only a few houses are structurally complete, no roads have been paved, and there is not a single tree because water is not yet piped in.

More serious is the fact that all along the perimeter, creeping up the surrounding hillsides, is a steadily expanding belt of new shacks, many of which are occupied by the poorest sector. This peripheral growth (which in fact started as soon as

View showing the various stages of house development.
Credit: J. C. Turner

Main Street of Cuevas, March 1963.
Credit: Eva Lewitus, Foto Art, Lima.

the area was occupied, probably by those who could not pay the dues or who were late-comers) now threatens the future status and development of the entire settlement. The resident priests estimated that the population of the *barriada* had increased from 9,000 to 12,000 between 1963 and 1965. This is partly accounted for by a normal and healthy increase in the density of the planned area where a proportion of plots remain unoccupied, but part is also due to the ring of "sub-squatter settlement." Its existence could well frustrate efforts to bring the rest of the area up to modern standards—which should be only a matter of time—by reducing the status of the neighborhood and the value of the properties. Those with the greatest expectations and social mobility are therefore likely to leave, further downgrading the area and perhaps leaving it to degenerate into a slum before it can develop its potential. Thus, in spite of the remarkable progress that Cuevas (and many other similar areas) has made to date, its future is by no means assured. What happens now depends very much on the nature and the effectiveness of the aid it receives from the municipal and central government authorities.

Whether the settlement as a whole will down-grade the adjacent and as yet undeveloped urban land, or whether its presence will hold potential development in the area at a low level, also remains to be seen. Presumably, Cuevas' influence will depend on the nature of its development. If the community achieves the level it is at present capable of reaching—that of a working and lower middle class neighborhood—there is no reason why adjacent land values or development should be damaged. Both the public and private sectors, therefore, as well as the actual inhabitants, have a considerable vested interest in Cuevas' continued development.

POPULAR VERSUS OFFICIAL SING NORMS

The most striking thing about this type of development is the spontaneous mobilization of human and material resources—spontaneous in the sense that it has taken place independently and even in spite of the public institutions. If governments could induce the same initiative, efforts, and sacrifices for their own housing and urban development policies, both living conditions and the rate of economic growth would be immensely improved.[22] Scarcely less striking is the contrast the spontaneous popular settlement process makes with the "normal" subdivision and construction procedures required by law and practiced by capitalist and state enterprise. If the latter procedures were preferred by squatters and would-be squatters the differences might be dismissed as being the inevitable consequence of the violation of law and the failure of the government to provide low-cost housing. But the more traditional popular procedures are not only a logical response to the economic and social circumstances of modernization, they are actually *preferred* by the great majority of the people concerned.

This fact is less surprising after one has examined the main differences between "popular" and "official" norms in the light of the human situations and experience involved. If we start by comparing the typical programs of operations, the advantages of the popular program are immediately clear: In a society that does not possess, or which cannot mobilize, the necessary material resources to build complete modern minimum standard units for all who need them, each family must wait its turn. Generally, the wait is very long, the best part if not the entire time that the applicants are parents of young children. The squatter's procedure of occupying his plot as soon as he obtains possession, living initially in any sort of shelter he can manage, allows the family to improve its living conditions and to become far more independent at a much earlier and a more active stage of life. Even if they have to pay for the land at commercial rates, the typical family will still jump at the chance to follow this procedure (as a recent clandestine sale of building land adjacent to Cuevas has shown).[23] The sequence of operations subsequent to occupation is also radically different. Official norms give priority to residential construction and the installation of public utilities. The popular procedure is to provide community facilities and services before either dwellings or utilities. Since security of tenure is more important than physical comfort (especially in this favorable climate) and since security of tenure is enhanced by a reduction in the cost of living and the presence of medical and police services, the advantage is clear.

Finally, the disadvantages of orthodox modern "instant" as opposed to initially primitive "progressive" development are considerable, both economically and, once again, from the social security point of view. If capitalization takes place at one fell swoop it must be financed on the basis of long-term credit. Credit is very scarce in a developing economy and thus the cost of an instantly built, fully or semifinished housing scheme is very great. Even if the interest rates are heavily subsidized by the state (greatly reducing, of course, the number of units the state can finance) the cost of the most economic orthodox housing schemes still impose a long amortization period on the beneficiaries.[24] A long-term mortgage can also greatly reduce the occupants' security of tenure. The official procedure, therefore, is doubly disadvantageous: it forces the great majority to live in rented slums for many of the years that the need to own a home is greatest, and once a home is obtained they are saddled with a long term debt which threatens the very security which they seek through ownership.

The outstanding physical advantage of "progressive development" over the "instant development" procedure—apart from an early escape from overcrowded and unhealthy slums—is that the families' living areas are generally much larger at an appreciably earlier stage of construction. The progressive developer often provides much more living space than in the average, low-cost instant development scheme. If given the choice, many of the readers of this article would prefer a living area of 700 or 800 square feet enclosed by cane mats lined with newspapers rather than a brick or concrete house half that size and 15 times the cost. Besides offering more living space, the great majority of *barriada* dwellings have roofed areas of over 1,000 square feet per floor, and virtually all are designed to take a second floor. In one *barriada* begun some 12 years ago, a large proportion of the dwellings have second floors under construction or already habitable. From an analysis of six typical *barriada* dwellings it is evident that after approximately 20 years of construction without any outside financial assistance, a two-story house with a total floor area of over 2,000 square feet can be completed for the same outlay that a government sponsored instant dwelling of half the size or less would cost, even when the administrative overheads and credit financing are heavily subsidized.

It has been stressed that the investment programs naturally reflect both these differences and the advantage of reducing the need for credit to a minimum or of eliminating it altogether. The other vital economic advantage of progressive development is that it permits and stimulates the investment of nonmonetary resources—those that are in most abundant supply in a developing economy. The cause of the great difference in the financial costs of "instant" and "progressive" construction (the former costing at least 100 percent more than the latter) is that the owner-occupier-builder provides other resources in the form of initiative, skills, and time. The time, patience, and bargaining skills of most wage-earning families together with the myriad contacts through workmates, friends, and relatives often results in remarkably good value for precious money spent on materials and on hiring skilled labor. This is true in spite of the fact that substantial help from relatives or even neighbors seems to be quite rare as a spontaneous or traditional attribute of these newly forming communities.

An additional "product" of progressive development is its stimulation of social development through the cultivation and strengthening of the family and of the positive attitudes and relationships to society that the satisfied family acquires. These are qualities which elude quantification but which are, perhaps, the ultimate test of the validity and value of any activity. Anyone who doubts the reality or existence of such "products" has only to spend a little time among people who are working in these ways.

A further very serious problem often created by "instant" housing projects and one that is now receiving the anxious attention of many authorities,[25] is the social stratification and subsequent stagnation of the communities formed. An important difference between the groups formed by officially sponsored projects and squatter settlement communities is that of the criteria and procedures for participant selection. The financial liabilities and sociopolitical risks of projects that depend on the recovery of capital from people with low and uncertain incomes automatically imposes a demand by those responsible for the careful screening of the prospective "beneficiaries." The taxpayers' representatives are likely to require that accommodation be provided only for those who are either financially able to afford the costs involved, or politically acceptable by being the "deserving poor" who most need subsidies. The resultant social groups are stratified either way: if selected on the basis of economic capacity they are narrowly lower-middle-class or, if on the basis of need, they are narrowly lower-class.

In neither case will one get the mix necessary for social change and development. Squatter settlement selection is more orthodox in the commercial sense because no attempt is made to match precisely the consumer and the product.[26] Anyone who decides that he would do well by participating in an invasion is free to do so. A mid-wife, a dentist, or a retailer, for example, might well decide that their livelihood could be ensured by becoming a participant member of a squatter community. In this way the initial socioeconomic composition of the squatter community is far more likely to include the necessary elements for social and economic balance and development than a screened project community. Furthermore, as long as the squatters, as an auto-selected community, experience a reasonably continuous rate of progress, diversification will increase. In an adequately located progressive *barriada* where the basic land use pattern is sufficiently flexible (as the simple grid-iron systems generally employed usually are) social diversification will be matched by a growth of industrial and commercial activity. The more there is going on and the more people there are with whom one can have contacts, the more opportunities the poor have of improving their status. The policy of limiting the allocation of housing units in specific projects to specific income groups—and of imposing specific housing types—naturally limits the social mix and inevitably increases the administrative costs both in the short and in the long run. The progressive development procedure virtually eliminates the necessity for direct subsidy, however, and therefore eliminates the motives for socioeconomic selection.

Contrary to the beliefs and arguments of many opponents of "progressive" development, the process provides for relatively high urban densities. It is frequently held that progressive development procedures, which demand one-family housing, is uneconomic because of the immense areas required and the consequent increase in the spread and costs of urban services. In the case of Lima, this argument collapses on close examination. In the first place, during the earlier phases of development, the demand and need for urban services are very limited. Initially, sewers and even water mains are unessential. The difference in time for public transportation, if only a matter of minutes, is negligible in cost terms. An efficient bus service requires very little capital and, in any case, is usually a commercial proposition. By the time sewers and water mains are essential the densities are great enough to justify them. The potential density of the average progressive development settlement, like Cuevas, is 160 persons per acre, in single-family dwellings and in structures of no more than two floors. This is assuming that no structures are higher than two stories and that every purely residential property would house an average of one and a half families, a reasonable assumption considering that the majority of second floors are built for children's families or for rent.

If this development procedure is adopted by the planners, and its administration is given over to local authorities, there is no reason why a proportion of land should not be put in public ownership to ensure some flexibility, particularly the attainment of higher densities when circumstances justified them. In the earlier stages, for instance, a market could be a collection of stalls on an open plaza, later to be occupied by shops and apartments. Similarly, cheap one-story rental tenements, municipally owned and administered, could be later replaced by multistory apartments. Land values, in any case, are likely to rise as metropolitan expansion leaves the neighborhood relatively closer to the city core.

Normally the walk-up apartment solution imposes a relatively low density, but in fact there is very little difference between the residential densities of typical walk-up apartment projects and the potential and probable future density of Cuevas.[27] Exceptionally, as in the case of the 7-story walk-up, one-room apartment blocks of Hong Kong, very high densities can be achieved. Only very rarely, however, are such solutions likely to be socially and politically viable. The more orthodox and socioeconomically practical "high-density" developments for families with very low incomes rule out the "progressive development" procedure. In relation to the incomes and amortization capacity of the beneficiaries, low-rise, relatively high density developments require excessively high initial capital outlays. That the financial economies achieved through a slight—or even appreciable—increase in residential density will be sufficient to compensate for the financial and social economies of the "progressive development" procedure is very doubtful. The spatial economy of initially high density residential development (for owner-occupiers) rests on the false assumption that the residences must be fully equipped to modern standards, whatever the economic situation and real needs of the inhabitants or, alternatively, on the so far unjustified fears of excessive land consumption by modern growth.

CONCLUSIONS

The argument for progressive development and against "instant" development based on modern minimum standards can best be summarized by considering the priorities between the basic functions of the dwelling environment in relation to the changing life-situations and consequently changing priorities between the physical components of the environment.[28] It has been argued that the order of priorities between the basic components for popular housing—in the wider sense—are the reverse of those required by official standards. The average lower income family seeking a home in an urban environment wants secure land tenure, community facilities, an adequate dwelling, and utilities in that order. The state offers the exact opposite: a modern (but minimum) house in the first place, some community facilities (generally at later stages), and eventually, title to the property after the mortgage has been paid off. This latter procedure, however, is generally preferred by the middle income groups, whose social and economic security depends far less on home possession than it does on occupation and social status.

Further, in a developing free-market economy, they also have access to insurance as well as to banking services and financial credit seldom available to the lower income sector. Since the socioeconomic security of the middle-income family depends more on the material status of the dwelling they occupy than on actual ownership of it, the "progressive development" concept is, understandably, anathema. The unconscious transference of middle-class values to the designs and plans for the lower classes is, undoubtedly, the main reason for the emotionally loaded opposition of most technicians and administrators to the idea of permitting—still less of encouraging—people to live in an only partially completed environment, and of their apparent blindness to its obvious potential.

The significance of the cultural change that takes place over time and in the same *barriada* location not only confirms this kind of dwelling environment as a vehicle for social and economic development, but also points to the connections between the different demands of various social levels. It is clear that the relative priorities and demands of the low-wage earner and that of the high-wage (or low-salary) earner must be different though not as different as the levels compared above. Preoccupation with material status is as evident in the *barriadas* as it is elsewhere. The typical home-building family, for example, may finish the facade and a "parlor," often to quite high standards and at considerable expense, before the rest of the dwelling is complete. As the family becomes more secure, so will their dependence on the proximity of community services diminish. The pattern of upper-lower or lower-middle income level priorities will be an intermediate link between the lower and the upper-middle priority patterns.[29]

If over-capitalization and the consequent strains on the inhabitants and the state are to be avoided, and if the maximum contribution from the inhabitants is to be obtained in order that the state can serve the greatest number, the interpretation put forward in this article points clearly to the progressive development principles practiced by squatters—and city builders from time immemorial—as against the principles governing housing and urban development policies based on the direct construction of minimum modern standard dwelling units. The modern minimum standard concept, which acts as a barrier to development by attempting to prohibit the intermediate stages, must give way to a concept which uses standards as guides toward the progressive achievement of minimum *goals.*

NOTES

[1] J. C. Turner, *Uncontrolled Urban Settlement: Problems and Policies,* a paper prepared for the United Nations Seminar on Development Policies and Planning in Relation to Urbanization, Pittsburgh, Penna., Fall, 1966.

[2] Patrick Geddes, *Town Planning Towards City Development,* a report prepared for the Durbar of Indore, India, 1918. Vol. I, p. 85.

[3] J. C. Turner, *A New View of the Housing Deficit,* a paper prepared for the Seminar on a Housing Policy for a Developing Economy, University of San Juan, Puerto Rico, April 1966.

[4] United Nations, *Methods for Establishing Targets and Standards for Housing and Environmental Development,* E/C. 6/31. 1965.

[5] Charles Abrams, *Man's Struggle for Shelter in an Urbanizing World* (Cambridge: M.I.T. Press, 1965), p. 53.

[6] A report made by the author for the United Nations on the housing situation in Arequipa, Peru, with special reference to the squatter settlements, 1959–60 (unpublished).

[7]

	1940 Census	1961 Census	Estimated Growth Rate (per acre)
Cities of over 50,000 inhabitants	675,000	2,556,100	6 percent (own estimate)
Total population	6,208,000	10,365,000	3.2 percent (1961 census)

[8] Ernest Weissmann, United Nations, Economic and Social Council, Social Commission. Statement made at the 403rd meeting, April 25, 1966. U.N. bulletin number E/CN 5/L. 313.

[9] Turner, *Uncontrolled Urban Settlement,* chap. IV.

[10] J. C. Turner, "Lima's Barriadas and Corralones: Suburbs versus Slums," *Ekistics,* 112 (March, 1965).

[11] William P. Mangin, "Urbanization Case History in Peru," *Architectural Design* (August, 1963).

[12] Sam Schulman, "Latin American Shanty Town," *New York Times Magazine* (January 16, 1966)—a typically misleading generalization from a case study of doubtful worth.

[13] Bernard J. Frieden, "The Search for a Housing Policy in Mexico City," *Town Planning Review,* XXXVI (July, 1965), and Granville H. Sewell, *Squatter Settlements in Turkey: Analysis of a Social, Political and Economic Problem,* Ph.D. Thesis, M.I.T., Cambridge, Mass., 1964 (monograph).

[14] Turner, *A New View of the Housing Deficit, loc. cit.*

[15] Further information will be provided from the field studies recently carried out under the auspices of the Joint Center for Urban Studies of M.I.T. and Harvard University.

[16] The "Ley de Remodelación, Saneamiento y Legalización de los barrios marginales" Lima, 1961. This law provided for the improvement of *barriadas* of the "progressive development" variety and for the relocation of those incapable of improvement. New low-cost subdivisions were to be provided in order to satisfy the continuing demand for building land.

[17] The "components of the dwelling structure" which are subject to different sequences of operations in the construction process in the Lima *barriadas* are: a *cerco* or perimeter wall enclosing the plot: the walls of the first floor (or of the first rooms) with a provisional roof: a permanent (hollow clay tile reinforced concrete slab) roof structure: joinery and metalwork (doors, windows, and window grilles): installations (water supply, domestic drainage, electric light) and fittings: finishes (floor finishes, plastering, and painting): and second story (repeat of the relevant components).

[18] The main source for the interpretations of the basic functions of housing, and the priorities between them, are the minutes of a series of meetings between architects (from the National Housing Agency), a U.S. Peace Corps volunteer, a priest resident in the locality (an Englishman), and an average of three *barriada* leaders. The two items discussed were: "In what location should the working-class family live, and why?" and "In the locations selected, what services, utilities, and buildings are required, in what order of priority, and why?".

[19] *United Nations: Report of The Ad Hoc Group of Experts on Housing and Urban Development.* (New York: United Nations 1962), p. 1.

[20] From a survey carried out by Ralph Pattisson, student of architecture at the University of Newcastle, England, while resident in the *barriada* in 1965.

[21] Though the legalization process (the administration of the "Ley de barrios marginales") is incomplete, the municipal incorporation of the principal *barriada* districts has proceeded and it is now likely that the newly created municipalities will be largely responsible for subsequent development and legalization.

[22] "The unutilized talents of their people constitute the chief waste and future hope of the developing countries. Only a small fraction of these populations participate actively in national life today." United Nations document on *Self-Help.* ST/SOA/53.

"Squatter building is probably the main contributor to the building inventory of the developing nation. It is largely self-help or aided self-help construction. It is financed without government aid." Charles Abrams "Squatter Settlements: The Problem and the Opportunity" (Washington, D.C.: Department of Housing and Urban Development, 1966).

[23] In July 1965, a large tract of land was bought by an "Associación" which, within the space of one month, has sold every plot (reportedly 800) for $500—50 percent cash, the balance in 12 monthly payments—to low-income families with similar status to those that establish the *barriadas.* The plots measure 25 by 60 feet. No services or utilities were included in the agreement and no legally valid title could be given as the subdivision and sales are illegal.

[24] Mortgage and credit terms for typical low-cost housing generally provide for a 20-year amortization period and interest rates of between 5 and 10 percent. Where the loans are made with foreign currencies such low rates (relative to the commercial bank rates generally between 15 and 20 percent) imply a direct subsidy of about half the financing cost.

[25] The "José María Caro" district of Santiago de Chile, with a total low-income population of over 100,000 is an illustrative case. This is discussed in J. C. Turner, *Uncontrolled Urban Settlement.*

[26] The typical agency project is "sold" under circumstances that no free market producer or distributor would dream of imposing: both the buyer and the article are predetermined. Few, if any commercial manufacturers or distributors would care to risk investments on such narrow margins: if the producer wants to decide what to make then he must offer the product on the widest possible market. If he wants to sell to a given sector of the market, then he must produce what that sector demands. Official housing policies commonly attempt to define both and commonly encounter serious consumer problems.

[27] Walk-up apartments (one room dwellings) have been built in large numbers in seven-story structures in Hong Kong and, at 12 square feet per person, have achieved very high densities. A typical 4-story apartment block project in Peru (Tacna) has a planned density of 160 persons per acre—the potential (and probable future) density of Cuevas.

[28] Turner, *A New View of the Housing Deficit.*

[29] The very low income sector is not discussed in this article. In J. C. Turner, *A New View of*

Author's Note:
The author wishes to acknowledge the support of the Harvard-M.I.T. Joint Center for Urban Studies and the Olivetti Fund for work in part reported in this study.

the Housing Deficit, arguments are put forward to justify the priorities shown on the chart: since the very poor are primarily concerned with feeding themselves and of getting employment, it is argued that they are even more dependent than the wage earners on community facilities (and proximity to sources of employment) but that they are consequently less concerned with stable residence having little or nothing to invest or gain by investment.

ADDENDUM

After this article went to press, my attention was drawn to the U.S. Department of Urban Development publication "The Unfinished but Habitable Home" by William M. Shenkel. This report surveys the existing unfinished house market in the USA—which "In recent years . . . has absorbed a significant share of the housing market"—from 30,000 to 100,000 units a year. The report concludes that the system is economic and should be supported and extended. In principle, it is similar to the procedures discussed in this article, although the savings achieved are proportionately much less—rarely exceeding 25 percent. "Unfinished," however, refers mainly to dwellings that lack only the finishes and fittings. On page 73, Shenkel writes: "Four room houses sold with open stud interiors with no interior walls would probably not conform to the minimum property standards. But it is most doubtful that houses unfinished to this point would be regarded as adequate loan security without some provision for early completion of the dwelling." Both the potential economy of "progressive development" and the institutional barriers to its achievement are thus confirmed.

In another very interesting report that has just come to my attention: *A Proposal to Demonstrate Financing and Construction Techniques for Developing Low-Income Housing in Rural California*, by Bellow, Lorenz, Powell and Goldes for the Rural Development Corporation of Los Angeles, the relevance of these principles is further confirmed. Quoting from the 1963 State *Report on Housing in California*, the authors point out that 40 percent of farmworker families (of the survey sample) own or were purchasing their own homes in spite of average monthly incomes of only $222.50! Having demonstrated that the demand exists, the report goes on to specific proposals for financing, technical assistance, and designs—illustrating the rather advanced "roof house" and "core house" concepts derived from experience in the developing countries.

Letters to the Editor

I would like to raise a question pertaining to the validity of Dr. James C. T. Mao's analysis for assisting in the public decision-making process as presented in his article, "Efficiency in Public Urban Renewal Expenditures Through Benefit-Cost Analysis," which appeared in the March 1966 issue of the *Journal*. I feel that Mao has committeed an error of omission which would render his analysis misleading if public resource allocation descisions were to be founded upon it.

In both his article and the research report from which it is drawn, *Efficiency in Public Urban Renewal Expeditures Through Capital Budgeting*,[1] Mao omits from the cost side of the ledger the dollar amounts expended for land purchase by the public urban renewal authority. He justifies this exclusion (rather vaguely in the *Journal* article but quite explicitly in the research report) on the assumption that the only "real" costs to society are those which are related to the "using up" of resources in the renewal process. Mao feels that, for society as a whole, an exhaustive payment cannot be made for an indestructible site resource. He then views the dollar expenditure for land by the public authority as merely a transfer payment which should not be treated as a cost to be weighed against benefits in the decision-making process.

My question is, simply, is this distinction between exhaustive versus transfer payments relevant to resource allocation decisions in the public sector? I feel that it is not. Mao is attempting to draw on modern economic theory and analysis to make resource allocation decisions in the public sector more rational and efficient. This is an admirable objective, and I think that, aside from the question I am raising, he has done an excellent job. However, I fail to understand the justification he makes for not including land costs in his benefit-cost scheme.

Neo-classical economic thought of the nineteenth century does contain reference to the *real costs* of production. Neo-classical economists define these as the exertions (i.e., disutilities) of labor and the abstinences from consumption (i.e., saving) that were required for creating the capital needed to produce goods. According to their view, the ultimate basis of cost was a set of psychological concepts based on a hedonistic philosophy. In the case of land, since neither the disutility of labor nor the abstinence from current consumption accounted for either its existence or quality, no real cost was thought to be present. In general, land was considered to be a "gift of nature."

Few economists today employ the "real cost" doctrine as stated above. The notion of *opportunity cost*, that is, that the cost of any particular course of action is the amount of gain which could have been obtained by pursuing the next most desirable alternative, is widely accepted by contemporary economists. In its modern form, the opportunity cost doctrine would probably appear as a statement that the cost to society of producing a unit of any given product (for example, an urban renewal project), is the amount of the next most desirable product (whatever product that market forces indicate should be produced), which could be produced with the given marginal resource input. Wherever choice is involved, the opportunity cost doctrine may be employed. Where there is no real or close alternative use for a resource, the opportunity cost doctrine is useless, or at least misleading. Such a situation does not usually exist in the case of urban land sites.

I am not supplying this definition of opportunity cost for Mao's edification, nor am I accusing him of not applying it elsewhere in his analysis. He is obviously well aware of its existence. However, he chooses to apply it only when, as he states it, real resources are used up. Even if it is true that an urban land site may still exist fifty years hence, while the brick and mortar structure erected upon it may not, is this relevant to a public

UNITED NATIONS
Centre for Housing, Building & Planning

ESA/HBP/AC.20/21

English only

Expert Group Meeting on Lower-Income Urban Settlement Types
New York, 28 November to 2 December 1977

LOWER-INCOME URBAN SETTLEMENT TYPES, PROJECTS AND POLICIES

Lawrence F. Salmen

Lawrence F. Salmen, Foundation for Cooperative Housing. The views and opinions expressed in this paper are those of the author and do not necessarily reflect those of the United Nations.

LOWER-INCOME URBAN SETTLEMENT TYPES, PROJECTS AND POLICIES

The statistics on the gap between the need and supply of world housing are as bleak as they were 10 and 20 years ago. In the mid '60's, governments and international institutions began to realize that adequate resources to fill this gap were not going to appear in the foreseeable future. Attention shifted from production of finished houses to lower-cost, semi-finished, "shell" or "core" houses. There was even talk of merely providing serviced land and materials, "sites and services," though this was rarely done in practice. More recently, in the last few years, the public sector has seen that even these minimal solutions have their problems, due the scarcity of conveniently located land and to the difficulty of uprooting pre-existing urban communities and attempting to create instant neighborhoods. Housing alone, in whatever state of completion, does not a viable community make. Finally, then, attention has focused on preserving and upgrading existing lower-income communities, to the extent possible, thereby maintaining the housing stock and respecting the communities which have generally taken years to evolve to their present state.

Having recognized that the most viable way to better the shelter for the poor is to improve what they have, questions are legitimately being raised about the particular characteristics of their existing situation. Implicit in these questions is a recognition that "slum" is a catch-all word which encompasses widely divergent physical and sociological forms of settlement. Anthony Leeds has developed a fairly exhaustive typology of the various settlement forms appearing in Latin America which may well have applicability to other developing areas. The purpose of this paper will be to relate certain differences between two lower-income settlement types observed in one Latin American city, to draw on the experiences of the Foundation for Cooperative Housing which relate to inner-city slums in another Latin American city (past), and two lower-income settlement types in a Middle Eastern city (proposed), and to discuss certain policy implications which derive from but transcend these particular experiences.

Two Types of Slum in Rio de Janeiro

A study done in the later '60's on the Casas de Comodos, or inner-city tenement slums of Rio de Janeiro, revealed living conditions in this type of housing to be quite different from that reported for the favelas, or squatter settlements of Rio.[1] In this Brazilian city the poor generally live in either one or the other of these two slum types.

Multi-family, single-room occupancy tenements have been a major type of slum dwelling in Rio de Janeiro since the mid-nineteenth century. Originally taking the form of corticos, which were built for this purpose, this kind of housing has increasingly been made up of casas de comodos, large buildings built originally as town houses for the rich and subsequently subdivided for low-cost rental to many families, all of whom share the facilities of water, toilet, shower and washtank. These casas were found to be generally two-story structures with an average of 17 rooms each and a mean occupancy rate of 3.1 persons per room. There are at present roughly 150 to 200 thousand persons living in these houses throughout the centrally located districts of the city of Rio, more than in any other city of Brazil except Sao Paulo, which has over three times this number. This latter city,

---

1 Lawrence F. Salmen, "The Casas de Comodos of Rio de Janeiro; A Study of the Occupants and Accommodations of Inner-City Slums and a Comparison of the Characteristics with the Favelas," Ph.D. Dissertation, Columbia University, New York, 1970.

however, has almost no favelas, which first sprung up in Rio in the 1920's and now shelter close to a million of the city's population.

The major problems associated with the cases de comodos evolve from the deteriorated physical condition of the buildings and the overcrowding of the occupants. These include infestation by rats and vermin, poor health and lack of privacy. While 70 percent of the tenement residents expressed dissatisfaction with their housing, well over half of these persons (66 percent) did not feel financially able to move to another kind of housing. The sharing of bathrooms and overcrowding in the rooms were the features of the casas most disliked by the residents.

The study reported three major advantages to living in a casa de comodos: 1. Most important, it is the cheapest accommodation which provides minimal plumbing facilities and is close to the centers of work, commerce and education. More than half of the employed casa residents either worked at home or walked to work, and the great majority of the remainder lived within short commuting distance of their place of work. 2. The casas de comodos are generally located very near the residences of the middle and upper-classes and thus many of the residents of this housing are well-situated to gain favors and economic opportunities from the affluent members of these classes. 3. Due to the close proximity of residence in the casas, there is a considerable amount of exchanged favors and services which is not present in other forms of habitation.

Though it would appear that the resident of the casas de comodos might naturally want to leave his rented room for a house in a favela, not one of the sample expressed a desire to do so. This is so despite certain definite advantages which favelas offer, notably: low-cost housing which can be built over time as resources become available, lack of threat of eviction for failure to pay rent, land near the house for small agriculture or animals, credit and other favors from favela shopowners, and fuller community life. It may be that part of the reason for the casa residents' lack of desire to move to the favelas a..e from the little familiarity they had with them—only four percent of the sample of 300 were very familiar with the favelas or their residents; this ignorance would make for a greater gullibility regarding the general bias against favelas in Brazilian society.

The reasons given by the residents of casas de comodos for not wanting to move to a favela fell into two general categories, social and physical: the people of the favelas were felt to be socially inferior and the favelas to be dirty, distant from work and schools and poorly serviced. The social bias had little factual foundation: there is remarkably little crime in the favelas and social disorganization is less in these communities than in the casas de comodos. However, an authoritative survey of the favelas[2] taken at that time does give data which show the favela population to be considerably less educated, less fully and stably employed and, most important, more poorly paid than are persons living in casas de comodos. Confirming the impression that the standard of living is lower in the favelas than the casas is the fact that the average casa domicile has more major appliances than does that of the favela. Physically, favelas appear to be somewhat worse than the casas de comodos. Though less densely settled, they are on the average farther removed from places of work, and more important, far less adequately serviced for sewage, water and electricity.

---

2 Companhia de Desenvolvimento de Comunidade (CODESCO), Pesquisa sobre tres favelas, Rio de Janeiro, 1967 (Xeroxed).

An Improvement Program in a Tenement Slum in Panama City

At about the same time this study in Rio was being conducted, the Foundation for Cooperative Housing (FCH), a non-profit, private organization working on housing problems in the U.S. and the developing world, was assisting the Panamaian Housing Agency (IVU) in implementing an AID-financed project aimed at improving the living conditions of residents of multi-family tenement houses in Panama City which were similar to the casas de comodos. In Panama this form of housing is known as casas de inquilinato. Many blocks of these houses had been constructed in downtown Panama City at the time of the building of the Panama Canal to house the canal workers. They were built as two-story structures around a small courtyard with 12 rooms and one wash/toilet area to a floor. Once these buildings became tenements, they were occupied by a family per room, with the result that the high density gave rise to many of the same serious health and crowding problems reported for the casas of Rio.

The intention of the AID project was to improve the conditions of the residents of two of the worst tenement slum areas, Curundu and Maranon, by providing the residents various alternatives for lower-density yet low-cost housing. The program also included upgrading of selected existing squatter settlements. A survey was conducted to determine the number of persons desiring to remain in the same area of the city and those who preferred to move to a new settlement, Nuevo Veranillo, located within the development area of Panama City at a distance roughly 25 minutes by bus from the tenements.

Selected blocks of tenement housing were razed (using labor from the communities) to allow for construction of new low-cost yet more fully serviced housing and commercial structures in the vacated lots. Residents of the demolished tenements were given the choice of moving to new minimal housing in New Veranillo or to the new housing built in their same neighborhood. The structures which remained were rehabilitated to allow each family two or three rooms, water and sanitary facilities in place of the one unserviced room it had had. Nuevo Veranillo was planned as a modified sites and services project with 1,200 core and shell housing units which the residents could finish as their incomes allowed. In addition, there were health education facilities and vocational training programs in the new community and a housing materials production center which employed 50 persons and produced enough to generate an income of $4,500 (net) a month. By 1971, 1,500 families had voluntarily relocated to Nuevo Veranillo and the densities of Maranon and Curundu had been reduced, with some blocks cleared for new development. The Nuevo Veranillo site had been planned to accommodate those desiring the amenities of a more suburban location (land, single-family residences, clean air, etc.). Most important, several alternatives were made available to the slum residents, to be selected according to residential preferences and economic ability. The key factor in the success of this program was the involvement of the residents through community associations--participating in the design, promotion and implementation of the project--and relocation by voluntary as opposed to force methods. Upon completion of this AID-funded project, IVU developed a new area near Nuevo Veranillo providing similar core house alternatives to 2,500 additional families.

Proposed Improvements for Selected Slum Areas of Cairo

Drawing on its experience both overseas and in the U.S., FCH became involved very recently in the development of multi-faceted demonstration projects affecting both inner-city and peripheral area lower-income settlements in Cairo, Egypt. In March of this year, the Egyptian Ministry of Housing and Reconstruction (MOHR) and AID requested FCH's help in preparing a preliminary report "Housing and Community Upgrading for Low Income Egyptians. The FCH team worked jointly with MOHR counterparts in selecting several sites for demonstration projects, now under consideration by AID for financial support.

The principle followed in all target areas was to preserve the existing housing stock, respect present community organization and improve or build on both to allow for increased and better serviced shelter. A brief account of the selection of sites in Cairo[3] and of the development plans for two types of lower-income settlements illustrates an approach to the question of how to improve differing types of lower-income communities.

The three areas of Cairo tentatively chosen for upgrading were Al Gamalia, a section of Old Cairo in the center city, Ain Shams, a growing area of low-cost housing and small industry in the northern part of the city, and Helwan, a major industrial complex to the south of Cairo.

The criteria for this selection was as follows:

1. High concentration of poor
2. Availability of employment
3. Commercial center
4. Growth pole, north and south - to relieve congestion at the center
5. Location on desert rather than agricultural land
6. Cultural significance (Al Gamalia)
7. Potential for self-generating development.

---

3 Sites were also selected in secondary cities with a view to slowing immigration to Cairo and spurring regional development.

The last two of these criteria played a major part in the selection of Al Gamalia as an area for improvement. Located in the old section of Cairo and containing many mosques and other historical monuments as well as a part of the old commercial center, or Bazaar, Al Gamalia appears to offer a Major potential for revitalization, once provided with a small impetus of capital and technical assistance. The hope is that as the physical aspects of the area are improved, tourism, which already comes to the bazaar, may increase; this growth in tourism will raise the demand for goods and services which will, in turn, generate increasing employment. As more people get better paying jobs, they will be able to pay for increasing physical improvements and invest in better productive enterprise, which will attract more visitors, and thus the self-generating cycle proceeds.

For this optimistic vision to become reality many hard problems will have to be dealt with. Suffice it here to name a few: rent control laws, very low income and educational levels of much of the population, lack of vacant land and insufficient space for needed improvements in transportation, sewerage and water facilities.

The proposed demonstration project would include the following components: Water and sewer improvement, loans for repair and expansion of residential structures, construction of new multi-family dwelling units, additional community services--health, family planning, nutrition, improved circulation for vehicles and pedestrians, restoration of monuments, small scale tourist facilities--restaurants and rest areas. There should also be a program of vocational training, loans and technical help to small business enterprises to help produce more jobs and increase incomes. A community based savings credit system would also make a major contribution to the upgrading process.

There is no easy answer to the rent control problem which inhibits landlords from making repairs and improvements. However, several possibilities should be considered.

A number of old residential buildings are owned by the Government and these could be rehabilitated and sold to residents as cooperatives or condominiums, allowing recuperation of the investment with long-term mortgages.

The mortgage could be on the property only, with the Government retaining title to the land, making it available on a long-term lease to the cooperative. This would help prevent speculation on unearned profit to the cooperative, since land values will increase dramatically as the upgrading program progresses. It would also reduce the monthly payments on individual apartments.

Another possibility which should be considered to reduce monthly charges would be the use of very long-term mortgages, perhaps 40 years. This is not uncommon in developed countries and might work in Cairo. The security is in the building and the certain appreciation of the land. Monthly payments could also be stepped for younger families, increasing as their incomes increase.

The Government also owns vacant lots in the area which would allow for new construction of cooperatives and condominiums which would also be sold with a land-lease arrangement, avoiding rent control problems.

In both the new and rehabilitated units the street level space would be reserved for commercial shops on the front and small "factories" in the rear, following the traditional pattern of the area. These areas would be rented by the cooperative, and the income would help subsidize the monthly payments of the residents on the upper floors.

Both new construction and rehabilitation work would be done by private contractors, with encouragement to use small contractors who already do much of the repair work and small new construction jobs. There would be a need for helping them to upgrade their management and administrative capabilities and to improve the quality of their work through training and apprentice programs. They would be encouraged to hire from the community.

In addition to the physical improvements-tourism cycle mentioned above, improved health, education, vocational training and childcare centers would also contribute to increased incomes as residents benefitting from these services would be better able to find meaningful employment outside the project area.

The other two areas to be upgraded, Ain Shams and Helwan, are both located in desert land, thus signifying a Government attempt to encourage city growth away from the scarce arable land needed for agriculture. Both settlements, at opposite ends of Cairo, have grown up over the last twenty years in relatively unplanned informal fashion. Housing in these two areas is generally of inferior quality and poorly serviced by water and sewerage systems. Some of the housing in each area is squatter. Like newly growing suburban fringe areas in other cities of the developing world, these areas also lack social and community services.

Comprehensive, integrated urban development is often recommended though rarely put into practice due to competing, sometimes conflicting and uncoordinated bureaucratic structures both within the municipal and national governments of developing countries and within foreign assistance agencies of donor nations. It is hoped that the projects for Ain Shams and Helwan will be an exception and achieve an integrated development; with this as a goal, they are to include the many and varied components of water, sewer and electric lines, home expansion and improvement loans, "roof loans," vocational training, and other methods of employment generation, a community credit system, adult education programs in health, nutrition and family planning.

The hope is that these two outlying new slum areas, with a full complement of physical, social and economic improvements, may become, like Al Gamalia, communities with the potential to generate their own development process.

Policy Implications

A general conclusion that can be derived from the foregoing is that the poor are where they are due to their own assessment of what is best for them, given the severe constraints within which they live. The inner-city tenent slums are home for people who cannot afford to move to better housing; they have chosen their habitat largely for its convenience to places of employment. Squatters, who pay no rent, are generally poorer than the residents of the tenements; they do, however, enjoy the benefit of a small plot of land which allows for future improvement and a more cohesive community, both lacking in the tenements.

What is becoming the conventional wisdom is born out by the research and experiences cited here: good urban development policy is that which reinforces and builds upon the existing social and physical structures of the poor. The best policy would not only improve what is already in place but do so in such a way that the poor may increasingly affect the decisions which touch upon their own lives.

Center-city multi-family tenements are favored by location and plagued by overcrowding and inadequate services. Improvement in these center-city areas should not displace persons away from their job markets. It should lessen densities, on a voluntary basis, as was done in Panama, providing new housing in the same general area for those for whom the center-city location is important, while facilitating the transition to low-cost housing and land farther removed from the center for those who desire and can afford the transportation to and from work which this move generally entails. It is important that tenants of the down-town converted tenements be assured of continuous provision of adequate services. Once water and sewerage facilities are provided to these buildings, the municipality needs to keep constant surveillance over the landlords to assure adequate maintenance and delivery of these services. Whenever new structures are built, the physical design should facilitate the constant close interaction which has been shown to be of great importance to the poor's struggle to survive.

Each of the major slum types, downtown tenements, squatter areas and newly-settled peripheral settlements, all benefit far more from the kind of integrated, comprehensive approach proposed for Cairo than piecemeal uni-sectoral programs. Poverty is caused by many factors, bad health, low educational levels, poor motivation, squalid physical environment, etc. Not one but a combination of these problems must be remedied for any real benefit to accrue to the poor.

More important, any improvement which is carried out in any type of slum will only have a lasting value to the people affected if they ultimately come to determine the scope and direction of the improvement effort. Development is only effective if it becomes internalized such that the objects or recipients of improvement become the subjects or promoters of change. In policy terms, this means that urban development efforts should be dedicated to building up community organizations, in the form of coopera-tives of all kinds (consumer, production, housing), credit unions, neighborhood associations, and other such network linkages. Unless there is the opportunity to enter into the decision-making process with the transfer of power which these forms of community associations allow, any development effort, be it physical amenities, jobs, health centers or whatever, will fail, in that the poor will still passively depend upon rather than become an active force in changing the social and economic system from which they receive so little benefit.

UPGRADING OF SLUMS

By

Menezes and K.C. Sivaramakrishnan

Introduction

A large portion of urban residents in the developing countries are poor and many live in unserviced settlements without security of tenure. (See Tables) These settlements represent a considerable part of the existing housing stock. The quality of this stock could be improved if the residents were provided with basic services. Many residents are willing to improve their dwellings if they are given security of tenure. The upgrading of slums is an approach to the provision of low income shelter which is being used with success in many LDC's.

Background

Large squatter settlements, or other types of slums, have become a characteristic form of development in the LDC's within these last 20 years. (See Tables) In many countries governments tried to control this settlements by demolition e.g., Peru, Brazil, Kenya etc.: or by refusing to acknowledge their existence e.g., Philippines. In addition, attempts were made to remove the squatter population to rural areas or the urban fringe e.g., Philippines, Brazil, Tanzania, etc. None of these methods could prevent the steady increase of slum growth. Where attempts were made to provide alternative accommodation for slum dwellers they proved no more effective. In Madras a clearly defined slum clearance program was begun in 1971. The Tamil-Nadu (the province of which Madras is Capital) Slum Clearance Board was established with the target of clearing all slums by 1977. All residents were photographed and identified and a building program was established on the required scale. Between 1971-75, 20,000 units were completed. The dwellings cost approximately Rs 10,000 (US$1,100) per unit but were let at only Rs 10 (US$1.1) per month which recovered only 10% of the cost. It became increasingly difficult to sustain the program. Hopes of recovering the capital cost on the completed units were abandoned in 1975 when the state government decided to treat the investment as a grant to the Slum Clearance Board. Recently the State has adopted a complementary program of slum upgrading and sites and services development. (For more information on slum clearance/upgrading programs in India see K.C. Sivaramakrishnan, Indian Urban Scene: Chapter V attached). The history of demolition, deportation and refusal to accept any but the standards of conventional housing, has been common to most countries. However, in the face of the increasing growth of squatter settlements and severe resource constraints, many governments have begun to look to the less expensive, more affordable approach of slum upgrading.

The Rationale for Slum Upgrading

(1) Given the scale and spread of slums in most cities, it is not politically or financially feasible to remove them.

(2) Squatters or slum dwellers are generally among the poorest any relocation attempt removes them farther from sources of employment, reducing their capacity for economic survival.

(3) Upgrading existing settlements enables an overall improvement in living conditions at less cost and with less disruption than other approaches.

(4) Once occupants are given security of tenure and access to credit their savings can be mobilized and directed into shelter. Significant improvements have been noticed in several settlements once secure tenure is established. Existing resources are used and the principle of continuous improvement is established.

(5) Established community organizations do exist within many slum settlements and can save administrative effort for project management and form a strong support system necessary for the social and economic survival of low income urban squatters. (See Philippines Tondo Foreshore attached).

Arguments Against Upgrading

The arguments that have been used against this form of development are as follows:

(1) By giving squatters security of tenure, future illegal invasions by others are encouraged (see Issues on Land Tenure by Doebele).

(2) The legal owners of the land may not get adequate compensation.

(3) Recovering costs from the occupants is difficult.

(4) The existing site may not make the most efficient use of land. Other forms of development might yield higher rates of return. Alternatively, the sites may be too difficult to service (e.g., ravines, floodplains), leading to a more costly overall development.

(5) Defacto regularization of squatter invasion is not the best method to accommodate urban growth. In the long run planned sites with good access to employment and services may be a less expensive and better alternative.

Operational Issues

The operational issues in slum upgrading are:

A. Criteria for Site Selection

B. Eligibility

C. Approaches to Land Tenure

D. Content of Program

E. Community Participation

F. Cost Recovery

A. Criteria For Selection

In establishing an order of priority for upgrading of squatter areas a number of factors require consideration. In Jakarta, areas of high density and poorest living conditions were developed first. High density settlement is characteristic of older, centrally located areas. These may prove difficult for development requiring demolition of structures and displacement of residents. Older areas, however, are more likely to have an established, organized community structure which can assist in the decision making process, e.g., Tondo Foreshore, Manila. Centrally located settlements have frequently created friction with authorities by nature of their conspicuousness and occupation of highly valued land. Alternatively areas of low density may provide greater opportunities for planned development. In addition, ownership of land, community pressures, access to trunk services and compatibility with adjacent development should all be considered in selecting areas for upgrading.

B. Eligibility

Once an area has been selected for upgrading it is to be assumed that all the residents of that settlement are beneficiaries. An identification program is required at this stage to record existing structures and residents. A survey of this kind should establish 'ownership' of structures and prevent speculation and invasion by residents and outsiders. Not all residents may benefit equally and local leaders and community development workers can help resolve the issues arising from demolition or displacement and determining the rights of landlords and tenants.

C. Approach to Land Tenure

Tenure issues are complex but their solution is important for the success of an upgrading project (see Doebele Land Policy Issues, Vol. I). Security of tenure is the prime benefit derived from a slum upgrading. This is usually established by conferring legal title on the resident following some form of payment. In Jakarta, where basic improvements were made without conferring legal tenure, upgrading itself represented a defacto regularization of the squatters' status. Doebele states - the critical element in tenure may not be "the precise legal category involved ... rather the perception of the occupant of his security in relation to the investment contemplated. The amount of investment in housing seems to be closely correlated with the perception of risk of removal irrespective of the technicalities of legal title." A distinction can be made between the rights of use, and the ownership of land and the right of compensation for any improvements made on that land. In most upgrading programs regularization of tenure is of prime importance. In Lima, legalization of tenure was the first issue to be tackled, in 1963, prior to improvements in infrastructure. In the Tondo Foreshore the purchase price of the land which will confer legal tenure has not been satisfactorily decided. In Cartegena, Colombia, a distinction is made between ownership and tenure. The resident has right of tenure without purchasing the deed which confers ownership. This deed is only required if the resident wishes to sell or transfer his plot.

D. Content of the Program

Improvement programs may vary widely in content, from provision of basic infrastructure as in early K.I.P. Jakarta to a complex reorganization of the settlement as in the Tondo Foreshore reblocking exercises. The content will be determined by the priorities and needs of the residents, the resource constraints and the nature of community and governmental organizations. Health education, recreation, etc. are other items which need to be integrated within the upgrading program.

E. Community Participation

The participation of the residents is particularly important in upgrading. In fact, in established settlements the initiative for slum improvements has frequently come from the slum community itself. The experience from many projects suggests that the success of the design, implementation and particularly future maintenance of a project, depends greatly on the degree of community participation. Experience in Manila suggests that community groups can deal successfully with the issues of removal of dwellings to facilitate reblocking and questions of compensation. The degree and nature of community participation will vary from area to area and country to country.

F. Cost Recovery

Cost recovery can be more difficult in slum upgrading than in alternative forms of development. A program of this nature will contain families of very low income who would be ineligible for any other form of development. However, substantial cost recovery from beneficiaries is essential to replicability of programs. It is important to determine the extent to which costs can be recovered directly from the beneficiaries, for what services and by what techniques. Some programs may facilitate cross subsidy of the poorer beneficiaries by the richer. In Jakarta costs have not been recovered directly from the beneficiaries but from an increase in the general tax revenues. In Lima the majority of costs were recovered from tariff charges and monthly payments for utilities and site purchase. The cost of health and nutrition centers, technical assistance and some access roads are recovered from general tax revenues.

Conclusion

Given the rapid urbanization rates and wide spread slum growth, upgrading of slums alone should not be regarded as an exclusive instrument. It is important that new sites are prepared and developed to absorb low income migrants and overspill families from upgraded slum areas. Sites and services and slum upgrading should be regarded not as mutually exclusive but mutually supportive.

INCIDENCE OF SLUMS AND SQUATTER AREAS IN SELECTED LDC CITIES 1/

Country	City	Slums and Squatter Settlements as Percent of City Population	
Subsaharan Africa			
Cameroon	Douala	80	(1970)
	Yaoundé	90	(1970)
Ethiopia	Addis Ababa	90	(1968)
Ghana	Accra	53	(1968)
Ivory Coast	Abidjan	60	(1964)
Kenya	Nairobi	33	(1970)
	Mombasa	66	(1970)
Liberia	Monrovia	50	(1970)
Madagascar	Tananarive	33	(1969)
Malawi	Blantyre	56	(1966)
Nigeria	Ibadan	75	(1971)
Senegal	Dakar	60	(1971)
Somalia	Magadishu	77	(1967)
Sudan	Port Sudan	55	(1971)
Tanzania	Dar es Salaam	50	(1970)
Togo	Lomé	75	(1970)
Upper Volta	Ouagadougou	70	(1966)
Zaire	Kinshasa	60	(1969)
Zambia	Lusaka	48	(1969)
EMENA			
Iraq	Bagdad	29	(1965)
Jordan	Amman	14	(1971)
Turkey	Ankara	60	(1970)
	Istanbul	40	(1970)
	Izmir	65	(1970)
Lebanon	Beirut	1.5	(1970)
Morocco	Casablanca	70	(1971)
	Rabat	60	(1971)
Low Income Asia			
Afghanistan	Kabul	21	(1971)
India	Calcutta	33	(1971)
	Bombay	25	(1971)
	Delhi	30	(1971)
	Madras	25	(1971)
	Baroda	19	(1971)
Indonesia	Jakarta	26	(1972)
	Bandung	27	(1972)
	Makassar	33	(1972)
Nepal	Katmandu	22	(1961)
akistan	Karachi	23	(1970)
ri Lanka	Colombo	43	(1968)

Country	City	Slums and Squatter Settlements as Percent of City Population	
Middle Income Asia			
Hong Kong	Hong Kong	16	(1969)
Korea	Seoul	30	(1970)
	Busan	31	(1970)
Malaysia	Kuala Lumpur	37	(1971)
Philippines	Manila	35	(1972)
Singapore	Singapore	15	(1970)
Latin America and Caribbean			
Brazil	Rio de Janeiro	30	(1970)
	Belo Horizonte	14	(1970)
	Recife	50	(1970)
	Porto Alegre	13	(1970)
	Brasilia	41	(1970)
Chile	Santiago	25	(1964)
Colombia	Bogotá	60	(1969)
	Cali	30	(1969)
	Buenaventura	80	(1969)
Ecuador	Guayaquil	49	(1969)
Guatemala	Guatemala City	30	(1971)
Honduras	Tegucigalpa	25	(1970)
Mexico	Mexico City	46	(1970)
Panama	Panama City	17	(1970)
Peru	Lima	40	(1970)
	Arequipa	40	(1970)
	Chimbote	67	(1970)
Venezuela	Caracas	40	(1969)
	Maracaibo	50	(1969)
	Barquisimeto	41	(1969)
	Ciudad Guayana	40	(1969)

1/ Definitions vary from country to country and from city to city, therefore, these data only present the roughest of impressions regarding the housing problem in these cities.

Source: Grimes (1976).

PERCENT OF POPULATION WITH ACCESS TO WATER SUPPLY AND EXCRETA DISPOSAL: 1970 AND RECENT YEAR

		Access to Water				Access to Excreta Disposal			
		1970		Recent Year		1970		Recent Year	
		Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
	Subsaharan Africa								
1.	Benin	83.0	20.0	100.0	20.0	83.0	1.0		
2.	Botswana	71.0	26.0	95.0	39.0				
3.	Brundi	77.0							
4.	Cameroon	77.0	21.0						
5.	Central Afr. Emp.					64.0	96.0	100.0	100.0
6.	Chad	47.0	24.0	43.0	23.0	7.0		9.0	1.0
7.	Comoros								
8.	Congo	63.0	6.0	81.0	9.0	8.0	6.0	10.0	9.0
9.	Equitorial Guinea								
10.	Ethiopia	61.0		58.0	1.0	67.0	8.0	56.0	8.0
11.	Gabon	6.0							
12.	Gambia	97.0	3.0						
13.	Ghana	86.0	14.0	86.0	14.0	92.0	40.0	95.0	40.0
14.	Guinea	68.0		69.0		70.0	2.0		
15.	Guinea-Bissau								
16.	Ivory Coast	98.0	29.0			23.0			
17.	Kenya	100.0	2.0	100.0	4.0	85.0	45.0	98.0	48.0
18.	Lesotho	100.0	1.0	65.0	14.0	44.0	10.0	51.0	12.0
19.	Liberia	100.0	6.0			100.0	9.0		
20.	Madagascar	67.0	1.0	76.0	14.0	88.0			9.0
21.	Malawi	29.0				63.0			
22.	Mali	98.0	10.0			100.0			
23.	Mauritania								
24.	Mauritius	100.0	29.0	100.0	22.0	51.0	99.0	63.0	100.0
25.	Niger	37.0	19.0	36.0	26.0	10.0		30.0	[illegible]
26.	Nigeria								
27.	Rwanda	81.0	66.0	84.0	68.0	83.0	52.0	87.0	56.0
28.	Sao Tome & Principe								
29.	Senegal	87.0							
30.	Seychelles								

	1970		Recent Year		Access to Excreta Disposal 1970		Recent Year	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
31. Sierra Leone	75.0	1.0						
32. Somalia	17.0	14.0	77.0	22.0			77.0	35.0
33. Sudan	61.0	13.0	59.0	26.0	100.0	4.0	100.0	10.0
34. Togo		5.0	49.0	10.0	4.0	1.0	36.0	12.0
35. Upper Volta	35.0	10.0	50.0	23.0	49.0		47.0	
36. Zaire	33.0	4.0	38.0	12.0	5.0	5.0	67.0	6.0
37. Zambia	70.0	22.0	86.0	16.0	12.0	18.0	87.0	16.0
EMENA								
1. Cyprus	100.0	92.0	94.0	96.0	100.0	92.0	94.0	95.0
2. Greece								
3. Portugal								
4. Turkey	51.0	53.0	74.0	64.0			13.0	5.0
5. Romania								
6. Yugoslavia								
7. Algeria	84.0		100.0	61.0	13.0	6.0	100.0	50.0
8. Bahrain								
9. Egypt			87.0	63.0				
10. Iran	68.0	11.0	76.0	30.0	100.0	48.0	100.0	59.0
11. Iraq	83.0	7.0	100.0	11.0	82.0		75.0	1.0
12. Israel								
13. Jordan	98.0	59.0						
14. Kuwait								
15. Lebanon	95.0	85.0						
16. Libya	100.0	42.0	100.0	82.0	100.0	54.0	100.0	69.0
17. Morocco	92.0	28.0			75.0	4.0		
17. Oman			100.0	48.0	100.0		100.0	5.0
19. Qatar								
20. Saudi Arabia								
21. Syria	98.0	50.0						
22. Tunisia	92.0	17.0			100.0	34.0		
23. UAE								
24. Yemen (ABAD)	45.0	2.0	51.7	6.7 a/				
25. Iceland								
26. Spain								

Sanaa, Taiz and Hodeidah only.

	Access to Water				Access to Excreta Disposal			
	1970		Recent Year		1970		Recent Year	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Low Income Asia								
1. Afghanistan	18.0	1.0	40.0	5.0	69.0	16.0	63.0	15.0
2. Bangladesh	13.0	47.0	22.0	61.0			40.0	
3. Bhutan								
4. Burma	35.0	13.0	31.0	14.0	45.0	32.0	38.0	32.0
5. Cambodia								
6. India	60.0	6.0	80.0	18.0	85.0	1.0	87.0	2.0
7. Indonesia	10.0	1.0	41.0	4.0	50.0	4.0	60.0	5.0
8. Lao								
9. Nepal	53.0		85.0	5.0	14.0		14.0	
10. Pakistan	77.0	4.0	75.0	5.0	12.0		21.0	
11. Sri Lanka	46.0	14.0	36.0	13.0	76.0	61.0	68.0	55.0
12. Vietnam								
Middle Income								
1. China, RO								
2. Hong Kong								
3. Korea, RO	84.0	38.0	95.0	3.0	59.0		80.0	50.0
4. Malaysia	100.0	1.0	100.0	5.0	100.0	43.0	100.0	43.0
5. Philippines	67.0	20.0	82.0	1.0	90.0	40.0	76.0	44.0
6. Singapore	96.0		100.0		100.0		99.0	
7. Thailand	60.0	10.0	69.0	16.0	65.0	8.0	58.0	36.0
Latin America								
1. Argentina	69.0	12.0	76.0	26.0	87.0	79.0	100.0	83.0
2. Barbados	95.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3. Bolivia	92.0	2.0	81.0	6.0	25.0	4.0		9.0
4. Brazil	77.0	29.0	83.0	52.9	86.0	26.5	86.3	39.0
5. Chile	67.0	13.0	78.0	28.0	33.0	10.0	36.0	11.0
6. Colombia	88.0	28.0	86.0	33.0	75.0	8.0	73.0	13.0
7. Costa Rica	98.0	59.0	100.0		66.0	43.0	94.0	93.0

		Access to Water				Access to Excreta Disposal			
		1970		Recent Year		1970		Recent Year	
		Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
8.	Dominican Republic	72.0	14.0	80.0	27.0	63.0	54.0	74.0	16.0
9.	Ecuador	76.0	7.0	67.0	8.0				7.0
10.	El Salvador	71.0	20.0	89.0	28.0	66.0	18.0	71.0	17.0
11.	Guatemala	88.0	12.0	85.0	14.0			11.0	16.0
12.	Haiti			46.0	3.0				
13.	Honduras	99.0	10.0	99.0	13.0	64.0	9.0		
14.	Jamaica	100.0	48.0	100.0	79.0	100.0	92.0	100.0	91.0
15.	Mexico	71.0	29.0	70.0	49.0			13.0	14.0
16.	Nicaragua	58.0	16.0	100.0	14.0			8.0	24.0
17.	Panama	100.0	43.0	100.0	63.0	92.5	68.2	97.1	78.0
18.	Paraguay	22.0	5.0	25.0	5.0	16.0		28.0	
19.	Trinidad & Tobago	100.0	95.0	79.0	100.0	51.0	96.0	83.0	97.0
20.	Uruguay	100.0	59.0	100.0	97.0	97.0	13.0	97.0	17.0
21.	Venezuela	92.0	38.0				45.0		
22.	Surinam								
23.	Guyana	100.0	63.0	100.0	75.0	95.0	92.0	99.0	94.0
24.	Peru	58.0	8.0	72.0	15.0	52.0	16.0		

Source: World Bank, <u>Social Indicators Data Sheet</u>, Sept., 1978

ANNEX 1

Notes on the Experience of Slum Upgrading Programs in Jakarta.

These notes have been prepared by Mrs. Leonie Menezes based on the World Bank Appraisal Reports:

Indonesia Urban Development Project 1974
Indonesia Second Urban Development Project 1976
Indonesia Third Urban Development Project 1978

Necessary modifications have been made to suit EDI teaching purposes.

JAKARTA, INDONESIA

SLUM UPGRADING PROGRAM

Background

Indonesia is the fifth most populous country in the world with a population of 135 million (1976). Two thirds of Indonesia's population is concentrated on the island of Java which is only 7% of the total land area. The average rural density of 663 persons/km is nearly as high as in many urban areas in the industralized nations. This situation has created intense pressures on available agricultural land and consequently pushed thousands of unskilled, uneducated farmers into urban centers faster than the latter have been capable of absorbing them.

With a present population of five million and annual average per capita income of about US$ 160, the city of Jakarta is one of the largest as well as poorest in the world. The rate of natural population increase in Java has been 2.1% a year in the last decade: but, in addition to this, Jakarta has experienced a rate of immigration of 2.5% a year over the same period. The current average density in the city is about 8,000 persons/km^2. Because most people live in single-story dwellings and not apartment buildings density is a particularly accurate indicator of crowded living conditions.

The Kampungs

With immigration, thousands of rural families moved into crowded quarters with friends or relatives; thousands more hastily erected temporary shelters on land they did not own. This population influx increased densities and added to the number of existing kampungs (low income neighborhoods) which had been settled in a haphazard manner throughout the city for more than a hundred years. The provincial government recognizes these kampungs as permanent settlements even though few residents hold legal title to the land or houses they occupy. Kampungs now encompass more than 65% of the city's urbanized area and contain 80% of the population.

Although recognized by the Government and having an organized social base, in 1969 kampungs lacked all modern amenities such as piped drinking water, drainage, paved roads, proper sanitation, schools and clinics. Most of the inhabitants of the kampungs are squatters either on private or public land. They hold no legal title to the land or houses they occupy, although cases where the squatter intends to improve his dwelling, a temporary license for a maximum of five years can be given. The continued growth of the kampungs has meant steadily increasing demands on an already grossly inadequate infrastructure, which was designed to mainly benefit the upper income groups.

There are serious deficiencies in water distribution, sewage and waste disposal throughout Jakarta. There is no water borne sewerage. More than 50% of the population rely on groundwater wells which are contaminated by sewage seepage and increasing salinity. Approximately 40% are totally dependent on water vendors whose charges are five times greater than piped water charges.

Kampung Improvement Program

The Kampung Improvement Program (KIP) initiated in Jakarta in 1969 represents the authorities' efforts to deal with the provision of minimum services for large numbers of the urban poor at a reasonable cost. This program has been successful in social, technical and financial terms. The approach to the problem of provision of minimum infrastructure has allowed the Government to proceed on a large scale and its impact in Jakarta can be seen from the table below.

Urbanized area (1969)	-	12,000	hectares	
Area in kampungs (1969)	-	7,200	"	(60%)
Area improved 1969-1974	-	2,400	"	(20%)
Area improved 1974-1976	-	1,980	"	(16.5%)
Areas to be improved 1976-1979	-	3,000	"	(25%)
Total Improved (by 1979)		7,380	"	(61.5%)

Source: Appraisal Report Second Urban Project Indonesia 1976

The World Bank has supported this program since 1974 with three urban development projects. Under the third urban project 750 further ha in 30 kampungs will be improved between the years 1979 and 1982 benefiting an approximate population of 210,000. In addition, water supply and sanitation would be provided to the kampungs which were upgraded in 1969-74 to bring their level of improvement to the standards adopted in the second urban project under (Repelita II).

Scope and Objectives (Third Urban Project)

The first urban project upgraded sites in Jakarta. The second included improvements in Surabaya. In the third urban project the improvement program was extended to three additional secondary cities, Ujung Pandang, Semarang and Surakarta.

	Area (ha)	No. of Kampungs	% of Total Kampung Area	Population Upgraded	Per-Capita Cost (US$)	Per-Hectare Cost (US$)
Jakarta	750	30	8	210,000	69	19,400
Surabaya	580	27	20	275,000	35	16,675
Ujung Pandang	375	13	34	137,000	39	14,200
Semarang	310	15	15	95,000	44	14,200
Surakarta	170	10	16	49,000	35	10,150

This project will address critical short and medium term problems in solid waste management in Jakarta and Surabaya and drainage problems in Surabaya. Technical assistance is directed towards strengthening local government capabilities to sustain these improvement programs. Community health service will be supported and a pilot program is included to develop small businesses.

Target Population

The urban kampungs in Indonesia are populated by a relatively wide range of income groups. However in Jakarta, surveys have demonstrated that approximately 70% of kampung dwellers fall into the defined poverty level (income of US$750 and below p.a.). In the secondary cities 75-80% fall in the group. Kampung selection and eligibility criteria for these programs are especially tailored to ensure that the focus is on service to low income groups.

Design Standards (Third Urban Project)

Although hard and fast standards for KIP are not possible or desirable, given the considerable variation in existing conditions, levels of service and varying population densities, some guidance and control is necessary to maintain a reasonable balance of services within budget constraints. The functional standards adopted for the Second Urban Project have been maintained but modified in view of the experience. In addition to a minimum standard, a target and a maximum standard have been introduced for roads. The standards for water supply have been increased slightly to improve the coverage. The proposed functional standards have been defined as follows:

(a) Roads. All dwelling within a maximum distance of 100 m from a one-way road and 300 m from a two-way road. Length per ha may range between 50-100 m/ha for one-way roads and 15-35 m/ha for two-way roads; the target standard for the two types would be 60 m/ha and 20 m/ha respectively. Pavement widths will be 4 m or 6 m on a right-of-way of 6, 8 or 10 m, depending on traffic conditions.

(b) Footpaths. Paved footpaths to within 20 m of every dwelling not located on a road. The footpaths will have variable pavement widths depending on site conditions but ranging from 1.5-3 m with 3-6 m right of way. In addition, narrow footpaths of 1 m width will be provided where feasible to link groups of houses in the interior of kampungs with the main footpath system.

(c) Drainage. Open secondary drains along road and footpaths. Primary drains as required.

(d) Water Supply. Connection to city main supply or deep wells as appropriate. Design standards for the reticulation system will be about 60 lpcd. One standpipe will be provided to serve each RT (about 20 to 50 families). Where sufficient supplies are available, private connections will be available along the reticulation system.

(e). Sanitation. Pit privies for individual families and household groups will be provided wherever the appropriate soil conditions exist. In other areas community toilet and washing facilities (MMCK) will be provided at a rate of 1 toilet seat per 12 families.

(f) Solid Wastes Disposal. Hand carts and bins will be provided in all cities, and motor vehicles and trailers in Jakarta and Surabaya.

(g) Primary Schools. Primary schools (with furniture) to make up the deficiency of facilities in the kampungs and will provide enough space for about 75% of school-age children. In Jakarta, the schools will be financed from the INPRES program.

(h) Health Clinics. In the secondary cities small health clinics (sub-puskesmas) with 3 to 6 rooms and a total area of up to 300 m^2, with necessary furniture and equipment.

The functional standards defined above represent the desirable level of service. An overall per ha budget limitation in each city is maintained which, along with the existing service levels, determines the achievable level of service in a particular kampung.

The community facilities to be provided in the project cities, taking into account the availability of existing facilities. are estimated as follows:

	Primary Schools No.	Classrooms 1/	Sub-Puskesmas No.	Rooms	Population Upgraded
Jakarta	By INPRES		none		210,000
Surabaya	15	90	10	60	275,000
Ujung Pandang	6	36	10	60	137,000
Semarang	4	24	8	48	95,000
Surakarta	2	12	4	24	49,000

1/ In Jakarta the schools will be financed by the INPRES program (National subsidy for local development)

Community Participation

There has been little initial community participation in the implementation of improvement. However, surveys of residents have been conducted to ascertain the effects of the program and to refine the approach. The residents have responded to the program by improvements and extensions to their dwellings. The responsibility for maintenance rests with the kampung committees which are composed of residents and local government officials.

Cost Recovery

The financing mechanism for KIP in Indonesia, which has evolved over the past 5 years with the 2 Bank-financed projects, relies entirely on municipal resources. There are no direct levies like a betterment tax or plot charges imposed on the residents. There are various reasons for GOI and the Bank adopting this mechanism. First, the types of urban services provided under KIP are similar to those routinely provided to the higher-income neighborhoods without levying any charges. The Government has taken the view that to institute a special tax on KIP beneficiaries would be inequitable. Second, the argument in favor of direct levies on beneficiaries rests on the desire to assure that the program can be sustained over the long term so that the services can be provided to all kampung areas. The Government has addressed this issue by: (a) an explicit focus on the standards employed, with an aim to keeping these at a minimum level consistent with achieving the health objectives of the projct and (b) ensuring that the municipal taxes increase at a sufficient rate to pay for an expanding program. Third and most importantly, imposition of direct levies (e.g. plot charges) on beneficiaries would require a massive effort in cadastral surveys and in clarification and registration of tenure for each of the large number of families benefitting annually from the program. Such an effort is beyond the administrative capacity of the local governments and the Central Government. Finally, collection would have to be spread over time and, in many instances, the cost of collection may exceed the revenues generated.

At present, the municipal governments levy no direct charge on the residents for solid wastes collection, since the municipal services cover only the transportation of solid wastes from the collection points to the disposal sites. The residents themselves organize the collection for which they use either self-help (generally in the poorer neighborhoods) or make contributions to a community fund, which in turn pays for private collection services. However, under the proposed project, the collection responsibility would gradually shift from the community to the municipality thus requiring increased outlays from the municipal budgets. The most appropriate mechanism for charging for this service is not clear. It is estimated that a direct charge of about Rp 250-375 (US$0.40-0.60) per month per family would be sufficient to pay for the collection services. It is not clear whether it would be administratively cost-effective to collect such small individual charges. Also, there is concern that the low-income families may not be willing/able to pay for these charges, since they may not fully appreciate the need or benefit of door-to-door collection service. Interruption of services for even a few families in a neighborhood would cause public health problems for the entire community or for others who are affected by water pollution resulting from garbage dumped in the waterways. Because of these reasons, many cities prefer to finance garbage collection and disposal services from general revenues. During the first 2 years of the project, a study will be carried out in each city to determine the most appropriate mechanism of charging for solid was services. One or more different methods will be tried out on a pilot scale before making final recommendations for the city as a whole.

C. Replicability

The approach to kampung improvement being followed by the Government has already demonstrated in Jakarta its ability to sustain the program at a desirable scale of operation. The Jakarta KIP is unique in having been successful in providing basic services to virtually all of the unserviced areas in the city in 12 years. Each of the other cities included in the project has developed a 5-year program of kampung improvement. An estimated 35% of the population living in unserviced areas in Surabaya (including the 15% served under the second project), 34% in Ujung Pandang, 15% in Semarang and 16% in Surakarta would have been covered at the end of the project period (1981/82). If the pace of the program is maintained in the future, all unserviced kampung areas in these cities could be serviced in a period of 10-15 years.

Based on the unit costs estimated for the proposed project, a national program covering 65% of the country's urban population (assumed to be living in unserviced areas) would cost roughly $550 million, taking into account the investments which have already been made in Jakarta and Surabaya. A 15-year program of kampung improvement would, therefore, require capital investments amounting to about $35 million per annum in 1978 prices. Assuming growth of 5-7% per year for the slum area population following the present trends, an additional $20 million would be required each year during this 15-year period to deal with population growth. Thus the total annual outlay required would be roughly $55 million (December 1978 prices). This level of investment would be about 1.5% of total Central Government development expenditures and less than 0.2% of GDP. This is considered to be well within the level of investments on shelter affordable by countries at Indonesia's stage of development.

Future Policy

The success of the Kampung improvement programs has been the focus on provision of minimum infrastructure. This has enabled the authorities to proceed on a scale large enough and pace rapid enough to be effective. As the program has developed it has become more complex with the addition of other community facilities but the emphasis has always been on home ownership and replicability. The Central Government has now incorporated kampung improvement as part of a comprehensive housing and settlement policy in other Indonesia cities.

The prime advantages of the approach are the low overall costs, the use of local materials and labor and the exploration of existing housing stock. The expansion of their program is proposed in the next five year development plan (1980-84). The development of sites and services as a complementary program to kampung improvement has lagged behind primarily because of land acquisition problems. The Government has recognized the constraint and is undertaking steps to strengthen legislation governing its powers of land acquisition. In addition, other approaches to urban land development such as land consolidation and in-fill or low density kampungs are being considered.

Notes on the Experience of Slum Upgrading Program in Lima

These notes have been prepared by Mrs. M. Myers based on the following sources :

Peru: Appraisal of the Urban Sites and Services Development Project. World Bank. May 24, 1976.

Urbanization in Peru: International Urbanization Survey Report to the Ford Foundation.

Lewis, R.A. Employment, Income, and the Growth of the Barriadas in Lima, Peru. Cornell University. May, 1973

LIMA - PERU

SLUM UPGRADING PROGRAM

Background

Peru is South America's third largest country. It has an area of 514,059 square miles and it is divided into three regions: the coast, the highlands, and the eastern jungle. Traditionally, net migratory movements in Peru have been from the highlands to the coastal area because of the pressure of a fast population growth in the highlands, where arable land is limited, and governmental policies for rapid industrialization have favored the urban centers. A large proportion of the population moving to the coast has traditionally settled in Lima. Estimates are that Peru's population will increase from 14.1 million in 1972 to 27.2 million in 1990. The urban population as a whole is projected to increase from 8.4 to 18 million and Lima's population alone from 3.6 to 8.1 million over the same period.

The Barriadas

The barriadas are a characteristic urban phenomenon of Latin America. The barriadas of Lima began some 30 years ago right after World War II when the national economy began to shift from agriculture to manufacturing and other urban activities and when population rates began to increase. Most migrants could not afford to rent or buy space in the traditional housing market. The immediate result was the overcrowding of existing tenements in the central city. The next result was a move to the urban fringe. Migrant and other poor income families saw the possibility of occupying through invasion vacant land that was close enough to the existing city and employment opportunities. Such settlement by invasion was not new in Lima, but in numbers and extent it became all but revolutionary in character during the 1950s. In 1955, the barriada population of Lima had reached 10 percent of the city's total, and in 1965 it had climbed to 20 percent.

The barriada cannot be compared strictly with slums, shanty towns or squatter settlements. They are more accurately described as a process of urban settlement and accommodation. It develops on vacant land, which may be legally or illegally occupied, may be publicly or privately owned, and may or may not comply with municipal regulations; it may be the result of a swift invasion or a slow expansion of settlement; its structures may be of woven matting, adobe or of substantial brick; it may have initially no urban public services and it may ultimately acquire the whole range — lighting, water supply, sewage, paved streets, schools, and health centers.

The barriadas that had existed before 1961 had already been legalized by the 1961 Barriada Law. Under that law the Junta Nacional de Vivienda or JNV (National Housing Board) was formed in 1963 to coordinate aid to the barriadas. The Junta consequently began an improvement program which involved the survey of each barriada, a basic development plan and, upon completion of the plan, the granting of legal titles to the residents of the barriada. Finally, with the resident already owning a piece of land, he became entitled to improvement loans extended by the JNV for housing purposes.

The Pueblos Jovenes

In 1968 a new government agency was created by the military regime called the Oficina Nacional de Desarrollo de Pueblos Jovenes (ONDEPTOV). The official title of the barriadas that could be physically improved was changed to "pueblos jovenes" ("young settlement"). The population in Pueblos Jovenes had been increasing at 13.7 percent in the last decade. In 1975 it was estimated that about 2.4 million people lived in Pueblos Jovenes, of which 1.5 million were in the Lima Metropolitan Area and about 200,000 in Arequipa.

Because of the magnitude and expected increase of their population, Pueblos Jovenes are a social and political factor in the policies of the Peruvian government. The present Government continues with a program to legalize land tenure of Pueblos Jovenes residents, which had already begun in 1963. The legalization of ownership has fostered a sense of community and encouraged the planning efforts of the residents. A local self-government system has evolved focusing in successive stages on a) organized land invasion, b) economic development through the creation of cooperatives, c) urban community social development, and d) self-managed communal social, economic, and administrative development. The structure of self-government within the Pueblos Jovenes has been formalized, and the Peruvian Government has given acceptability as well as promotion and direction to the institutions of the Pueblos Jovenes through the establishment, in April 1972, of the Sistema Nacional de Apoyo a la Movilizacion Social (SINAMOS), an agency for support of social mobilization. Through SINAMOS, the Pueblos Jovenes have made their priorities known to the Government and have made it clear that they attach a much higher priority to job creation than to housing. Other basic requirements urgently called for at this time include the upgrading of services, particularly water supply.

Another agency which plays an important role in the Peruvian slum upgrading program is the BVP, Banco de la Vivienda del Peru, a semiautonomous agency under the guidance of the Ministry of Finance and Economy. In 1971, the BVP began to upgrade inner city slums (tugurios) and to provide urban infrastructure and services to the Pueblos Jovenes on the fringes of Lima Metropolitan area. About 37,500 dwelling units in Pueblos Jovenes are being provided with services.

BVP lending procedures for pueblos jovenes projects are well established. BVP lends money directly to the authority that is providing the service to the project area, for example to ESAL, a regional water company, or to the Ministry of Housing and Construction. The authority then becomes responsible for repayment of the loan by the individual beneficiaries of the project. BVP makes a loan on the basis of a plan from SINAMOS, which includes the names of 70 percent of the families who will participate in the project as well as the name of the authority that will execute the plan. After BVP's technical department reviews the plan it conducts a thorough technical and economic evaluation. If the project proves feasible, BVP signs a contract with the Authority which then becomes the supervisor, executor and collector for the loan. BVP provides a model of the contract to be signed by each individual family for the receipt of services and burden of debt. The Authority, ESAL for example, ensures collection by including amortization installment for the loan in the monthly payment for service. In the event of default, the service is cut off.

BVP makes disbursements to the authority or, for certain small items, to the supplier on the basis of invoices. The authority is responsible for selection of the contractor, and for reviewing with SINAMOS and BVP's technical department the contractor's value of authorized work. Disbursements are made on work progress. The conditions of BVP loans for pueblos jovenes programs are: 8 percent interest and 20 years repayment for housing.

In summary, present Government programs to upgrade Pueblos Jovenes include credits to individual residents for housing construction and/or materials; loans for sewage, water, and electric connections within Pueblos Jovenes, to be amortized, along with construction costs, through bills for service to individuals on a monthly basis; improvement of roads both within the community and outside to connect it with employment areas; construction and staffing of health facilities; and building of schools and community centers.

The underlying policy of these programs is to keep costs within the capacity of the Pueblos Jovenes residents. Consequently, the use of self-help and mutual aid to Pueblos Jovenes dwellers constitute a major factor in all construction and public work activities within the communities.

Recent Efforts

Recently the World Bank has agreed to assist in implementing a program which focuses on institutional development. By providing assistance for projects in Lima and Arequipa it will help to strengthen Government's program to work with the urban poor to achieve basic services and employment opportunities, and increased productivity. The components of the Bank assisted project are outlined below:

a) Infrastructure:

(i) water and sewage for pueblos jovenes in Lima and Arequipa providing about 7,200 household connections;

(ii) electrification of 16,300 households in pueblos jovenes in Lima and Arequipa;

(iii) access roads of 86.1 km to connect pueblos jovenes to main roads and upgrade existing roads in these settlements; and

(iv) health and nutrition centers in pueblos jovenes in Lima.

b) Productive investments:

(i) industrial sites and services, about 63.5 ha in Lima and Arequipa;

(ii) housing and commercial sites and services in Lima; and

(iii) supervised credit in Arequipa.

c) **Technical assistance:**

(i) to establish a technical assistance unit in the Ministry of Housing and Construction to assist settlers primarily in self-help construction;

(ii) to provide advisory assistance for the planning, management, and monitoring of the industrial sites and services in Lima;

(iii) to assist in the review of plans and in the preparation of a water supply and severage project in Arequipa;

(iv) to provide advisory assistance as well as vehicles and equipment for the development of a training program for community health and nutrition in pueblos jovenes; and

(v) to assist the Banco de la Vivienda del Peru in overall project implementation, financial planning, and related studies for the mobilization of additional resources for urban development programs and future projects.

The Bank loan of US$21.6 million would cover 50 percent of the total project cost (US$43.2 million) of the three-year project. The balance of the project cost would be provided by the Banco de la Vivienda del Peru (US$19.1 million) and down payments from project beneficiaries (US$2.5 million).

Cost Recovery

It is an accepted principle in Peru that investments made for the improvement of the living conditions of Pueblos Jovenes are to be recovered from the beneficiaries insofar as feasible. The project is not an exception to this general rule; recovery of costs for the project comes mainly from final users. In this connection, BVP will relend a portion of the proceeds of the loan to individual households to finance a) 90 percent of their portion of projects costs related to water supply and sewage (mainly tertiary distribution and household connections); b 90 percent of their portion of project costs related to electrification (low voltage networks and home connections); c) 90 percent of their portion of project costs related to construction and development of sites and services, and construction of core dwelling units and core shop/stores in Lima; and d) the construction of core housing units in Arequipa, within a framework of mutual aid, through supervised credit.

Extracts for this report have been taken from:

1. Peru: Appraisal of the Urban Sites and Services Development Project. World Bank. May 24, 1976.
2. Urbanization in Peru: International Urbanization Survey Report to the Ford Foundation.
3. Lewis, R.A. Employment, Income, and the Growth of the Barriadas in Lima, Peru. Cornell University. May, 1973.

ANNEX 3

Notes on the Experience of Slum Upgrading Programs in Lusaka.

These notes have been prepared by Mrs. M. Myers based on Lusaka Sites and Services I, 1974. Necessary modifications have been made to suit EDI teaching purposes.

LUSAKA - ZAMBIA

SLUM UPGRADING PROGRAM

Background

Zambia is one of several landlocked republics in south central Africa. It has an area of 290,586 square miles, a population of about 5,000,000, and is one of the richest states on the continent. It is bordered by a number of countries: Angola, Zaire, Tanzania, Malawi, Mozambique, Rhodesia and Botswana. A wedge of Zaire juts so far into Zambia that the northern and eastern regions of the country are united to the western and central parts by only a narrow corridor. Zambia has been one of the few African countries that has had sufficient income to finance most of its economic and social development. One of the largest copper-producing countries in the world, its copper output is exceeded only by that of the United States, the Soviet Union and Chile. Although copper provides more than 90 percent of domestic exports, some 40 percent of net domestic product, and up to a quarter of government revenue, the contribution of copper production to paid employment is relatively small, only about 13 percent. Agriculture provides the livelihood for about 60 percent of the population, but little of its agricultural produce is exported. Zambia's per capita national income, approximately $430 per year, is one of the highest in Africa.

Urbanization

Over 50 percent of Zambia's total population and 95 percent of its urban population are concentrated in the Copperbelt and along the line of rails where some 84 percent of the total national wage employment is found. However, there is no one dominant city. Lusaka, though Zambia's capital and largest urban center, is not a primate city like so many other African capitals.

Urban unemployment in Zambia has been low, but with continued urban growth and greater female participation in the labor force, however, unemployment is likely to become a problem with increasing reliance on self and casual employment.

The rapid influx of population into Zambian cities has given rise to spontaneous squatter settlements. Two separate urban environments have emerged: one modern, well equipped, expanding gradually in an orderly fashion; the other poor, unserviced and proliferating rapidly. Over 300,000 people or one-fifth of the total urban population live in these unserviced settlements. Zambia has emphasized agricultural productivity and improvement in rural living standards to slow urban migration. However, the Government recognizes that urban growth will continue at a significant level.

Lusaka Squatter Problems

Founded as a railway siding in 1905, Lusaka became the capital of Zambia (then Northern Rhodesia) in 1931. The city sprawls over a 360 km^2 municipal area and divides into five major districts. Lusaka squatters occupy 15 unique sites encircling the commercial and industrial area, the majority of which may be grouped into four major complexes. Apart from one area which has been provided with piped water and an access road, the remaining settlements are unserviced. Water is obtained from shallow wells shared by ten or more families, which are heavily contaminated by seepage from pit latrines, the sole form of sanitation. Drainage, especially during the rains, is a problem making penetration by emergency vehicles difficult.

Squatter housing ranges from traditional mud and thatch to quite substantial stone dwellings, well-spaced in planned and controlled areas. The United Independence Party (UNIP) is generally responsible for internal planning and administration of these areas — a role far beyond the normal responsibilities of a political party. New comers are required to register and must receive approval before starting to build. Although construction standards are not normally controlled, certain areas have been "zoned" for stone or concrete construction only.

Despite inadequate services, the vast majority of residents in squatter areas are generally satisfied with their settlements. Almost 90 percent indicated their satisfaction with the social environment, low costs and location. Piped water dominated the list of desired improvements, followed by roads and drainage.

Lusaka is the fastest growing city and has the most pressing squatter problem. The population more than tripled in the past decade to some 381,000 in 1973, an annual growth rate of over 13 percent. During this period the Lusaka City Council developed an average of 1,000 sites and services plots per annum compared to 5,000 new households formed annually. As a result the proportion of the city's population living in unserviced squatter areas rose from 16 percent to 42 percent. Lusaka's shelter needs are, therefore, twofold: to consolidate existing self-help housing investment (including security of tenure, piped water to communal stand pipes, gravel roads, etc.), and provide sufficient planned serviced areas to reduce emergence of new squatter settlements.

Land tenure regulations are contained within the housing legislation which a) enables the establishment of tenure of at least 25 years in upgraded areas where none existed before and increase the length of serviced plot leases from the current 10 to 30 years; b) simplifies registration of land title and regularizes plot transfers and inheritance; and c) enables the government to administer by regulation specific terms of tenure and sale, building standards, and commercial plot uses in both types of areas.

Government Programs

Regarding shelter, the national government has developed 25,000 site and services plots for self-help housing construction since 1965. The SNDP estimated that some 85,000 site and services plots were needed to accommodate urban growth during the 1972-1976 period, an average annual requirement of 17,000 units. In addition, improvements and services were required for the majority of Zambia's 50,000 squatter dwellings.

The government has identified those areas of the city that contain the major portion of the squatter population. An effort to upgrade these areas would have, therefore, a significant impact on Lusaka. In addition, other areas have been identified as potential locations for large scale site and services projects. While not meeting Lusaka's total shelter needs, a program that included both the upgrading of the major existing squatter areas and accommodated prospective low income newcomers to the city through sites and service projects, would substantially service existing and anticipated housing requirements of low income families.

World Bank assistance, starting with the project in Lusaka and later projects in other cities and towns, is designed to promote changes in national urban and services programs.

The IBRD project consists of:

a) site preparation and servicing:

   - servicing of 17,000 dwellings in four major squatter settlements;

   - preparation of 7,600 residential plots in three overspill areas located adjacent to upgraded settlements and serviced to the same level as the settlements themselves;

   - preparation and servicing of 4,400 residential plots in six sites designated for site and services under the Lusaka Master Plan;

b) building materials loans for house improvement/construction;

c) primary infrastructure (water, severage, roads) essential to the project;

d) community facilities including schools, health clinics, multipurpose community centers, markets, and demonstration houses; and

e) technical assistance, including project unit operations, construction supervision, training of community development workers, studies and further project preparation.

Squatter settlements to be upgraded were selected on the basis of nearness to employment and infrastructure, suitability for progressive improvement and conformity with the Lusaka Master Plan. The number of site and services plots to be developed is based on estimated demand for plots at various service levels, and the sites were chosen on the basis of accessibility and proximity to existing infrastructure.

The total cost of the project is estimated at US$41.2 million equivalent. Of the total, $8.2 million is for preparation and servicing of the upgrading and site and services areas, $9.1 million for building materials loans, $4.7 million for primary infrastructure, $4.0 million for community facilities, $5.6 million for technical assistance, $187,000 for land, and $9.4 million for contingencies (physical: $2.0 million; price: $7.4 million). The World Bank will finance US$20.0 million of the total cost, and the Government will provide the remaining US$21.2 million.

Cost Recovery

Lusaka City Council would recover the full costs of on-site services from project participants. In accordance with Government policy there would be no charge for land. Project participants would also pay recurrent charges for water and sewerage, property taxes, administration during and after construction. In addition there would be a building materials charge for those taking loans. Monthly charges would range from US$4.30 in upgraded areas to US$30.95 in the most expensive plots. Upgraded and overspill areas will be affordable to over 90 percent of the squatter households and site and services plots would be within the means of up to 86 percent of all low-income households.

These notes have been prepared by Mrs. Margaret Myers based on the World Bank Appraisal Report: Lusaka Sites and Services I, 1974. Necessary modifications have been made to suit EDI teaching purposes.

HUMAN SETTLEMENT UPGRADING PROCESS: PROBLEMS AND SOLUTIONS (BRIEF ON SQUATTER UPGRADING IN TANZANIA)

by Joram M. L. Mghweno, Director, National Sites and Services Squatter Upgrading Project, Tanzania

This brief endeavors to analyze the squatter upgrading process in Tanzania as experienced in the first phase of the National Sites and Services Project and squatter upgrading which is at the moment in its completion stage. Furthermore, the brief brings out problems encountered during the execution of this project and attempts to offer solutions towards better courses of action.

The frame of reference of this brief includes an explanation of the historical land tenure system, the existing nature of the squatter areas in terms of physical and socioeconomic characteristics and the strategies adopted by the government in tackling the problem of squatter settlements. Finally, the writer dwells on the squatter upgrading process which has been chosen as the best approach.

The brief, however, is not intended to offer an international working guide or manual for squatter upgrading. Yet in this regard the material presented offers the conference delegates operational observations and working experiences which are deemed to be of help to colleagues engaged in similar project operations.

LAND TENURE

In order to understand the squatter development and upgrading process in Tanzania, one has first to understand the system of land tenure in the country.

Before colonial rule, land in Tanzania was held under customary laws, whereby land was entrusted to the hands of society. The pillars of the traditional land policy were:

1. Land belongs to society, not to individuals, though the role of the trustee or caretaker passes to the government.
2. One's right to land is dependent on the use he makes of it.
3. Land is not a commercial commodity.

After the Berlin Conference of 1884-1885 and the Scramble and Partition of Africa. Tanganyika began to experience a series of imported land reforms which destroyed the fundamentals and spirit of communal land ownership and institutionalized the private ownership of land. Initially, local chiefs granted the foreigners land in exchange for small gifts, but with the enactment of the imperial ordinance in 1895, all land in Tanganyika became Crown land save for land already in private ownership or possessed by chiefs or indigenous communities. Henceforth the German Administration was empowered to alienate land on freeholds. Since that time, land alienation and land tenure became major objects to consider.

In 1919, Germany renounced all rights over her colonial possession in favor of the Allies who then conferred a mandate on Britain to administer Tanganyika. However, during the 42 years of British rule of Tanganyika, few freehold grants were made.

In compliance with the League of Nations' article on land in trust territories which called for safeguarding native laws, customs, rights and interests through Cap. 113 (The Land Ordinance), Britain declared all of the lands in the territory, whether occupied or not, to be public lands. Under that law, land was acquired through "Rights of Occupancy." However, freeholds and leaseholds granted earlier were honored.

In 1953, the colonial government issued what is known as Circular No. 4. The circular laid down in clear language the government policy toward land rights and in particular provided that "an African or African community lawfully using or occupying land in accordance with African Customary Law has a right of occupancy to that land, even though no documentary title is issued." This same Right of Occupancy continued to determine and regulate the rights of Africans to their lands, including the suburban areas which were later termed squatter settlements.

Tanzania achieved Independence in 1961 with a government committed to building a socialist state. In 1963, freeholds were found to be misused for they had an element of owning the land in perpetuity. Therefore, in that year the Freeholds Title (Conversion and Government Leases) Act, turned all freehold land into government leaseholds. That means development conditions were attached to the leaseholds, and each was to be for a term of 99 years, effective July 1, 1963.

In 1968, the customary type of land ownership that varied and was of an exploitative identity was investigated. In the same year, the customary Leasehold Enfranchisement Act (47) abolished all forms of feudalistic ownership of land. In other words, Tanzania had re-adopted the traditional land tenure system with necessary modifications and improvements for attainment of socioeconomic justice. Now all land in Tanzania is public land.

The year 1969 saw the introduction of only one type of ownership, i.e., right-of-occupancy system in lieu of three types which existed hitherto, i.e., freehold, leasehold and Right of Occupancy. The 1969 Conversion Act took effect on April 1, 1970. The right-of-occupancy system does not bestow on the occupier the status of being an exclusive owner of that piece of land but simply an owner of his property on that piece of land. He, therefore, cannot turn that piece of land into a commodity for sale. He can only sell his property (unexhausted improvement). The government is empowered to acquire any land for the public interest and pay compensation for crops, buildings and other unexhausted improvement. No compensation is paid for the land itself. This type of land policy enables the government to implement easily any development projects for the improvement of the quality of life in human settlements.

URBAN SETTING

Although Tanzania, with an estimated population of 15,000,000 (1977), is one of the least urbanized countries in the world, it has been experiencing a rapid rate of urbanization. The urban population is currently estimated to be growing at 9% per annum, and the proportion of the population living in urban centers increased from 5% in 1967 to about 9% in 1976.

A byproduct of these high rates of urbanization is a severe nationwide housing shortage, particularly among the nearly 80% of urban households in Dar es Salaam earning less than Tsh.500 per month, and proliferation of unplanned squatter settlements. In 1969, more than 40% of the housing containing an estimated 65% of Dar es Salaam population (Dar es Salaam has over a third of Tanzania's urban population) was located in unplanned squatter settlements. It is estimated that squatter houses in Dar es Salaam grew at an average annual rate of 16.6% during 1963-1973 and at 24% per annum during the last half of the decade. Between 40% and 70% of the residents of Tanzania's main towns now live in unplanned squatter settlements. Although these settlements are not dense by international standards and much of the housing is sound or improvable, the infrastructure in these communities is often inadequate or completely lacking, and their residents have less access to community facilities than other urban dwellers. For example, in 1969 it was revealed that in Dar es Salaam about 25% of the households had piped water to their plots, 38% had access to water kiosks (standpipes), and 37% had no access to piped water. Nearly 73% of the houses had no electricity. This situation, however, may have changed since the launching of the squatter upgrading program in 1972.

LOCATION OF SQUATTER SETTLEMENTS

Most of the squatter settlements in Tanzania towns have grown in what used to be periurban areas. Due to the extension of the town boundaries, such areas now fall within the township jurisdiction. Therefore, development of squatter settlements should be seen as two phases. The first is the development which occurred before the expansion of the town boundary and the second is that which occurred within the township boundaries after such boundaries had been extended.

As has been presented in the section under land tenure, natives who occupied public lands were lawfully occupying such lands under deemed rights of occupancy, provided they occupied and used such lands in accordance with Africa law and customs. However, upon the creation or extension of the city, municipality or town boundaries, urban lands ceased to be subject to native law and customs.

It is, therefore, assumed that the former owner who then becomes a squatter must apply for a right of occupancy permit which could only be granted if it fits in with the government's plan for the redevelopment of the area in question.

Under the Freehold Title Conversion and Government Lease Act of 1963, land owners were required to take up long-term leases. Many individuals who farmed and occupied suburban fringe land, under tribal or traditional law, did not understand the new act and therefore did not apply for, or receive leases. As urbanization took place, these individuals continued to subdivide "their" land and "sell" it off in small parcels at very reasonable rates for housing. This practice has continued unabated and large urban areas have been occupied in this way. Because the government was not able to offer an alternative to this informal procedure, it was politically and socially difficult to stop.

SOCIOECONOMIC CHARACTERISTICS

The socioeconomic characteristics of squatter development greatly influence the process of squatter upgrading. The squatters tend to gather and live in regional or even tribal grouping thus maintaining much of their accustomed lifestyle. A study carried out in 1976 in Manzese, one of the squatter areas in Dar es Salaam with a population of about 100,000 people, showed that about 50% of all the people were of two tribes originating from three regions (Tanzania has about 122 tribes with 20 administrative regions).

Each regional grouping tends to act as a reception area for incoming rural migrants, which eases problems of urban adjustment and provides a community framework. As has been stated before, many of the squatter areas are former suburban villages that have simply been swallowed by the expanding city. These village units, though visually intergrated with the city, retain much of their physical and social structure. The new settlers, while settling the fringes of these villages, have often maintained and extended the existing structure.

Hence these expanded villages have been endowed with character and a sense of order, as well as a feeling of community, which is irreplaceable in newly planned communities. Most of the houses in squatter areas are owner occupied, although there are some rentals. This factor, coupled with the potential compensation factor, causes owners to keep maintenance up, hence the visual impression of squatter areas is that of constant building and rebuilding.

As regards employment, a large proportion of the heads of households in the squatter settlements are employed. A study carried out in 1976 in Manzese, a settlement that is now being upgraded, showed that about 65% of the household heads are employed full-time in the formal sector, 22% are self-employed and the rest are unemployed. About 22% of those employed work in the manufacturing sector and 17% work in administrative services. The rest work mainly in communications. Under manufacturing, about 80% work as manual laborers.

Of those employed full-time, about 55% earned between Tsh.380-500 a month, 24% earned between Tsh.500-750. About 10% still earned less than Tsh.380 a month although this figure is taken to be the official minimum wage. These people are those working in jobs where the minimum wage regulation is not so easily enforceable. In addition to regular income, most of the house owners have rental incomes through the subletting of some of the rooms in their houses. About 30% of the households live in rental accommodations.

GOVERNMENT POLICY: UNTIL 1972

Until 1972 when the squatter upgrading program was launched, the government, and in particular the planners, deplored the unplanned, somewhat disorganized, character of squatter settlements. They looked at the use of traditional housing materials as inferior and very temporary. In other words, they considered squatter settlements to be slums. The bureaucrats insisted on high-standard housing knowing very well that the demand for housing was very high. Coupled with limited resources the bureaucrats fell far behind in meeting demand and placed little or no housing on the market for the lowest-income groups.

It goes without saying that while deploring squatter housing, the bureaucrats, in fact, reinforced the growth of squatter communities. Thus, ironically, the same rising expectations that shaped the government's negative view of squatting, reinforced its continued proliferation.

As a follow-up of the government's attitude toward squatter communities, consultants recommended the idea of extensive clearance in the 1967 Dar es Salaam masterplan. This recommendation was reinforced by a German study team in 1967-1968 who produced a report on slum clearance in Dar es Salaam. Acting on this report, the West German government undertook to provide aid for a clearance and renewal program for Buguruni, one of the squatter areas of Dar es Salaam. The area covered about 70 acres on which there were about 1,400 houses containing about 5,600 dwelling units with a population of about 22,000 people. Estimated compensation for the property stood at about Tsh.4 million. The renewal program recommended construction of about 2,800 dwelling units, housing about 11,200 people. If the program were to be fully implemented, the net result would have been a reduction of housing stock by approximately 2,800 dwelling units and a displacement of about 11,000 people.

Although it was recommended that in allocating the newly constructed houses the former squatter settlers would be given priority, it is very unlikely that such would have been the case. The life style of the squatter settlers, coupled with the fact that very little or no housing subsidies were provided would have rendered them ineligible for the renewal program.

Implementation of the first phase of the program, which started in 1975, involved demolition of about 450 houses. Compensation for property totaled about Tsh.2 million. The urban authority put in all the infrastructure required.

The National Housing Corporation, which was given the responsibility of redeveloping the area, started with about 10% of the cleared area. The remaining cleared area has remained vacant since then, and even the units started by the National Housing Corporation are less than 50% complete. While this exercise was going on, the government was revising its housing policy. In 1972, the cabinet endorsed the squatter improvement policy. Fortunately, the remaining phases of the Buguruni program will have to be developed on the principles of the new policy.

GOVERNMENT POLICY: 1972 AND AFTER

In arriving at the squatter upgrading policy, the government realized that:

1. There would be significant savings since the domestic savings of the people represented by their investment in existing housing would not be destroyed.
2. There would be significant savings on the part of the government, since the government would no longer be called upon to pay large amounts of capital for compensation, nor would it have to find money for low-income rental subsidies.
3. Manpower and recurrent expenditures would not have to be stretched to rapidly expand government institutions established to construct residential houses.
4. There would be savings in social costs in that existing viable communities would not be destroyed.

In 1972, the government established a unit in the Ministry of Lands, Housing and Urban Development to oversee the implementation of the new approach. In addition to implementing squatter upgrading projects, the unit was assigned the duty of undertaking a National Sites and Services Project.

As regards squatter upgrading, the unit was commissioned to:

1. engage in the process of legalizing squatter land holdings by giving them long-term leases and at the same time removing the stigma of "temporary classification" from the squatter houses. This would totally legalize the status of current squatters and remove

the threat of future clearance. With this load lifted one would expect to see housing improved beyond the minimum standards required for compensation;

2. prepare layouts for squatter areas respecting existing communities and provide substantial services to include roads, drainage, water supply, electricity and community facilities to include community education centers, markets and health posts;
3. find some means of getting low-interest funds to low-income people who wish to upgrade their existing houses.

SQUATTER UPGRADING PROCESS

The Sites and Services and Squatter Upgrading Unit planned to approach this national assignment in phases. The first phase, which was launched in 1973, involved upgrading of squatter settlements in Dar es Salaam and Mbeya. The selected area in Dar es Salaam covers about 500 hectares with about 10,000 housing units housing about 80,000-100,000 people. The selected area in Mbeya covers about 78 hectares with about 1,200 housing units housing about 10,000-13,000 people (1973 studies). The project is implemented through a US$8.5 million IDA credit which is also used for sites and services project and technical assistance.

Site Selection

Having been assigned a planning budget, the Project Unit set out to select the squatter areas on which to operate. This was necessary because even for Dar es Salaam, resource allocation was not adequate to cover all squatter areas.

The project unit did preliminary feasibility studies. These involved selling the idea of squatter upgrading to the leaders in the squatter settlements. Since the idea of squatter upgrading was being introduced for the first time, it was necessary to start in areas where there was likelihood of maximum cooperation from the local leaders and residents. The danger to such an approach is that one may raise expectations of all the squatter settlements thus creating havoc when the actual final priority list is established.

Having established the priority list for each squatter area, the following was investigated:

(a) As much of the area as possible should satisfy the requirements of the town's long-term development plan, i.e., it should have been designated for residential purposes. However, if the area was not so designated and is heavily squatted, long-term implications of recognizing the squatter settlement as a permanent residential area are investigated.

(b) The settlement should be of a reasonable size to allow for economies of scale during provision of required services. Further, most of the houses should be improvable.

Design Criterion and Standards

In preparing the plan, provision was made for vehicular circulation throughout the site, allowing easy access to residential areas, community facilities and the main truck roads, while protecting the settlement from excessive through-traffic. A safe, convenient footpath network was also provided, linking plots to public areas and to the transport system. In addition to utilizing open spaces for community facilities, the same are grouped to take advantage of their interrelationships and permit multiple use of the buildings and surrounding areas.

The design standards for infrastructure services were adopted after considering the requirements of the squatter upgrading project as well as the prevailing standards in the country. The standards are kept low enough to bring per plot costs within reach of the lower end of the household income scale. However, provisions are also made in the design for improvement at later stages.

Roads

Four classes of roads have been provided in the project. Class A roads, which are classified as collector roads, are designed to accommodate the heavy bus traffic. The road reserve is 33 meters with an initial carriageway width of 6 meters. The road will have a treated dry macadam surfacing on a mechanically stabilized gravel base. Shoulders, 4.5 m. wide, are provided to allow for future expansion of the carriageway. Class B roads which are classified as primary roads are designed to serve as main vehicular access to the settlement. These have a 20 m. road reserve and a 4.5 m. wide carriageway of rolled gravel. Shoulders of 3.25 m. are provided on each side of the carriageway for cyclists and pedestrians. Class C roads, classified as secondary roads, are dirt roads which serve as vehicular and pedestrian access to the individual housing units. The road has a 10 m. reserve width and a 5 m. wide roadway which can be surfaced in the future to form two lanes.

Drainage

The drainage system is designed to carry storm water and domestic water exclusive of latrines. The system consists of open ditches with culverts at vehicular crossings. The ditches are unlined, except in steep areas where erosion could occur due to high velocities. Sanitary services are provided through improved pit latrines which are constructed by the house owners.

Water Supply

The design has assumed that ultimately all houses will have private water connections. Initially, however, the plot occupants are being served by water kiosks, one for every 50 houses or a maximum walking distance of 150 meters. Kiosks serving 50 houses are provided with four taps while those serving less are provided with two taps. The distribution system follows the road layout and is divided into different supply areas controlled by valves. There is also provision for fire hydrants.

Power Supply

The design of the power supply system assumes that power will be required mainly for lighting purposes and that ultimately, through conversion of transformers to larger units, each house should have individual power connections. Initially only street lights along main roads and power to community facilities are provided.

The planning of sites for community facilities (markets, community education centers, health posts) has very much adhered to national standards. These include a three-stream community education center (one stream contains 45 pupils) for a population of 4,500-5,000 people, a dispensary for 15,000 people and a health center for 50,000 people. The standard for education assumes 50% enrollment of the school aged. The standards are now being revised following the government declaration of universal primary education.

The project unit has not managed to satisfy the stated requirements, since drawings for all the community facilities are designed to allow for future extension when conditions allow. In instances where even initial construction cannot be met, land has been reserved for the future.

The design standards for infrastructure have been questioned in several instances:

(a) The system of unlined ditches requires continuous maintenance, and mosquito breeding is possible. However, this system has been worked out as an economical first stage of development. A second stage, which can be embarked upon when resources allow, would be the lining of all ditches and provision of a central sewerage system handling all domestic sewerage.

(b) The design of roads assumes a local authority capable of undertaking constant maintenance; otherwise, after a short span, all the investment will be wasted. The project unit is now planning to provide minimum maintenance services following failure by local authorities.

(c) The provision of water supply through public kiosks is creating administrative and financial problems. According to government policy such water is free. The maintenance of the kiosks (fittings and the stand) is the responsibility of the local authority. It is being argued that, in the long run, the maintenance bill will be too high and that additional expenditure for installation so as to provide water for each house and bill the individuals for maintenance could have been cheaper. However, technically this is difficult to provide in a squatter settlement. People in squatter settlements will have to share such facilities. Maintenance bills can be reduced through community education on the proper use of such facilities.

Physical Investigation

In most cases, the physical investigation necessitated commissioning a fully fledged preliminary engineering exercise. Such an investigation was required to provide information on issues including:

(a) Base map indicating the extent of possible contours, prominent topographical features, existing buildings and services.

(b) An assessment of on-site and off-site existing facilities to include roads, water supply, power supply, sewerage and stormwater drainage.

(c) An existing land use map.

(d) A soil investigation report to establish sketch design criteria for roads and recommendation on the form of sewerage.

(e) A recommendation on the modifications to the standards set with a view toward reducing costs.

Planning

In planning for infrastructure in squatter settlements, planners have been called upon to compromise a number of well-established planning principles. While a reasonable level of infrastructure has to be provided, there should be minimum demolition of houses. Planners have also had to avoid expensive houses to cut down on the compensation bill.

In planning for community facilities, planners have had to make the best use of the existing open spaces to be able to cut down on the compensation bill.

Having produced the preliminary plans, the planners took them back to the community leaders. Before discussing the plans, the planners explained in detail the proposed services to be provided and the principles followed in the planning exercise. The plans to be discussed with the community leaders are prepared on enlarged up-to-date aerial photographs. It has been established that whereas the community leaders cannot very easily understand a drawing, they can very well orient themselves when an enlarged aerial photograph is used. The same aerial photographs are used to walk the infrastructure lines and to locate the proposed sites for community facilities.

While discussing the proposed plan, the residents concentrate more on which houses will be demolished or how far their houses will be from the proposed community facilities. The planners have to strike a balance between applying inevitable planning principles and securing the blessing of the community leaders.

The preliminary plans are then finalized and submitted to the relevant local urban planning committees for approval.

While planning the squatter settlement, the planners have had to simultaneously plan for an overspill area or area for resettling those people whose houses would have to be demolished to give way to infrastructure services and community facilities. Those affected had to be given a plot the very day they received compensation for the demolished property.

The overspill area must be as close as possible to the squatter settlement. This has reference to the stated socioeconomic characteristics of squatter communities. Experience has shown that a squatter would prefer securing a piece of land within the same community than a well-serviced plot in a newly planned distant site. The planners have not yet established the maximum distance at which a squatter is willing to be resettled and the socioeconomic inconveniences that a displaced squatter can tolerate.

Detailed Engineering Design

After approval by the relevant local authorities, the plans are submitted to the engineers who have been commissioned to undertake detailed engineering design for all infrastructure. So far, the unit has had this work done by consultants. The consultants are selected through international competitive bidding, a system followed in World Bank-financed projects. In performing this assignment, the engineers are required to undertake:

(a) Field surveys including traverse, setting up of beacons and bench marks properly referenced for infrastructure works.

(b) Additional soil investigation.

(c) Detailed designs and drawings and specifications for infrastructure works based on field surveys.

(d) Strip maps for all right of ways for identifying house/crops for compensation.

(e) Surveys to demarcate and clearly establish boundaries by beacons for community facilities areas.

(f) Bills of quantities for each component of work.

(g) Tender document.

During detailed engineering design, the layout as conceived in the preliminary engineering stage is expected to be followed in most cases. However, minor changes may have to be made to the layout during approval procedures to suit the actual situation of the site at the time of detailed field surveys. The consultants may also recommend revisions on the standards. These suggestions should be to improve upon the original design always keeping in mind that the project is essentially for the low-income and, as such, suggestions should be aimed at lowering the costs.

Valuation and Compensation

The government valuer or an appointed representative of the government valuer moves in to value all property marked in the strip maps. A valuation report is then prepared on a compensation schedule. The information prepared includes the name of the owner, address, property valued and monetary value of the property.

Based on the valuation report, the project unit prepares individual checks which are paid to those concerned on a set date and time.

(a) The payee has to produce documentary identity and has to be further presented by his local leader as the rightful owner of the property under which compensation is being paid. The local leader will by then have cleared all conflicts regarding the rightful owner of the property which is being compensated.

(b) The very day an individual is paid for his property, especially a house, he should be given an alternative plot in the overspill area and served with notice to vacate. This arrangement has been found to be necessary, otherwise individuals spend all the money on items other than a new house, and it later becomes very difficult to make them move.

(c) According to law, once individuals are paid compensation, they are required to move out with only their belongings and to leave the buildings intact. Because of the fact that the incomes of the individuals affected is very low and that compensation is not based on replacement value, the project unit has allowed such individuals to demolish their own houses and carry with them all the usable building materials to their new sites. It is believed that such materials plus the amount of money paid out as compensation can be enough to allow for a construction of a livable new house.

(d) At the beginning, the project unit left all the moving arrangements to the individuals concerned. As an additional assistance, the project unit will now provide transport and related assistance to those who will be affected with demolition and resettlement.

Construction of Infrastructure

The project unit does not have a construction wing. The work so far carried out has been let to private contractors through competitive bidding.

The consulting engineers have been working as agents of the project unit in preselection of contractors, advertisement of tender proposals and evaluation of the same, including recommendation of suitable contractors.

After award of the contract, the consultants do undertake general and site supervision until the project is completed. In so doing, the consultants on behalf of the project unit, do ensure that the work is carried out as per the terms and conditions of the contract and submit certificates of payment to the project unit which makes payment to the contractors.

It has been argued that the project unit could make some savings if the contractors would undertake their work in partnership with residents of the squatter communities. The communities would do all the preliminary work through self-reliance. Such work would include digging ditches for the water pipes and other related tasks. The contractors would bring in the materials and undertake installation of the same. Such an arrangement has not yet been tried by the project unit. It is felt, however, that such an undertaking would be administratively cumbersome especially as regards the need for very close coordination between timing of the contractor and the work schedules of the local communities. Further, it is argued that the squatter communities have enough work in that in addition to working as employees in either the formal or informal sector, they also have to build their new houses or engage in rebuilding their existing houses.

Community Facilities

Detailed drawings for community facilities have been prepared by a team composed of consultants, staff of the project unit and staff from the Buildings Department of the Ministry of Works. The design standards very much reflect the existing national standards.

As in the case of infrastructure, the project unit assigns construction of community facilities to private contractors through tendering. Supervision arrangements are similar to those provided under the construction of infrastructure except that in place of consultants, the Ministry of Works and Regional Civil Engineers serve as the project unit's agents.

The country has had a long experience in the construction of community facilities through self-help. The people are provided with building materials, and they provide all the labor, actually organize themselves and undertake all construction work. This arrangement which has been operating well in the rural areas is not well-established in urban areas especially in planned areas. There are signs of such undertakings in squatter settlements.

The project unit has realized this potential and is experimenting with the provision of community facilities. The arrangement will, of course, require more administrative input from the project unit than that required when dealing with an individual contractor.

Maintenance of Infrastructure and Community Facilities

Operation and maintenance of the infrastructure and community facilities are the responsibility of the local authorities, and funds for the purpose are supposed to be provided in their annual budgets. For the infrastructure, operation and maintenance work are carried out by the regional field staff of the respective ministries and parastatals (i.e., Ministry of Water Development, Energy and Minerals, Ministry of Communications and Ministry of Works). For community facilities, staffing, operation and maintenance are carried out by the staff in the regional administrations under the direction of the regional development director.

In the first phase of the project, experience has shown that there is a need to establish maximum coordination between the project unit and the bodies that will be responsible for the maintenance. If funds are not reserved early enough so that they are available for this work as soon as construction is completed, chances are that most of the services will degenerate quickly, and it will be very expensive to bring them to good condition again. The degeneration is attributed to the fact that most of the services offered are of low standard and need frequent maintenance.

House Consolidation and Socioeconomic Services

House consolidation in squatter upgraded areas is pursued on two levels. The first is the individual level covering all those people who resided in the area before improvement. Those individuals who have old improvable houses are offered credit facilities to improve their houses.

The Tanzania Housing Bank handles these clients through a house improvement loan system. It has been necessary for the project unit to monitor and recommend to the bank who should get such loans so that control is put on possible overcrowding through infill and construction proliferation due to new immigrants.

Another level of consolidation is at the community level. Here the people are encouraged to form housing cooperative societies which mostly take on the form of residential neighborhood groups. These societies are primarily formed to provide houses for their members, and can be the basis of multiple socioeconomic improvements through self-help activities.

There is technical aid which is offered to builders in the squatter upgrading areas. Advice on the use of cheap and locally produced building materials is offered to the people in consultation with the Building Research Unit of the Ministry of the Lands, Housing and Urban Development. A program which will result in the building of material depots in all project areas is being worked out jointly with the Tanzania Housing Bank. These depots will serve to provide building materials more conveniently to the builders.

With regard to the general improvement of the social welfare of the squatter settlers, the project unit has a component dealing with the nutritional requirements of the people. The pilot nutrition program covers education in nutrition and home economics, mother and child care classes and demonstration gardens in several centers in the respective areas.

There is an element of income generation whereby small-scale industries are envisaged for construction around the upgraded areas. These cluster industries are intended to serve as employment opportunities to respective residents. This provision to be effected in the second phase of the project will aim at increasing income levels and hence a better standard of living among the population in the respective upgraded squatter areas.

CONCLUSION

In a developing country like Tanzania where quite a large proportion of the urban population live in squatter areas, urban development must deal with the problems of the squatters. A good urban development policy should entail an approach which aims at alleviating the poor living conditions among the majority of people who stay in squatter areas.

Tanzania has adopted a policy approach which basically recognizes and accepts the existing squatter areas and aims to improve and upgrade them. This has come after realizing that earlier approaches such as squatter clearance only serves to escalate the poor living conditions in a vicious circle.

The implementation process of squatter upgrading in Tanzania has enabled us to learn and experience several problems. Some of the most pressing problems connected with squatter upgrading include:

1. *Resettlement Problems*. When squatters are displaced to make way for community facilities, roads, etc., they are resettled in other areas which are usually planned. Yet in reality, many of them do not move to these new areas but sneak in and return to the original areas to locate themselves in the improvement areas. Some of them use the compensation money to put up cheap houses in other squatter areas in another part of the town.

2. *Maintenance Problems*. Community facilities which are installed in the upgraded areas, such as water taps, get damaged easily because they do not receive the communal care and proper maintenance. The infrastructure designed and put in the areas also wears out due to lack of proper maintenance.

3. The insecurity of tenure in the squatter areas prohibits the plot owners to put in developments which need legal rights. The people cannot be issued long-term rights of occupancy because the area cannot be easily surveyed to demarcate the individual plots.

4. The self-help approach has not been worked out fully as expected. It is administratively cumbersome, and there is a lack of close coordination which is needed between the contractors and the local communities. Self-help efforts which could have been utilized in the construction of community facilities and the maintenance of infrastructures so far have not been used. Moreover, the self-help process at individual and group level is limited with tight work schedules, lack of expertise and lack of effective motivational variables.

5. Whereas the people are expected to improve their poor houses through the house improvement loan system, some of them fail to meet the Tanzania Housing Bank conditions. Employment security and the maintenance of a bank account are some of the conditions attached to the loans. Many of the people in the squatter areas who are petty tradesmen and casually self-employed fail to get the credit facilities because they do not meet the Tanzania Housing Bank requirements.

   Despite the mentioned shortcomings, the project unit intends to use the vast experience which has been gained in the first phase of the project to tackle the upgrading process more rationally in the second phase. Several alternative courses of action are to be implemented as attempts to overcome the already mentioned problems. Thus the project unit intends to make sure that:

   (a) The people in the project areas are made to understand that the project is for their own benefit and they have the obligation to guard the infrastructure and community facilities against damage or misuse. This can only be possible by involving the people in the planning and implementation of the project. An effective way of educating the people in the project areas is essential, and it must be done with the cooperation of the local authorities.

(b) Since the squatter area population has been basically recognized and the banking credit and other development agents need them to have security of land tenure, renewable short-term rights of occupancy should be offered to the plot owners. This could also curb the problem of new immigrants to the upgraded area.

(c) Low-standard infrastructure which is installed in the upgraded areas need frequent and proper maintenance. In order to achieve this, there should be very close coordination between the project unit, the local authorities and the people in the respective area. Minor maintenance works such as clearing of water trenches and ditches can be done by the people on a self-help basis. Major repair works will have to be dealt with by higher authorities.

(d) Self-help can work better and be of meaning if it is done by committed cooperative groups. Cooperative housing societies in the squatter upgrading areas can be established if the people are made to understand that the societies are nucleus groupings for social and economic development among the respective members and the community in general. There is need for a massive community education and campaign for cooperative activities among the people.

(e) One way by which squatter residents can be assisted to raise their income levels and uplift their standard of living is to create employment opportunities for them. The establishment of small-scale industries in their vicinity will offer many of them jobs. These enterprises would comprise of carpentry, blacksmithing, shoemaking, etc., depending on the demand of the local markets. Capital, equipment and technical know-how can be taught to them on terms agreed upon at its start. The groups can later be self-supporting in their activities.

The implementation of the squatter upgrading process entails the existence of a clear urban policy. How to reconcile the technical views and the freedom of individuals is indeed a hard task. Thus the problem of displacement of squatters and their resettlement remains a major bottleneck. Planners have yet to agree on what is the maximum distance from his original home that a squatter is willing to be resettled and the degree of social and economic inconveniences that he is willing to tolerate.

The process of squatter upgrading is fundamentally an activity which touches people's way of life both socially and economically. The success of such an endeavor which aims at improving the well-being of the poor majority of the people in our countries' urban areas is a result of the overall consideration of national resources vis-à-vis our people's aspirations. Thus, the justification of choosing the squatter upgrading approach as a permanent way of solving the squatter problem will be associated with the elevated socioeconomic status of the people in the squatter upgraded areas and the general improvement of their standard of living.

Sivaramakrishnan, K.C. Indian Urban Scene. Indian Institute of Advanced Study 1978. Chapter 5 Slums and the Urban Poor.

Slums and the Urban Poor

"Slums, semi-slums and super-slums"[1], is how Patric Geddes once described the evolution of cities. Undeniably a product of the industrial society and rapid city growth, the urban slum first emerged as a significant phenomenon in the nineteenth century western world. The early industrial slums of England have received much attention from historians and social reformers. Lewis Mumford traces the origin of the slums to the fact that in the evolution of industrial cities the factories got the best sites. The effects on the environment are aptly described by a contemporary account of nineteenth century Manchester. "Nothing seems more characteristic of the great manufacturing city than the river Irwell which runs through the place: a pretty enough stream a few miles up loses caste as it gets among the mills and the print works. There are myriads of dirty things given it to wash, wagon loads of poison from dye-houses and bleach yards, seething contents of boilers, fetid

impurities of drains, and sewers, till at length it rolls on—here between tall dinghy walls, there under precipices of red sandstone...".[1] Engels wrote with more passion on the living conditions of the workers and urged the seizure of the commodious house of the big wigs. England and many countries in the West have come a long way since then. Social reforms and humanitarian legislation commenced in the nineteenth century, and the large scale housing efforts from the twentieth have helped change the face of industrial England from the appalling working and living conditions in the first few decades of the industrial revolution. But the previous disarray has also characterized the early industrial exertions and consequent city growth in the developing countries. Unfortunately, the initial approach to the industrial order has been the same as in eighteenth century: that costs meant what the Industrial entrepreneur could not avoid paying.[2] Housing and amenities have been usually the first casualties in the process. Even in the non-industrial cities the rigours of the land market and the high costs of services have tended to price the poor out of reach. No part of the developing world is free from slums. Indeed they constitute the more numerous components of urban increase and in many metropolitan cities of the developing countries, usually one out of three or four people is in a slum as in Dakar, Rio, Lima, Djakarta or Manila. Even the much vaunted, 'brand new' creations like Brazilia or Chandigarh have about the same proportion of slum households. A recent U.N. study concluded that slum building was about the fastest growing activity with a 12 percent increase, on an average, in developing countries.[3]

In India slums do not figure separately in the census counts. A Planning Commission Working Group estimated that as of 1972 around 22 million out of the total 108 million urban population were living in slums.[4] Traditionally, the definition of a slum has been derived from a definition of a hut in engineering terms. A hut, in the parlance of the Calcutta Municipal Act,[5] for instance, is "any building no substantial part of which, excluding the walls up to a height of 18 ft. or up to the floor levels constructed of masonry, reinforced concrete, steel, iron or other metal"

Based on this a Bustee in Calcutta is defined as a collection of huts in a given area. The environmental aspects as a measure of slum definition is contained in the Slum Areas Improvement and Clearance Act 1966 which applies to Delhi and other union territories.[6] The relevant section reads as follows:

3(1) Where the competent authority upon report from any of its officers of other information in its possession is satisfied, as respects any area that the buildings in that area—

(a) are in any respect unfit for human habitation; or

(b) are by reason of dilapidation, overcrowding, faulty arrangement and design of such buildings, narrowness or faulty arrangement of streets, lack of ventilation, light or sanitation facilities, or any combination of these factors are detrimental to safety, health or morals, it may, by notification in the Official Gazette, declare such area to be a slum area.

Fitness for habitation is to be determined with regard to items like repair, stability, natural light and air, water supply, drainage etc. If the laws were to be applied strictly most dwellings would perhaps be declared unfit. It is a combination of the engineering and environmental aspects that has been guiding the demarcation or definition of slums. The Maharashtra Slum Areas (Improvement, Clearance and Redevelopment) Act, 1971[7] reproduces the Central Act's criteria. A similar Act of Tamil Nadu adopts the Central Act's definition in respect of slum structures and adds that any area which "is or may be a source of danger to the health, safety or convenience of the public of that area or its neighbourhood by reason of the area being low-lying, insanitary, squalid or otherwise", may be declared a slum area.[8] The West Bengal Slum Areas Improvement and Clearance Act 1970, has summarized the main features of the Central Act. It also has some social overtone in the sense, that if conditions in an area are "injurious to public health, safety, health, hygiene or morals of its inhabitants" it may be declared a slum area.[9]

While statutory definitions may help quantification o slum growth, a major element of complexity is the ownership and tenancy patterns prevailing in slum areas. Briefly, on the basis of ownership and tenancy criteria, slums in Indian cities could be classified as follows:[10]

(a) Squatter settlements such as Jhuggis and JhomprIs in Delhi, Cheris in Madras, or Jopad-Pattis in Bombay, where the slum is a collection of individual hutments erected by the dweller himself, usually on land belonging to the Government or the local authority, without permission;
(b) Squatter settlements with a slight variation of the category above, where the hut is erected by one person but is sublet to another: a more organized version of squatter settlements are those inspired by some people who seize a sizeable stretch of public or municipal land and organize large scale unauthorized construction by prospective hut dwellers, in return for some consideration;
(c) Tenancy settlements such as Bustees in Calcutta and Ahatas in Kanpur, where the title to the land is held by one person, the structure belongs to a second person and the third person is the dweller who is a tenant of the hut owner;
(d) Parts of a city with a group of buildings where the title to the land and structure is valid but the structure itself is divided by the owner and sublet to a very large number of people with the resultant overcrowding and in sanitation. The Chawls in Bombay or Ahmedabad and the buildings in Central Calcutta or the Katras of Delhi which are divided into numerous cubby-holes and let out to the poor are of this type.

Usually the settlements of the first and second category are found on the fringes of the city, or alongside highways and drainage canals, i.e. on lands which are not required for any construction in the near future and which are not guarded too closely. The settlements of the third category could be anywhere. For instance, in Calcutta the tenancy-type bustees exist in 97 out of the 100 municipal wards.[11] It is also to be noted that in the first two categories the huts are regarded as transient compared to the huts in the bustees or ahatas. Of course, the type of slum dwellings vary from one part of the country to another. In the south, slum huts are invariably single stories with roofs of hay or palm leaf. The bustees of Calcutta are a mixture of single dwelling or multiple dwelling huts usually with bamboo walls packed with mud and fire proof roofing like tiles or G.I. sheets. The chawls in Bombay might, of course be of brick and mortar but would present all the features of congestion and blight.

Given the extent and spread of slums in our cities it has to be recognized that these are not an anamolous and pathological phenomena on the urban landscape but a manifestation of the poverty that is still preponderant in the urban economy. According to a Government of India report 51.34 percent of urban households have a per capita monthly expenditure of less than Rs. 30.[12] Even this average figure obscures the situation in some metropolitan cities, which is still worse. In Calcutta, for instance, it is estimated that out of 14.35 lakh households in the Metropolitan District, about 6.6 lakh households have monthly incomes of less than Rs. 200 while another 2.42 lakh households have incomes up to Rs. 300. Thus nearly 63 percent of the households are below the poverty line.[13] The position may vary slightly in other cities, but it is c[illegible] that when we talk of metropolitan or large cities in India we are referring, in essence, to large concentrations of the poor. By any contemporary standard of housing or urban services the urban poor are priced out. At current costs of land and construction all households earning less than Rs. 300 a month are virtually beyond the reach of the cheapest pucca dwelling which is priced around Rs. 6,000. And even for the semi-pucca or kutcha dwellings the poor have to pay a much larger portion of their income. A sample survey in Calcutta reveals that households occupying on an average 80/90 sq. feet with monthly incomes of upto Rs. 100 have to pay about 16 percent of that income as rent.[14] At the next bracket where monthly incomes are Rs. 101 to 300, for an average of 175 sq. ft., the rents paid worked out to about 14 percent. Invariably, at the top of the bracket housing expenditure accounted for 10 to 12 percent only. To use another indice of the grossly inadequate services, out of CMD's 14.37 lakh households only 32 percent had a separate kitchen, 16 percent a separate water tap and only 11 percent a separate toilet.[15]

Given the size and spread of the problem what has been the response ? In the pre-independence period there was a

kind of laissez-faire for the slum landlords. Improvements, if any, were left to be done or undone at the discretion of the slum landlords or hut owning middlemen, depending on the potential for additional rent income. As a fall-out from the freedom movement and increasing participation of Indian leadership in municipal institutions, some attention began to be focused on slums from the 1930's. The onus for action, however, was shifted to the landlords. Under the Municipal or Corporation Acts the landlords were called upon to effect some improvements in the slums failing which, the local body reserved the right to carry out such improvements on its own and realize the costs from the landlord. A righteous stand indeed, but it was hollow nevertheless, considering that a substantial portion of the slums were located on Government or municipal lands for which the onus for reform, if any, had all along been with the Government or local authorities. In the case of Calcutta, the Thika Tenancy Act, which secured for the tika tenants or the middlemen the rights of the structures they had erected, further removed, in effect, the interest or the lia[illegible] of the landlord. The measurable gains, if any, during the decade before independence were confined to such marginal improvements, like street lights or hand tube-wells that could be secured for some slums through the efforts of local councillors.

The first response to the slum issue after Independence was one of anger. "They are a blot on the society's conscience", Jawaharlal Nehru had once remarked, "It is bad enough to inherit slums but to allow them to grow is the society's fault: the Government's fault".[16] The initial efforts were aimed at the removal of slums and rehousing of the slum dwellers. A programme with Central assistance was commenced under the Slum Clearance and Improvement Scheme which sought to rehouse slum dwellers in small two-roomed pucca tenements of about 180 sq. ft. floor area with individual bath and latrine. The ceiling costs initially adopted varied from Rs. 2,700 to 4,000, depending upon the city concerned. These have been raised higher from time to time and, by 1971, they ranged from Rs. 5,340 to 8,000. All the same, in these fifteen years i.e.

1956 to 1971, the sum total of tenements constructed in the country remained at 88,804 i.e. less than half percent of the total slum households in the cities. More important, the tenements remained, by and large, beyond the reach of the slum dwellers, for even after subsidies of 30 to 40 rupees the rents varied from 20 to 40 rupees, far above the capacity of the slum dwellers.[17] With the result that the tenements were sublet unauthorizedly to income groups well above the slum dwellers. The fact that in most cases the rehousing tenements were cited at city fringes, disrupting long established links to employment, rendered them even less attractive to the slum dwellers.

The 1956 scheme also envisaged the provision of open developed plots ranging from 1,000 to 1,200 sq. ft., (in size) with an earthen platform to limit the area of construction, a pucca latrine and an enclosed pucca bathing and washing platform with a tap, wherever possible, leaving the housing structure to be raised by the slum dweller. This approach was adopted mainly in Madras and Delhi, both being radial in structure and lands were available between the arteries. Prior to 1970, Madras managed to provide about 8,500 such open, developed plots measuring on an average 22x40 ft. but thereafter further allotment was given up due to scarcity and the high price of land.[18] Delhi was able to mount a much larger effort in what are called the j.j. colonies. Initially, the plot size was about 80 sq. yards, and it was envisaged that the plots would be given on a 99 years lease upon payment of half the price in a lump sum, or in ten yearly instalments, the other half being subsidy. However, in the face of large scale illegal transfers, the scheme was reviewed and plot sizes reduced to 25 sq. yards, to be given on a rental basis. A special census of Jhuggi dwellers carried out in 1960, revealed that there were about 50,000 families squatting on public lands.[19] The target was to remove them to camping sites within a year from 1960, and to provide them developed plots in phases. By 1970, not more than 20,000 plots had been developed and allotted. The pace quickened thereafter and by the end of 1974, over 53,000 plots had been provided.[20] It is a measure of the problem that at least an equal number will be needed to

provide for all squatters in the urban area. While illegal transfers, unauthorized uses and poor maintenance of the services continue to plage the j.j. colony programme in Delhi, it is to be recognized that the Delhi effort represents by far the largest programme in bringing sites and services within the reach of the poor.

The size and spread of the slums in Calcutta has been mentioned earlier. A survey carried out by the State Statistical Bureau in 1958, had revealed that in Calcutta city alone, excluding Tollygunge, there were 3,000 registered bustee holdings.[21] The distinction between a 'bustee' and a 'bustee holding' should be noted. A bustee, usually identified by the streets or other prominent features at its boundaries, may comprise one or more bustee holdings which in turn may consist of one or more huts. Bustee holdings are distinct entities for tax paying purposes. Not that much tax is paid. The system of registering bustee holdings separately came into vogue, mainly because the property tax in respect of these holdings was to be limited to a ceiling of 18 percent, of the rateable value instead of the usual ceiling of 33 percent.[22] Nevertheless, there were several unregistered bustee holdings as well, not taken into the account of the SSB survey. In fact there have been no reliable estimates of the bustee population in Calcutta city or other parts of the metropolitan district. The Calcutta Slum Clearance and Rehabilitation of Slum Dwellers Act 1958, had envisaged the gradual clearance of the bustees and rehousing of the bustee dwellers within specified distances but in view of the enormous costs involved the Act could not be applied in any significant scale. Nor was any major field survey taken up under the Act.

The Basic Development Plan of 1966, advocated for the first time a massive bustee improvement programme based on the following judgements:[23]

(a) That, in the interest of public health and public welfare, a massive attack must be undertaken without delay to improve living conditions in the densely populated central areas of the metropolis, and particularly to eradicate endemic and epidemic diseases such as cholera....

(b) That, total clearance of all the bustees in Calcutta and Howrah, and the provision of adequate sanitary housing for the 9,12,000 bustee dwellers, must be the ultimate long-term goal; but because this total clearance, with the accompanying enormous re-housing programme, in all likelihood will not be completed for several decades, a programme of bustee improvement must be devised to bring the basic amenities of sanitation and environmental decency to the hundreds of thousands of bustee dwellers who must remain in their present bustees for many years to come.

(c) That, the per capita costs of improvements (in sanitation, water supply, drainage, filling of insanitary tanks, paving of passageways, and installation of street lighting) are comparatively low, and that a programme covering several hundred thousand bustee inhabitants is financially feasible....

The Plan was not wholly in favour of improvement. It sought to make a distinction between slums in the centre city and slums elsewhere. The Plan's approach was to combine 'intensive' bustee clearance in the central areas of Calcutta and Howrah for "economic as well as urgent health considerations", and 'extensive' bustee improvement in the remaining bustee areas. Subsequent experience has, however, shown that for a variety of reasons this distinction could not be maintained. Even the so called 'massive bustee improvement' programme could not be given a start due to a lack of resources. Despite the clear logic for, and enunciation of, the improvement approach, opposition to the concept itself was prominent in the State and Central Government circles. A pilot scheme commenced in the Pilkhana bustee of Howrah did not achieve much convincing progress either, due to meagre funding. But the situation altered rather dramatically in mid 1970 with the decision to take up a large-scale development programme for Calcutta. On the assessment that an outlay of about Rupees ten crores would be needed, based on a per capita expenditure of Rs. 100, a scheme covering about ten lakh bustee dwellers in and around Calcutta and Howrah was taken up as a first effort of the Calcutta Metropolitan Development Authority set up in September 1970. In sharp contrast to the doubts and fears expressed about the programme in the preceding years the Government of India announced in October '70, its generous decision to give eight out of the

ten crores needed. Within a few months the Metropolitan Authority set up a Bustee Improvement Wing and commenced work in several bustee concentrations. After some initial reservations the Calcutta Corporation also decided to join the effort as an implementing agency of the CMDA. The West Bengal Slum Areas (Improvement and Clearance), Act was passed to enable easement rights to be secured for effecting the improvements and to acquire rights to the land and the structures as necessary. Despite the highly disturbed law and order condition prevailing in the city it was possible to make an effective beginning at the numerous sites.[24]

The scheme has been in progress for about six years now. Out of the estimated twentyfive lakh bustee dwellers in the metropolitan district about twelve lakhs have been brought under its purview. In brief, the improvements include items such as the conversion of existing service latrines into sanitary latrines on the basis of one latrine per twentyfive persons either with septic tanks or connection to street sewers (where available), surface drainage, potable water supply at the rate of 20 gallons per head per day (usually one tap for 100 persons), paving of the bustee pathways and street lighting. Till June '76, nearly 30,000 sanitary latrines and about 12,000 water points had been provided. Sewer and drainage networks provided so far exceed six lakh meters and paved pathways would cover about seven lakh sq. meters. Out of 310 clusters where the improvements were commenced, work has been completed in 270. Since the beginning a little over Rs. 15 crores have been spent under the programme, initially at a per capita rate of about Rs. 120 and later at Rs. 140.[25]

In size and scope the Calcutta programme for bustees has been unprecedented. There is no doubt either, that in most of the bustees this has been the first ever attempt to provide the basic amenities of water supply and drainage. It is too early to assess in quantitative terms the effects of such 'sanitizing' on the health of the dwellers. There are numerous other factors such as nutrition, child care, medical facilities, density of living, quality of air and so on, which are important in health care but these are not directly the concern of the bustee improvement scheme currently being implemented. A modest nutrition programme for the bustee children up to five years in age was commenced along side the scheme for physical improvements through the Metropolitan Authority's social workers and voluntary organizations, but the scale of the effort is still too small compared to the need. The physical environment of the bustees, however, is showing signs of changes for the better but several nagging questions remain which, in turn, would determine whether the improvements gained will endure.

The most important relates to maintenance of the facilities. It is fair to say that many of the development schemes taken up by the metropolitan authority have been necessitated by long accumulated, maintenance deficits. The record of the maintenance of public utilities in the city has rarely been good and in the years after independence it has visibly declined. The bustee scene is no exception to this general phenomenon. In fact it is worse, for the line of distinction between capital and maintenance works in a bustee, is very thin indeed. It has been a sad experience of the Authority that as more is built in the bustees, less is maintained. The Calcutta Corporation and other local bodies which were expected to take over the maintenance of the improved facilities have declined to do so citing many reasons, the more prominent one being a lack of funds. And this plea cannot be brushed aside either because municipal taxes, low and poorly collected as they are, are practically non-existent in the case of bustees. As mentioned earlier, under the Calcutta Municipal Act, consolidated rates in respect of bustees are limited by a ceiling of 18 percent of the annual value compared to 33 percent in other cases. In other municipal areas like Howrah, bustee holdings hardly pay any tax at all under one pretext or the other. It is not that the bustee dwellers themselves are always unwilling to pay. In real terms they might be paying far more to reach what few services are available to them. In the summer months, for instance, it is not uncommon for 'bistis' or water carriers to charge ten or fifteen paise for a bucket of water. While accurate figures are not available for the rents paid for bustee dwellings, it is safe to assume that

what little municipal taxes are being paid are passed on in full by the landlords or the thika tenents to the dweller. Thus the poor tax yield from the bustees is not so much the refusal to pay as the absence of a system that would help quantify services rendered, identify beneficiaries and help recover charges from them. Very recently the State Government has passed legislation which has removed the ceiling of 18 percent in bustees where the Metropolitan Authority has carried out improvements.[26] One hopes that legislation would be followed quickly by the action needed to revise assessments on the improved bustee holdings.

Maintenance of improvements made in slums has been a vexing issue not only in Calcutta but in other metropolitan cities as well. For instance, in Delhi the maintenance of the improved j.j. colonies has been a long debated issue between the Delhi Development Authority and the Delhi Municipal Corporation. Even where slum improvements have been carried out by the municipal authorities themselves, their subsequent maintenance has not been adequate.

Despite poor maintenance and other problems that have characterized slum improvement schemes in the country, the concept and the programme have been widely applied in recent years. Till 1973-74, i.e. end of the Fourth Plan period, about Rs. 14.21 crores had been spent under the centrally financed Slum Improvement Programme, covering in all about twenty lakh slum dwellers in about twenty cities.[27] The extension of the scheme to so many cities came in the wake of the All India Housing Ministers' Conference in 1973, which urged that slum improvement schemes should be taken up in all towns with populations of three lakhs and more, and in each State at least one slum improvement scheme should be taken up. It is difficult to resist the feeling that the rapid extension of the improvement concept has been nearly as arbitrary as its rejection in earlier years. While in the case of metropolitan cities like Calcutta, Bombay, Madras etc., environmental improvements to the existing slums might well have been the only feasible alternative, its adoption in towns like Rohtak, Ludhiana, Jaipur or Srinagar is open to question. A programme of sites and services might have been more relevant to these towns.

Apparently the temptations of accepting a centrally financed scheme have been too strong to resist. A Planning Commission's Working Group had suggested a provision of Rs. 100 crores in the Fifth Plan period to cover about sixty lakhs slum dwellers in the selected cities, but the scheme itself ceased to be centrally financed from 1974-75.[28] Pursuant to a decision of the National Development Council, the slum improvement scheme was transferred to the 'Minimum Needs', programme under the respective State Plans. 'Minimum Needs' cover many items like health, primary education, roads etc., and many States have not been able to sustain for slum improvement even the outlays that were earlier provided, when the scheme was centrally financed. For instance, compared to an average of Rs. 2.5 to 3 crores given annually for the Bustee Improvement Programme in Calcutta, the provision under Minimum Needs in the State Plan has not exceeded Rs. 1.5 crores since 1975-76.[29]

In determining alternative strategies for housing the urban poor, it is worthwhile to consider the recent experience in Madras. As mentioned earlier, the strategy of open, developed plots, was pursued till about the sixties. According to the 1961 census there were about 4.12 lakhs slum dwellers in Madras city, comprising about 98,000 families. By 1971, the number had increased to about 7.37 lakhs in 163,000 families.[30] The Tamil Nadu Slum Clearance Board was set up in 1971, under the Tamil Nadu Slum Areas (Improvement and Clearance), Act. The Board's origin had been marked literally by flame and ashes. A month after the DMK party had come to power in the State (in 1967), a series of fire accidents occurred in different parts of the slums. Strange as it may seem, this ordeal by fire for the slum dwellers continued for a few years. In each case, with admirable speed, usually within a month, the administration managed to rehouse the slum dwellers in fireproof sheds. The concept of the Board to provide permanent dwellings to the slum dwellers was devised in these circumstances, and when the Board was set up the listing of its functions specifically referred to relief and rehousing of slum dwellers affected by the fire. The principal objec-

ve of the Board, however, was to clear all the slum within e city limits within seven years and to prevent the furer growth of slums.[31] Soon after its formation, the Board ok up an elaborate socio-economic survey. A major purse of the survey was to clearly identify the families livg in the slums. Each family was photographed and an entification, or a Pass Book, was issued to that family. he survey revealed there were 1,202 slums, where about 63,804 families lived. The average monthly income of the mily was about Rs. 164 with less than twenty percent rning more than Rs. 200. The survey also indicated about l percent of the families lived in self-erected huts, and the st in rented huts. The rents paid averaged between Rs. 5 10, in sixty percent of cases, and between Rs. 11 to) for the rest.[32]

Commencing with grants from the State Government, e Board set to work on construction of rehousing teneents. After the enumeration and issue of Pass Books, ach family was given an ex-gratia payment of Rs. 50 to nable them to shift their huts to a temporary rehabilitaon site, while construction work was taken up at the riginal site. The tenements ranged from 197 to 215 sq. ., in carpet area and consisted of a multi-purpose room, kitchen, a bath and a lavatory closet. The pace of contruction was remarkably quick and in many cases the lum dwellers were shifted to the rehousing tenements ithin about nine to twelve months of commencing the ork. Since allotments were confined to the slum dwellers, arlier identified and provided with Pass Books, a kind of ested interest grew among slum dwellers in ensuring the ompletion of the tenements and in preventing new families rom setting up huts in that particular slum. By 1971-72 he Board managed to deliver about 3,500 units. The pace as stepped up to 4,700 units in the next year. At the end f 1975-76, 17,000 units had been constructed and another ,300 were in progress. And schemes for an additional 6,000 units had been sanctioned. Out of about Rs. 18.5 rores provided, the Board had been able to utilize about ts. 15.15 crores.[33] It is obvious this degree of success would ot have been achieved but for the State Government managing to elevate the slum clearance programme as an important DMK party platform. The involvement of the party cadres at the grass roots level appear to have been instrumental in ensuring the temporary shifting of the huts, the timely completion of the housing estates and the reasonable state of their upkeep. The Board's Chairman, a member of the Legislative Assembly, also brought to the scene his commendable organizational skills. What the Board has done, undeniably is a good record for any organization in less than six years but the achievements have to be measured against the size of the problem. Even with the completion of over 36,000 units in another year or so the Board will be nowhere near its first objective of rehousing 163,000 families and clear all slum within seven years of its founding. On the financial side the costs at the rate of Rs. 8,000 per unit on an average, have been prohibitive. Initially there was a hope that half the capital cost at least could be recovered through rents, but this worked out to about Rs. 45 per month, clearly beyond the reach of the dweller. A license fee of Rs. 15 per tenement is now being collected which just about provides for the maintenance expenses. While the rate of collection of this license fee has been quite good, all hopes of amortizing the capital were given up quietly when the Tamil Nadu Government passed orders in June '75 treating the entire amount provided to the Board as a grant. The Board had also hoped that some surpluses would be available from remunerative schemes such as shops and other commercial facilities set up in the redevelopment areas but the actual earnings from such schemes have been meagre, amounting to less than Rs. 2 lakhs in 1975-76.[34]

As for the prevention of slum growth, while the record of vigilance and protection of public lands has been reasonably good so far within the city limits, elsewhere in the metropolis the slums have proliferated. New slums have come up especially in those areas where major industries have been set up. The Slum Clearance Board's activities have not gone beyond the city limits as yet. Given the financial picture, it is most unlikely that the State Government would be able to sustain annual grants of two to

three crores for slum clearance schemes in the future without any possibilities of reasonable return and guarantee of even adequate maintenance. Opinion is already veering around to the view that the earlier approach of open, developed plots was better and, at any rate, any housing construction would have to be based no self-help, at drastically reduced costs and standards.

As in other metropolitan cities, Bombay too has undergone a change of approach in these years with regard to the slum problem. Chawls (low to medium rise buildings partitioned into several portions and let out), have been a major problem in Bombay for years. Most of the buildings where chawls were located were old and prone to collapse frequently. In the fourteen years after 1956 nearly 1700 buildings collapsed killing over 200 people, injuring some 800 and rendering several hundred families homeless.[35] In many cases the homeless persons moved to slums or 'jhoppad-pattis', as the squatter hutments are called in Bombay. The rapid industrialization of Greater Bombay led to further influxes (one estimate places this at 350 per day), and the slums began to proliferate on municipal, government and private lands. The initial approach to the problems was clearance of slums and rehousing of the dwellers in tenements. In the ten years between '55 and '66, Greater Bombay added 175,000 dwelling units at the annual rate of about 17,000.[36] Remarkable pace no doubt, but nearly 55 percent of these units were built by private agencies, most of which were in the middle and high income categories and luxury flats. Against the ambitious target of about 40,000 tenements for slum dwellers which the Greater Bombay Development Plan had urged, by 1966 the aggregate of all tenements put up by all the official agencies, such as the Maharashtra Housing Board, was a meagre 17,340.[37] There seemed very little chance of doing anything about the 200,000 odd hutments scattered all over Greater Bombay with its million dwellers.

When the Slum Improvement Programme was launched by the Government of India as a centrally financed scheme in 1971. Bombay readily adopted it. The Slum Improvement Board was created to fund and coordinate the improvement work. The Bombay Municipal Corporation, as the principal implementing agency commenced work in most of the slums located on municipal lands. By the end of the Fourth Plan period (1974-75), about 200 slum pockets with about five lakh slum dwellers were covered under the improvements scheme at a cost of about Rs. 8.5 crores.[38] Towards the maintenance of improved facilities, the Municipal Corporation also decided to realize a 'compensation' or a 'license' fee ranging from Rs. 5 to 8 per hut.

The Maharashtra Government, however, wanted to proceed further than just providing improvements in the slums. Early in 1976, a massive survey of all the slum pockets on the State Government, Municipal and Housing Board lands was carried out, which placed the number of slums (on these lands), at about 850, consisting of about 260,000 hutments with a population of about 15 lakhs. In addition it was estimated that slums on the central government and private lands accounted for at least another 120,000 huts, with a population of about six lakhs. In the wake of the survey, all slum dwelling families were identified and given a 'patch holder' or 'hut occupier' card, similar to the pass book in Madras, containing particulars of the patch/hutment, the family, occupation, income etc., and also providing for the recovery of compensation, license fee or service charge ranging up to Rs. 20 per hut. In essence, this is only a transfer of what used to be paid either to the hut owner or, in most cases, to the local toughs or organizers as a kind of protection money. The fee is to be realized by the Slum Improvement Board, and the proceeds invested in improvements not only of the slum areas but of the slum structure itself.[39] The slum census had revealed that at an average cost of about Rs. 500 per hut, the 260,000 huts enumerated, represented an investment of about Rs. 13 crores. If slums on the central government and private lands are added, the investment would be double. Irrespective of architectural and engineering standards this is an investment that a massive number of people had made in devising their own shelters. It would have been grossly unrealistic to ignore this and exclude this investment from the total housing stock in the city. The first contribution of the slum census has, therefore, been the recognition it brings to their fact. By the acceptance through a hut-wise enumeration and a commitment to devise means of improving the structure itself, apart from the environment, the Bombay effort marks a major initiative in truly integrating the slums in this cityscape.

The realism of the approach should be apparent if we consider the present level of housing costs and the possible market for pucca dwelling units in the lower income groups. The gross disparities in incomes in the urban economy as a whole and the preponderance of poor income households has been stressed before. The difference may be only slight, but between 60 to 65 percent of the households in the Metropolitan cities report a monthly income of less than Rs. 300.[40] At the current cost of about Rs. 8,000 per pucca dwelling unit of about 250sq. ft. including proportionate land cost, amortization works out to over Rs. 60 per month, assuming 20 percent down payment and the rest payable in 20 years at the lowest available interest rate of 5.75 percent. If a housing expense-income ratio of 15 percent is adopted it will be seen that all households with monthly incomes of less than Rs. 400 are priced out straightaway. Even if by a tremendous saving in land and construction costs, the per unit price is brought down to Rs. 5,000, and monthly costs on the same financing pattern to Rs. 40, households with incomes of less than Rs. 275 are still priced out.[41] But even at this reduced price construction, outlays on an adequate scale would run into several hundred crores. At the end of the Fourth Plan, housing shortage was assessed at six million dwelling units. Taking the additional requirement of four million units, about 10 million units in all were required to be constructed during the Fifth Plan. The most optimistic assessment, however, places possible construction at no more than 2½ million units.[42] If pucca dwelling units are to be taken as the sole indice of housing stocks or addition, it is obvious we shall be worse off than before. The Fifth Plan document recognizes the anamoly of the situation and has rightly called for a change of approach.[43]

> Given the constraints it is extremely difficult for any developing country even with the highest ideals of social welfare to implement an ambitious programme of housing which is unrelated to the economic level and the saving capacity of the people (or) preservation and improvement of existing housing stock.... As regards housing for the urban poor there may be a need for orientation towards the provision of developed plots with kutcha and pucca construction.

The acceptance of slum improvement as a concept and a programme, is part of this preservation strategy. Perhaps, in scope and content, the programme could go farther than just sanitizing the slums. In many cases the settlements badly need some realignment of the pathways, some creation of open spaces, some determined removal of a few activities, like cattle keeping or noxious trade. This would certainly involve some demolition and some displacement but, given a well-ordered scheme, it should be possible to secure the needed public support. Improvements to the environment apart, efforts to organize improvements to the shelter itself have some rewarding potential as the Bombay experience indicates. This is, of course, connected with the issue of land ownership. When the slums are on government lands, conferment of title and its use as a colateral for financing house improvements should be possible. In places like Calcutta, the complex web of landlords-middlemen, rights and titles have to be broken. The first effort to apply the provisions of the West Bengal Slum Areas (Improvement and Clearance), Act 1971, which enables the acquisition of such rights upon payment of compensation, based on the net annual income and payable in bonds, landed the Metropolitan Authority in a series of Court actions that has taken more than four years to resolve. The recently enacted Urban Land Ceiling and Regulation Act, does not offer a breakthrough either, in the particular instance, for, the bustees are already built up and there is hardly any vacant land to come by. Calcutta's, and for that matter, West Bengal's land and tenancy problems are of course unique, dating back to Cornwallis, but this need not deter other cities more fortunately placed from going ahead.

In the various schemes taken up so far dealing with the slum problem, three basic approaches are discernible. One is traditional, and that is to view the slum as incompatible 'per se' and as such seek to remove it altogether and rehouse the dwellers in storeyed tenements. The high cost of land acquisition and construction, the inability of the slum dwellers to pay the economic rents for the rehousing units, the inevitable subsidies involved, the numerous constraints faced in the re-development of land and the serious limits to any cross subsidization that can be achieved, are factors that continue to plague any slum removal and rehousing attempt from the beginning. On the whole the size and record of this programme has been insignificant.

The second approach of environmental improvements to existing slums clearly recognizes the magnitude of the problem, especially in the larger cities, and concedes it is impossible to mobilize the resources needed for clearance and rehousing. This approach seeks to ensure that at least some minimal conditions of environmental hygiene are provided in the slums. To many, this may seem no more than an interim palliative but, given the scale of the problem and its concentration, this is perhaps the only important and feasible course of action open to larger cities. There is no need either for taking too limited a view about the scope of the environmental improvements. Apart from inputs such as piped water supply, sanitary latrines, drains, pathways etc., physical improvements could also be extended to the provision of play lots for children and the nucleus of a community space which could serve multiple uses such as health care, maternity and child welfare, primary and adult education, community gatherings etc. The convergence of investments for physical improvements and social services, are not always easy to accomplish but the difficulties are due, in the main, to a lack of inter-departmental co-ordination rather than to a lack of funds.

The third approach, which is inherent in the programme for open, developed plots, recognizes that at the present economic level certain income groups are priced out of the pucca city. The approach favours the creation of settlements with minimum sanitary requirements, but allows flexibility as regards the housing structure itself. The settlement is viewed not as transitional to be replaced by something else in the future but rather as evolutionary where the dweller himself expands or transforms his dwelling from 'kutcha' to 'pucca' depending on his own needs and his income. Of course, such an approach is contingent upon the land being available at locations which can provide gainful employment to the settlers. There is also the need to take a view of the cityscape as a whole in determining possible areas for these evolutionary settlements so that options for the future are not preempted by indiscriminate squatting. Squatting as such need not be regarded as a crime in itself, but as a measure of the extent to which poor people are prepared to provide their own housing. The open, developed plot to use the more sophisticated contemporary word 'sites and services' only seeks to engage this enterprise and initiative effectively.

The sites and services approach is particularly relevant and suitable for rapidly growing industrial towns where migration is high, land is available and options for their use are still open. Though India's New Towns are less than two decades old, in the more populous cities of Durgapur, Rourkela or Bhilai slums account for nearly a fifth of the population. Planned mainly as residential colonies for the industrial workers, these townships have failed to perceive the secondary and tertiary employments triggered off by massive industrial investments. Physical outgrowths have in most cases encircled the so called planned townships. The housing provided by the industry itself has rarely exceeded half the requirement and in the absence of any imaginative ideas for self help housing, the slum growth has proliferated. Surprisingly, in the early stages when land was acquired for the Steel Plants, considerable imagination was shown in resettling the villages affected by the acquisition. In Durgapur, for instance, where a dozen villages, big and small had to be acquired a reasonably self contained settlement i.e. Gopalmath was set up with facilities like water supply, drainage, roads and street lights, schools, health centre etc., to service about 10,000 people. Similarly in Rourkela, Jalda and Jhirpani were set up as rehabilitation villages with some services. The same concept could have been extended to plant labour as well instead of confining investments to the construction of expensive and highly subsidized rental housing. Semi pucca colonies were, of course, set up for labour construction but (in most cases), at temporary sites used up later for industry. In Bokharo the present author came across some efforts to provide about 3,000 developed sites to the steel plant employees at a low cost where they could erect their own huts in a planned layout. About a thousand have been put up but the project has not been pursued further. A vast construction colony of about 15,000 people is located close by, where the contractor provides some amenities. The colony has the potential to evolve into a good-sized settlement but here again the site will be taken up when the steel plant expands. Unfortunately, the plant's management and the planners do not seem to comprehend the value and realism inherent in their own efforts and seem to prefer a fruitless struggle for funding highly expensive housing construction. Even where sites and services have been addressed to middle income groups, the locations have been carefully chosen at the peripheries rather than within the so called planned sectors of the township.[44]

There is much to learn from the experience of some Latin American countries in dealing with slums and squatter settlements. The 'Barriadas' in Lima, Peru, are probably the world's most organized squatter colonies. There are several hundred of them in the captial city and one estimate is that 100 out of the 140 sq. miles of the city are covered by the Barriadas. Each is a community of 5 to 6,000 people; each has been preceded by a group or an action Committee on behalf of the prospective squatters banded together, which had sent 'scouts' to look out for vacant lands, preferably Government-owned or disputed. The land would have been surveyed secretly and plans for the 'occupation' drawn up in advance. On the appointed day, or night, the squatters would move in strength with straw mats, tin sheets and canvas rolls and set up a settlement with the speed of 500 huts per night. For years, a see-saw battle was waged between the authorities and the squatters until the Architect, Belaunde Terry took over as President of Peru in 1963. President Terry viewed the dispute as a futile exercise and ordered a phased regularization of the Barriadas. The National Housing Corporation (Junta Nacional de la Vivienda, established earlier was asked to operate a scheme to confer titles to the land on the squatter, then use the title as a mortgageable asset to meet part of the cost of providing basic utilities in the barriada (usually water, sewers and lighting: not drains, for it never rains in Lima). Later, as land values improved further, mortgages were to be allowed towards improvements to the hutment itself.[45]

> San Martin de Porres is a barriada of 300 hectares and 9,500 families. The land had been a farm till the late forties. Its planned' invasion had taken 15 years to accomplish. The J.N.V. moved into the area six years ago to bring light and sanitary sewer first; and then followed with loans for house improvements.' By 1968, San Martin was not a festering slum but several rows of gaily coloured, riotously different, single and double storeyed houses which the dwellers themselves had put up. The J.N.V. does not hope to receive more than a third of its investment but the principle of 'slum integration' is established—of letting the slums change on their own with Government funds as the catalysts. There are at least 150 big and small 'barriadas' in Lima today covered by J.N.V.. where change is taking place, each has its own Council, its own 'mayor' and the people of the barriadas are proud to report that elections of the 150 unofficial 'mayors' are more regular than one to the official position.

The barriada experience is reported in varying degrees in the ranchos of Caracas, the Favelas of Rio, the 'Ciudade Livre', or free cities, around Brazilia and the reception areas near the new town Ciudad Gueyana in Venezuela. In the last named, as major industries began to take shape, low cost sites were included as part of the New Towns layout where migrant workers were encouraged to put up their own dwellings, often a simple structure of wooden posts and corrugated tin sheets. A credit system operated to provide these materials, and cheap transport to these sites was emphasized from the beginning. As the workers' income increased, they were expected to improve their own

dwellings with mortgage funding. Aptly the process is known as 'Urbanisation Popular'.

At a seminar held in Delhi (1967), on squatting, a participant lamented "this is an industry (squatting) which knows no strikes or lockouts; shortage of raw materials and administration hurdles do not impede its course: like Tennyson's brook it goes on for ever". The concern inherent in this lament is one of legitimacy. The view that squatting and slum growth are somehow not legitimate has undermined, or prevented more than any other factor, any serious effort towards positive solutions. Political pressures have often tended to soften the positive attitudes towards squatting but here again some escapes have been sought on the time scale: e.g. a decision in Delhi to confine allotment of Jhuggi resettlement plots to migrants till 1960, declaring the post-'60 migrants as 'ineligibles'. In highly respected circles the view is still held that sites and services or slum improvement schemes would only encourage further migration. As Konigsburger[46] points out, this is perhaps the one view that has been tested and disproved time and again. The rapid pace of slum growth in most cities of the developing world is in itself ample evidence that migration is not halted by any lack of water supply and sewerage, shelter or housing sites. Deplorable as living conditions in most cities are, in the past 25 years 300 million people have migrated to cities in the developing countries of the world. In India between '51 and '61, nearly 20 million people moved into cities.[47] The concern for the level or quality of urban services ranks far below the concern for employment and food; it does not even feature in the reckoning of the migrant.

What is irreversible need not be a tragedy. The enterprise and initiative shown by the migrant or the slum dweller in devising his own shelter is not an impediment to city growth, but could well be an instrument for positive development. Contrary to popular imagination slum dwellers often display a much higher degree of social adjustment and sharing than middle class neighbourhoods. Their closely packed dwellings and the low levels of services often dictate this. There is no evidence that slums and squatter settlements are any more unsettling to the body politique than other parts of a city. What is needed is a clear recognition that indigent migrants are not the dregs of a society but only the inevitable phenomenon of its urbanization. Innovation and organized effort could very well transform the migrant force from liabilities into assets. A special report[48] prepared for the U.N., neatly sums up the requirements that any programme for slum improvements or sites and services should fulfil:

1. The programme must be a wholehearted contribution to city development: an essential part of an overall plan and not a makeshift method of getting the squatters out of sight.
2. The settlement chosen must be accessible to employment possibilities and transport.
3. Services provided must be adequate and above all must be properly maintained and serviced.
4. Public services such as schools, health centres and community centres are essential and should allow full community participation.
5. Space for shopping should be sufficient and ensure gains to the community.
6. Allottees should be granted security of tenure with needed safeguards to prevent speculation and trafficking in land.
7. Selection of settlers should reflect the socio-economic picture that prevails: not confined to just migrants or 'eligibles' determined with reference to a particular date, but to those genuinely in need of shelter.
8. Rents should cover as much of the land costs and services as feasible.
9. Transport costs should be minimized by careful sitting.
10. While settlers should be allowed to build any form or structure they choose assistance should be on hand for easy credit to build walls and roofs, and for technical assistance.

This is by no means a checklist of impossibles. The expertise and the sensitivity needed to fashion such programmes are not in short supply either. In its plans for New Bombay; the twin city across the Thana creek, CIDCO has demonstrated the feasibility of attractive and well-serviced, single-storeyed but high density settlements which can accommodate more than 300 people an acre.[49] The houses of the poor in the developing world have always been built by the poor themselves. The image of the contemporary city of glass and steel is alien to them and as indices of progress they are just as irrelevant to public policy. Sheltering the urban poor is of course not a matter of just design and layout. There are other compelling circumstances such as income, and how far this occupation corresponds to, or differs from, the pattern of the economy itself as conventionally viewed. Nevertheless recognition of the marginal settlement as a part of the cityscape could be a major advance in thinking.

REFERENCES

1. Hugh Miller
2. Conf. Barbara Ward and Rene Dubos, *Only One Earth*, *Pelican*. 1973.
3. U.N. Centre for Building, Housing and Planning: "Urban Slums and Squatter Settlements in the third world". Paper No. RPC 9 prepared for Habitat Conference.
4. "Report of the Working Group on Slums": Planning Commission, New Delhi 1972.
5. "Calcutta Municipal Act 1951" (West Bengal Act XXXIII of 1951.)
6. "The Slum Areas (Improvement and Clearance) Act 1956".
7. "The Maharashtra Slum Areas (Improvement, Clearance and Redevelopment) Act 1971".
8. "The Tamil Nadu Slum Areas (Improvement and Clearance) Act 1971", Act II of 1971.
9. "The West Bengal Slum Areas (Improvement and Clearance) Act 1970". (Presidents Act).
10. Confer. op. cit. 4.
11. "Basic Development Plan for Calcutta Metropolitan District": CMPO: Govt. of West Bengal, 1966.
12. "Statement of the Minister for Planning", in Rajya Sabha in August 1973.
13. Conf. G. T. Kingsley and F.S. Kristof, "A Housing Programme for Metropolitan Calcutta", Ford Foundation Planning Advisory Group, March 1971.
14. &15. Ibid.
16. Tamil Nadu Slum Clearance, First Year in Madras: Tamil Nadu Slum Clearance Board, 1971.
17. *Tamil Nadu Slum Clearance Board and its services to society* 1970 to date, Mimeo, unpublished 1976.
18. Op. cit 16.
19. "Report of the Committee for Slum Clearance/Improvement Scheme", Ministry of Works and Housing, May '75.

20. Ibid.
21. K. C. Sivaramakrishnan: *Bustee Improvement Programme in Calcutta*, Position Paper, Mimeo, unpublished, March '72.
22. Ibid.
23. Op. cit. 11.
24. Op. cit. 21.
25. *Reports to the Government of India Review Team*: 25th Meeting CMDA: Mimeo, unpublished, September '70.
26. "Calcutta Municipal (Second Amendment) Ordinance 1970" (W.B. Ordinance XV of '70).
27. Op. cit. 19.
28. Op. cit. 4.
29. Op. cit. 25.
30. Rama Arangannal (Chairman: Tamil Nadu Slum Clearance Board): "Paper on Slum Clearance & Improvement Schemes in Tamilnadu". Seminar in Indian Institute of Public Administration, Delhi, February '74.
31. Ibid.
32. Op. cit. 17.
33. Ibid.
34. Op. cit. 17.
35. "Progress of Slum Improvement in Bombay", *Economic Times*, 20th Dec. '73.
36. Ibid.
37. Ibid.
38. "Annual Report", Maharashtra Slum Improvement Board, 1974-75.
39. Bombay Slums Census: "Bringing Urban poor into the mainstream": *Economic Times*: 2nd March '76.
40. Op. cit. 12.
41. Op cit. 13.
42. Fifth Five Year Plan" (1974-79): Draft Planning Commission.
43. Ibid.
44. Approach to the 4.75/5.50 and 10 MT phase of Bokharo Steel Conf.: Deptt. of Architecture and City Planning Bokharo Steel Plant: 1974.
45. Op. cit. 21.
46. Otto H. Konigsberger: "The absorption of New comers in the Cities of Developing Countries": Paper No. RPC/BP/22 preparing for U.N. Habitat Conference.
47. Ashish Bose, *Studies in India's Urbanization 1901-1971*, Institute of Economic Growth, Delhi 1973, Tata McGraw Hill.
48. Ronald Mendelsohn and Balwant Singh Saini: "Sites and Services, Housing the poor in India and Indonesia". A report for the U.N., Australian Government Publishing Service, 1973.
49. "New Bombay Draft Development Plan"; CIDCO, October 1975.

Status of the Tondo Foreshore Development Project

This material has been extracted from various World Bank Appraisal Reports. Changes have been introduced to suit EDI teaching purposes.

II.- STATUS OF THE TONDO FORESHORE DEVELOPMENT PROJECT

Summary

i. The upgrading of the Tondo Foreshore is a major component of the Manila Urban Development Project (Loan 1272/1282 PH, approved by the Executive Directors in May 1976).

ii. Supervision of the Project has been intensive, with missions visiting the Philippines at three or four monthly intervals since loan signing. Much has already been learned from the Project about the process of slum upgrading and the provision of health and other social services. Particularly notable is the process which has come to be known as "reblocking". This is the process of preparing a subdivision layout as a basis for providing access and basic services as well as for establishing land tenure. This process involves formal and intensive planning with the families living in Tondo, on a neighborhood by neighborhood basis. This is described fully in paras 16 to 22 and in Annex 4. The reblocking experience in Manila has already influenced the design of subsequent urban projects financed by the Bank.

iii. Perhaps the most important contribution of the Project is the impact it has had on Government policy. The metropolitan Manila area (population 5.5 million) is characterized by great disparities in income and living standards. Estimates are that almost one third of the city live in slum and squatter areas lacking in sanitation facilities, and characterized by high levels of malnutrition, infant mortality and parasitic and intestinal diseases. Following an initial period in which much of its resources were devoted to relocation of squatters from drainage canals and other waterways in metropolitan Manila, the National Housing Authority (NHA) has established and is actively expanding a nationwide program of slum upgrading. Some 450 candidate upgrading areas in metro Manila involving a population of about one million persons have been identified, most with sanitation and health conditions similar to those in Tondo. On June 11, 1977 two Presidential Letters of Instruction (LOI), which carry the force of law, were signed to establish slum upgrading as national policy. In addition, these LOIs specify that relocation of squatters will only take place if necessitated for public infrastructure, and not to distant relocation centers. Local governments of 14 cities and municipalities in the Manila metropolitan area already have established permanent technical teams to undertake design and feasibility studies for upgrading slums in their respective municipalities. Similar teams have also been established in the regional cities of Cebu, Davao, Cagayan de Oro and Baguio.

iv. The Tondo Foreshore Development Project enjoys a very high level of support by residents of the area and is being implemented as originally agreed with the Government. Initial survey results of community attitudes towards the Project indicate that almost 90% of the residents are satisfied with the Project to date (see para 43). While several important steps have to be completed before the Project can be finally labled a success, the Project continues to merit strong support from the Government and the Bank.

Background

1. Consideration by the Bank of an urban project in the Philippines began in late 1973 when an urban sector mission visited Manila. The sector mission highlighted certain consequences of past growth patterns in the metropolitan Manila area including imbalances between the locations of residences and work places and extreme income differentials and service level disparities.

2. Early work on project identification involved a review of a long list of major infrastructure projects resulting in the selection of a project in the Tondo Foreshore as prototypical of important urban problems requiring solution.

3. A Government task force was established with technical personnel from several agencies to develop plans for the Tondo, a 180 ha site with a population of about 180,000 located directly behind the Port and close to the commercial centers of Manila. In December 1974, this task force recommended a plan, subsequently abandoned, that involved converting approximately half the land to industrial and commercial uses and significantly reducing the residential density on remaining land. That earlier plan would have resulted in approximately 70% of the families being displaced from the area. New housing construction proposed for the remainder would have necessitated high levels of subsidy. Community groups strongly opposed the plan. Following a review by a Bank mission in February 1975, agreement was reached with the Government on a completely different approach, which involved provision of services to families in place, i.e. water supply, human waste disposal, surface water drainage, paved footpaths and streets, schools and clinics. The project was specifically designed to keep relocation to an absolute minimum consistent with satisfactory installation of basic services.

4. A revised "framework plan" for the Tondo, based on this new approach, was prepared and discussed with community groups and other government officials, during staff visits in 1975. The community groups, including Zoto/Ugnayan 1/greeted the revised framework plan for Tondo and Dagatan with a great deal of enthusiasm.

5. Subsequent to Project appraisal, and in consultation with Bank staff, the National Housing Authority (NHA) was established in October 1975 and absorbed the Tondo Foreshore Development Authority (TFDA) which previously had responsibility for the Project. The head of the TFDA was named as General Manager of the NHA. In November of the same year, the Metro Manila Commission (MMC) was established. One of the first major programs of the MMC was to attempt to obtain relief from chronic flooding in Manila by clearing obstructions from rivers and drainage canals in the city. A crash program was established under the NHA to remove all squatter families living on waterways.

1/ There are many organized community groups in the Tondo, of which Zoto (Zone One Tondo Organization) and Ugnayan (Ugnayan ng mga Samahan ng mga Mamamayan) are two of the more politically active groups.

This was given extra impetus in the Summer of 1976, when fatalities occurred from flash flooding. Since sites for permanent settlement close to the urban core were unavailable, the NHA established temporary relocation centers on land owned by local governments in the MMC and also expanded two distant relocation centers. Thus, the most visible activity of the NHA during the first year of its existence was the program of relocating thousands of families from waterways. While clearing of the flood control canals was needed, the severe time constraints imposed on the program precluded the preparation of permanent relocation settlements in suitable locations. This program very severely soured relations between the NHA and city-wide squatter groups, many of which are headquartered in the Tondo. Apparently it also led some community groups to express doubts about NHA's sincerity in fulfilling promises of not relocating families out of the Tondo Dagat-Dagatan Project area.

6. Because the waterway relocation program was initiated after the 1975 appraisal of the Tondo Project, it was not reflected in discussions with the Government that led to the Project. The discontent expressed by squatter groups during the time of the 1976 Bank/Fund Annual Meetings seems not to have been brought about by discontent with the Tondo Project (though the residents expressed strong feelings about being able to purchase the land at a low price) but by anger at the NHA over the city-wide waterway relocation program. While no families in the Tondo Project area itself were affected by this program, families living along drainage channels and rivers adjacent to the Project area were affected.

7. It has previously been alleged that families in the Tondo Project area had been or would be relocated to Dasmarinas (a distant relocation center). Any such relocation would have been in violation of public commitments made by the General Manager of NHA and in violation of agreed Project implementation procedures. To our knowledge, no such relocation took place. Within the Project area, the only relocation that has taken place that could be considered inconsistent with the development plan was the widening of Zaragoza Street, which took place in September 1976. Thirty structures were affected by the widening of this road, twenty-four of which were squatter houses and six of which were titled. Families affected were resettled within the Project area. The Zaragoza widening relieved a major bottleneck to Port traffic access. However it was not envisaged for widening under the agreed development plan, because by 1979 the congestion would have been relieved by the construction of R10 roadway. Although the widening of Zaragoza could possibly be justified as a needed interim traffic relief measure, it was hurriedly done and was a cause of local resentment.

8. Other projects have been undertaken in the general Tondo Dagat-Dagatan Project area which the Bank is not financing but with which Press reports have associated the Bank. These are:

(a) Expansion of the International Port

(b) The Kapitbahayan Housing Project

(c) International Design Competition Area

International Port Expansion Some three thousand squatter families live on the site being reclaimed for the International Port (see map), which is financed with German bi-lateral support. These families are due to be relocated as Port construction proceeds. Although we are not involved with the Port development, we agreed, as a means of assisting these families, to finance sites in Dagat-Dagatan for 1,500 families who would be affected by the first phase of the Port construction. Families living in the International Port area have fully endorsed the plan for permanent settlement in the Dagat-Dagatan area, which is about four kilometers away. In fact, community leaders have indicated that they are anxious to be able to move, because their current location is subject to severe typhoon and flood exposure.

Kapitbahayan This project is a high standard, relatively high cost (reportedly about ₱45,000 or US$6,000 per dwelling unit) development in the Dagat-Dagatan area adjacent to the Project site (see map). It was constructed by the NHA's Tondo Project Office prior to the Vancouver Habitat Conference. The Bank is not financing this development. To the contrary, Bank staff have been critical of the high unit costs and high design standards. Rental units in Kapitbahayan were offered to residents of the Tondo who could afford the somewhat high (₱70-120 per month or US$9.46-US$16.20) but heavily subsidized rent. While the residents are generally happy with these units, some community groups were concerned that the Government had changed its mind about lower cost sites and services units to be built at Dagat-Dagatan, and expressed fear that the more expensive Kapitbahayan model would be replicated under the Project. These fears are now allayed by the near completion of the first 500 sites and services units at Dagat-Dagatan under the Project (48 m^2 lots with monthly charge averaging about ₱ 47 or US$6.47).

International Design Competition In 1974 an international competition was held for the design of improved settlement for low-income and resettled families. The winning design was to have been constructed in a 5 ha site in Dagat-Dagatan (see map). During the Habitat Conference in Vancouver in 1976, the Government was criticized by various participants for holding a competition at all, since by its nature such an international competition results in technical solutions being developed abroad and precludes community participation. Of more significance, however, was criticism of the Government for not permitting a spokesman for Zoto/Ugnayan to participate in the Conference or in judging of the entries. It now appears that the design selected by the award panel will not be constructed.

Implementation Status

9. Construction under the Project is now proceeding reasonably well. After a slow start caused by difficulties in hiring experienced technical staff, the upgrading of the Tondo is now expected to be completed approximately on schedule. The Dagat-Dagatan component is approximately nine months behind schedule.

A. Tondo Upgrading

10. Sanitation Infrastructure - Work is progressing on several primary infrastructural components in the Tondo including: main surface drainage (80% completed); secondary watermains (70% completed); and the interceptor sewer (50% completed). Also, substantial fill materials have been added to low-lying areas. In addition, 450 new sites and services units on the former Public Works Compound within Tondo will be completed in December.

11. Work has also begun on "tertiary infrastructure" in an 18 block section of Tondo that has been designated for completion on a priority basis. This tertiary infrastructure includes connections for water and sewers, paving of streets and footpaths and minor drainage.

12. Health Facilities and Programs - The new health clinic in Tondo has been completed and upgrading of another existing clinic will start after February 1978. Health programs assisted by the Project are under way in the following areas: mother and child care, nutrition programs, deworming, TB X-Ray, vermin and rodent control, improved garbage collection and health education (leaflets, films, pamphlets, etc). In addition, some 98 barangay health workers, and 285 nutrition aides who were trained under the Project, are actively working on a part-time basis. These health workers in the Tondo Project are considered a model for similar health workers being considered under other proposed population and health projects and have resulted in a 50% increase in referrals to clinics and hospitals.

13. Education - Families in the Tondo area place a high priority on education. The new Tondo High School is expected to be completed in December and construction of additional classrooms for the four existing elementary schools in the area will begin in February 1978. Toilets and piped water have already been added to two existing schools.

14. Materials Loans and Small Business Loans - Approximately 463 loans for building materials averaging ₱930 (US$52) each have been awarded. Applications have already been received from 99 businesses for small loans. Of these, about 44 appear to have sufficient merit for continued follow-up. Applications are pending the completion of the layout and lot awarding in the blocks within which the businesses exist.

B. Dagat-Dagatan Sites and Services

15. Construction has started on 1,500 out of 2,000 sites and services units to be constructed in Dagat-Dagatan. The first 500 units will be ready for occupancy in December 1977.

Reblocking

16. The most interesting and important aspect of the upgrading program in the Tondo is the process that has come to be known as "reblocking". This is the process of preparing a subdivision layout as a basis for providing

access and other services as well as establishing land tenure and individual plot boundaries. The Tondo Project, as the first Bank-financed slum upgrading Project that involves provision of services to individual lots and the provision of land tenure to beneficiaries, is the first Project involving direct experience in reblocking. As a result, much has been learned regarding appropriate approaches to this process.

17. Houses in the Tondo have been built in an extremely dense and irregular fashion. Access to many properties is by way of very narrow and winding footpaths. Bank missions to the Philippines in the past had argued for an upgrading procedure that was essentially "as is, where is", e.g. footpaths would be paved wherever they were and to whatever width existed. New streets would be added only to provide access to fire protection vehicles. Government Project Office staff, however, argued for an upgrading process that would result in a more regular street and lot layout pattern and involve movement and realignment of structures within blocks. Streets would be straightened in the process. This issue was resolved by <u>leaving the decision</u> about the degree of regularization of streets and plot shapes <u>to each neighborhood</u>.

18. For planning purposes, the Tondo was divided into 24 "superblocks" consisting of areas bounded by main roads within which planning for facilities can most easily be focused. Each of the "superblocks" is in turn divided into neighborhood blocks involving 100-250 families within which the "reblocking" occurs. The process includes the presentation to the block residents of three alternative plans for street layouts and house locations within their neighborhood, from which the residents of the neighborhood designate their preferences in an open forum. The three plans presented to the residents include: (i) Plan "A", involving minimal changes in property alignments and leaving the existing irregular pattern of lot shapes and footways; (ii) Plan "B", creating more regular street and property alignments than currently exist but involving more changes in property layouts; and (iii) Plan "C", a fairly regular pattern of streets with rectangular lot shapes, which requires substantial shifts of houses within blocks.

19. The alternative block layout plans are explained to the block residents in community meetings where the differences in the various options are explained. The Project Office establishes a composite technical team to work with the families comprising an architect, a community relations worker, and a member of the socio-economic development group within the Project Office. The community votes on their preference and is free to propose whatever modifications they desire as a community. The architect and other members of the composite team assist in preparing modifications to block plans. A more complete outline of the steps in reblocking is given in Annex 4. This Annex illustrates the complexity of the reblocking process and the intensity of the community work required to make it a success.

20. It has been interesting to observe that in almost all blocks of Tondo, the residents have voted for Plan "C", even though this usually requires from 50-70% of the houses within the block to be realigned. This option creates a residential layout which most closely resembles that of other

more permanently established neighborhoods, which is one of the aspirations of the residents. Another reason for the selection of the regular block layout appears to be the desire to create a neighborhood which has better access and is therefore less susceptible to fire and health hazards. House movement necessitated by community selection of Plan "C" is the responsibility of the residents and is usually undertaken through "Bayanihan" or community self-help by neighbors. The NHA also provides some additional semi-skilled manpower. Materials loans under the Project are made available at the time of the movement.

21. To date, attention has focused on 18 contiguous blocks in the "priority" area (see map) with a population of about 13,500 persons, although some reblocking has occurred in 22 blocks out of a total of 97 blocks. Annex 3 shows the number of blocks in various stages. Five blocks have completed all movement of houses, and four additional blocks are almost completed. Sample surveys of families that have been involved in reblocking reveal that 27% of houses either have been or expect to move a few lots away, and another 32% involve a shift within approximately the same site to conform to street and lot subdivision plans.

22. It had been originally hoped that realignment of structures, awarding of lots, and completion of construction in the "priority area" would be completed by September 11. However, because of persistent rains, errors in surveys, and slower than expected movement of structures, this priority area is now expected to be completed by December 11. Initial work is shown in attached photographs. In blocks where permanent locations and lot boundaries have been already agreed, there is already substantial evidence of house improvement and expansion through self-help means. Each such block has several substantial buildings under construction — some to two stories.

Outstanding Issue: Purchase Price of Land and Lease Rate

A. Purchase Price

23. Many Tondo residents feel very strongly about the question of land ownership and tenure. Except for a small area called "Old Tondo", where property is fully owned, the Tondo Foreshore (Project area) is mostly inhabited by squatters, who, after years of residence feel entitled to full legal ownership at a nominal price compared with the current market value of the land.

24. Legislative acts passed in 1956 (particularly R.A. 1597) provided for the subdivision and sale of part of the Tondo Foreshore area at P5 per square meter, a fraction of the current market value. In implementing the program, families in what is now called the "Old Tondo" section of the Project area, were offered lots of 96 square meters. This relatively large lot size meant that many families would be dislocated because there was insufficient land to provide all of the families in the area with lots of that size. As a result, only a few Tondo residents took advantage of the provisions of the earlier acts, and most were not able to do so.

25. Presidential Decree (PD) 814 was issued in October 1975 reaffirming the Government's intention to provide all Tondo residents with security of tenure and the right to purchase land; it also expanded the geographical area of land available for lease and purchase to cover the Dagat-Dagatan area. PD 814 provided that residents of Tondo would lease their property from the National Housing Authority under 25-year leases, renewable at the option of the leaseholder. Lease rates would cover development costs and amount to about US$6.40 per month for a typical 48 square meter lot. Families were to be allowed to purchase their lots after five years under a purchase plan which would require higher monthly payments than under leases. Those wishing to continue the lower-cost leases will be able to do so with security of tenure assured. The purchase option in PD 814 specified that purchase will be at the market value at the time the purchase option is exercised. Government technical staff insisted on this provision to minimize land turnover and speculation. The residents of the area, however, argue strongly for a lower than market price. In an effort to resolve this difference, we have been in consultation with Philippine authorities during the past year, and the NHA has now devised a formula whereby the charge for services will be distinguished from the charge for land, and the total purchase price for land and services will be lower than market values. The formula adopted by NHA has the twin objectives of providing full cost recovery within the Project area (thereby ensuring Project replicability), while at the same time establishing a purchase price which can be afforded by the current residents in Tondo.

26. On several occasions, Bank staff and NHA have discussed the determination and timing of the announcement of the purchase price to the residents. NHA has been concerned that, if an announcement of a price significantly below market value were made prior to the completion of the legal subdivision and assignment of lots to all families, excessive disputes by families over the size of lots to be obtained might occur. Discussions between the Tondo Project Office and community groups (including Zoto/Ugnayan) on the question of the purchase price were scheduled to begin in November/December. It is expected that an announcement of the revisions to PD 814 will be made shortly.

B. <u>Lease Rates</u> 1/

27. During appraisal, the proposed monthly lease payment of roughly ₱0.95 (US$0.13) per month (on average) per square meter was widely discussed in a series of meetings with all community groups. All groups, at that time, indicated that the amount was affordable; this was confirmed by careful analysis of the income distribution of families in the Tondo Foreshore (Table V-4, Staff Project Report). The analysis in the Staff Project Report assumes that families can spend 18% of income on housing and related services including water and property taxes. 2/ The analyses also indicate that an average size

---

1/ The question of affordability is discussed in paras 62-63 of the President's Report and 5.15 to 5.17 of the Staff Project Report.

2/ Most Bank-supported sites and services projects assume that families can afford to spend between 15% and 25% of family income on housing and services.

lot (48 square meters) could be afforded by about 75% of the Tondo residents, that a somewhat smaller lot could be afforded by 85%, and that the vast majority of families below the fifteenth percentile are transients or renters. The poorest group is expected to continue renting rooms in the area and should receive substantial indirect benefits from the Project.

28. Developing an affordable cost recovery scheme for a slum upgrading project requires a series of difficult judgements and compromises. It is impossible to make everyone happy. Also, there is inevitably some degree of bargaining on the part of the residents for as favourable a deal as possible.

29. The debate over wherether ₱0.95 (US$0.13) per square meter per month is affordable however, may turn out to be moot. Current estimates of Project costs (see Annex 2) are lower than those at the time of appraisal, and NHA is currently revising its estimates of the lease price. It is expected that when the final lease rate is announced the amount may be 15-20% below original estimates.

Relocation

30. The amount of relocation in the Project is still substantially the same as described in the appraisal report. However, the concept of relocation and community attitudes towards relocation need to be clarified. As the Project is now being implemented, the number of houses affected by construction of streets and footpaths within the Tondo depends largely on the decisions of the community itself. As noted earlier, families are electing to shift the location of houses to permit construction of a fairly regular pattern of streets and footpaths. Thus, although certain minimum circulation patterns and street access standards for fire safety purposes are dictated by general planning considerations, the community is electing a degree of house movement far in excess of minimum requirements. Families affected by the realignment are generally accommodated in the same block though there is also movement from denser blocks to less dense blocks and other open space (e.g. former Public Works Storage Compound). Relocation in this sense is voluntary and based on community consensus and therefore does not generate social and political problems.

31. The infrastructure items that do not fit this pattern of movement through community choice are the R10 and C2 roadways and the International Port. R10 and C2 are important national roadways which pass through Tondo and are financed under the Project. The alignment of both roads has been designed to keep relocation to a minimum, but the construction Right-of-Way of the R10 will nevertheless affect an estimated 422 1/ families and that of the C2 an estimated 69 families. Channel reclamation associated with the C2 will affect another 200 families. The International Port Expansion (not financed by the Bank) will cause the eventual relocation of some 3,000 squatter

---

1/ The NHA would prefer to relocate families on the remaining ROW of the R10 roadway (another 450 families) even though construction of future lanes would not be required for about 15 years. This proposal is still under discussion between Bank staff and NHA.

families living within the Port boundaries and account had to be taken of this fact when planning the development of Dagat-Dagatan and assigning lots there. As a means of assisting these families, the Project includes finance for about 1,500 lots in Dagat-Dagatan for families affected by the first phase Port expansion. As noted earlier (para 8) the families living in the International Port area fully support the idea of permanent resettlement in Dagat-Dagatan, which they regard as a desirable area.

32. It had been expected earlier that, apart from the International Port families, only 500 families from the interior of Tondo would need to be resettled in Dagat-Dagatan. However, the options being elected by neighborhoods in the reblocking process are utilizing existing vacant land to a greater extent than previously envisaged and there may be an additional 200 families from the interior of the Tondo Project area who are resettled in Dagat-Dagatan, for a total of about 700 families (out of a total in the Tondo of about 27,000 families). Total movement to Dagat-Dagatan under the Project is therefore estimated at 2,200 (comprising 1,500 families from the International Port plus 700 families from the Tondo itself).

33. The amount of relocation in the Project as agreed with the Government, is not and has not been an issue within the community. Where concern about relocation has been expressed, it has been the concern that the plan would not be implemented as agreed.

34. Our discussions with squatter families in the MMC, including many outside the Project area indicate in fact that these families do not object to relocation to nearby areas, when necessitated by public utility construction, provided their needs are taken into account. What these families ask for is that the relocation site be a permanent one (so that unnecessary investment in temporary house building and public services and facilities are not required) and also that sites be located within reasonable commuting distance to jobs. Under such circumstances, it is our impression that squatter families are in fact pleased with resettlement and feel that they are the beneficiaries of a positive program under which they are finally being given a chance to settle permanently.

Current Status of Community Relations

35. The Community Relations and Information Organization (CRIO) is a department within the Project Unit which serves as a liaison between community residents and NHA staff. CRIO, faced with an extremely difficult and delicate task because of the history of political unrest in Tondo and changing Government policies affecting the Tondo area, appears to be succeeding in building trust with the community residents. CRIO is responsible for discussing the objectives and implementation schedule for the Project with the community, for assisting them at the time of relocation, and for maintaining contact with all leaders of the community about problems as they may arise during the course of implementation. CRIO also publishes a Project newsletter "Pahayag" which is written in Tagalog and which discusses various aspects of the Project. This newsletter is distributed at least monthly and usually more often.

36. The exact position towards the Project of some of the more radical groups within the area such as Zoto/Ugnayan is unclear at this time. They seem supportive when Bank missions discuss the Project with them but on other occasions, they are alleged by both NHA and moderate citizens groups to be lobbying against the Project. It is hard to tell how many residents belong to each group; nevertheless, moderate groups, (e.g. the barangay chairmen, the Women's League and the Don Bosco Fathers) are quite influential among the residents and are supportive of the Project.

37. As far as Bank staff are concerned, relations with all community groups including Zoto/Ugnayan have been good; during one of the missions Zoto even referred to the Bank as its "hero" because of revisions in Project brought about by the Bank's involvement. It was perhaps in large part because of the Bank's interest in what Zoto and Ugnayan had to say that after loan signing in May 1976, letters began to be written to the Bank requesting intervention in activities not related so much to the Project as to other happenings in the Philippines. It appears that Zoto/Ugnayan began to look to the Bank for non-project-related assistance for the following reasons:

- The Bank staff had proven its capacity for listening carefully to the problems of the most vocal community groups;

  There was confusion in the minds of many as to the Bank's participation in other projects in the Tondo area, such as the architectural competition project and the Kapitbahayan project, which were not designed in consultation with community residents; and

  The Bank was a participant in the Vancouver Habitat Conference, which Zoto community leaders were not allowed to attend.

38. Although it has avoided being involved in discussions not related to the Project, the Bank has continued to meet with community representatives during supervision missions. Each mission holds meetings with groups ranging from barangay leaders to religious groups, to Zoto/Ugnayan and representatives of the Fishermen's Channel Association. The meetings usually take place in the Project Unit's office. Representatives of the Tondo Project Office are always asked to attend. The sole purpose of the meetings are to serve as a forum for the residents to express their feelings about Project implementation. The primary concerns most recently expressed by all community groups are that the final purchase price of the land and the terms of payment be announced. The Zoto/Ugnayan also believe that more frequent meetings should be held between themselves and the Project Office. On the latter point, the NHA considers the barangay leaders 1/ to be official representatives of the community and directs its communications through the barangay organization.

---

rangay is the smallest political unit comprising 500-2,000 families.

The issue is made more difficult because the NHA considers Zoto/Ugnayan to be anti-government and does not want to enhance their credibility in the community. While few regular meetings have been held during the past year with Zoto/Ugnayan apart from those requested by Bank staff, arrangements have now been made to schedule meetings on a bi-weekly basis for the next several months. These meetings would focus primarily on tenure, lease, and purchase price options.

Project Monitoring and Evaluation

39. As part of a larger effort of monitoring and evaluating Bank-financed urban development projects in El Salvador, Senegal and Zambia, the Bank, with co-funding from the International Development Research Centre of Canada (IDRC), is sponsoring research to assess the overall socio-economic impact of the Project on the Tondo population and to comment on the efficiency and effectiveness of the Project components. A local field research team composed of Filipino social scientists, has been established within the NHA under the leadership of a Filipino sociologist on an IDRC consultancy. Its findings are to be reported simultaneously to the Bank, IDRC and NHA management; they are also discussed in periodic conferences held with the researchers of the evaluation programs and project managers of the three other countries.

40. The evaluation unit is charged with two main tasks. First it will seek to determine the overall impact of the Project on the socio-economic characteristics of the Tondo population; i.e. demographic composition, income and expenditure patterns, employment, housing conditions, and health. It will do so by noting changes in these variables through sets of surveys applied over time in the Tondo. These changes will then be compared with developments in other areas which have conditions similar to the Tondo but which are not affected by the Project. We expect reports periodically, depending on the timing of the surveys.

41. Second, the unit will also evaluate the appropriateness of Project components to local conditions, their efficiency in delivering the services, and their effectiveness in achieving the Project goal of improved housing at minimim cost to the maximum number of low-income residents. For example, a report on the reblocking exercise is currently being finalized which will comment on its efficiency as a means of improving services in a way that is affordable by the bulk of the population (see para 43 for initial survey results). The unit will also produce interim reports on the general progress of the Project each calendar quarter.

42. The evaluation unit started its work in the Summer of 1977. Thus far, the full cooperation of NHA general management has been received in establishing the team. It is hoped that as the unit's reports are submitted Project management will perceive them as inputs into making informed policy decisions.

43. Survey Results of Community Attitude Towards Reblocking - Initial surveys of community attitude in the areas that have been reblocked have been

conducted by the evaluation unit (see para 39). These surveys reveal a fairly high level of community satisfaction, despite the fact that construction is still in progress, and there is considerable disruption being caused by the works underway in the community. The results of this survey are summarized below: 1/

(a) Satisfaction with Reblocking Process: Approximately 65% of families stated that they were very satisfied with the reblocking process and another 22% stated that they were slightly satisfied for a total of 87%. Only 6.4% were very dissatisfied and 5.4% were slightly dissatisfied.

(b) Information About the Project: About 92% stated that they were aware of the objectives of reblocking, and in response to another question, about, 75% stated that they felt that NHA had provided adequate information.

(c) Participation in Decision Making: Some 72% of families feel that they were given a chance to participate in decision-making; 14.5% believe decisions were made by NHA, and 8.0% believe that decisions were made by barangay leaders.

(d) Satisfaction with Lot Size: Some 55% have expressed high satisfaction with their lot size and another 33% have expressed slight satisfaction. Only 6% are dissatisfied with their lot size (mostly those who suffered decreases in lot size).

(e) Affordability: When families were asked about their ability to pay, some 33% indicated that they could well afford the proposed development charges (currently estimated at ₱0.95 per square meter per month). Another 55% indicated that they would manage. Only three respondents (1.6%) stated that they could not afford the proposed charges.

(f) Perception of Extent to which the Welfare of Residents has been Considered by NHA During the "Reblocking" Process: About 64.5% feel that the welfare of residents was to a great extent taken into account, and another 31.2% believe that it was to some extent taken into account. Only 3.8% believe that it was not taken into account at all.

Remaining Risks and Implementation Issues

44. Foremost among the outstanding issues is the pending revision to the previously announced policy for establishing the purchase price for land

---

1/ Percentages for responses to various questions do not total to 100% because of either non-response or no opinion expressed.

and the charge for services (see paras 23-29). This issue could continue to be picked up by some of the more politically minded community groups, who may attempt to use bargaining for lower prices as a means of increasing local support. Our discussions with a wide range of community groups, however, lead us to believe that the formula worked out by NHA will be acceptable to the residents and will be seen as fair by them.

45. Misinformation about the nature of the Project and the attitude of residents towards the Project continues to persist mostly outside the Philippines. The start of the reblocking process and the assignment of lots to residents has had a very positive impact on the attitude of the residents within the Project area. On the other hand, it must be recognised that some groups will see it in their interests to complain whatever happens. To improve information about the Project, this status report could be distributed along with the appraisal report, in response to all serious inquiries.

46. Other implementation problems exist, but are of a more normal type for a project of this size and complexity. These relate to staffing, training and management difficulties and are being discussed with the NHA in the course of Project supervision.

Urban Projects Department
December 8, 1977

STATISTICAL REVIEW OF TONDO FORESHORE/ DAGAT-DAGATAN PROJECT STATUS

(As of October 31, 1977)

Component	Status
Land Reclamation	
1. Reclamation (Tondo Channel)	Not designed
2. Survey	(1) Preliminary survey work and boring tests on Channel; (2) Work in progress in re-blocking areas
Civil Works	
1. Surface Drainage	80% completed; remaining work depends on the reclamation of Channel and infrastructures of the reblocking
2. Secondary Water Mains	70% completed, the remainder to be completed by mid-December
3. Interceptor Sewer	50% completed, the remainder to be completed by March, 1978
4. Tondo Pump Station	Out for Bids by December 15, 1977
5. Area I Infrastructures	General Design Work completed; to be reviewed and updated
6. Area II Infrastructures	Designs to be reviewed and updated
7. Area III Infrastructures	Part of this work included in Area IV, the remainder will go to a Contractor to be selected in end-December, 1977
8. Area IV Infrastructures	4 blocks in progress and designs for 4 more given to Contractor

Component	Status
9. Area V Infrastructures	Design work not commenced, selection of contractor and work to commence in January
10. Civil Engineering Plant	Bids being evaluated
11. Experimental Area Infrastructures and Core Units	60% completed, completion projected in mid December
12. Water Meters	Preparation of contract documents not yet started
Community Facilities (Tondo)	
1. Elementary Schools	Designs to be completed by late-November; construction to begin on January 1978 on A. V. Hernandez, February for General Lim, and in March for the M.L.Q. and Magat Salamat schools
2. High School	85% complete, completion date projected in mid-December, 1977
3. Tondo Health Center (new)	Completed
4. Health Center Upgrade	Designs under review, work expected to commence early February 1978
5. Barangay Recreation and Community Center	Design completed
6. Fill Materials	Materials being supplied on demand for areas subject to reblocking and flooding areas
Dagat-Dagatan	
1. Sewer Interceptor	Phase I completed
2. Stabilization Ponds	Plans & Specifications issued to Contractors: Bids due October 31, 1977
3. Phase I Development	25% completed 120 core units completed; extension possibly granted: To be completed by end of May, 1978 500 units to be ready by early December, 1977
4. Health Center (Annex to Tondo General Hospital)	Design under review

COMPARISON OF APPRAISAL ESTIMATE WITH CURRENT ESTIMATES

Project Component	Appraisal	Current 1/ As of August 1977
	(₱ million)	(₱ million)
I. Tondo Foreshore		
1. Land, Reclamation and Survey	12.87	7.80
2. Civil Works	130.62	106.80
3. Community Facilities	34.45	40.45
4. Model Community	4.25	3.96
5. Purchase of Civil Engineering Plant	3.81	3.81
6. Land Fill Materials		3.80
7. Housing Materials loans	13.54	13.48
8. Small Business loans	3.29	3.29
Sub-Total	202.82	183.49
II. Dagat-Dagatan		
1. Land, Reclamation and Survey	16.79	16.79
2. Civil Works (2000 core units)	16.72	23.50
3. Stabilization Pond	1.82	8.0 2/
4. Community Facilities	8.12	2.18
5. Housing Material loans	14.27	14.27
Sub-Total	57.78	64.74

1/ Not all costs are chargeable to beneficiaries. See appraisal report for full discussion of method of computation of lease rate.
2/ A larger pond capable of serving a larger population will be built.

I. Status of Reblocking

As of October 1977

There are a total of 97 blocks in the Tondo Foreshore area, of which 18 are in the Priority Area. These 18 plus 9 others from outside the priority area, a total of 27, are in the process of being reblocked. The following chart shows the stages of their reblocking:

18 Priority Areas + 9 Other Blocks	Completed	In Process
1. Collection of Socio-Economic data	27	0
2. Preparation of Initial Design	26	1
3. Community Deliberation and Approval	26	1
4. "Monumenting" i.e. staking of lot boundaries	11	15
5. Movement	5	22
6. Awarding of Lease Purchase Contracts	-	5

PROCEDURAL STEPS FOR REBLOCKING

1. Based on the experience gained in the 1st block, a reblocking procedure composed of 13 basic steps was developed by the Tondo Project Office. The sequential steps are as follows:

Step I. Block Identification - The Block is identified from the structural map of the area and block boundaries are established by the architect and surveyor. Each reblocking team works with one block composed of 90-150 families.

Step II. Information Campaign - CRIO conducts an information campaign through distribution of the "Pahayag", a newsletter published by the TFDDP and mass meetings. The information campaign is intended to inform the community of the objectives, nature, scope and implications of reblocking, the requirements of prospective lot awardees and to elicit community participation and involvement.

Step III. Ocular Structural Survey - The structure map is updated to ensure that all pertinent data about the block is included. The team verifies/identifies the following:

(a) structures reflected in the map but not in the block;
(b) structures not reflected in the map;
(c) tag numbers reflected in the map against actual as claimed by occupants of the structure;
(d) present lot size occupied by structure;
(e) present structural quality;
(f) exact positions of structure;
(g) titled lots;
(h) block area; and
(i) block boundaries.

Step IV. Census Verification and Interview - A survey of the block is undertaken by the Research group to:

(a) verify untagged structures and census status of residents of the block;
(b) determine affordability levels of households;
(c) determine recommended lot size;
(d) determine total number of people occupying the structure; and
(e) determine place of origin of structure owners.

Step V. Verification of Eligibility - Letters of Inquiry are sent by the Legal Division of the Project Office to the Register of Deeds of various provinces and cities requesting information on urban land ownershi of household heads and spouses. Ownership of other urban land disqualifies a prospective lot awardee.

Step VI. Planning of Alternative Designs - The architect prepares the preliminary alternative plans to be presented to the community, utilizing the data on present occupied lot size affordable lot size, recommended lot size and other pertinent information gathered from the interviews and surveys. Three alternative plans are designed: Plan A which allows for a minimum dislocation; Plan B which allows for 25% - 50% dislocation and Plan C which provides for regular shaped lots with a uniform lot size of about 48 sq. meters. The alternative designs are prepared to provide the community some planning alternatives for their consideration. The community may opt for any of the three alternative designs, propose modifications, or develop an entirely different plan.

Step VII. Approval of Preliminary Alternative Designs by Project Manager - The Project Manager signs the alternative plans to be presented. The approval of the plan by the Project Manager signifies the approval by NHA of the plan as well as the intention and capacity of NHA to implement the plan.

Step VIII. Community Discussion of Block Plans -

(a) Plans are presented to the community.
(b) People discuss among themselves and with the team the alternatives.
(c) People will vote on the alternatives to be chosen.
(d) People will propose modifications on the alternative chosen.
(e) The architect will consider modifications and make changes accordingly.
(f) Project Manager approves revised plan.
(g) Revised plan is again discussed with the community.

Step IX. Final Subdivision Plan - Surveys computes for exact lot areas, prepares technical description of lot and prepares final subdivision plan. Final subdivision plan is approved.

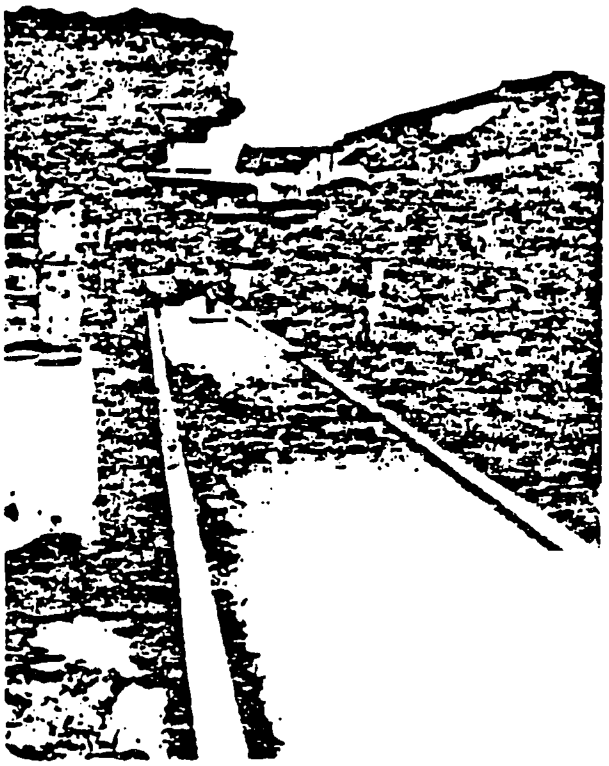
Step X. Movement Into Assigned Lots - Team assists structure owner in moving structures.

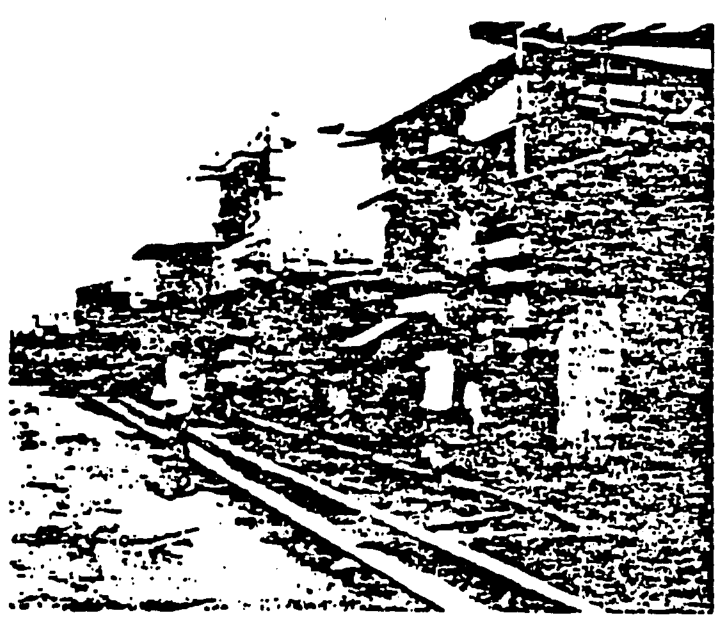
Step XI. Preparation of Certificate of Awards

(a) Estate Management checks if subdivision plan is same as approved by the community.
(b) List of proposed lot awardees is prepared.
(c) List of proposed lot awardees is endorsed by Project Manager and approved by General Manager and Bureau of Lands Director of Subdivision Plans.
(d) Certificates of Awards are prepared.

Step XII. Awarding of Lots

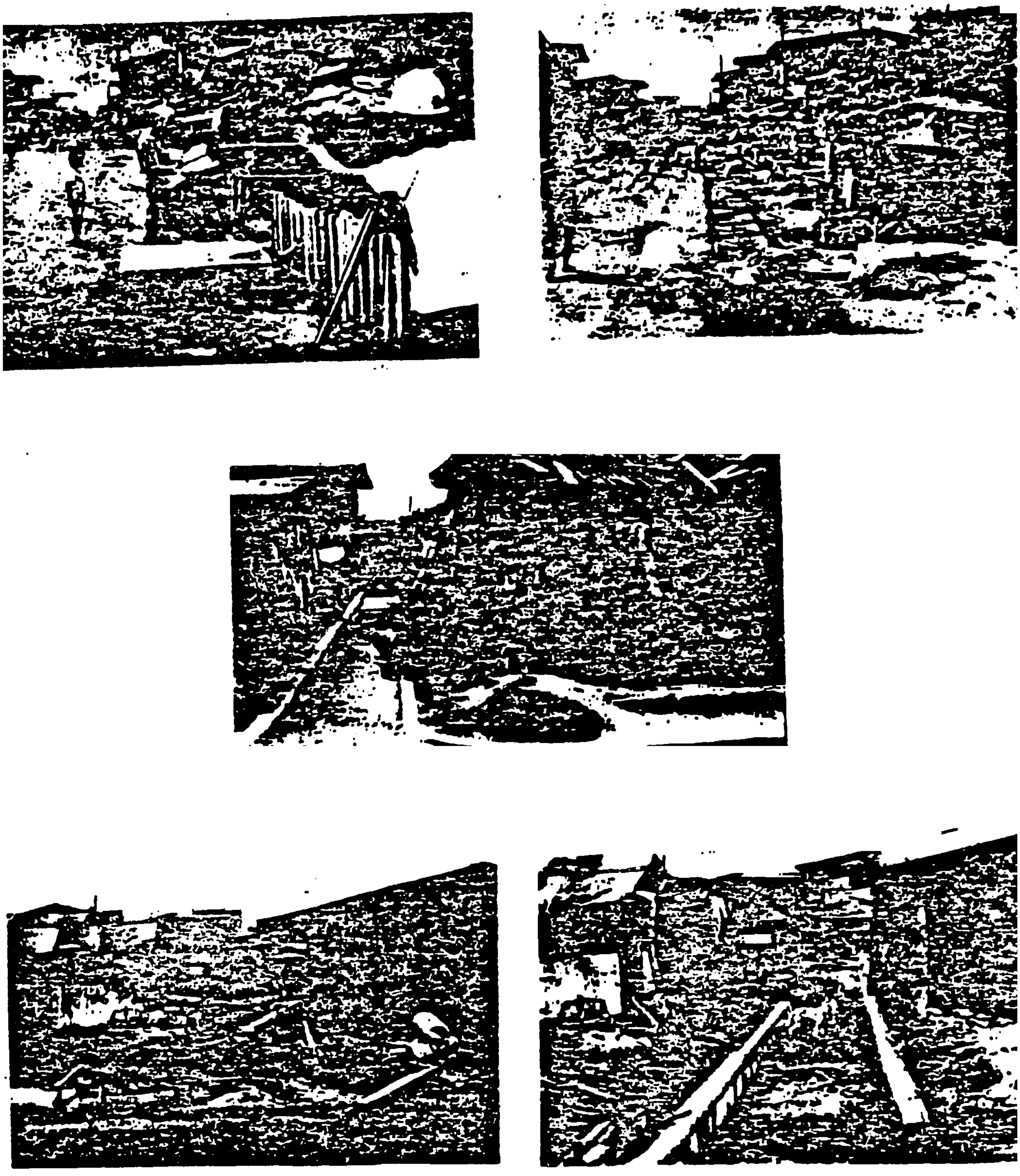
Movement of house to new site within the block as part of "reblocking" process



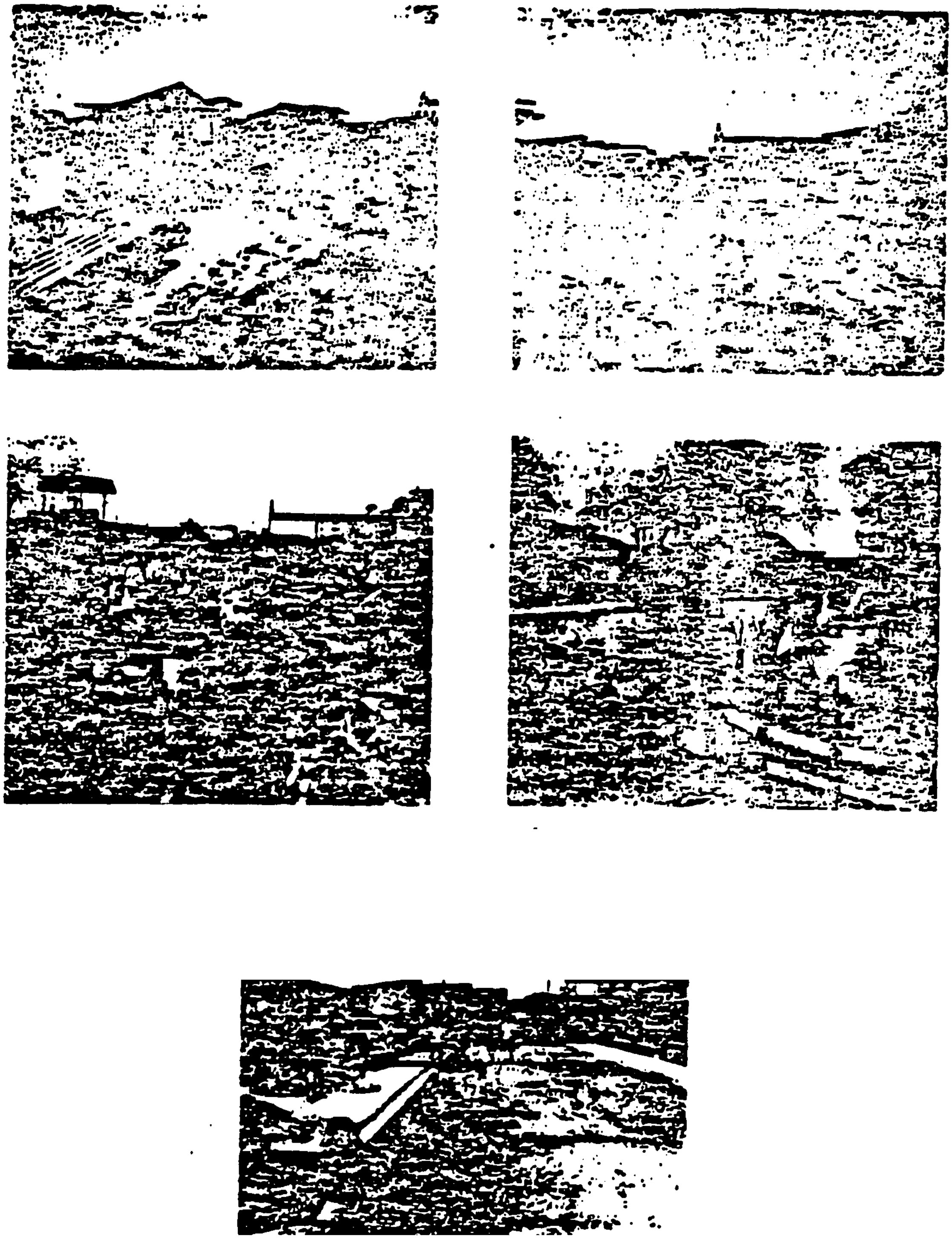


Street and Footpath Construction

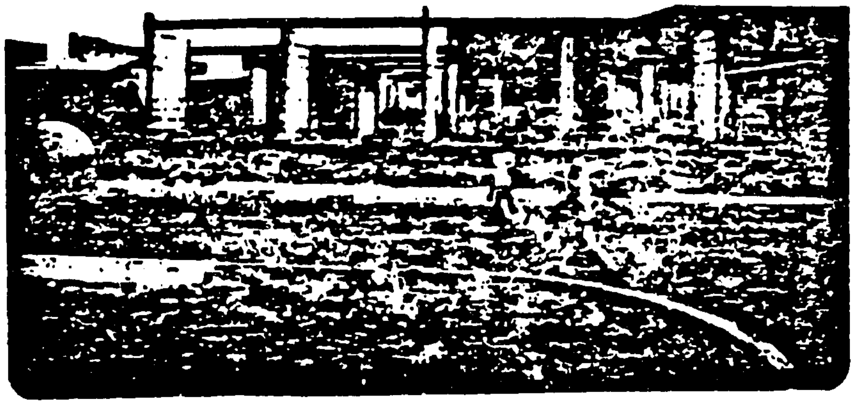
Bottom photograph shows substantial upgrading of buildings already underway



Installation of streets and footpaths in three locations within Tondo



Installation of drainage and paving of street



Sites and Services Units (Fire Wall and Sanitary Core) in vacant land of former Public Works Compound in Tondo

Substantial House Under Construction

AN OUTLINE OF THE NALEDI SQUATTER UPGRADING PROJECT / GABORONE, BOTSWANA

A paper pr[illegible]
Viable Communities' which is being sponsored by the National Building Research Institute of South Africa in Pretoria from November 14-16, 1978.

Author: John C. van Nostrand
CIDA Project Manager,
Ministry of Local Government and Lands,
Government of Botswana.

CONTENTS

INTRODUCTION

This paper provides an outline of the history, planning and implementation of the Naledi Squatter Upgrading Project which is currently under construction in Gaborone, Botswana.

In many ways Naledi is typical of most of the squatter or 'illegal' settlements one finds on the edges of large third-world cities. Although smaller than usual, having a total population of only 10,000 persons, it too has been densely settled and is devoid of most urban services. Again, typically, it came into being as the result of the rapid urbanization of a previously rural-based economy. As such Naledi lies at the heart of certain fundamental issues facing Botswana in the years to come. These include the future relationship of agricultural an trial development, the role of traditional patterns of settleme uture urban planning, and, above all, the respective roles o overnment and the individual in the provision of housing.

Botswana is one of the few places in Southern Africa where the government is actively engaged in a process of upgrading existing squatter settlements. In addition to Naledi, similar programmes are currently underway in Francistown, Lobatse and Selebi-Phikwe. All of these programmes are based of the fundamental principle of self-help, that is, the ability of groups and individuals to directly engage in the provision of their own housing. This being the case, the primary objective of the Naledi Project is to provide a framework of urban services which will not only permit, but also encourage, a continuation of individual and group initiatives, the ultimate focus being self-constructed housing.For, as the Government of Botswana has recognized, it must be remembered that over the past fifteen years the inhabitants of Naledi themselves have demonstrated their ability to provide affordable housing for almost 10,000 people without any official aid whatsoever.The true significance of the potential benefits of the upgrading approach are demonstrated by the fact that the estimated total number of squatter plots to be upgraded throughout Botswana by 1981 will constitute about 28 % of the estimated total national housing demand for this period.

HISTORICAL BACKGROUND

The original twenty-year plan for Gaborone, the new administrative capital of the Bechuanaland Protectorate replacing Mafeking, was drawn up in 1963. In 1966 Gaborone became the capital of the new country of Botswana. The construction of the new capital began also in 1963 based on designs prepared in Britain. With the commencement of construction there was a great demand for labour and Gaborone soon became as attractive a source of income for the rural Batswana as the South African mines. As construction workers began to enter Gaborone temporary labour "camps" were established. One of these was located on the site of present-day Naledi, lying between the Rhodesian Rail line and the Lobatse highway, southof the main part of town. This camp was located on land which, accordingto the new official plan, was zoned for industrial development.

While the camp grew slowly for the next three years, following Independence, in 1966, rural migration to Gaborone increased tremendously. In fact, Gaborone's growth rate up to 1971 was 24 %, one of the highest in the world. While, on the one hand, the need for construction workers continued to grow, on the other, the relocation of the old colonial bureaucracy from Mafeking had the effect of creating a whole new range of lower-income jobs for office-workers, cleaning staff, housemaids, etc. Many of these people also moved to Naledi. By 1971 there were 17,718 people living in Gaborone and almost one third of these lived in Naledi. However, no new low-cost plots were being developed during this period in Gaborone, and, consequently, in 1971 the Ministry of Local Government and Lands in conjunction with the Town Council introduced the first site-and-service area to Gaborone. Council partially expected that this new area, known as Extension 14, would attract many of the residents of Naledi to move from their temporary structures into "town". However the growth rate of the town still stood at 16 % and site-and-service plots were shortly taken up by new immigrants.

The first direct attempt to address the so-called problem of Naledi came in 1973 with the announcement of a large-scale resettlement scheme. According to this plan, the Botswana Housing Corporation, the para-statal national housing authority, was charged with the design and construction of a new low-income housing development lying across the road from Naledi. This area, called 'New Naledi', was to be specifically set aside for families from the existing squatter area. Once they had all moved it was further proposed that 'Old Naledi' would be bulldozed. Once again, however, little account was taken of the actual number of people living in the squatter settlement which was by then almost 8,000 persons. As there was little possibility of accommodating all these people and given that few could afford to pay even the subsidized rents this scheme also failed. Moreover BHC already had an expanding list of applications for houses from newcomers to Gaborone.

However, the failure of the New Naledi scheme did expose once and for all the true magnitude of the housing problem in Gaborone. It was clear that the national and local governments could no longer choose to ignore the presence of Old Naledi in hopes that it would somehow disappear. By that time it was also clear that the 8,000 inhabitants had created,on their own initiative, a substantial settlement which was no longer temporary in nature. Indeed, the area was now referred to by its inhabitants as the "village" and the strength of their committment, let alone their sheer number, were something to be reckoned with.

Thus, in early 1975, the President announced that the industrial designation was to be withdrawn from the Old Naledi site. No longer was it to be an illegal settlement, but rather a bona-fide residential extension of Gaborone. In technical terms this decision meant that the site automatically reverted to state land, to remain as such until a plan incorporating an upgrading scheme had been deposited with the Director of Surveys and Lands who in turn would attend to the issuance of legal certificates securing residential tenure for the residents.

EXISTING CONDITIONS

Following the Presidential decision, attention was turned, for the first time, to Naledi itself. For, in order to commence with the upgrading it was essential, first of all, to determine what was to be upgraded- what were the existing characteristics and structures which were capable of supporting the settlement in the future.

Naledi covers an area of about 116 hectares lying between the Rhodesian Rail line in the west and the Lobatse highway in the east. Its northern boudary almost touches the southern end of Gaborone's largest industrial estate where many of the residents are employed. From here it stretches almost two kilometres to the Kgale Quarry Road in the south. These boundaries are very well defined and between them live about 10,000 persons occupying about 2,000 plots. Thus the current density is about 17 plots per hectare with an average of 5 persons living on each plot.

First settlement took place at the northern end which currently has a density of about 40 plots per hectare. However, as Naledi has grown southward densities have decreased to a current level of about 12 plots per hectare at the extreme southern end. This pattern can, perhaps, be explained by the fact that as the number of residents grew so also did their sense that they were here to stay. Consequently, newer residents have claimed larger plots, similar in size to those located in traditional villages. This observation is strengthened by the fact that these people have also built their houses of more durable materials.

Throughout the area groups of plots are separated by an extensive network of lanes and paths. Individual plots are well defined by hedges, trees and fences. The quality and design of individual structures vary tremendously. While the majority of houses are built of temporary materials there are some substantial homes, particularly in the south. In addition, while there are some traditional houses, built of mud bricks with thatched rooves, there are also an increasing number of of contemporary rectangular structures built of concrete block with corrugated iron rooves. Most of the temporary structures hover somewhere between these two types.

In comparison with the older villages of Botswana it is clear that Tswana traditions have greatly influenced the settlement pattern and house form of Naledi, such as they exist today. Given that these were determined by the inhabitants themselves and that the majority of these people have come to Naledi from outlying traditional villages, this is not surprising. To a large degree, Naledi must be viewed as an extension of traditional Tswana culture.

Unlike the majority of the indigenous peoples of Southern Africa, the Tswana are predominantly urban- orientated. Traditionally, each tribe settled in and around a central tribal capital where the royal family lived. While historically these capitals were often relocated on account of wars, famine or drought, at no time was this urban pattern of settlement ever abandoned and it has remained relatively fixed since the turn of the century.

In the founding of a new capital village the royal head first selected a site for his own quarters and one for the tribal council-place (kgotla). He would then assign other residential areas to the principal families of the tribe. These areas were known as 'wards' and were often occupied by up to 500 persons. The wards were separated from each other by lanes and roads of varying width. Each family head was allocated a household plot which, although they were densely organized, were usually large enough in themselves to accommodate successive generations. Each family was also allocated a number of fields lying beyond the village for the production of subsistence crops. Finally, each household was allocated a cattlepost at some further distance from the village, usually close to a reliable source of water. Livestock constituted the principal family assets.

The village-lands-cattlepost relationship established a framework for the daily, monthly and yearly cycles of activity of both the tribe and the individual. For example, villages were virtually abandoned for the period of November to June when families left to plough and seed their lands.

While on the one hand, the settlement pattern of Naledi is closely linked with that of the traditional villages, on the other its role as part of future urban Botswana cannot be denied.

Naledi's most obvious similarity with the past lies in the overall organization of plots However, while individual structures are often arranged within each plot in a traditional fashion, that is, addressing an open courtyard or 'lapa', contemporary building materials have been absorbed into traditional building methods. Load-bearing walls are constructed today of concrete block instead of mud brick and corrugated iron is attached to a framework of rafters and purlins in place of grass thatch.

What links Naledi most clearly with future development in Botswana, aside from its overall location, is the unusual perception of it by its inhabitants. For the majority of the residents of Naledi continue to view their residence here as a second or third home, not unlike those located on the lands or at the cattlepost. The single most important attraction of Gaborone is industrial or commercial employment, and the subsequent incomes resulting from these. Their primary Home is still perceived to lie within the village of their birth and they often return here for week-ends or to the lands or cattleposts for longer periods of time depending on the season. Large portions of their incomes are being returned to their original holdings to build new houses, refurbish old ones, improve their fields or enlarge their herds. In other words, the traditional village-lands-cattlepost cycle has simply been extended to include Naledi, which serves as a base for employment in Gaborone.

The situation outlined above has a number of important consequences.

First, it establishes a strong relationship between the agricultural and industrial/ commercial sectors of the country as a whole, a major objective of the government since Independence. Moreover, in terms of the latter alone, Naledi is an important source of labour and self-generated production. In 1974, only about 18 % of the male population and 48 % of the female were unemployed. Of those employed about 70 % worked in Gaborone, 5 % were employed directly in agriculture and 25 % were self-employed. Many of the latter often work on their plots selling food, homemade beer, Chibuku (the national beer) or various other groceries. Others were also home-employed in the production of bricks, pottery, furniture, tinwares, clothes, etc.

Second, the village-lands-cattlepost-Naledi cycle, and variations of it, partially account for the temporary nature of many of the homes in Naledi. To be sure, other factors also come into play. For, in spite of the fact that Naledi may serve as a second place of residence, most people would like to build a sound house here of permanent materials. Furthermore, many people already have an idea of the kind of house they would like to build. However, with the absence of tenure many have felt they could be forced to move at a moment's notice and they have, therefore, been reluctant to invest a lot of money. It is anticipated that once they are given long-term tenure house construction will flourish.

Third, and this is largely accounted for by the fact that people from all tribal backgrounds have come to Naledi, the community is still in the formative stages of political organization. There is no single headman. nor is there a single kgotla. At the moment, Naledi is represented by a single resident Town Councillor and an officially-appointed Village Development Committee. Certain other unofficial 'headmen' are sought out in instances of family or plot disputes and there are four or five witch doctors.

All these consequences suggest that, currently, Naledi occupies a critical, although somewhat precarious position in the lives of not only its inhabitants but also the future of Botswana as a whole. Moreover, it is the people themselves who have brought Naledi to this position. In initiating the upgrading scheme the government hopes to establish a framework capable of re-inforcing and encouraging the continuation of this search for a more stable future.

THE PLAN

All urban development in Botsw na proceeds within ter of a National Development Policy which is revised every five years. The policy statement most affecting the Naledi Project, as drawn from the NDP for 1973-78, reads as follows:

> "The cost of urban developments must not be subsidized by Government. The reasons for this are first, that development priority within the plan period is to upgrade the standard of life in the rural araes, and revenue surpluses should be used for this purpose. To achieve (this) policy .... land will be sold at prices which cover the cost of development of the land. In order to reduce the costs of development of land to the poorer urban inhabitants, fully-serviced land will be sold at a price somewhat higher than cost, and the difference applied as a 'cross-subsidy' to reduce the charges of semi-serviced land."

With approval being granted to proceed with the upgrading of Naledi the aspired-to level of improvement was that of a typical site-and-service area, such as was being built in other parts of Gaborone at that time.

Occupants of a site-and-service area do not purchase plots, but are given a Certificate of Rights guaranteeing their right to occupy the plot for 99 years and permitting them to bequeath it to other family members, provided certain conditions are met. These conditions include the construction of a sound house and regular payment of charges levied by the Town Council to partially defray the cost of road maintenance, water supply, streetlighting, refuse pick-up, etc. Building Material Loans are made available at low interest rates to be re-payed over a period of fifteen years.

While the ostensible odjective is to upgrade Naledi to this level it is also realized that these standards are neither wholly applicable nor wholly implementable. Above all, there is a danger of imposing standards which are to high in the event of which people are likely to begin to squat elsewhere.

Nevertheless, the first plan for the upgrading of Naledi which was prepared by the Department of T wn and Regional Planning in 1976 did contain two major components- f rst, a physical framework of urban services and, second, a programme for the provision of Certificates of Rights and subsequent Building Material Loans.

The Physical Plan

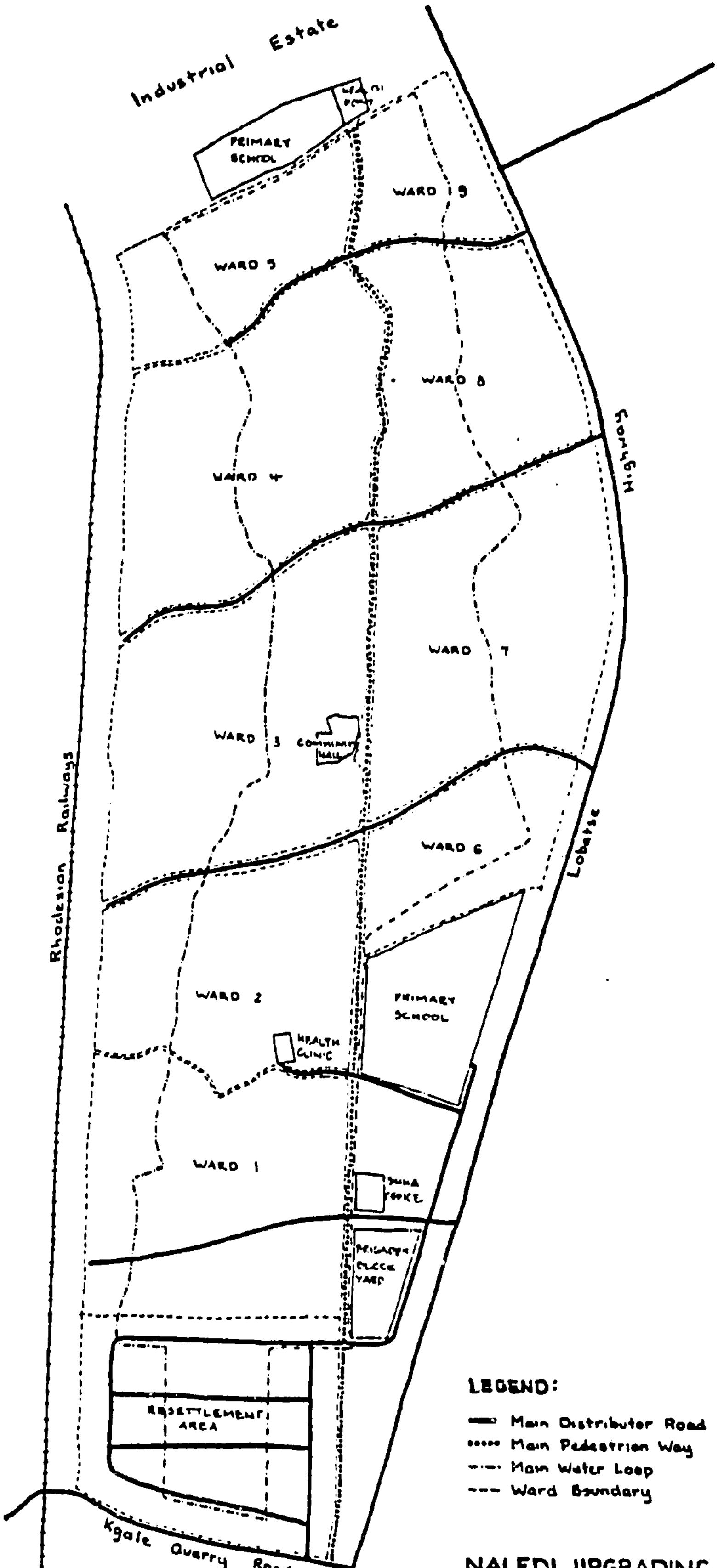
The proposed physical plan (see attached diagrams) calls for two stages of development with Stage I serving as a completed entity capable of supplying a minimal level of service to all residents. Stage I includes the construction of four new Main Distributor Roads (15 m. width) with corresponding open drainage channels, a main water supply loop serving 25 standpipes distributed throughout the area, the installation of a power and streetlighting system along the central Main Pedestrian Way and the erection of two primary schools, two health clinics and a community hall.

Stage II comprises the construction of a supplementary network of secondary and tertiary roads (6-10 m. width) and storm drainage channels, the installation of an additional 75 standpipes (bringing the level of service to 1 standpipe per 20 families), the installation of toilets on each plot, the development of market and small-scale industrial plots and, finally, the issuance of Certificates of Rights and Building Material Loans.

In an attempt to re-inforce the existing pattern of settlement, without causing an inordinate number of dislocations, the road and water networks have generally been aligned with existing paths and lanes. The four Main Distributor Roads run east-west across the site giving access to the Lobatse highway. These are in turn linked by a north-south secondary loop road which serves as a collector of the numerous tertiary roads which give access to clusters of plots. The main water main follows the secondary loop road and secondary water lines lead to standpipes located off the tertiary roads. Not all the existing paths are being upgraded, and those which are not will continue to serve as bycycle and pedestrian ways linked to the Main Pedestrian Way. This central path leads to most of the public facilities such as the schools, health clinics and markets.

As it was anticipated that it would be neccessary to move some houses either to make way for new roads or to reduce overcrowding in

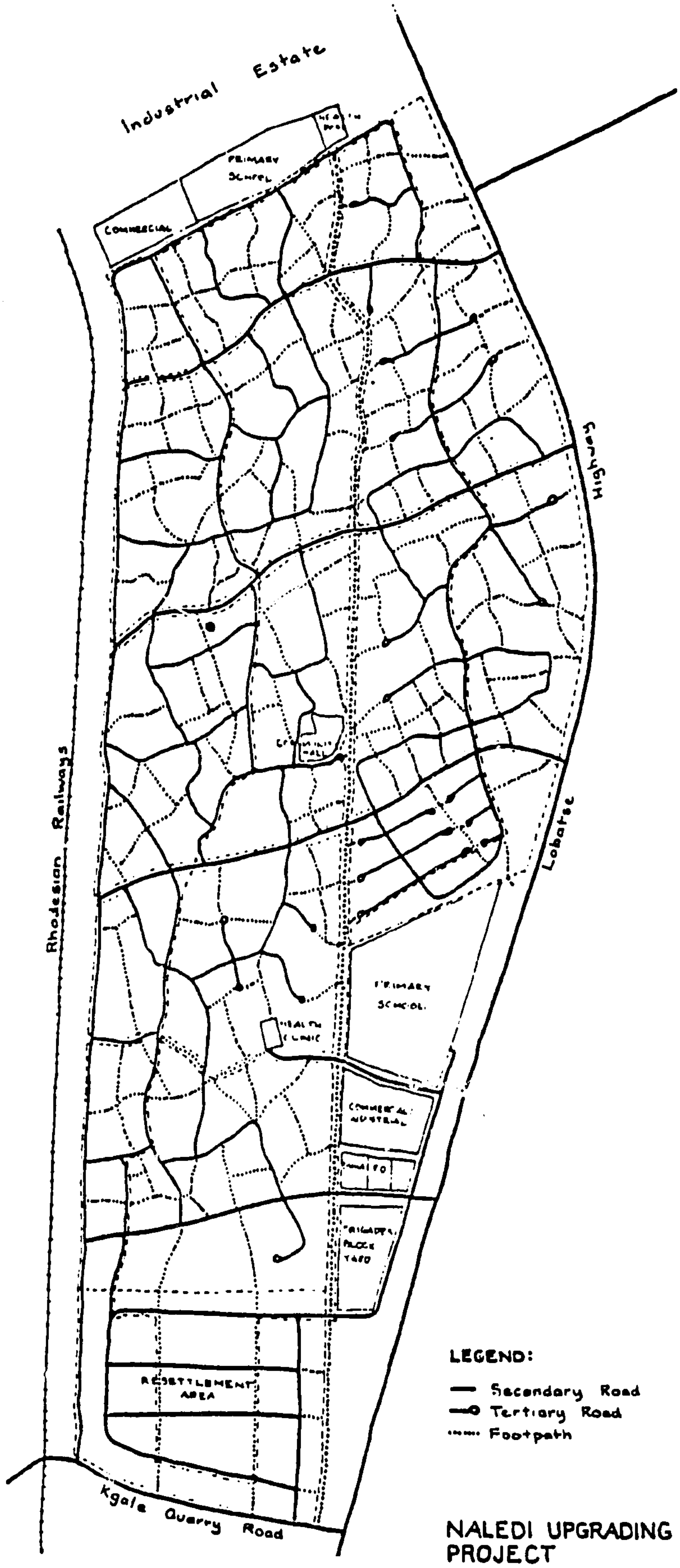
9a



NALEDI UPGRADING PROJECT

STAGE I

9b



NALEDI UPGRADING PROJECT

STAGE II

certain areas, a Resettlement Area containing 150 serviced plots has been established at the southern end of the site. Plot-holders who loose all or part of their plots during construction receive monetary compensation based on the estimated costs of labour and materials for the structures involved. It is estimated that between 250-300 families will have to be relocated over the life of the project and the additional 100-150 will be allocated new site-and-service plots elsewhere in Gaborone.

The new main roads and the Main Pedestrian Way divide Naledi into nine well-defined 'wards'. Each ward has chosen a name for itself and a public meeting place. Moreover, the residents of each ward participate in a series of "walks" which serves to establish the exact location of the roads and standpipes.

Most of the public buildings are located on existing open areas of land lying either within or directly adjacent to the settlement. Exceptions are the central Health Clinic which is located on the site of an existing smaller clinic which was started by one of the local churches, and the Community Hall which is located directly adjacent to an existing central market place , along the Main Pedestrian Way. Development of the commercial and industrial plots is still under discussion with the residents and has not been finalized. In principle, however, it is likely that the two larger, centrally-located, sites will be supplemented by smaller stands located at major intersections throughout the community.

Toilet construction has also not been finalized and is subject to the outcome of detiled soils investigations currently in progress. It is likely that the Reed's Odourless Earth Closet will be used wherever possible and ROEC units have already been installed throughout the Resettlement Area.

Land Tenure And Building Material Loans

On completion of each of four phases of secondary and tertiary road construction, low-level aerial photographs will be flown. Plans showing all plots eligible to receive a Certificate of Right will then be plotted on 1:1000 enlargements of these, thus eliminating the need for lengthy on-the-ground surveys. In most cases existing plot boundaries will be followed as these are well-defined and, obviously, are acceptable to most residents. However, in crowded areas, smaller plots will be consolidated into larger holdings based on a minimum plot size of 325 square metres. Interviews have been held with all persons claiming ownership of the whole or part of an existing plot. All disputes which arise will be placed before an Adjudication Tribunal prior to the issuance of Certificates of Rights. While more than one related family may be permitted to occupy a single household-area, only one head of the household may receive a Certificate of Rights.

On receipt of a Certificate the plot-holder commences with the payment of a monthly service levy. The levy rate which has been set for Naledi is P 2.50 until the completion of construction at which time it will be equalized with that for other site-and-service areas in Gaborone. At the same time, the plot-holder automatically becomes eligible to receive a Building Material Loan of up to P 600.00 which is to be payed back over a fifteen year period.

The cornerstone of the Building Material Loan scheme is a face-to-face interview conducted with each applicant. The focus of these interviews is a modelling device which was developed (1) in the belief that most plot-holders have a pre-determined idea of the kind of house they would life to build, now that they have tenure. The objective of the model is to provide a medium for the expression of these ideas. As such, it consists of a base, scaled to the size of an individual plot, which is composed of a grid of grooves at a scale of 0.5 metres. Vertical metal sheets can be slotted into these grooves to act as 'walls'. Scale furniture is also provided and magnetic doors and windows can be attached to the walls. At the same time, discussions are held with each applicant to determine the amount of loan he or she is eligible to receive. This amount is then added to any savings the applicant might have. With the help of various measuring devices, a technical assistant can calculate the approximate cost of the proposed design and the amount of materials required.

Costs are based on the construction of the house being carried out by either the owner himself or a contractor hired by the owner. Both are considered equally as valid although, in the case of the latter, the owner must pay the contractor from his own pocket. The technical assistant also checks to ensure that certain basic standards are met regarding setbacks from plot boundaries, distance from toilet, ventilation and fenestration. The model is then modified or the building staged according to the amount of money the plot-holder will have access to. Once the final version has been modelled a simple plan is drawn up and registered with the loan application.

On approval by the Town Council, the loan is payed out in installments of actual building materials which are issued from a warehouse in Naledi. No cash exchanges hands. Plot-holders may wish to purchase certain materials elsewhere but, again, these must be payed out of their own pockets. The same technical assistant that participated in the initial interview will liase with the owner-builder throughout the construction period, offering advice when requested and generally ensuring that the house is being built in accordance with the agreed-upon plan.

In summary, the proposed Building Material Loan Scheme is based on the fundamental belief that plot-holders are not only capable of designing affordable reconstructions of, or additions to, their present homes, but also that they are the ones best equipped to carry out the actual construction, either on their own or through sub-contracts. Hence, the primary object of the scheme is to provide plot-holders with improved access to the 'tools' and money they may need to continue what is essentially their own upgrading.

IMPLEMENTATION

The Naledi Upgrading Project is being implemented by the Ministry of Local Government and Lands and the Gaborone Town Council through its Self Help Housing Agency. This agency has constructed an administrative office and materials warehouse in Naledi and they are primarily responsible for the administration of the Certificates of Rights and Building Material Loans and the collection of service levies. The SHHA office also employs community development workers who assist residents with day-to-day problems and assistant works foremen who are responsible for providing technical aid to home builders.

Construction began on the project in January, 1978 and is currently nearing the completion of Stage I. Stage II is due for completion in mid-1980. Total costs for the project are estimated to be about P 2.0 million and the majority of the capital costs are covered by a grant received from the Canadian International Development Agency.

Throughout the design and implementation process regular meetings have been held with Naledi residents. As a result, each of the nine wards has elected 2-3 people to represent it on an overall Ward Development Committee which meets once a month. Furthermore, work crews comprising 6-8 residents from each ward are being selected and hired on a part-time basis to assist with the construction of local roads and the maintenance of public areas in their ward. This has the effect of returning certain monies to the community and alleviating many of the day-to-day problems which outside crews would be likely to run into. Above all, the local residents take more pride in construction.

Finally, a monthly newsletter is printed and circulated to all residents.

CONCLUSION

Faced with problems of rapid urbanization and a corresponding shortage of low-income housing, the Government of Botswana, through its initiation of the Naledi Upgrading Project, has recognized the potential for existing squatter settlements, when provided with an adequate framework of services, to serve as viable communities. While much has still to be learned, the government has also realized the fundamental importance of involving the community in reaching solutions to its own problems. For Naledi, by its very existence, demonstrates the inherent capabilities of individuals and groups to come to grips with problems which have otherwise frustrated entire governments. Given long-term tenure and access to new building tools, it is anticipated that the quest for dignity and self-respect on the part of the inhabitants of Naledi will unveil some entirely new solutions to the accommodation of rural migrants in urban Botswana.

FOOTNOTES

(1) This modelling device was invented by Mr. Graeme Hardie, an architect and anthropologist currently in Botswana on a Fullbright Scholarship (U. S. A.)to study the settlement patterns and house form of the Tswana. Mr. Hardie is also affiliated with the Department of Town and Regional Planning.

SHELTER TRAINING WORKSHOP

November 5-30, 1979

AID SHELTER INSTITUTE

Program Package on

ECONOMIC AND SOCIAL COMPONENTS OF THE SHELTER PROJECT

Wednesday, November 21, 1979, 2-4 p.m.

Code 43.P

Presented by Jack Hjelt

AID Office of Housing

Contents

OUTLINE

Economic and Social Components of the Shelter Project

2 p.m. - 4 p.m , Wednesday, November 21, 1979

Speaker: Mr. Jack Hjelt
AID Housing Officer

"What is Meant by Economic and Social Components of a Shelter Project?"
More than merely a place to eat, sleep and be protected from the rain, the dwelling unit is a base of activity for the family's economic and social life. It is a financial investment and sometimes a source of cash income (from rentals) as well. In developing these shelter projects, we often take too limited a perspective if we see them simply as providing a physical setting for shelter. What we are really initiating is a process of community-building.

The range of basic needs considered in planning these communities must be broad enough to encompass immediate and future provisions for earning a livelihood. Although shelter programs do address concerns of basic social welfare, they are, after all, not welfare programs. The ultimate objective is development--people moving toward self-sufficiency and capability to generate their own improvement.

Provision of child-care facilities may enable secondary wage earners to contribute to household incomes. Labor training can widen the range of available job opportunities. Small enterprise credit can be a stepping-stone to establishment of trades, services, businesses and independent commercial activity. These and other activities could enhance the economic and social condition of the residents by helping people to develop themselves.

This may mean providing space within the project where these services and enterprises may function. It may mean, perhaps. going farther to organize the building of facilities.

Coordinating the budgets and programs of the agencies which offer social services may be another step in the process. It may be preferable or necessary in some cases to assist in creating new community-based institutions.

Technical or management assistance to formal and informal small-scale enterprises may be incorporated in a project along with credit to the entrepreneur to help him get started--possibly in the production of building components for the project itself or in providing a service such as solid waste disposal.

Job training provided in the context of the shelter project could be the basis of later employment, and prospects for the trainee enhanced through a locally-based job placement service.

Family education in nutrition, child care, budgeting and financial management could likewise contribute to the welfare of family members and the soundness of their financial position.

Organizing public transportation between the project site and employment centers might also be an important contribution for the residents.

Over and above these sorts of measures that could be undertaken actively to stimulate income-earning opportunities, it is important in shelter projects to refrain from placing obstacles in the way of enterprise that the community itself generates. Over-regulation, for example, should be avoided. Zoning which prevents use of the residential plot for small-scale fabrication of furniture or the raising and sale of poultry or vegetables, would close an important channel through which families could supplement their incomes. Lot sizes, that by their small size, preclude the construction of extra rooms to let to non-family members also eliminate an important source of extra money for some families. Inadequate or absent market facilities and excessive licensing fees would also suppress local business initiatives.

Of course, there are the standard components of social services to be adequately provided; schools, health clinics, recreation fields, religious and community gathering places. These may not require that special, new "delivery systems" be established, but they could require organizational effort toward a self-help or mutual-help building construction. They all require space.

Finally, the much stressed point: The shelter project itself--by maximizing the use of self-help labor and labor intensive technology--absorbs unemployment. In exchange, the workers and their families gain a much needed service (shelter) and savings or capital value in the form of their improved plots. They gain the security of a tangible asset--a visible one, capable of being embellished and improved and the stimulus to ambition that can come from such a symbol of status and progress.

Why the Economic and Social Components are Important to the Shelter Program

When a number of development activities are conducted in the growing community at the same time they tend to reinforce each other. It is important that the residents' interests be engaged and that their aspirations receive support in several ways.

Improved income-earning capacity enhances self-esteem of the resident families, and also their ability to meet financial commitments.

Over time, the continued upgarding of public services in the community will likely depend on the ability of residents to pay for them through property taxes (rates) or service charges. Employment and income--whether through the formal wage sector or informal entrepreneurship--will, therefore, be crucial.

The speaker (Mr. Hjelt) will draw from his own experience and background knowledge of the participants, focussing on such points of reference as:

--assessing the problems and opportunities--surveys and interviews. (use of present inhabitants as potential beneficiaries)

--reviewing and evaluating existing institutional arrangements for assisting small-scale enterprise and for vocational training. (includes project management structures)

--identifying existing sources of initiative, evidence of entrepreneurial talent.

-the staging of efforts to generate economic activity and repercussions for management

-development of specific projects, case examples covering how the target population was identified, how the implementing agency was selected or created, how the sources of financing were found, how the projects were implemented, how well they succeeded.

-resources for assistance in job stimulation programs (e.g. ILO, Unicef, local government, etc.)

-training for the shelter sector specifically.

Selected Readings

The Urban Edge, Vol. 1, No. 3, December, 1977
(Earning an Urban Living)

The Urban Edge, Vol. 2, No. 2, February, 1978
(Urban Transit)

The Urban Edge, Vol. 2, No. 1, January 1978
(Health Problems of the Urban Poor)

Final Report on Low-Cost Cooperative Housing Project in Lesotho, UN Project LES/74/C31, June, 1979

THE Urban Edge
FACTS & IDEAS

Volume 1 Number 3 December 1977
Published by the Council for International Urban Liaison, Washington, D.C.

Earning An Urban Living

Long lines of job-seekers for a few positions are a common sight in the developing world. The scarcity of jobs has not discouraged the flood of urban migrants, however, causing many cities to grow at more than twice the rate of the general population. Recognizing that the success of squatter upgrading and site/service schemes—previously discussed in The Urban Edge—depends upon substantially reducing urban poverty, governments are trying various approaches to increasing urban employment and income. The current issue will consider some of these approaches, with the understanding that most are relatively recent and await full evaluation of their effectiveness. Wider applications must take into account the degree to which local conditions are comparable.

Lusaka Self-Employment: Father and son make charcoal burners in upgraded squatter settlement.

Small-Scale Enterprises

Small-scale enterprises (SSEs) tend to have fixed assets below $100,000 and employment below 50. They include one-man shops, family businesses, cottage and handicraft industries, etc. In many developing countries, SSEs account for at least 90% of total manufacturing and service sector establishments and about half of total employment.

Authorities in the past have tended to ignore or discriminate against SSEs. Large-scale industries are preferred because of their prestige, access to credit, higher wage-payments, stability, political influence, and revenue-earning capacity. As a rule, monetary and fiscal policies, elitist preferences, protective tariffs, the salesmanship of foreign businessmen and local legislation—all have encouraged large-scale projects requiring heavy capital expenditures and a skilled labor force.

Of late, however, there is a growing recognition in developing countries that SSEs are desirable. On a comparative basis, their output and their job-creating capacity per unit of capital are often greater and their need for imported capital goods, raw materials, and skilled labor is lower than that of larger firms. The type of goods and services produced, moreover, generally are more suitable to the needs of the poor.

Actually both large and small firms are important to urban development, and they can often work together through subcontracting relationships. As the owners and managers of small firms improve their skills, widen their contacts, expand their markets, and increase their savings, the gap between the two can be narrowed.

Typically, SSEs have weaknesses preventing them from developing their potential. Their access to supplies, credit, specialized personnel, and technical information tends to be limited. Consequently, their purchasing, production, bookkeeping, and marketing are likely to be unreliable.

To overcome these weaknesses, a number of countries have instituted programs that meet the particular needs of their SSEs. The following techniques appear particularly noteworthy:

(continued on page 3)

The ILO's Campaign for Employment Generation

by
Darwin Bell
Special Assistant to the Director General

As we enter the last quarter of the 20th century, and in spite of the immense efforts that have been made both at the national and international levels, a significant proportion of mankind continues to eke out an existence in the most abject conditions of material deprivation.

Productive employment opportunities must be found not only for the approximately 300 million people at present unemployed or inadequately employed, but for a total of 1,000 million, if those who will be entering the employment markets of the Third World over the next 25 years are included. The pressure on natural resources, including land, and on the environment will further intensify and may constitute additional obstacles to economic growth.

It therefore seems clear that major efforts will be required and major changes will need to be made in national development strategies and in the international economy if the world employment situation is to be improved within a generation and a substantial amelioration brought about in the standards of living of the working masses.

The International Labor Office is one of the international organizations that has been deeply concerned about these problems for some time. In addition to establishing an employment unit in the Geneva headquarters, regional units were established in the regions to assist with individual country problems of unemployment and underemployment.

The Regional Employment Program for Latin American and the Caribbean (PREALC) has its origin in the resolutions adopted by the Eighth Conference of Member States of the ILO held at Ottawa, Canada, in September 1966. The agreements reached and the mandate conferred on the ILO at that time point to the need to create a regional program, to encourage the application of national policies aimed at improving the employment situation.

PREALC's fundamental objectives, therefore, are to promote and assist national and regional actions aimed at generating employment. This is done through:

a) Giving technical assistance to governments and subregional institutions responsible for the definition and execution of policies and programs directly affecting the level of productive employment.

b) Training of personnel required by national and subregional bodies to analyze the employment situation and to formulate and execute policies and programs with high employment effects.

c) Promoting and coordinating research projects in employment, poverty and income distribution carried out by various academic centers and research institutions.

d) Providing assistance to countries in designing projects which depend on international financing and are aimed at raising the rate of employment growth.

Similar regional programs have been established for Africa (JASPA—Jobs & Skills Program for Africa) and Asia (ARTEP—Asian Regional Teams for Employment Planning).

The extensive research of the ILO has resulted in many books, manuals and papers on all aspects of the employment problem. This research effort is now being moved into the operational phase via projects in developing countries. (Note: We begin our review of notable ILO employment generation projects with a look at the Kenya experience.)

The ILO Study of Nairobi

It has been observed that there are two Nairobis. There is the one admired and peopled by the tourists, expatriates, and local elites. Here are situated parks and gardens, tall public buildings, impressive hotels and theatres, good sewage and drainage systems, an adequate water supply and other public services, notably lacking in most African cities. The other Nairobi consists of inhabitants without an officially licensed occupation, paid jobs, or an approved residence. They are collectively referred to as "the informal sector" by the International Labor Office in its 1972 study of Kenya.

The ILO proposal

In its study, the ILO emphasized the need for government to take a more positive approach towards the informal sector, including the hawkers. The self-employed in Nairobi earn about US $140 annually and provide real services for the low-income segment of the population: selling, exchanging, repairing, transporting, and even making or assembling much of what is needed by those unable to afford the amenities enjoyed by the elite. Consequently, the harassment of the informal sector, consisting of more than a third of Nairobi's population, is counter-productive as well as futile. It hurts the poor who patronize the informal sector, increases unemployment, diminishes national output, and frustrates those anxious to succeed in the urban environment.

As an alternative, the ILO suggested a major reform of existing trade and commercial licensing practices, removing unnecessary licenses, substituting health and safety inspection for licensing, and issuing licenses to any applicant able to pay the license fee. It was felt that such a reform would eliminate the existing black market in licenses of all types, while lowering the prices that stemmed from the monopolistic profits of license holders.

Recent Developments

The Nairobi City Council, along with the Kenyan Government, eventually accepted most of the ILO recommendations. As a consequence of the reforms, there has been a significant shift away from retail trading into all aspects of manufacturing, repair, construction, and maintenance, thereby

(continued on page 5)

Earning (continued from page 1)

Access to raw materials

Because SSEs have difficulty competing with larger firms in importing, purchasing, transporting, and processing adequate raw materials, they need special assistance. The Government of India, among others, has taken steps to give SSEs at least equal access to imported or scarce raw materials, including: bulk purchase; storage and resale of key imported raw materials; the treating and processing of raw materials to reduce perishability; and the provision of credit and logistical support to assure availability in remote areas.

Exclusive purchase arrangements

Under its Store-Purchase Program, the Government of India has reserved 220 manufactured items for exclusive purchase from the small scale sector. In addition, it has reserved to the small scale sector 177 items for exclusive manufacture. More than 21,000 SSEs are reported to be participating in these programs.

Tanzania has attempted to assist SSEs through a Small Industries Development Organization (SIDO). Following a 1974 directive, government agencies have been encouraged to buy from small industry producers. In 1974, over T Sh 3.2 million ($384,000) worth of goods produced by small-scale industries were purchased through SIDO.

In Botswana and Lesotho, thriving exporters of garments, sponsored by the local SSE intermediary, got their start through domestic contracts for police and school uniforms.

Technical assistance

The Government of West Bengal will expand its Directorate of Cottage and Small-Scale Industries (CSSI) to meet the needs of business in **Calcutta**. Initially about 20 officers are to be hired to: (a) coordinate the activities of various agencies catering to the small scale sector; (2) identify new entrepreneurs and investment possibilities; (c) assist in provision of raw materials and in marketing; (d) promote associations/cooperatives so that purchase of raw materials, production, and marketing can be pooled; (e) help in filling out loan applications; (f) conduct statistical surveys; (g) identify training needs of small entrepreneurs and enlist them in training programs. Each officer will be expected to service about 80 loans per year, covering businesses in both residential areas and the industrial estates.

The hope is that the extension workers will serve as a catalyst between the low-income urban population and the SSE sector. In doing so, they will act as intermediaries between the social workers who are most knowledgeable about the low-income areas and the commercial bank managers who need more information about socio-economic conditions in these areas.

The effectiveness of technical assistance has already been demonstrated in Botswana. Here, small construction jobs, previously monopolized by foreign-based firms.

Work sheds and core shops

Urban development projects have started to provide adequate land and credit for work sheds and/or core shops. In the **Madras** Urban Development Project, for example, plots are provided with work sheds which have a living area on an upper level. These sheds, together with a loan program, are estimated to generate 5,000 jobs at a cost of US $800 per job.

In **Lima**'s sites and services project, 161 corner lots (200 m² double-fronted) have been set aside for expandable core shops. Sufficient credit is provided for the construction by self-help of a multipurpose shelter, including a small storage room and water, sewerage and electrical connections. The site is well suited for the small industrial and commercial establishments such as shoe and electrical repair, metal and woodworking shops, etc. They are located near the central market, the traditional site of such activities, and across the street from over 70 different industrial firms.

Industrial parks

The advantages of industrial estates include possibilities for joint raw-material purchase, shared equipment, as well as marketing partnerships and inter-firm technical assistance. Firms can thus achieve economies of scale in procurement, production, and sales. However, these advantages may be offset by the costliness of industrial estates and their distance from the prime commercial aeras on which SSEs depend.

The Tanzanian government is now seeking to mitigate the frequent problems of industrial parks. Those being planned in **Tanga** and **Tabora** are relatively small in size and adjacent to urban development projects. Expensive buildings are being avoided by using a combination of traditional building materials and tamped earth floors, with cement slabs as needed for machinery. In order to minimize costs, project participants assume the responsibility for actual construction of sheds, following the introduction of basic infrastructure. Building costs consequently are expected to be only US $84 per m².

Covered markets

The city of **Jakarta** has recently initiated a major program to help SSEs by providing large covered markets with electricity, water, sewerage, and access roads. These market places are designed to accommodate a variety of trade activities.

A year from now, 38 markets in 14 areas of the city are expected to be ready for operation, providing space for about 35,000 enterprises. Eventually most of the trading enterprises in **Jakarta** are expected to be located in such markets.

(continued on page 4)

Covered Markets *(continued from page 3)*

The covered markets will make it possible for enterprises both to improve their earning capacity and to better serve the surrounding neighborhoods. Banks and government agencies will find it easier to deal with a cluster of enterprises rather than, as is now the case, many scattered small shops. Clustering will also facilitate the development of programs for upgrading the skills and technology of production. Insofar as enterprises will be anxious to maintain their privilege of operating in the markets, they can be trusted to repay loans, thereby reducing risks and collateral.

The Provision of Credit

In the center of a Calcutta slum there is an entrepreneur whose business it is to assemble incense sticks. He buys all the components from wholesalers, i.e., the wooden sticks, the actual incense paste and the dry powder in which the stick has to be rolled before it is ready for sale. Some 12 months ago he employed nine people to do the work for him. His working capital was so short that he had to sell a batch of the product before he could buy the raw material needed for the next operation. The volume of raw materials he could buy did not allow him to expand employment. He was indebted to the moneylender and had to pay interest rates that ran as high as 200% on an annual rate.

At about that time, he approached a social worker active in the slum for a loan of Rs 200 or about $22 to buy himself out from under the moneylender. Within three months he had paid back this loan. A few months later, he approached the social worker again for a larger loan of Rs 1,200 or approximately US $130. As he obtained the loan he expanded his employment to 21 people. Regardless of the merits of incense sticks, he has no marketing problems and can sell all he produces. His problem now is to find people who are dexterous enough and who will agree to work for the minimal wages he pays. Nevertheless, he believes he could expand his operation to twice its present size.

If there is a moral to this story, it is not that all the Calcutta slum populations, let alone the rest of the poor in urban India, should be employed making incense sticks. There are, however, many similar examples of how a small injection of capital can turn marginal operations into success stories. They provide a persuasive argument for trying.

Note: Readers personally familiar with the progress or problems of projects discussed in **The Urban Edge** are invited to comment on the statements made and opinions expressed. We will share them with the audience.

Learning How to Earn

While many countries are greatly increasing the percentage of their budgets on education, they are also increasingly concerned about the relevance of teaching programs. The education provided generally tends to be conservative and formalistic, with an emphasis on rote-learning. It neglects scientific and technical subjects and is directed at preparing students for office work, despite limited opportunities for administrative skills. At the same time, the demand for technically skilled manpower cannot be met. Consequently, severe unemployment among the educated is often accompanied by critical shortages of skilled manpower in certain occupations.

However desirable, vocational and technical education is not easy to provide. It lacks the prestige to attract motivated and qualified students. Those interested may have such a low level of education and technical sophistication as to waste much of the training offered. Competent trainers or technical assistance personnel tend to be as scarce as training machinery. Courses are often too long and too general to be of direct use to students. Usually there is no standardization of course content and instructional methodology. Training programs seldom include adequate assessment of the labor market and student needs. They are usually costly and difficult to evaluate.

Despite these problems, a number of developing countries are making a determined effort to raise the skill level of their labor force. They are experimenting with some imaginative approaches to upgrading technical competence. Among them:

The combination of training and financial assistance

In El Salvador, the *Federacion de Cajas de Credito* is now establishing a training section within its Urban Credit Department in cooperation with the Salvadorean Foundation for Development and Low-Cost Housing (FSDVM). Courses will be offered within communities at local schools or community centers, emphasizing basic administration and management, simple accounting systems, inventory control, purchasing and marketing. The courses will be publicized in every major city and designed to meet the particular needs of local businesses.

While businessmen generally will be eligible to participate, the *Federacion* may require a borrower to receive training or assistance before and/or during the term of his loan, particularly in cases of high arrearage or a previous business failure. In the latter case, specialized efforts will be undertaken to identify and rectify the specific source of his business problem.

Training and production centers

In Madras, the Tamil Nadu Handicraft Development Corporation (TNHDC) is planning to set up 100 training centers, generating about 5,000 jobs per year. At each center, about 50 persons are to be

(continued on page 5)

Training *(continued from page 4)*
trained in selected trades for about one year. After the training, the centers would be converted into production units, including families in the area working at home.

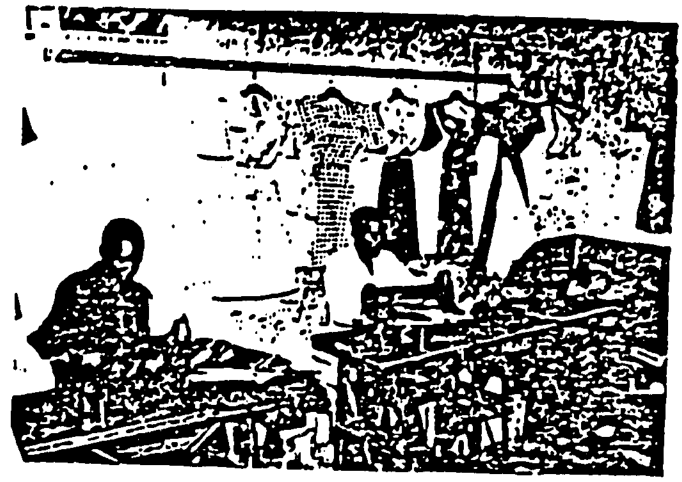
During the training period, the trainees will be provided a stipend of Rs 50 per month. After the training period, when the center goes into production, each trained worker will earn not less than Rs 4 per day, with higher earnings geared to productive capacity. Earnings can be further increased if several family members work as a production unit.

The production centers will be initially owned by TNHDC, which will provide the necessary investment for sheds, tools, equipment, raw materials, salaries of instructors, and working capital.

Each center is expected to be fully profitable when it starts the production of products made out of palm leaf, cane, bamboo, papier-mache, and various fibers. After two to three years of successful operation, it is intended to convert the centers to cooperatives. The training and production centers might become the basis for industrial types of cottage industry more profitable than the traditional handicrafts.

Pedagogic enterprises

In South America, Brazil has led the way in the development of vocational and technical training programs. The National Service for Industrial Apprenticeship (SENAI) offers different levels of courses in its 245 training centers and in its in-plant training programs. Some 420,000 people were involved in 1975. In addition, the National Service for Commercial Apprenticeship (SENAC) operates 76 training centers, concentrating on secretarial skills, nursing, and hotel service.



A small-scale enterprise in El Salvador

In recent years, SENAC has been experimenting with so-called "pedagogic enterprises" for training in hotel service and catering, beauty and barbering occupations. These training programs are financed out of the profits of the services provided to the public. Trainees receive graduated stipends during their training. At full operation in 1981, the annual output of the SENAC hotel-schools is expected to be some 200,000 persons nationwide. To permit maximum flexibility, the training programs are arranged on an individual basis, including the use of programmed instruction for the theoretical subjects together with on-the-job training and experience.

Nairobi *(continued from page 2)*
offering a wider range of openings to young people with limited capital and education. The rapid growth of the informal sector has exceeded expectations.

In a recent report on Nairobi's informal sector, Malcolm Christie, a consultant to the World Bank, notes the extent to which the informal sector is eating into modern sector markets by replacing their production methods and capacity. Because of the lower wages paid, the avoidance of insurance, rent, and taxation costs, the re-use of scrap materials, and the availability of inexpensive tools, informal sector businesses, particularly those in metal work, are becoming increasingly competitive with some of the well-established manufacturing enterprises. Consequently, they can hardly be said to be in the "informal sector" any longer. What seems to be happening is a diversification of the informal sector, with a growing number of self-employed artisans being absorbed into larger production units.

Based upon his observations, Christie makes a number of suggestions for helping Nairobi's small-scale enterprises: (1) a wide variety of market stalls, workshops, industrial plots, and premises for personal services; (2) technical assistance, loans, and machinery for rent to self-employed artisans; (3) a low-cost artisan training program for unemployed youths.

The Problems of "The Barefoot Borrower"

The barefoot doctor may be welcomed in a community, but the barefoot borrower, who may also be illiterate, is likely to be shown the door if he enters a local branch of a commercial bank or even a development bank. This type of lending therefore involves reshaping of attitudes as well as procedures and policies. Large problems remain.

Institutions catering to smaller firms generally have greater arrears than those financing larger enterprises. Even with good repayment performance, the cost-per-dollar of administering loans of $50,000 is higher than that for loans averaging $1 million. Because SSEs tend to keep inadequate records and cater to volatile markets, their risks and returns are hard to evaluate. While these factors justify charging SSEs higher interest rates or requiring larger collateral, to do so increases their debt service burden and engenders social and political resistance. *(continued on page 6)*

Borrower *(continued from page 5)*

Innovative credit delivery programs

To meet the special needs of SSEs, innovative types of assistance programs need to be developed. Incentives and guarantee schemes may be necessary to increase bank-lending to SSEs, including credit for working capital as well as buildings and equipment. New methods must be found to decrease the administrative costs of many small loans, while streamlining the procedures for obtaining them. Likewise, alternatives to high interest and collateral requirements have to be considered. Some innovative programs include:

Integrated support programs

Upper Volta, through its decentralized *Service d'Assistance, Conseil et Soutine* (SACS) provides assistance largely in kind, including raw material, tools, and equipment. Loans, averaging about $400, are also made to cover working capital and the costs of constructing unsophisticated structures for individuals or groups of artisans. This technique simulates the positive attributes of traditional middlemen: flexible, low-overhead organization; commercial incentives combined with stable marketing arrangements; linked sales and short-term credit repayments, without the traditional usurious interest rates.

So far, recovery has been satisfactory. This is partly because loan terms are designed to suit the individual borrower. Most are made at 7%, with flexible terms up to 5 years and with 18 months grace. Loans for raw materials and tools tend to have relatively short maturities (3-36 months), while those for construction carry longer terms (up to 10 years). Another reason for the success of loan recovery is that loans are combined with skill training, assistance in marketing output, and follow-up supervision. As repayments are made by artisans, these resources are retained by the SACS to establish a permanent revolving fund.

The group liability concept

The *Federacion de Cajas de Credito* is a limited liability cooperative society that was established by the Government or El Salvador to provide small enterprises with loans and technical assistance. The popular credit scheme is a segment of the Federation's program to serve stallholders in small retail markets. The average loan is about US $60, and is repaid within 2 months.

Loans are extended to groups of approximately 10 individuals who constitute an informal borrowing unit, in which members guarantee each other's loans. The system has a collective responsibility feature as all group members lose their borrowing privileges if one of them defaults.

While no form of collateral is required, risk has been minimized by the mutual guarantee. The bad debt reserve surcharge has been reduced to 1.6% and a net return rate of over 10% attained on loans outstanding in recent years.

Borrowers are selected on the basis of their eligibility for permanent stalls in the public markets and on their record in paying taxes. The pricing of small loans includes a compulsory savings plan that helps the borrower establish his own operating capital. These savings, amounting to 12.8% of what is borrowed, serve to secure additional loans. Collection is normally on a daily basis, with each user making installment payments that are punched on a card, dated and initialed. Because of the high cost of alternative private credit sources (12% per day), ample incentive exists to insure that members maintain the credit standing of the group as a whole.

Hire-purchase programs for machinery

Tanzania's Small Industries Development Organization (SIDO) has a hire-purchase program, under which equipment is made available to small industries, together with installation funds and technical training for the more unfamiliar machinery. An initial deposit of 10% is required prior to delivery. The balance is lent at 5% for three to seven years, with up to one year grace period, depending on the size of the loan and type of machines. Inasmuch as the repayment record appears satisfactory, with arrears to date less than 10%, the budget for this program is to be increased.

Cooperative programs

While small industry cooperatives have not worked out in most developing countries due to lack of management skills and mutual trust, occasionally small operators can be persuaded to cooperate for their mutual benefit.

The rickshaw-pushers' cooperative in Comilla (then East Pakistan) showed the effectiveness of internal leadership and external reinforcement in the early 1960's. Inspired and assisted by the Academy for Rural Development, the rickshaw-pushers, who had been paying nearly 60% of their daily earnings as rent for their vehicles, banded together to collect a few pennies each day to buy them. Their combined savings, supplemented by loans from the central cooperative federation, made them all independent operators within a couple of years. Having learned what miracles compound interest could accomplish, they went on to become joint-owners of a repair shop, trucking company, and commercial firm. We would like to hear how they have fared in recent years since Bangladesh attained independence.

THE
Urban Edge
FACTS & IDEAS

Vol. 2, No. 2

February 1978

Urban Transit: Quickening the Flow

The analogy is sometimes made that public transportation is the lifeblood of urban arteries. Inadequate transport undermines the capacity of cities to fulfill their functions and it negates the advantages that densely-populated areas enjoy by virtue of their concentration of skills and purchasing power. Poor transport and poverty are interrelated.

In many countries roads often are badly located, built, and maintained. So dusty are they in some of the *pueblos jovenes* in Peru that road traffic is considered responsible for the high incidence of respiratory disease. In *Recife*, Brazil, some of the urban arteries cannot be used at all by public transport as long as two months during the rainy season.

> Last November in the first issue of THE URBAN EDGE we set ourselves these objectives:
>
> - to provide information to interested professionals and decision-makers in urban development concerning the delivery of basic services and job creation for the poor, and
> - to provide the medium for a "network" whereby experiences can be shared among interested professionals.
>
> It was then noted that we would be publishing this newsletter on an experimental basis for six months. Based on the many favorable reactions to the first four issues, we hope and plan to continue this endeavor.
>
> Among the topics that we are considering for future issues are: Urban Administration, Urban Women, Education and Welfare, Crime and Punishment, Firefighting and Emergency Care, Low-Cost Housing and Road Construction, Appropriate Technology, Waste and Sewage Disposal, Housing Policies, Recreation and Culture, and Community Organization and Participation. We also look forward to covering more carefully the activities of international organizations and agencies concerned with urban problems.

Poor roads, combined with poorly maintained vehicles and inadequate traffic control, are also reponsible for the high fatality rates from accidents in many developing countries. A recent study of some of the cities of these countries found these rates to be 8 times greater than in Great Britain and up to 30 times greater than in the U.S. The highest figure was found to in *Bombay*, with 53 fatalities per 10,000 vehicles. This compared with 4.2 fatalities per 10,000 vehicles in Great Britain and 1.6 in the U.S.

Most urban poor are dependent on their own feet to get where they have to go. In many cities half of all work trips are made on foot, often for long distances. For poor people, the cost of motorized transport can be a severe impediment to finding employment. Of those able to afford motorized transport, between two thirds and three quarters use the bus, but services tend to be unreliable and inadequate.

New Approaches to Urban Transport

What can be done to improve urban transport in the developing world? Traditional transport planning methods, with their emphasis on deciding when and where to build the next road, do not provide the answer. Even in developed countries, the costs of urban road construction are becoming unacceptable, not only in monetary terms but also in social disruption and environmental destruction.

Traditional approaches have also encouraged private automobiles leading to intense congestion of urban streets, air and noise pollution, and the allocation of scarce foreign exchange on fuel, gasoline stations, and repair facilities. In terms of costs per passenger mile, buses are clearly much more economical than automobiles. A bus costing (in 1975) $40,000, or 13 times more than a typical automobile, may average 40 times the automobile's annual passenger mileage.

Because of their concern to make maximum use of limited resources and to avoid past mistakes of North America where resources went to improving facilities for private transport at the expense of those needing public transportation, leaders in developing countries are looking to innovative

The Paratransit Alternatives

"Paratransit" is the name sometimes given to a range of vehicles from mini buses to carts, powered by motors, animals, or humans. Paratransit services are privately owned. Beyond that, generalizations are difficult. Often, these vehicles have no fixed hours of operation or destination, and their drivers charge whatever can be negotiated or demanded. Yet, their flexibility, accessibility, and relative cheapness make them highly competitive.

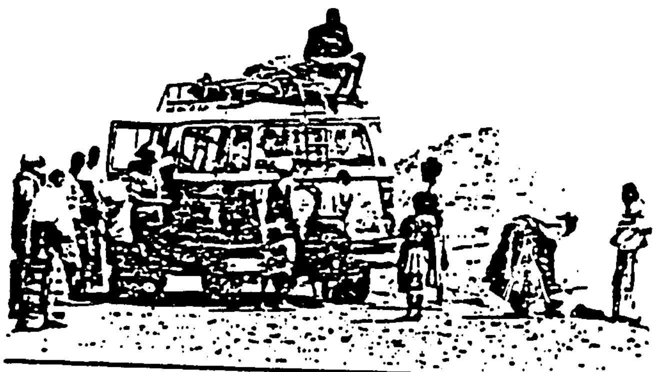
Because of their importance, a number of countries are trying to regulate the various forms of paratransit without discouraging them—i.e., to enhance their positive features while controlling some of their less desirable characteristics. A major study funded by a grant from Canada's International Development Research Center is now winding up an 18 month effort by researchers from five developing nations to determine how these low-cost and demand-responsive vehicles can better fit into the total urban transportation systems of their respective countries. We will report on the conclusions of the study in a future issue. Pending a more comprehensive report, here is a wrapup of recent paratransit experiences of developing countries involving minibuses, jitneys and pedal-powered vehicles:

Minibuses

Minibuses are often nothing more than pickup trucks fitted with benches for 10 to 14 passengers and a rack on the roof for goods. In case of rain, roll-down plastic sheets may be provided for protection.

In many countries, bus companies are in financial difficulties. Costs of fuel, vehicles, spare parts, and labor have risen more rapidly than fares, which need to be kept low for political reasons. There is also the requirement to operate buses at times or on routes where there are few passengers.

Minibuses, on the other hand, can operate efficiently with fewer passengers. The typical minibus is estimated to need only 25% of the fuel required by a 60 passenger bus. It also makes better use of road space in congested areas. Because minibuses are generally privately owned, they are not a drain on local government resources as are those bus companies that are plagued by costly overheads.



Minibus on outskirts of Ethiopian town (IDA photo)

Shared taxis in Agaro, Ethiopa (IDA photo)

The efficiency of minibuses makes financing or owning them a good business in many developing countries. The cost/return ratios of these vehicles suggest that they can be financed at commercial rates of interest of about 18% per annum. Such a loan could be amortized without too much difficulty even where gasoline prices were high and vehicle passenger utilization was only 60%, still leaving enough for insurance and a take-home income of equivalent to US $1,200 per year.

In addition to creating employment and income for owners-operators, minibuses stimulate the development of small engine and repair shops and other businesses in poverty areas. Other positive side effects include the spread of mechanical skills and vocational-technical education.

The usefulness of minibuses often makes official opposition to them counterproductive as well as futile. In *Hong Kong*, for example, over 2,000 illegal minibuses were estimated to have carried 17% of all bus passengers. By 1970, after being legalized, minibuses here numbered 3,800 and were carrying 1.2 million passengers a day.

Kuala Lumpur is another major city which has recently encouraged minibuses, licensing 400 of them between 1975 and 1977. Direct observation, inquiries among residents, and published accounts all indicate that the minibuses are providing a valued service, particularly in reducing congestion in central *Kuala Lumpur*. It is estimated that by 1980 they will handle about 8% of peak hour trips and 6% of all trips. By then the average trip time will be reduced to about 35 minutes, substantially increasing revenues to operators as well as benefiting passengers.

Contributing to the success of the *Kuala Lumpur* licensing project has been the effectiveness of certain regulations: (1) the requirement of a standard color for the minibuses; (2) the display of route numbers recognizable from a distance of 50 yards; (3) the designation of 28 routes (averaging 12.4 miles), each passing through the central area; (4) the fixing of a maximum fare, double that of
(4) the fixing of a maximum fare, double that of buses
parable distance; and (5) the prohibition of standing passengers. Fourteen terminals have been set up at which passengers have a choice between at least two different routes through the central area. However, passengers can hail a minibus anywhere along the route as well.

continued on page 4

Urban Transit from page 1
solutions. This issue of THE URBAN EDGE will review the following approaches to urban transport in developing countries.

(1) The giving of priority to projects that improve public transport;

(2) The orientation of public transport to the needs of residents in low-income areas;

(3) The development of traffic engineering and management measures that make better use of the existing street system;

(4) The application of organizational and financial techniques to improve the efficiency of bus fleet operations;

(5) The encouragement of low-cost, fuel-saving systems of transportation; and

(6) The changing of social attitudes and practices, such as staggered work hours, facilitating mobility.

In many developing countries, the poor lack income to pay even the most basic of transport costs. Thus, a balanced approach is needed that will create jobs closer to homes and thus reduce the need for travel. The achievement of greater mobility through better physical planning will be the subject of a future issue.

Making Better Use of Roads

Roads are often inefficiently used. Making better use of existing roads requires more attention to traffic management than to the physical improvement or enlargement of existing roads. Likewise, the building of new roads is only sensible if they are properly integrated with existing roads. Some of the possibilities include:

Better organization of traffic flows

Calcutta is attempting to reduce traffic tie-ups by:

(a) restriction of certain streets to pedestrian use;

(b) improved traffic islands in the center of wide roads, particularly at junctures;

(c) introduction or improvement of road markings, signs, and traffic signals;

(d) more effective parking controls; and

(e) exclusive bus lanes with indented bus stops or other protective measures to facilitate passenger pick-up.

This combination of better road markings, integrated traffic signal systems, intersection improvements, pedestrian crossings, footpaths, and priority lanes for buses is becoming more widespread. *San Jose* Costa Rica, for example, is avoiding an extensive, expensive road construction program. Only one section of new road will be built to link up with a new inter-city highway. In four corridors the streets will be widened, where possible within existing rights-of-way, to allow the introduction of exclusive bus lanes during peak hours.

A number of Brazilian cities are paying particular attention to the development of bus lanes. In *Recife*, about 40 km of exclusive rights-of-way for buses are being constructed in four radial corridors leading into the central area. The work involves repaving or constructing new sidewalks, curbs, bus stops, and shelters and signals.

In addition to over 20 km of exclusive and priority lanes for buses and taxis, *Manila* is planning to provide or improve over 20 km of footways, together with 200 crosswalks in mid-block positions. *Madras* is another city recognizing the importance of both foot and cycle paths. The project here calls for the improvement of about 200 km of footpaths and about 50 km of cycle tracks, together with the construction of nine pedestrian underpasses and the lighting of 24 dangerous intersections.

Inexpensive road upgrading

The effect of unpaved roads on public transportation is long remembered by passengers required to use such vehicles during a rainy season. But a road-paving program need not be expensive. Where soil conditions are reasonably stable, the paving can take the form of a simple macadam surface dressing, that can cost as little as 20% of the cost of traditional road construction.

In *El Salvador*, a totally new two-lane road is being planned to allow bus services to penetrate for the first time into the heart of one of the poorest neighborhoods with about 60,000 inhabitants. The project also includes about [illegible] km of two-lane access roads with very simple design standards for service vehicles, such as garbage and utility trucks. To improve access from houses to the bus lines, about 18 km of current tracks will be paved—a width of 3 meters—as pedestrian footpaths. Finally, a series of concrete stairs will be provided to eliminate the need for bus passengers and other pedestrians to scramble up and down muddy hillsides. The project includes surface water run-offs.

Staggered work hours

In *Madras*, in 1976, it was estimated that 40% of all daily passenger trips were made between 8 a.m. and 10 a.m. and between 4 p.m. and 6 p.m. This resulted in severe congestion during these hours and the overloading of buses by as much as 100%. To alleviate this situation, the state government in August of that year implemented a system of staggered work hours for government offices, private businesses, factories and schools. The impact of this change is currently being evaluated. A similar experiment is being carried out in *Bombay* by the state government of Maharashtra.

Area licensing

In the middle of 1975, *Singapore* became the first country in the world to systematically curtail the use of private automobiles in congested areas. By then, the need was clear: within a radius of 8 km, over one and a half million people were using over a quarter of a million registered motor vehicles, of which 150,000 were private cars.

continued on page 5

Paratransit *from page 2*

Jitneys

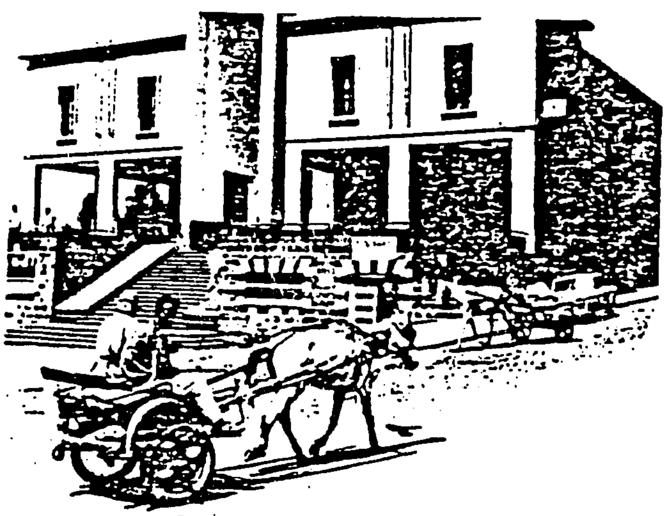
The jitney, jeepney, or shared taxi did not originate in the developing world. A jitney was early slang for a nickel said originally to have come from the French *jeton* or token. Jitneys seem to have originated in San Francisco, picking up passengers for a nickel along a more or less fixed route before World War I, before becoming the victims of mass transit opposition. Shared taxis are now starting to come back in a few American cities.

The distinction between jitneys and minibuses is not an easy one to make inasmuch as the larger jitneys carry as many passengers as the smaller minibuses. However, usually they are passenger-carrying automobiles rather than converted trucks or vans. They differ from conventional taxis by operating on fixed routes stopping to pick up and discharge passengers along the way. Like minibuses, they are hailed from the street.

In many developing countries, jitneys are an effective response to the inadequacies of public transit. Indeed, they may be the only practical alternative for the majority of those who cannot afford private cars. For example, in *Lagos*, which suffers from serious transportation inadequacies, the *kia-kia* service is crucial to the operations of the city, although frowned on by officials because of its free-wheeling nature.

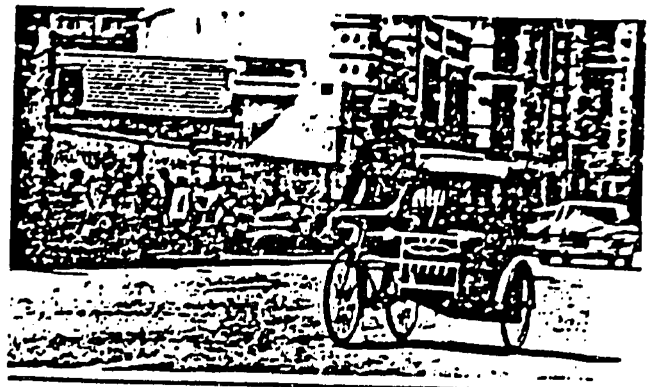
In *Tehran*, some 2,000 jitney-taxis running on fixed routes carry about 100 million passengers a year, compared with 700 million carried by buses. In *Manila*, an estimated 18,000 "jeepneys" carry as many passengers as do buses. Here buses and jeepneys charge the same fare and operate along the same routes. The major distinction is that buses are perceived to be more comfortable for longer journeys, while the jeepneys are faster.*

For countries anxious to discourage private automobiles, jitneys can prove quite useful. In *Mexico City*, for example, they carry more passengers than private automobiles, though much fewer in numbers. The popularity of jitneys seems to be extending to industrialized countries. In



Horsepower in Africa (IDA photo)

The Jeepneys of Manila, by I. Sigurol Grava, Traffic Quarterly, Oct. 1972



Pedal power in Singapore (World Bank photo)

Osaka, Japan, a taxicab company that started out with 12 "jumbo" cars at the end of 1976, now has nearly 300 operating, using a computer-assisted dispatching service. The nine-passenger cabs pick up and discharge passengers along their route charging each new user the equivalent of US $1.25 for the first km and 25¢ for each additional third of a km. The cabs may also be hired by the hour for about $10, and they are being increasingly used by companies to pick up employees and for company outings.

Many countries have had a problem regulating jitneys. In *Manila*, public agencies, while controlling the entry of new operators, have been relatively unsuccessful in introducing service criteria and follow-up enforcement. As a result, the Police Department estimates that three quarters of local accidents are caused by poorly maintained and badly driven jeepneys.

In *Caracas*, on the other hand, where jitneys serve about half a million people daily, effective controls are maintained on the number of vehicles allowed on the streets and the rates charged. Owners are required to (1) obtain permits and licenses from a Ministry; (2) be approved by a city department; and (3) be accepted by an association (a form of transport union). Specific routes are determined by the more than 50 existing associations (each with 150 to 300 jitney-owners).

Pedicabs

Pedicabs (three-wheeled, muscle-powered vehicles) have been going strong since invented in 1947 by an American Baptist missionary, concerned with public transportation difficulties in Japan. They now go under many different names: *trishaw* in Hong Kong and Malaysia, *samlow* in Thailand, and *becak* or *betjak* in Indonesia.**

Until recently, pedicabs were very common in most Indonesian cities. There were an estimated 300,000 in *Jakarta* alone. Gradually, however, governments have discouraged them because they are blamed for accidents and traffic congestion. Moreover, leaders such as the late Ayub Khan of Pakistan viewed them as undignified and degrading and, therefore, banned them back in 1961. The *Bangkok* government also prohibited them from operating within the metropolitan area in 1961. In *Jakarta*, they were banned from the central area in 1972.

continued on page 6

Roads *from page 3*

A number of alternatives were considered: import duties, gasoline taxes, city street tolls, higher parking fees, etc. The solution eventually adopted —area licensing—has proven more effective than any of these alternatives could possibly have been, though it required significant political courage and planning.

Area licensing in *Singapore* initially involved the following steps: (1) the designation of a restricted area containing 62 hectares and 22 entry points; (2) the requirement of a dated windshield sticker for privately owned automobiles with less than four passengers to enter the restricted area between 7:30 and 9:30 a.m.; (3) the opening of 10,000 spaces in car parks around the periphery of the restricted zone; (4) the operation of shuttle buses from the fringe car parks to the central areas; and (5) the doubling of parking charges at public car parks within the restricted area, making them especially high for all day parking. Based upon experience, minor modifications have been made, including better bus services, restrictions on taxis, and upgrading of roads.

The success of the *Singapore* experiment soon became apparent. Since its introduction two years ago, speed within the Restricted Zone during the restricted hours has improved by an estimated 22%, and on inbound radials, by 10%. The number of cars entering this zone during the restricted time dropped by 73%! Approximately 18% of the vehicle owners chose new options. Of these, about the same numbers changed to the bus, joined car pools, and made the trip at different times.

The total capital costs have already been recovered almost entirely from the sale of stickers costing US $26 a month or $3 a day. Above all, the public has been pleased with the experiment. According to public opinion surveys, Singaporeans note the improved conditions in the central area: less congestion, safer streets, reduced pollution, etc. Even business leaders agree that the scheme has not had the adverse impact on sales that was initially feared.

The success of an Area License Scheme depends on a number of factors; competent management, comprehensive policy making and planning, attention to administrative details, preparation of the public, and flexibility. While *Singapore* has a number of advantages in this regard, other cities could, with suitable modifications, follow the example set. (*Kuala Lumpur* is doing so this year.) What is essential is the conviction that such a scheme would be worthwhile, and the political will to carry it through.

Evaluation Status Report

As we go to press we have received well over two hundred individual responses to our evaluation survey. More are coming in every day. The cut off date for our report is the end of this month and we will share the results with readers in a future issue.

Keeping the Buses on the Road

It is not uncommon to find one third of the buses in a given bus system out of service at the beginning of the day, and another breaking down during the day. For example, in the *Tunis* metropolitan area only 58% of the fleet were available for service on an average weekday during a recent year. Almost 40% of the buses departing from the depot experienced breakdowns, of which half required towing.

Part of the problem in *Tunis* was the age of the bus fleet owned by the *Societe Nationale des Transport* (SNT). One-third of the bus fleet were more than 12 years old and about 1/10 could not be used any longer. The lack of preventive maintenance was another aspect of the problem, worsened by the inadequacy of the existing depot.

With World Bank assistance, 210 new buses have been added to the SNT fleet, and a new bus maintenance depot is under construction. These new buses, together with technical and managerial reform, account for the fact that, by 1977, 85% of the SNT buses were available for service every day. Moreover, breakdowns have declined to less than 20% of the former totals and greater service regularity has been achieved. Between 1973 and 1977, bus ridership increased nearly 150% over projected figures prior to modernization.

Innovative management measures

The Pallavan Transport Corporation (PTC) of *Madras* has introduced an effective system of financial and management controls. Each bus depot has been designated as a cost center and a close check is maintained on performance indicators, such as: utilization of fleet, completion of scheduled service, trips lost, breakdowns, accidents, fuel consumption, maintenance costs, fare collections, etc. An incentive wage system links the performance of the depot to staff compensation.

As a result, there has been a significant improvement in fleet availability (above 90%) and utilization (indicated by the increase in the kilometer run per bus in service). This has meant that PTC has been able to keep its cost increases to 12% per annum between 1972 and 1975, when price levels rose an average of 14% annually and when fuel prices were doubled.

Another measure being tried by the PTC is to schedule older buses during morning and evening peaks only, using newer buses for the entire day. With this rescheduling of bus use, it is estimated that bus replacement can be postponed until after about 12 years of service. This contrasts with the present policy of replacing buses after eight years.

(A detailed report is available to practicing professionals through the Council.)

Paratransit *from page 4*

With the outlawing of pedicabs, they have increasingly been replaced by motorized rickshaws (three-wheeled motor taxis). As with pedicabs, the superstructures are produced in local workshops, often with elaborate canopies including silver, gold, and mirrored surfaces.

In *Karachi*, the auto rickshaws operate in the taxi mode, but are much less expensive. At the same time, they can go much faster than buses. Their maneuverability allows them to penetrate even the narrow back alleys of residential districts. Thus, short or long hauls throughout the metropolitan area can be undertaken on demand.

Motorized rickshaws obviously create noise and air pollution, particularly when not properly fueled and maintained. Drivers tend to be reckless and unconcerned with traffic regulations and speed limits. The instability and fragility of the vehicle causes accidents. There are also complaints about rigged meters and refusals to make short trips. Nevertheless, motorized rickshaws could become increasingly important in many places.

Low Cost Parking Controls Bring Tel Aviv Revenue

An ingeniously simple parking coupon system operating in Tel Aviv over the past six years has eliminated parking meters and their associated costs while raising money for the city. Anyone desiring to obtain a hunting license for parking space in the inner city may purchase a booklet containing 10 detachable tabs. On finding a vacant space the driver parks, detaches a coupon, tears off a tab indicating his arrival time, punches out the perforated date, and displays the card against the inside pane of his side window by rolling up the window against the folded upper edge. Each card can be used only once, being invalidated by the perforations. Some drivers keep them to document parking expenses.

After several years of operation the Tel Aviv system takes in more than 1.2 million Israeli pounds ($80,000) annually, as against parking meter revenues less than a quarter of this total at the time it began operating in October 1971. The expense of purchasing, maintaining and collecting coins from meters, which exceeded the revenues collected, was completely eliminated.

Tel Aviv deputy mayor Ramot told the city council after the system had been in operation a few years: "... we got rid and relieved of the complaints against broken meters, their bothersome supervision, criticism of inspectors, vandalism and burglary. We introduced the parking card patiently ... and we are now completely relieved of the 'drivers' arguments'."

**See Nancy Grace, "The Stubborn Pedicab Goes On and On," TRAVEL & LEISURE, October/November 1973

Pedal Power

- 100 bicycles can be made from the materials needed for one automobile
- The annual costs for a bicycle are $50, for an automobile $1,170
- 20 bikes can be parked in the space of 1 automobile
- 2½ billion gallons of petrol would be saved each year if trips of less than 2 miles were taken by bike
- Bikes get the equivalent of 1,100 miles per gallon
- In the U.S. more bikes have been sold than autos each year since 1972
- Inner city trips are taken faster by bike than by taxi in New York, Hong Kong and Bangkok.

These are among the facts presented by TRANET, a newsletter-directory of, by and for those individuals and groups around the world who are actively developing appropriate/alternative technologies. A copy of their issue on bicycles and low-cost transportation can be obtained from P.O. Box 567, Rangeley, Maine 04970, USA.

In a background paper presented at the OECD Conference on "Better Towns With Less Traffic" (Paris, 14-15 April, 1975) T. Bendixson suggests the need for action on four fronts regarding two-wheel transport: (a) facilities for movement and parking, (b) regulations covering the use and maintenance of vehicles, (c) improved or more specialized designs of bicycles and mopeds, and (d) education and training in accident prevention.

A low cost approach to urban transport, he points out, may be made by creating cycle tracks in areas where the use of bicycles and mopeds (low power motor cycles) is well established and where the quality of public transport is low. Dangerous crossings may be dealt with initially by changing road layouts and traffic signals. As funds become available, tunnels or bridges can be built, creating cycle tracks that pass over or under heavy traffic flows.

Follow Up?

As part of our editorial responsibility towards our readers who are working hard to improve life at the urban edge we will seek to obtain detailed, technical background on projects, products or techniques discussed in these pages. Practicing professionals are invited to write the editor. Where this information supply function involves a charge, we will bill it at cost after checking with you.

Vol. 2, No. 1

January 1978

The Urban Poor Are Also Sick

Disease	Symptoms	Incidence	Intervention or Prevention
Tuberculosis	Cough, fever, physical deformities, paralysis, death	Affects about 10% of the people in slums.	Detection, inoculation, drugs, lower densities (better housing).
Cholera and other gastrointestinal illness	Fever, diarrhea, vomiting	Variable according to year and area. In Indonesia, Bengladesh, India and Pakistan is endemic. About 200-300 deaths a week in some slums during periodic epidemics.	Nutrition, rehydration, tetracycline, and most important, better water supply and sewerage.
Typhoid and other gastrointestinal diseases	Fever, diarrhea, vomiting	Carrier rate may be as high as 30% in some areas.	Better water supply, sewerage, hygiene education.
Vitamin A deficiency	Infections increase and eye lesions and blindness develop	About 1% to 4% of children in slums world-wide show some symptoms of this deficiency.	Nutrition education, vitamin A. Mass does. injections (twice a year).
Syphilis and Gonorrhea	Venereal diseases	About 1% to 5% in most of the world's slums.	Education and detection, follow-up treatment.
Anemia	Lethargy, reduced work output, susceptible to infections	About 50% of slum population world-wide (present in around 80% of all women and children).	Better iron nutrition and removal of parasites, if present.

(Table continued on page 2)

That health resources should be primarily directed towards the rural areas is an almost universal assumption. After all, the city already contains the best medical specialists and facilities. And in many developing countries, over half of the national health budget is spent in urban areas containing less than one-fifth of the population. Moreover, the death rate in the urban areas of the developing world is estimated by the United Nations to be 15.4 per 1,000, compared with 21.7 per 1,000 for rural areas.

But these statistics are misleading, according to Samir Basta, in a recent article in *Ecology of Food and Nutrition* (Vol. 6, 1977) insofar as they are based on *average* figures for the city. For the poor, urban life is extremely unhealthy, even if treatment is more accessible. Data from *Manila*, *Calcutta*, *Madras*, *Karachi* and other cities in developing countries show the prevalence of most diseases in the squatter settlements to be more than 50% higher than for the city as a whole. In *Manila*, for

continued on page 2

Disease	Symptoms	Incidence	Intervention or Prevention
Worms (Hookworm, Ascaris, etc.)	Lethargy, reduced work output, sometimes death	About 50% prevalence can go up to 90% in some areas.	Better sewerage, water supply, food and hygiene education.
Protein Calorie Malnutrition	Failure to grow. Lethargy, susceptibility to infections, and eventually, death	About 50% of children in developing world's slums.	Detection and follow-up treatment. Nutrition education for women. Better use of foods in home and for children. Breast feeding for infants.
Measles (adult and childhood)	Fever, eye infections, rashes, pneumonia	About 10% serious cases worldwide in slums.	Better nutrition, inoculation, and treatment
Malaria	Fever, inability to work, death	Varies in different countries—at the moment, severe in South India, S.E. Asia and some Latin American and African countries.	Better drainage. Spraying, detection and treatment.

example, the rate of tuberculosis is ten times higher in the squatter settlements than the rate given for the entire city. In *Madras*, the death rate from dysentery in the squatter settlement is three times higher than the average death rate for this disease.

In reality, the squatter or slum dweller, despite his greater income and closer proximity to health facilities, has greater problems maintaining health than his rural counterparts. Only a minority in the urban areas of countries with per capita incomes below US $150 have adequate access to both unpolluted water supply and sanitation facilities. While this is also true in the rural areas, densities are far lower, allowing for a reduced impact from communicable diseases.

Access to food, shelter, and clothes tends to be a bigger problem for the poor urban settler than for a peasant. Surveys in Pakistan, Thailand, Columbia, and Morocco reveal that poor urban families consume an average 10 to 25% less calories, iron, calcium, and vitamins than do either the "very low or low" rural socio-economic class. The proportion of babies under one year of age from the Bangkok slums, for example, who suffer from protein-calorie malnutrition is enormously high compared with babies in the rural population.

The diseases of the urban areas (see Table, page 1) are often classified according to their origin: fecally-related, air-borne, vector-borne, and malnutrition. Of all of these, malnutrition seems to have the most serious consequences. The urban poor suffering from calorie deficiencies are estimated to be 360 million, among which infants, children, and pregnant women are particularly vulnerable.

The subjects discussed in previous issues of *The Urban Edge*—squatter upgrading, site-and-service schemes, increasing employment and income—are all relevant to improving the health of city dwellers. Indeed, raising the health status of a community requires attention to all aspects of the environment and socioeconomic development.

New Approaches to Health Care

There is a growing recognition that the conventional institutional health system, oriented towards curative medicine, is inadequate. This model puts a premium on expensive equipment and facilities and highly trained professional personnel capable of doing difficult surgery and curing unusual diseases. The wastefulness of this approach stems from the fact that, however successful, the conditions giving rise to diseases remain unaffected. Curative care is also very expensive. Hospitalization of a child suffering from complications of malnutrition, for example, will cost at least 200 times more than preventive treatment. On the other hand, the prevention of Vitamin A deficiency blindness is calculated to be 1,250 times cheaper than the cost to a developing country of maintaining a blind person.

Consequently, developing countries are placing an increasing emphasis on rapidly trained primary health workers, simplified medical technology, respect for traditional forms of health care and local cultural patterns, community participation in health activities, public information and mobilization programs, and a reallocation of resources to areas of greatest need. The following are some of the approaches that have particular relevance for the urban poor:

The use of voluntary workers

In *Calcutta*, voluntary workers are being recruited from womens and youth clubs or from non-government agencies in the low-income (*bustee*) areas under a pilot program designed to be applied throughout *Calcutta* and other Indian cities. They are being trained to perform periodic health check-ups as well as treatment for minor ailments, referring cases to medical personnel when necessary. In addition, they are to provide nutrition and family planning education and to follow up on patients discharged from hospitals.

continued on page 3

Health Care *from page 2*

A trainee health worker in Brazil tends a newborn baby under the supervision of a qualified nurse. (WHO photo

The voluntary workers are to update the family health records with routine home visits every four months. They will receive the necessary supervision, equipment, and medicine. After one year's service and additional training, volunteers may advance to the salaried public health position of multi-purpose worker.

In *Manila*'s Tondo project, 300 volunteers (called Barangay Volunteer Medics or BVMs) are to be used. The training of each BVM will take about two months and include the recognition and first-aid treatment of malnutrition, communicable diseases, and worm-infection; the administration of drugs and vaccinations; and the preparation of records and statistical information. In addition to dispensing certain medicines and injections, the BVMs will be expected to refer those in need of special care to clinics and then to follow-up on referrals. In their visits to families, BVMs are to provide information on nutrition, family planning, and sanitation. They are specifically directed to instruct mothers how to weigh their children and to keep a record, using a simple weight chart.

Community health workers

In *Jakarta*, health workers, chosen from among the community, are being trained in the Local Health Centers to deliver integrated services. Each of the 30 health posts that are being established in a pilot project area are to have 12 health workers, so that there will be one health worker on duty for every 500 persons. There will be two shifts, with someone "on call" at all times. Health workers will be paid US $18 per month. Eventually, it is hoped that neighborhoods will fund their operating costs via a small "health insurance" contribution.

While using the Health Centers as their operational base, the health workers will spend most of their time home visiting in the community. Their responsibilities are numerous: first aid and emergency services, immunization, registration of births and deaths, collection of data on diseases, monitoring of the nutritional status of mothers and children, referral to the health centers, dispensing of contraceptive devices, etc. Above all, the health workers are expected to provide information to local families on many aspects of health, including childbirth, nutrition, including vegetable gardening, family planning, personal hygiene and environmental sanitation.

The community health workers will usually have had nine years of general education, a two-month basic health program, and a refresher course starting 4 to 6 months after being in the field. They will be given a procedural manual after successfully completing the training as well as a certificate and uniform. Six full-time supervisors are to be appointed for the project, together with a training coordinator.

Small health centers

In *Jakarta*, simple two-room health facilities are being built: one room for health activities in general; the other for a young child center, which will focus on nutrition, disease prevention, and education of pre-school children. There will be one such health post in each community of about 3,000 people.

These facilities, it is hoped, will overcome the condition revealed locally by an international health agency which discovered that most clinics, even in areas of high disease prevalence, were little used by the local population. The obstacles to more frequent usage included household and marketing chores, the need to care for small children, transportation costs, crowded waiting rooms, and socially distant health personnel. The treatment given tended to be rapid and superficial, with no time available to explain causes and prevention of disease.

Nutrition: The Key To Health

While malnutrition does not have the dramatic impact of a plague, "the day-in, day-out erosion of health it causes may reach epidemic proportions," to quote Alan Berg.* In parts of Latin America, it is considered the primary factor in more than half of childhood deaths, particularly those under five years of age. Combined with malnutrition, relatively minor childhood diseases become fatal. And insofar as malnutrition adversely affects both the learning ability of children and the productivity of adults, it can seriously undermine a country's standard of living.

Because of the growing realization that much of the expenditure on health care will be wasted if nothing is done about malnutrition, developing countries are trying various ways to cope with the problem. Each of the following approaches have limitations but, in combination, they represent an effective approach to overcoming the threat to nations posed by malnutrition.

continued on page 5

The State of the Art

In 1976, the American Public Health Association (APHA) conducted a unique study of low-cost health delivery systems in 54 countries, under the direction of Dr. Barry Karlin. Detailed descriptions were obtained from 180 projects serving an estimated 150 million people in Asia (75 projects), Africa (56), Latin America (44) and the Near East (5). Based upon this data, the APHA is in the process of preparing a series of selected case studies following site-visits by teams of health experts. In addition, a series of in-depth technical monographs are being prepared on such topics as manpower utilization, consumer participation, and program evaluation.*

The initial monograph (*The State of the Art of Delivering Low Cost Health Services in Developing Countries*) summarizes the results of the question naire survey. It concludes that project goals and objectives tend to be vague with few and varying measures of progress. The major obstacles faced by these projects include too few paramedical workers, inadequate human waste disposal, illiteracy and superstition. Of moderate importance were the lack of safe water, physicians, funds, supervision, and public transportation. While primarily devoted to the rural areas, some of the efforts are relevant to urban areas. Examples:

Training of paraprofessionals

A family health project in Nigeria is attempting to prepare clinic-based auxiliaries and a new cadre of community-based auxiliaries to take over such routine work as the weighing of children, immunization, health education, and the dispensing of drugs, thus freeing nurses to provide a higher level of primary health care.

In *Lampung*, Thailand, a large-scale, ambitious project involves the training of Thailand's first group of Medex workers called "Wechakorn" or doctors' hands. Six months of classroom and supervised clinical training is followed by a six month preceptorship prior to assignment to rural health centers and the provincial hospital.

(photo courtesy of Voluntary Health Association of India)

Nutrition programs

In India, where scales are not available, a bangle bracelet four centimeters in diameter made of cheap material available in the area has been used. If the bracelet slips easily over the child's elbow, it is certain that the child is underweight. This technique seems to work for children up to four years of age (see photo).

In Ghana, it has been found that many children discharged from the nutrition rehabilitation center continue to suffer because their mothers cannot afford to buy appropriate food. A sewing school was therefore established to provide vocational education for mothers. Those who finish the course are placed in jobs, thus supplementing the family budget.

Architectural Innovations

In Kenya and the Philippines, it is common to use movable bamboo room dividers in health centers. Floor space can thus be easily rearranged to meet the need for offices, treatment and conference areas, thereby improving services to the staff and providing privacy for patients.

In Bangladesh, India, and the Philippines, inexpensive housing, using local materials, has been built adjacent to in-patient facilities. Families can assist in food preparation and in care of their sick members. Cost of care may be reduced, while attention by the patient's family provides more personal care within a familiar environment.

In Ghana, an "adventure-playground" has been added to a health clinic for children not in need of medical attention. In addition to providing space and facilities for chidren waiting for their mothers and siblings to be cared for, the playground serves as an immunization and health education center.

Administrative Innovations

In New Guinea, at the suggestion of local leaders, fines are imposed on mothers who fail to visit the mother/child clinics with their children. After a six-months trial, clinic attendance is up to 80-85% and increasing. These leaders also suggested that medical workers accompany census officials and tax collectors in order to immunize and check for communicable diseases. As a result, more than 90% of the population is receiving immunizations.

In the Philippines, a "Special Integrated Financing Program" has been established through which people may borrow money and receive a 2% rebate on the loan interest if they meet the following conditions: (1) no birth for one year, (2) the planting of a vegetable garden, (3) the improvement of environmental sanitation, and (4) the nutritional upgrading of their diet. The two percent rebate is placed in a special savings account to meet medical expenses.

In a Bangladesh health center, medication is being pre-packaged in standardized amounts by using old newspapers and magazines made into small bags. This method has proved less expensive in that there is no need to hire an additional compounder because people with little or no training could perform the packaging. Likewise, the dispensing of medication is carried out much more quickly, enabling the center for the first time to deal efficiently with the large numbers of people waiting for medication.

*Further information about this project can be obtained from the Council or directly from APHA, 1015 Eighteenth St., N.W., Washington, D.C. 20036, USA.

Nutrition ·om page 3

Nutrition education

The use of radio and other mass media is most directly useful if the message is short, simple, and sustained. The clearer the message, the more likely it is to be spread by word-of-mouth, particularly if consistent with cultural patterns and suggests a practical course of action.

In *Manila*, the use of mass media is combined with face-to-face persuasion in the Barangay centers and in schools by personnel from the Nutrition Foundation of the Philippines. Particular emphasis is given to breast feeding and the preparation of nutritious foods. The design and distribution of posters and advertising is handled by the National Media Center, which is also responsible for carrying out surveys to evaluate the effectiveness of nutrition and health education programs.

In *Madras*, literacy programs are combined with nutrition programs for an estimated 20,000 women. These programs are aimed at bringing illiterate women of child-bearing age up to the level of education which will allow them to make use of the health and nutrition materials presented. These materials promote an awareness of nutritional needs generally but particularly those of pregnant and nursing mothers. In addition, the health implications of hygiene, sanitation, immunization, and family planning are covered.

Nutrient-dense foods

In *Manila* (Tondo), as part of the infant nutrition program, mothers are taught the use and preparation of a simple nutritious food mixture using local ingredients. The mixture contains mango nut powder, rice, red palm or coconut oil, and unsalted anchovy or shrimp powder in a proportion of 2:6:1:1. For a one-year old infant, about 50 gm/day are needed, in addition to breast feeding and the usual mixtures of strained fruits and vegetables. The mixture costs about US 7 cents per day at current retail prices. It can be prepared at home by grinding the ingredients.

On-site and take-home feeding

In *Jakarta*, each health post (*Pos Kesehatan*) is reponsible for improving the nutritional condition of the young children in the communities being served. Young children are brought to the post several times a week for nutritionally balanced meals prepared from locally available foods. Mothers are involved in meal preparation to give them a lesson in better nutrition. At the same time, children suffering from severe malnutrition are identified and referred to hospitals or health centers for treatment. Every six months, massive doses of vitamin A are administered to prevent blindness.

In some of the urban areas of India, Mexico, and Peru, large central kitchens prepare food not only for schools and clinics but also for mothers and children to take home. Pick-up times can be assigned or selected in such a way as to avoid long waits for the recipients. However, considerable care must be taken to minimize infestation or rodent damage and pilferage or leakage to non-target groups.

Food processing and fortification

In Algeria, Brazil, Columbia, Ethiopia, India, Lebanon, and Tunisia, among other countries, blended cereals are being widely produced and distributed by governments, commercial firms, and international agencies to meet the nutritional needs of adults as well as children. Two of these products, CSM (corn-soy-milk) and WSB (wheat-soy blend) were developed in the United States for international distribution. Outside of the U.S., India is the largest producer. Not only are these blended cereals substantially less expensive than most conventional forms of animal protein, vitamins and minerals but also they do not require cold storage.

For many years, the majority of states in the United States have required flour and bread sold to the public to be enriched with iron, calcium, thiamine, niacin, and riboflavin. The effect of doing this in Newfoundland starting in 1944, in combination with adding Vitamin A to margarine has been a remarkable improvement in public health. By 1953, infant mortality had dropped 63% and stillbirths, 59%; tuberculosis was reduced 81% and beriberi had disappeared. ----

In the developing world, the fortification of food is also becoming more common. Taiwan has instituted a large scale project to introduce thiamine-enriched rice. India and Guatemala have successfully reduced the prevalence of goiter in certain areas through the iodization of salt. Brazil, Costa Rica, Chile, and Turkey have added vitamins and minerals to margarine; India, to wheat and cooking oil; and Thailand and the Dominican Republic, to rice. Considering the benefits, the costs of fortification are extremely low: a fraction of a cent per pound of cereal grain or quart of milk. To the extent that urban dwellers buy from shops handling fortified food, they can benefit from these measures.

Ration shops and coupon programs

Government-operated stores that distribute staples at subsidized prices exist in urban areas in many countries. The difficulty of this arrangement is to keep food intended for the poor from going to the more affluent segments of the population. To overcome this difficulty, governments often locate shops in low-income areas and require ration cards or similar identification. Special market packaging is used to reduce resale to high-income groups.

The United States, though not thought of as a developing country, has had a long experience with a food stamp program. By using the existing network of sto. es, it avoids the expense of mounting a new government network. The objective is to distribute enough food to those most in need to meet nutritional requirements without an excessive financial burden on the government. In practice, however, the proper targeting of the population, distribution of food stamps, prevention of resale to higher income groups, and reimbursement of store owners are difficult to administer.

*_The Nutrition Factor_ (Washington, D.C.: The Brookings Institution, 1973)

Family Planning: For Health and Wealth

There is a growing recognition that family planning is important for public health. In Rwanda, 20% of infants who are the fifth-born in their families die within a year of birth. For the ninth born, the risk of death is 40%*. In Punjab, India, infants born less than two years after the previous child were 50% more likely to die by age one than were infants born two to four years after the previous child.

In many countries, children in large families suffer more from malnutrition. In Zaire, for example, members of families larger than nine consume an average of 50% fewer calories than those in families with four or fewer members. Medical records in *Hyderabad*, India show that 61% of all the severely malnourished children were the fourth or later offspring.

For teenage mothers and those over forty, childbirth is especially hazardous. In *Sao Paulo*, Brazil, for example, 104 of every 1,000 babies born to teenage mothers died before the age of one, compared with only 53 per 1,000 born to mothers between the ages of 25 and 29. In Thailand, maternal death rates among women in their forties were more than three times greater than among women in their twenties.

Family planning is as important for economic development as for public health. While many rural residents continue to believe in the usefulness of large families, urban residents are increasingly aware of the expense of feeding, clothing, and housing each additional family member. Likewise, leaders increasingly realize that the more rapid the population growth, the more difficult it is for a country to raise per capita incomes and to improve the quality of life.

Because communication and transportation are easier in urban areas and medical facilities more widely available, family planning programs would seem to be more successful in urban than in rural areas. Yet, there is little evidence of this being the case in developing countries. The rate of natural increase in the urban areas equals that of rural areas. Nevertheless, an increasing number of countries are taking family planning seriously, and, as here suggested, some of their most interesting efforts are being made in urban areas.

The techniques employed to promote family planning include the use of a bonus system, distribution of birth control devices by shopkeepers, a telephone information service, publicity campaigns, volunteer workers and organizational education programs. We will take a look at specifics in a future issue.

*Eric Eckholm and Kathlene Newland, *Health: The Family Planning Factor*, Worldwatch Paper 10, January 1977

Replies Needed by January 31!

Under separate cover, readers of *The Urban Edge* will have received an evaluation questionnaire this month. To keep this newsletter coming and to make it most directly useful to you, it is important that we get your views and answers to the questions posed. Please remember the January 31 deadline.

Managing Urban Growth

The March 1978 issue of *The Urban Edge* dealing with urban administration will be based on materials and student/faculty contributions generated by the Economic Development Institute's Course on *Managing Urban Growth*, being held January 16–March 17, 1978 in Washington, D.C. The main objectives of the course are (1) to give participants who are senior government officials an understanding of the use of information and systematic analysis for decision-making on urban programs and projects; (2) to expose participants to a range of urban policies, programs, and projects in developing countries; and (3) to strengthen the working relationships between participants from different agencies and disciplines.

Among the subjects to be covered are: financing and pricing of urban services, land policy and use, mass transit, shelter and related services, increasing employment and earnings, and implementation and management. Based on lectures, readings, discussions, and field-trips, the participants will have the opportunity to apply the analytical approaches and techniques covered in the course to work problems based on actual case studies.

The 26 participants selected from among a large number of nominees include: Adolfo A. *Navarro* Flores (Bolivia), Ricardo *Militao de Morais* and Albert M.R. *Paranhos* (Brazil), Mohamed T.E.D. *El-Sahly* (Egypt), Francisco R. *Altschul* Fuentes (El Salvador), Andrews Narteye *Nartey* (Ghana), Dilip K. *Roy* and Kewal K. *Sachdey* (India), Kismet *Kosasih* and Suwarno *Prawirasumantri* (Indonesia), Ansel C. *Mahabir* (Jamaica), Gibson G. *Maina* and Isaac G. *Wanjohi* (Kenya), Young H. *Cho* and Joo-Sok *Suh* (Korea), Abdulla bin Haji *Masud* (Malaysia), Vijaya Lakshmi *Saha* (Mauritius), Olusegun A. *Jawando* (Nigeria), Syed M. *Shah* (Pakistan), Augustino S. *Changani* (Tanzania), Sukree *Coompanthu* (Thailand), Kelvin M. *Romero* (Trinidad and Tobago), Fatma Ulke *Aren* and Mate *Atac* (Turkey), Peter M. *Changala* and Lawrence F. *Mulenga* (Zambia).

FINAL REPORT ON

LOW-COST COOPERATIVE HOUSING PROJECT IN LESOTHO

UN PROJECT LES/74/C31

JUNE 1979

TABLE OF CONTENTS

CHAPTER 1

PREFACE - "THE WAY IT IS"

Because it captures much of the spirit of the man and of the chemistry of technical assistance, we have lifted from . of Eduardo Galindo these two paragraphs which highlight his wo.

> My modest success, if one may call it that after a proper evaluation, has not been because of my skills but rather because of my human background as a Mexican belonging to the Third World. After working with my own people, under hunger and humiliation, I have learned the lesson. When you work with people the first thing to do is to try to understand them. "Communication is the key." "Sharing your heart is the tool." "Pushing gently is the strategy."
>
> My type of work is a very complicated one. You have to deal with a range of different social strata from the poorest to the richest and from a family to even the President of a nation; and in this case the King and the Prime Minister, the Ministers, Permanent Secretaries, suppliers, contractors, engineers, lawyers, auditors, architects, accountants, etc. You have to play the role of a politician without being one. But it's a beautiful experience, I would not change for anything.

Eduardo Galindo
ICHDA Advisor
Cooperative Low Cost Housing Project
Maseru, Lesotho
1974 - 1978

CHAPTER 2

LOW-COST DEMONSTRATION PROJECT - MASERU, LESOTHO

Enclosed with this summary is an extended report on the initiation, development and accomplishments of a low-cost cooperative housing project in Maseru, Lesotho, developed between January 1974 and December 30, 1978.

The Pilot Program

The pilot program was undertaken on invitation of the Government of Lesotho with funding by the United Nations Capital Development Fund (CDF); technical assistance funded by the United Nations Development Programme (UNDP) and provided through the International Cooperative Housing Development Association (ICHDA).

This pilot project is now completed in its first phase and includes 190 homes built on a self-help basis by the families who are living in the project known as the Mohalalitoe Cooperative.

These homes were well-built with "sweat equity" from the participants and located within a mile of the center of the capital city of Maseru. The well-planned community includes regular infrastructure including water, sewerage facilities, access roads and electricity. It's the largest housing project ever built in the mountainous Kingdom of Lesotho.

Background

The Mohalalitoe Cooperative grew out of the early recommendations of a village priest who worked for a quarter of a century in Lesotho organizing credit unions, and cooperatives and who was the inspiration of the Roma Village scheme, a smaller cooperative housing project completed earlier.

Lesotho has faced a housing shortage for many years which, combined with recent and rapid urbanization, led to a crisis in the shelter sector in Maseru. As one of the steps to meet this need the Government of Lesotho requested a feasibility study which was undertaken by Mr. Lloyd Morris and Mr. Eduardo Galindo of the International Cooperative Housing Development Association in 1974. The feasibility study and its recommendations were accepted by the CDF which provided a grant of $845,000 to provide the costs of water and sewerage facilities, roads and other infrastructure for the new housing development and a revolving mortgage fund to finance the self-help housing project.

Creation of the TSO

Eduardo Galindo was sent to Lesotho as project manager with responsibility for creating a technical service organization (TSO) capable of providing the multi-faceted supervisory needs in architecture and planning, site selection and development, and supervision of the pilot self-help construction. The TSO which was created was the Low-Income Housing Company, best known as LEHCO-This was followed immediately by the formation of the Mohalalitoe Cooperative which drew members from qualifying families in the Maseru area; families with dependent children, with a severe housing need, and yet with the ability t a small down payment and maintain monthly charges for their house until paid for. The families provided the initiative and manual labor for the actual construction of their own homes and those of their neighbors with technical assistance from skilled laborers employed and directed by LEHCO-OP.

Creation of Production Systems

A third institution known as Production Systems (PS) was created as a subsidiary of LEHCO-OP. Unfortunately this was done without adequate prior approval from CDF in New York. PS was set up to manufacture the building blocks, bricks, doors and door frames, window frames and other joinery products essential for the project. The Resident Representative of the UNDP, together with the Project Director for ICHDA saw a great need to produce building materials in Lesotho instead of importing them from South Africa. The Government of Lesotho encouraged this new aspect of the program because it provided additional jobs in Lesotho and conserved foreign exchange in its balance of payments with South Africa.

The steps taken in the formation of the cooperative and in the construction of the homes is outlined in detail later in this report.

Supplementary Technical Assistance

At several stages in the development of the pilot project Mrs. Ruth Senior was sent to Lesotho as a consultant sponsored by ICHDA to assist with the training in organizing community development and management, her professional field in the United States. The Foundation for Cooperative Housing (FCH) provided the services of Jack Edmondson who took overall responsibility for the project. He arranged later for FCH, with financing from USAID, to provide for the expansion of Production Systems and management for its development to serve the housing supply needs for individuals and builders throughout Lesotho who needed a local source of building materials. Mr. Lawrence Marchese was sent to Lesotho by FCH early in 1978 to implement the expansion of Production Systems.

As the families worked on their own housing they were encouraged to plant small gardens and fruit trees and do some basic landscaping on their homes when they were completed.

The problems involved in the pilot cooperative project were many, and a number of mistakes were made from which much can be learned for subsequent housing developments in Lesotho. These are examined in the body of the report itself.

The Outreach of the Pilot Project

In addition to providing home ownership for nearly 200 families, the technical service organization and the cooperative provided the basis for an outreach of even greater significance.

To build on the example of the Mohalalitoe Cooperative, the Economic Commission for Africa, working with the Government of Lesotho, sponsored a seminar in Maseru in June 1978 for representatives of cooperatives, housing officials and government officials from nine East and Southern African countries. Leadership for the seminar was provided by the UN Habitat and Human Settlements Foundation, ICHDA, FCH, and LEHCO-OP itself for the "on the spot" study of how low-cost, cooperative self-help housing can be produced.

The outreach of the project is illustrated by Production Systems which now provides jobs for 50 people and a dependable source of locally produced building materials. The project director and other officials of ICHDA and FCH were responsible for securing the funding for Production Systems from USAID.

In addition, LEHCO-OP, the Lesotho Housing Cooperative and the Government of Lesctho were responsible for persuading the Canadian International Development Agency (CIDA) to provide funds for a $2.6 million program of low-cost sites and services and cooperative housing in Maseru and several other towns in Lesotho.

The World Bank is now looking at the possibilities of embarking upon an even larger progrm of shelter and housing to begin early in the 1980's.

Continuing Role of the Government of Lesotho

The full and complete cooperation of the Government of Lesotho is illustrated by the fact that various high-level officials of the Government serve on the Board of Directors of LEHCO-OP, and the Minister of Education, the Honorable A. S. Mohale, serves as its Chairman.

The King of Lesotho dedicated the first six prototype houses completed in the project in 1976. The Prime Minister and his Cabinet made a formal visit to the project when it was nearing completion in 1978. Government agencies such as the Lesotho National Development Corporation, the Lesotho National Bank, the Ministries of Commerce and Cooperatives, etc., have all played vit roles in the achievement of the success of this venture.

The Prime Minister told the President of ICHDA when he visited Maseru in May 1978 that he was "proud of the cooperaitve housing project and that the people developing the program could count on his complete support in carrying it through to the point of completion." In the long run, it is the people who live in the cooperative from day to day who transform the buildings into a community. The process seems well under way.

CHAPTER 3

BACKGROUND

The Country

The Kingdom of Lesotho is a constitutional monarchy surrounded by the Republic of South Africa. The entire country is at a high altitude with the "low lands" varying between 5,000 to 6,000 feet above sea level. This is the main agricultural zone. The rest of the country is highlands that rise to 11,000 feet.

Lesotho won its independence in October of 1966 and is governed by an executive department including the Prime Minister and his Cabinet. A National Assembly carries legislative powers and a Court of Appeals anu subordinate courts comprise the judiciary.

The principal industry is agriculture with production of corn, wheat and sorghum, beans and potatoes. Industry is limited principally to carpets, woolen articles, candles, pottery and jewelry with major exports of wool, mohair, cattle and diamonds.

The population of 1.2 million people in 1976 is made up of about 85% Sotho and 15% Nuguni or Bathetu, less than 1% of the population is white. English the official language with Sesotho as a second official language.

A shortage of adequate shelter and an increasing population with an annual growth rate of 2.2% have precipitated a housing crisis.

The Pilot Project

Against this background the Government of Lesotho invited the UN Development Programme (UNDP) and the UN Capital Development Fund (CDF), to provide a feasibility study and undertake a program of low-cost housing in Lesotho.

The feasibility study was carried out by the International Cooperative Housing Development Association (ICHDA) in the persons of Lloyd Morris and Eduardo Galindo. This feasibility study was the basis for a grant of capital from the CDF of $845,000 with a parallel grant from the UNDP for the technical assistance to aid the Government of Lesotho in implementing a pilot low-cost housing project. The program began in early 1975 with the arrival of Eduardo Galindo the ICHDA Housing Advisor. Galindo is a citizen of Mexico; an architect who had a background of cooperative housing in his country and had served with the Foundation for Cooperative Housing in the United States before undertaking the present assignment.

The TSO

Galindo's first assignments were to create a technical service organization (TSO and a pilot cooperative housing project in cooperation with the various depa ments and divisions concerned with low-cost housing. The Lower Income Housing Company (Pty.) Limited, commonly known as LEHCO-OP, was formed with representati of the National Development Corporation (NDC) and the Ministries of Commerce and Industry, Education, Cooperatives and Planning represented on the Board of the TSO. LEHCO-OP is a non-profit organization which has skills and technical know-how as well as experience in the promotion, organization and administration of cooperative housing programs. The functions of a technical service organization normally include site selection, land acquisition, fiscal planning and design, general contracting and construction, site planning, construction inspection and control, legal services, promotion of savings programs among the members, education, training and organization.

The technical service organization is a parastatal organization with the principal board members appointed by the Ministries of Government; the Chairman is the Minister of Education, the Honorable A. S. Mohale.

The incorporation of the TSO was handled by the Ministry of Planning, but for purposes of convenience the shares of stock in the company were assigned by the General Counsel of the Lesotho National Development Corporation to two individuals, the ICHDA project advisor and an official of the Central Planning Agency. This allocation of shares has, unfortunately, led to continuing confusion and a local investigation. The confusion was settled when it was agreed that the shares should be reassigned to the Minister and Permanent Secretary of the Ministry of Commerce and Industry.

Throughout its history the TSO has had the advice and support of the Resident Representative of the UNDP and strong advice and counsel from that office.

LEHCO-OP has become a continuing technical service organization which assumed responsibility for the construction of 190 homes in the pilot project and is now working with the Government and with the World Bank and the Government of Canada on a substantial extension of the program described elsewhere in this report.

The Mohalalitoe Cooperative

Almost in parallel with the founding of LEHCO-OP was the formation of the Mohalalitoe Cooperative Housing Society as the pilot project in Maseru. The lessons learned in the creation and continuing operation of the cooperative are described in some detail later in this report. The cooperative members were chosen from eligible families defined in part by the project agreement with a careful selection process to reach families in lower middle income levels currently without adequate housing and with dependent children and with a source of income to repay the mortgage loans granted to the members.

Although a predisposition of LEHCO-OP was to minimize the number of families of Government employees admitted to the cooperative, this program was modified during the course of member selection. Many of the eligible families outside the Government service were unwilling to risk the down payment and the commitment to monthly payments which seemed to them too large a commitment to be feasible. On the other hand, Government employees and blue collar workers in industry felt assured of their ability to pay and were anxious to achieve home ownership.

<u>Program Objectives</u>
The specific program objectives that guide LEHCO-OP are as follows:

a) To establish housing cooperatives for lower income families in Lesotho. Within this overall goal the program establishes certain limits and guidelines approved by the donors: the Government of Lesotho and CDF.

i) Establishing a revolving fund which lends the cooperative money to be used in construction.

ii) These ~~funds~~ to be returned in a period of time which allows the funds to be used for subsequent projects within a reasonable time span.

iii) The establishment of an interest rate high enough so that the funds will not be dissipated by inflation.

iv) The selection and training of a management staff in the TSO to insure professional administration.

b) To assist other enterprises of a parallel nature which will help the Lesotho economy and furnish employment opportunities.

c) On-the-job training of local personnel to upgrade their skills; and finally the TSO undertakes an ongoing program of cooperative education and orientation.

<u>Project Terms of Reference</u>
The manager is the chief executive officer of the TSO with overall responsibility for program execution and administration. These general responsibilitie include (a) setting operating policies for all TSO activities in accord with the general guidelines established by the Board of Directors within the terms of the project agreement; (b) recruitment, training and direction of TSO personnel; (c) the overall budgetary control of funds of the TSO or monies held in trust by it; and (d) liaison with UNDP, CDF and the Government of Lesotho concerning provisions of agreed program implementation, program progress and adjustment of implementation plans.

The manager of the TSO must have substantial experience in self-help cooperati organization and housing finance, housing design or construction and TSO administration.

A principal objective of this technical assistance endeavor was the preparation and promotion of local personnel during the early years of actual project operation. The ICHDA advisor served as project manager while selectin and training a local deputy manager. At the end of a training period, which ended January 1, 1978, the ICHDA advisor stepped down as manager and turned over responsibility to his deputy, Mr. Vincent Makhele, who now serves as chief executive officer.

CHAPTER 4

THE TECHNICAL SERVICE ORGANIZATION (TSO)

The Lower Income Housing Company, or LEHCO-OP, as the Technical Service Organization (TSO) is known, is a non-profit organization which has capability and technical expertise for the promotion, organization and administration of cooperative housing schemes and other related societies or organizations. In many countries the TSO is a cooperative apex organization representing all cooperative housing societies in the country. But in Lesotho it was not possible to register it as such mainly because of donors' demands and also because there was already a registered cooperative housing federation, which unfortunately was dormant.

The Board of Directors -- Policy:

LEHCO-OP has a Board of Directors, the majority of whom are Permanent Secretaries from ministries related to housing such as Interior, Commerce and Industry, Finance, etc. The Chairman is the Minister of Education, the Honorable A. S. Mot

The Board of Directors sets policy and meets only when policy issues are involved. An Executive Committee meets regularly to interpret the Board's policies with a view to helping management to implement them. The Committee is made up of those people from housing and related ministries who are willing to devote a substantial amount of their time in attending meetings that help solve problems. Normally these people are not permanent secretaries or managers which means that they can afford to attend more regular meetings.

Management - the Operations Level:

At the operations level the management is composed of the Managing Director and his Deputy. Under their direction various departments deal with different aspects of the program. These are:

a) The Administration Department: Headed by the General Administrator with responsibility for day-to-day personnel and administrative matters.

b) The Community and Social Operations Department: Headed by a Senior Community Organizer in charge of the sales program, education and training of cooperative members before, during and after construction; production of a newsletter for the members, etc. This department must always have a strong cooperative background and social leadership

c) The Finance Department: Headed by the Controller has custody of all company and cooperative funds keeping appropriate books of accounts. This department is staffed with people who have background in bookkeeping and accounting. The Finance Department purchases and issues building materials to the member families.

d) The Technical Service Department: Headed by an architect, the Department is in charge of programming, scheduling, designing, construction and delivery of the completed homes and community.

e) Production Systems Department: This department was set up in 1977 to manufacture building components and materials for the project. This is described in more detail in Chapter 7.

The Managing Director and the Deputy Managing Director carry responsibility for all five departments. But their responsibility doesn't stop there. Initiation of long range planning and the outreach of the organization -- an official responsibility of the Board of Directors often comes from the management and the implementation of those policy decisions usually comes back to management. Board and management are necessarily a team.

CHAPTER 5

PROJECT IMPLEMENTATION

Land Tenure

In Lesotho, the right to use and occupy land is by leasehold; all land is owned by the nation with the King serving as trustee.

This system of land tenure may look very convenient from the outside, but if one looks at how the system has been working, one can see the limitations, shortcomings and misuse. In general, land is allocated by the chiefs. Unfortunately without priorities, without a framework of proper planning, land is often given to individuals with no guidelines and controls. This practice has resulted in very low densities in the use of land for housing in all urban areas especially Maseru.

The average plot size allocated to individuals ranges from 1000 square meters up to 3000 square meters (1 meter = 3.3 feet). This trend has caused land shortage in Maseru, making it extremely difficult to obtain land for low-cost housing. It was by fortune that the site used for the Mohalalitoe Cooperative was earmarked and actually allocated to the Lesotho Housing Corporation (LHC). As the Government was committed to provide land for the project under the GOL/CDF Grant Agreement, it was easy to obtain from LHC the transfer in the name of Mohalalitoe. LHC at that time was dormant and had no plans under consideration for the use of the site.

When plans to go ahead with Phase II, within CDF/GOL agreements, were okayed, a site adjacent to Mohalalitoe was applied for to accommodate the 70 houses to fulfill the agreement's limit of 270 units. An application was filed and after persistent pushing and with the backing of the Central Planning Development Office (CPDO) and the LEHCO-OP Board, the site was finally allocated a year later in the name of LEHCO-OP. Again it was fortunate that this site was found with no allottee, although it was supposed to have been reserved for Lesotho High School situated adjacent to the site.

The high school did not have the resources to make proper use of the site and also it was found that the site in which the school is located was large enough for them to satisfy any future plans.

This was a small scheme of 270 houses and yet the struggle to obtain the site was incredible. One has to put a question mark on what is going to happen with the Canadian International Development Agency (CIDA) project with 1100 units out of which more than 400 will be built in Maseru. At the time of the initial draft of this report no land as yet has been officially allocated, although an application for 10 hectares at White City had been presented to the Town Clerk. If and when the World Bank scheme for site and services in Maseru (500 plots) decides to pump in resources of capital for housing through LEHCO-OP land allocation may well be the bottleneck.

On-Site Infrastructure

By mid-July 1975 LEHCO-OP engaged a firm of consultant engineers (Brian, Colquhoun, Hugh, O'Donnel and Partners) to prepare the layout for the sewerage, water and road works. After they had completed the design, tenders were open for contractors. John Ward (Pty.) Ltd. Company was awarded the tender and preparation to begin with the work started in September 1975. After some delays that occurred due to rain and supply of materials the job was completed with a reasonable speed and almost on schedule. The total cost was reasonable, measured against the rate of inflation at the time of construction. Each plot cost about R750 ($820)*

The on-site infrastructure including street lighting and electrical reticulation was a straightforward grant, non-repayable, from CDF to the first project as a pilot project. This task was carried out by Lesotho Electricity Corporation at a cost of R26,000 (about $30,000)

Planning, Construction and Production Activities

LEHCO-OP Site Buildings: When the ICHDA Project Director arrived in the country, one of the first problems he faced was that of office accommodation. The only option for the first month, with three people on the staff, was the Board Room of the Lesotho National Development Corporation (LNDC). A few days later, two rooms at the Victoria Hotel were rented at a rate of R310 ($350) per month. After consultation with Central Planning Development Office (CPDO) an attempt was made to get some cheaper accommodation but with no success. Then with a Board of Directors' decision, LEHCO-OP started building its own office in the middle of Mohalalitoe site. The first idea in building the office was to use it as a prototype house and also for training the labor force before starting construction of the houses. Today the office is the headquarters of the organization giving a sense of permanency for all the employees. At the moment the office is too small to provide room for all the staff and plans are underway to expand it.

Another major problem was the difficulty of obtaining building materials. Ninety-five percent of building materials came from across the border in South Africa. The only available materials in Lesotho were burnt bricks, sand and crushed stone. Unfortunately the high demand for these products locally made it difficult to get them in bulk thus causing problems with schedule implementation. To solve this problem in part it was decided to build storage facilities or a supply depot. This decision soon precipitated one of the crucial decisions in the program, namely the creation of a building supply depot now known as Production Systems, of which more will be said later.

*Rand (R) = U.S. $1.20)

CHAPTER 6

THE OUTSIDE AGENCIES

The ICHDA Role:

The Institution
The cooperation between ICHDA and the UNDP has been one of the factors that contributed to the success of the project. ICHDA is the International Cooperative Housing Development Association owned by seventeen national cooperative housing organizations in fifteen countries with headquarters in Lonc

Steps in Operation
Much of the report is devoted to the ICHDA role but to outline it here the steps were as follows:

a) Preliminary negotiations;
b) Preparation of the feasibility study - made by Lloyd Morris and Eduardo Galindo;
c) Negotiations for budgets and operations;
d) Providing the Project Director who carried the major responsibility over the years 1975-78 including the selection and training of a deputy who became managing director to complete the process independent operation of LEHCO-OP the TSO for completion of the pilot project and continuing operations; ~~also~~,
e) Supervision; and
f) Special supplementary technical assistance.

Supervision
ICHDA provided the Project Director with supervision from Mr. Jack Edmondson of the Foundation for Cooperative Housing headquartered in Washington, D. C., a founding member of ICHDA. He personally made six trips to Lesotho including the initial development of the project paper for the CDF and continuir liaison with New York. ICHDA also provided all the administrative backstopping for the personnel.

Supplementary Technical Assistance
ICHDA also made available Mrs. Ruth Senior's first visit of six weeks to help in the preparation of legal documents that were already delaying the overall progress and causing certain problems with the newly-formed cooperative society. Another purpose for Mrs. Senior's visit was to make recommendations to the Government about setting up a revolving fund. These and other financial recommendations made it possible to correct some of the problems concerning the cooperative.

Because of her important role in the cooperative housing development in Maseru it is important to know a little about her background. Ruth Senior served for many years as director of management for the Association for Middle Income Housing in New York City. She later served as advisor to cooperative housing programs in Puerto Rico for the Foundation for Cooperative Housing; and later made several trips as advisor on management, finance and member relations for cooperatives in Jamaica, Chile and other countries on request of the Foundation for Cooperative Housing with financing from the

Her second mission to Lesotho from 25/2/77 to 4/5/77 was intended to work very closely with the Community Department of LEHCO-OP in areas such as post-occupancy education, with emphasis on the loan repayment. Mrs. Senior had frequent discussions with individual members of the cooperative on the issue of loan repayment and the rate of interest which seemed to be bothering them. She also advised and assisted LEHCO-OP's Finance Department to formulate a format to remind the defaulters that they are in arrears. (Editor's Note: Since the important role of Mrs. Senior is not described elsewhere in this report, it is reported fully in this section.)

With Mrs. Senior's assistance the Community Department was able to provide a monthly newsletter for the cooperative, containing cooperative news, reports of committees, coop education and other relevant material of value to the cooperative and its members.

Mrs. Senior's third mission to LEHCO-OP was divided into two fields. First, she helped the coordinating team for Phase II in preparing the sales program. She also helped the coordinator of the team to improve the self-help element, trying to eliminate the deficiencies that occured in Phase I. Her most important task, however, was her input to Production Systems (the building materials production center) in training methods.

UN Development Programme:

As reported earlier, the UN Development Programme (UNDP) provided the funding for the technical assistance requested by the Capital Development Fund (CDF) and implemented by ICHDA. This support from headquarters was supplemented in Lesotho.

The support from UNDP Maseru to the project as well as to the Project Director has been unequalled. The former Resident Representative Mr. A. Kabbah and his Deputy Mr. F. Mallinckrodt strongly supported LEHCO-OP operations. Their enthusiasm and support for the project made it possible for the project to run smoothly especially at the beginning when things were very tough. They were the first ones to welcome the initiative of Production Systems and gave their blessings to the operations. Unfortunately the concept of Production Systems, which those on the scene felt was essential to the successful self-help project was not spelled out in the original documents. As these plans were developed and implemented, UNCDF in New York was not consulted adequately. Resources from the mortgage fund were used to activate Production Systems without advance approval from New York. This was a mistake even though the responsible persons in Maseru were convinced that the action would speed up construction and benefit the entire program in the long-run.

UN Capital Development Fund:

The United Nations Capital Development Fund (UNCDF) was the key factor in the funding of the low-cost, self-help, cooperative housing project with a capital grant of $845,000.

CDF was officially established in 1966 although the plans for a Capital Development Fund had been under debate at the UN for many years. For coordinating purposes CDF was placed under the supervision of the Administrator of the UN Development Programme. It was initially given only token resources and very general direction; however, following the reorientation of the Fund's functions as requested by the UN General Assembly in December 1973 the principal governments of the United Nations began providing it with a level of useful contributions which allowed it to implement its novel operating practices. The objective of CDF is to provide capital assistance to smaller, high impact projects benefiting the poor in ways often not available from traditional sources or from the very large institutions

CDF addresses the needs of smaller demonstration type projects. It seeds relatively small amounts of money directly into the grassroots of local economies and societies to provide simple agricultural equipment, irrigation and food storage systems, to establish cottage industry centers, to construct village schools, functional training facilities, health clinics, low-cost housing farm to market roads and to set up credit unions and cooperatives.

In Lesotho CDF attained its aims of achieving quick significant development in productivity, jobs, community services and human opportunities.

Agency for International Development (AID):

One of the important outgrowths of this project has been a multiplying effect in generating additional external and internal resources for shelter, urban and related activities. The establishment of Production Systems (see Chapter 7) as an integral part of LEHCO-OP in 1977 for the purpose of producing building material which would be used in the project was assisted through an AIG grant of $325,000.

These resources are being used to provide a full-time business manager/advisor to PS as well as $75,000 of capital for the construction of a new plant for the joinery and cement manufacturing activites. At this writing AID is considering an additional $100,000 grant to further assist this activity.

CHAPTER 7

PRODUCTION SYSTEMS

(Note: A crucial decision made in the field without consultation with the UNCDF in New York led to the creation of Production Systems. The examination of the background of this action is an essential factor in this report.)

Background of the Decision

The project document signed by the UNDP and the Government of Lesotho in the chapter "institutional framework" article "k" states ... "to support the promotion of builder and construction material production cooperatives."

Although the article does not give details as to how to implement the idea, it was clear from the beginning that Lesotho was dependent on South Africa specifically in the building materials industry, especially the most basic raw materials.

Lesotho only produces small amounts of crushed stone, sand and burnt bricks which are not sufficient to meet the internal demands. As a result, it is obliged to import from South Africa to supplement these materials. Lesotho requires cement, steel, timber and other materials which the country does no produce. These constraints, plus the fact that more than 200,000 Basotho work in the mines and industries in South Africa leave the country handicapped in essential skills. Underemployment and unemployment in Lesotho, even with all these workers in South Africa, is still very high.

Implementation

After a thorough analysis the project management took the initiative and proposed to UNDP Maseru and the Central Planning and Development Organization to build facilities within LEHCO-OP to produce wooden windows, door frames and concrete blocks. The idea was to provide and deliver these components which could be locally produced to the family members of the co-op with no delay and with savings on transport, which would have to be paid if the materials were to be transported from across the border. Apart from these savings there would be reliability of supply. The source of supply in South Africa is sometimes not very reliable. But perhaps the most important point in setting up Production Systems was the employment generation accompanying its establishment. At this moment Production Systems has 45 employees.

The implementation of this aspect of the program by LEHCO-OP was controversial with the funding agency, UNCDF. Their main concern was that LEHCO-OP had not informed them in an appropriate form and in a timely way. The only source of funds that could have been used for establishing Production Systems was earmarked for construction of the houses. These funds were to be used to produce those materials cited above in Lesotho instead of buying them in the Republic of South Africa. In other words, the same money available for the of materials for the houses was invested in buying machinery, financing the building and purchasing the raw materials. The only items which tied down the UNCDF funds were the small building and the machinery, but the products manufactured in PS were delivered to the beneficiaries about 30% cheaper tha purchasing them from South Africa

UNCDF was correct from the procedural point of view. Nevertheless, Production Systems and LEHCO-OP, and most importantly the country, have benefitted in the long-run by the creation of this very successful enterprise. In addition to supplying the pilot project, Production Systems is already providing building materials for the general market in Lesotho; and perhaps with the forthcoming Government of Lesotho support, will be able to export to other countries.

The Outreach
In addition to this initiative of Production Systems, as an important link in the housing program, it was possible to attract other donors. An illustration of the multiplier effect of this initiative came early in 1978. The Foundation for Cooperative Housing (FCH) and USAID, after being approached by LEHCO-OP through the Government, came to Lesotho to make a feasibility study to determine the possibility of funding Production Systems.

By the time the ICHDA advisor had left Lesotho, appropriate request for assistance from AID had been prepared. FCH in consultation with USAID Maseru proposed an AID program to support PS with technical assistance and capital investment to upgrade the installation of PS -- mainly the joinery carpentry shop and the concrete products.

Expansion and Tightening of Controls
The USAID-funded Operational Program Grant (OPG) was initiated in February of 1978 with the arrival of the FCH resident technician. Under the terms of the OPG, FCH is providing 30 months of technical assistance and $75,000 in capital assistance for the development expansion of production Systems (PS), the manufacturing division of the Lower Income Housing Organization (LEHCO-OP).

Currently, PS employs 45 people in two distinct manufacturing areas: concrete products including bricks and blocks, and joinery products ranging from door frames and window frames to household, office and institutional furnishings. Recently PS began offering interior joinery and design services to local architects, builders, and contractors. During 1978, PS sales are projected to R180,000, or $208,800. Already the outreach is in effect. Most of its sales volume will be obtained from private and public sector clients.

During the initial nine months of the resident technician's scheduled 30-month assignment the following key tasks have been accomplished:

a) Streamlined and made current PS accounting system in preparation for financial audit covering the operating period ending March 31, 1978.
b) Designed and installed financial reporting systems which generate monthly budgetary control statements, and quarterly profit and loss statements.
c) Executed financial planning for financial year 1978-1979 including sales and operating budgets, projected profit and loss statements, etc
d) Analyzed, streamlined, improved PS manufacturing operations including design and installation of manufacturing cost control system.
e) Developed employ policies and procedures and established program of twice weekly informal discussion groups to transfer policies and procedures to employees.

f) Designed and implemented non-formal skills training program to assist the development of skilled Basotho joiners employed by PS.

g) Obtained short-term technical assistance from FCH/DC to research and develop materials for a non-formal training program geared to LEHCO-OP and PS administrative and management staff.

h) Implemented staff development training program utilizing group dynamics, participating management and experiential learning techniques. Twenty LEHCO-OP and PS staff personnel participate in weekly training sessions.

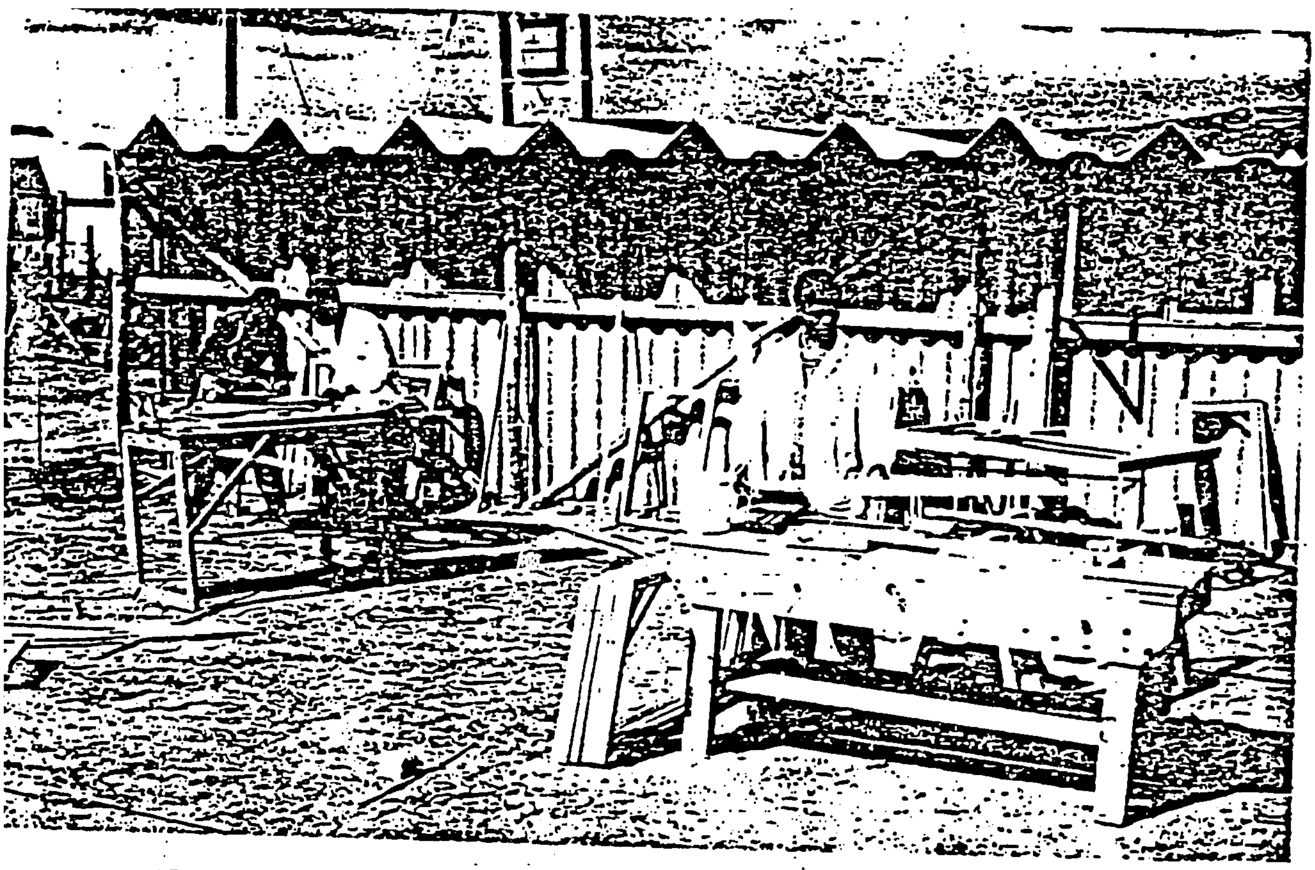
i) Obtained short-term technical assistance from FCH/DC in marketing.

j) Obtained technical assistance from US Peace Corps/Lesotho in formulating marketing, sales, and advertising programs for PS products; these programs include budgets, direct mail materials, advertising logo and copy.

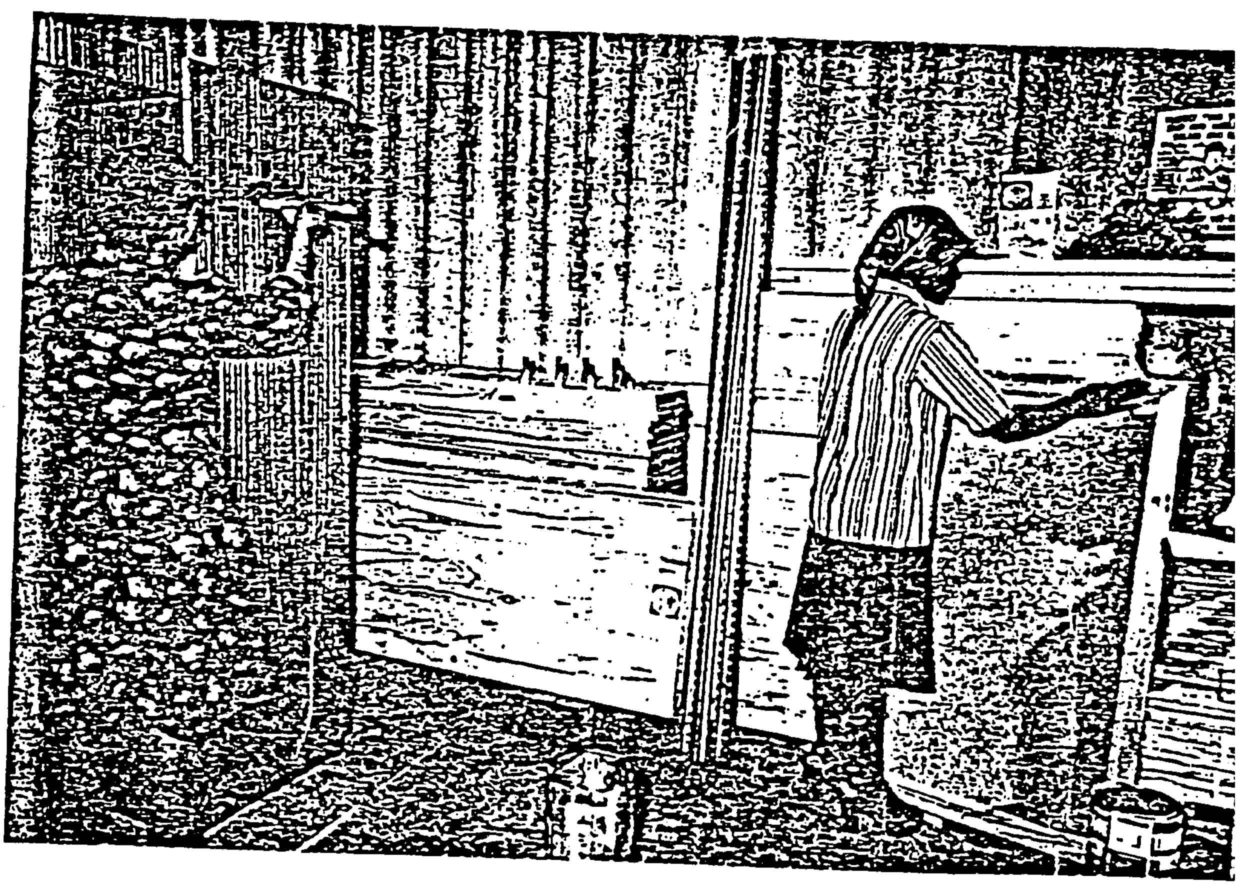
k) Coordinated the construction of 1500m^2 block-making facility with a productive capacity of more than 500,000 units per year.

l) Construction of a modern joinery equipped with semi-mass production equipment completed early 1979.

In the coming year, emphasis will be given to consolidating and improving the work accomplished by the resident technician and his staff, and to strengthening the financial viability of PS as a small enterprise.



Depicted above is an early photo of the Production Systems joinery operation at the project site. As can be seen, conditions are extremely cramped, requiring some operations to be carried on outdoors.



Shown above are two women employees of Production Systems finishing a special order of furniture which represents one of a variety of wood products, building materials and other items which are manufactured by this department of LEHCO-OP.

CHAPTER 8

MOHALALITOE COOPERATIVE - HOW IT WORKS

The Mohalalitoe Cooperative Housing Society

According to the Work Plan in the Project Document under the heading Project Activities, the first six months of project activity was to consist of preparatory activities among which was the setting up of the Technical Service Organization and formation of a cooperative housing society which was to be the recipient of the loan from the CDF.

A sales program was to be outlined for the project to be presented to the public in general; and one of the major aspects of this program was the selection criteria which were to serve as guidelines for selecting eligible beneficiaries.

Applications

The sales program soon brought applications from the public. The application form was always filled by a community organizer who explained fully the conditions of the project to all those who came to apply. Only those members of the public who fulfilled the majority of the selection criteria, especially that of income range, were allowed to complete an application form. All the qualifying applicants were later interviewed at their residence for a deeper and thorough interview as a family unit. This family survey follow-up method also enabled the community organizers to have an opportunity to assess the applicant's conditions of living, i.e., how poor or how good his or her dwelling quarters were. This included assessment of availability of social amenities such as water, sewer or sanitation system, electricity, etc. Beyond this physical check-up of the dwelling conditions, this practice was intended to build a sense of confidence in the community organizers by the would-be beneficiaries so that from that point onward they would be in a position to discuss potential or real family problems which could otherwise lead to difficulties in the repaying of the loan in the future. For this reason the community organizers always insisted that both parents and their children and other dependents be present during the interview.

The data from both the application and the family survey forms were compiled on one form with major headings which were based on the primary selection criteria. The selection of any particular family depended on how high that family scored on the selection criteria and also on the recommendation of the community organizer who interviewed the family at home. The latter was found necessary because often families have a tendency to exaggerate the inadequacy of their living conditions and their ability to repay the loan just to gain acceptance.

Pre-Selection

Because of the difficulty of determining fully those who qualified until applications have been filled, there was a pre-selection stage whereby a first screening of all applications filled out in a day was made. At this stage applicants that failed to fulfill the majority of the selection criteria were discarded forthwith while those who qualified were put on a pre-selection list. All those in the pre-selection stage were due for a family survey described above.

Final Selection

The family survey stage was followed by the final selection and notification. To reach this stage was not easy with the phase-one development; first, the demand was higher than expected; second, the majority of applicants were government employees; third, between that period of selection and the formulation of the project there had been about two salary reviews; and fourth, the number of divorcees, widows, and single or unmarried mothers was much higher than expected. To have a balanced group which would result in a harmonious community under these circumstances was not easy.

Of major difficulty was the determination of the household income. According to the Project Document the income criterion was to be on total household income but in the case of Lesotho this was found to be terribly lacking because of its unreliability. It was soon discovered that because of meagre job opportunities, both man and wife were employed. This rendered household income as a selection quite a weak base since it was often irregular. In addition, Lesotho has one of the most progressive forms of taxation in the world. All these reasons, plus the fact that most families had numerous dependents because of the extended family systems, left the project management with no choice but to use the income of the breadwinner as the major selection criteria. The merits of such a decision may not be fully appreciated by anyone who has not been close enough to the real situation. Assessment of economic conditions in a developing country is complicated because statistical data is inadequate or unreliable. The assessment of real incomes is even complicated in an African setting where the extended family is common. Here you find that even an unmarried young person from school is as burdened as a married one in terms of number of dependents that he is obliged by tradition to maintain. This is exacerbated by rife unemployment that exists in countries like Lesotho.

At the very outset the Project Manager encouraged selection primarily from the private sector, the rationale being that Government employees could resort to Government for assistance in solving their housing problems. This thesis soon proved to be inappropriate for Lesotho. According to a recent report on "Proposed National Housing Policy" by Robert S. DeVoy, Housing Consultant in May 1978 for the Lesotho Government, only 20% of the Government employees live in Government houses while the rest either rent or provide their own housing. In the absence of a formal lending institution in the housing field when the project started, it was therefore not possible to exclude civil servants from the project without meeting widespread public protest. There were also other factors which made it even harder to exclude Government employees; the project being Government sponsored, the civil servants were the first to know of it and rushed in large numbers. Their exposure to mass media compared to the average man in the street also gave them an added advantage.

Of utmost importance was the fear of the average factory employee to get involved in a relatively big and long-term mortgage agreement. This kind of loan agreement is most unusual in Lesotho and as a result many people with relatively low incomes and insured jobs were hesitant about getting into what seems to be a large debt with long-term maturity. This was even further complicated by the interest element which was akin to traditional ways of lending money. To illustrate the points mentioned above the following statistics show the composition of beneficiaries in our Phase I development.

	Households
1. Group earning from R50 to R60 per month	68
2. Group earning from R61 to R70 per month	36
3. Group earning from R71 to R80 per month	37
4. Group earning from R81 to R90 per month	24
5. Group earning from R91 and over	20
	185

Final selection of beneficiaries was made by a selection panel, headed by the Project Manager initially, to give him an opportunity to train the Senior Community Organizer and his staff. As this team got used to their job the Project Manager gradually withdrew. Later when the cooperative committee was sufficiently trained in cooperative principles, by-laws and administration of their society, they were asked to name representatives to the selection panel. These steps were taken to give the committee a say in the selection of their future neighbors. It was also felt necessary to do so, so that LEHCO-OP could share responsibility for selection of beneficiaries.

As indicated above, final selection was made on the basis of data from applications and family survey forms. Selection was granted only to those who appeared to have the greatest need in addition to being in the right income range. Of particular importance was that the prospective beneficiary presently lived under poor conditions which could be hazardous to his or her health and that of his family. Another reason was that he or she had a relatively large family to maintain. Those families who were not successful in the final selection were put on the waiting list. This meant that those on the waiting list were in fact qualified and could be used to fill any vacancies that could occur later in the life of the project if his family was still interested and still at the same income level.

Plot Allocation

Right from the beginning the intention was to be as impartial as possible in the allocation of plots to those selected. While the plots were more or less of the same size, $350m^2$, they differed here and there in terms of location, type of soil and ease with which to work them. It should also be noted that they were substantially smaller than any other civil servant, private or government housing developed prior to that date. To avoid being accused of favoring certain individuals, a lottery system of allocation was used. Plots were assigned numbers and a draw was made, and the condition was that everyone accepted whatever number he or she drew from the lot. The system worked well and there was never a complaint on that account.

Orientation of Beneficiaries

Beneficiaries were trained in separate groups because they were also selected in groups of 60 per group minimum and 70 maximum except at the latter stages of the program when numbers in a group were slightly lower for various reasons. After final selection and plot allocation those selected underwent an orientation and training program. The education program consisted of cooperative principles, by-laws, subscription and occupancy agreements, self-help methods including minimal training in construction. The duration of the education program was right through the stages of construction and was meant to continue into the post-occupancy period because it was felt that for any cooperative society to succeed there must be continuous education.

The education program was to be undertaken jointly with the GOL Cooperative Department staff, who were the only ones that could recommend registration once satisfied that members understood basic cooperative principles and their responsibility to administer the affairs of the society. Unfortunately due to lack of staff, or perhaps of staff trained in cooperative housing, it was not possible to include them in these training sessions until the society was actually registered. This shortcoming perhaps contributed to the problems that later sprang up in the cooperative. Subsequently, when problems surfaced, the Department of Cooperatives staff were as ignorant as the members of the Mohalalitoe Cooperative in many aspects of the project. If they had been included in the training program they could have learned from the project team and be able to mediate in the event of disputes.

Administration of the Cooperative

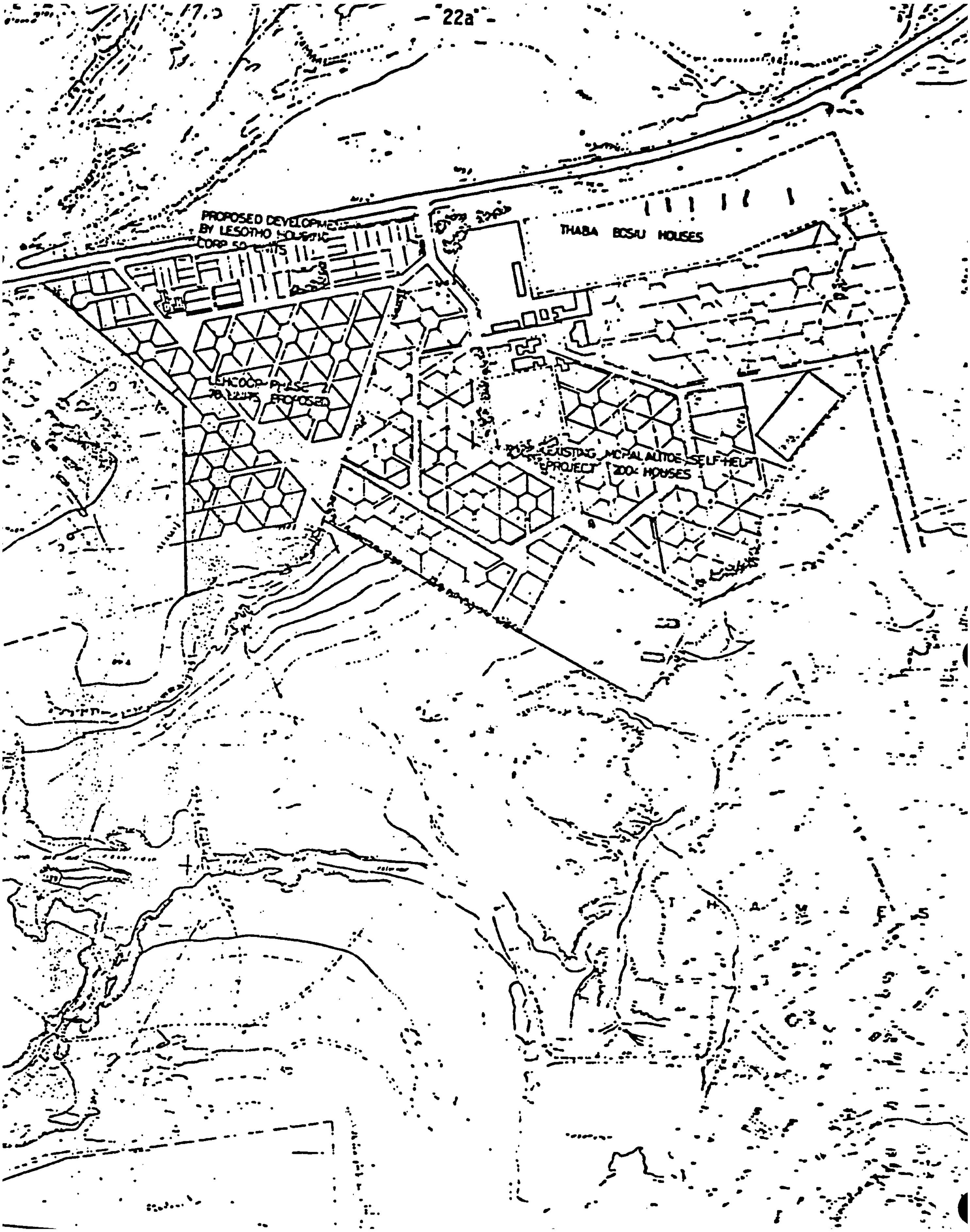
According to the Cooperative Law operating in Lesotho, each society is expected to run its own affairs through elected committees. The Department of Cooperatives is charged with the responsibility of promoting and guiding cooperative societies and also auditing their books at the end of every financial year. Cooperatives like Mohalalitoe which are promoted and developed by private initiatives can only be registered with the blessing of the Department of Cooperatives. According to the by-laws of Mohalalitoe Housing Cooperative, there is only one major committee or Board of Directors whose main responsibility is to administer and run the affairs of the society. Pursuant to the by-laws of the same articles, LEHCO-OP acted as the business secretary and manager for the cooperative. This proviso was included in order to give the lender an opportunity to monitor the use of funds and as a result monitor the repayment of the loan.

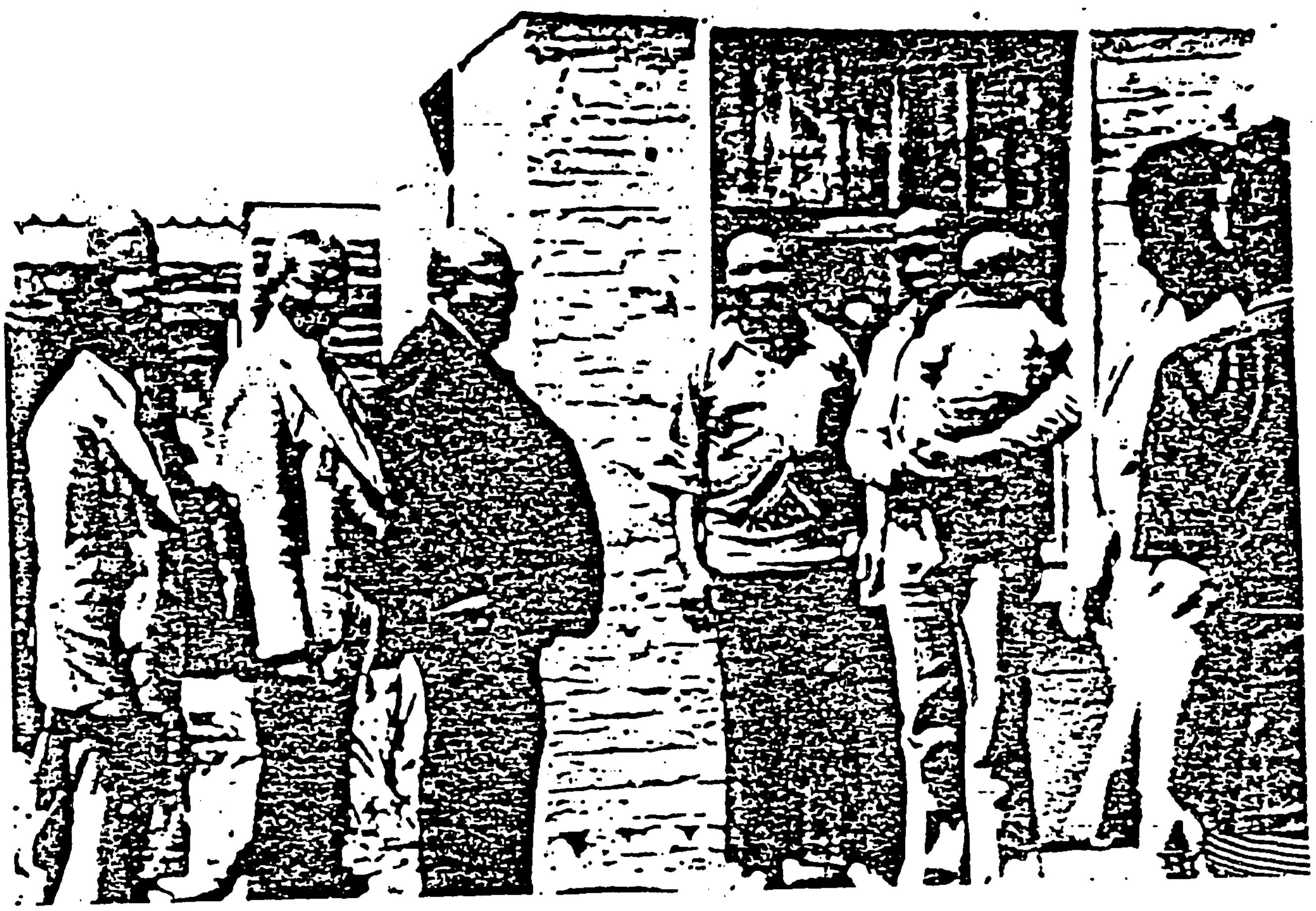
The first committee* of Mohalalitoe was elected on the 29th of August, 1975, which is the official anniversary of the society. The election of the committee was democratic and was held after the members had been taught thoroughly about the procedures and responsibilities of the management committee. The method used was that of appointing a committee which was charged with the responsibility of nominating the best would-be committee members. These were to be people with outstanding leadership qualities. The nominating committee then presented seven names (as by-laws specify) at an annual member meeting as candidates for the Board of Directors. Members were also given an opportunity to nominate additional candidates. Then the names were voted on.

* Board of Directors

The merits of the above system, especially in a situation where people did not know each other well, cannot be questioned. LEHCO-OP developed the project right from its inception and had an advantage of knowing which members could make good leaders given the necessary training. Secondly, this method assisted the members in electing their leaders without any whims or prejudice and in addition it eliminated any hit-and-miss that would otherwise occur if people were elected unguided. Although the present and third committee since Mohalalitoe was founded, was not selected in the same manner as outlined above, it was however informally selected on the same manner as outlined above.

LEHCO-OP undertook the training of all committees elected by the members as it was important for the societies to be able to run their affairs. It was LEHCO-OP's philosophy to educate and gradually hand over to the members of the society the right to run their affairs. Training did not center solely on cooperative principles but also included management principles as well as principles of leadership. Because LEHCO-OP believed that the respective committees should have a say in who becomes a member of the cooperative, three members of the management committee were included in the selection panel for new beneficiaries of the cooperative. This involved training the committee on all selection criteria and the subtle aspects that have to be taken into account before selecting anyone into the cooperative.


THABA BOSIU HOUSES



RESIDENTS OF MOHALALITOE COOPERATIVE WELCOME LESOTHO PRIME MINISTER AND CABINET MEMBERS

L to R: Hon. K. T. J. Rakhetla, Minister of Information and Broadcasting (at time of visit was Minister of Commerce and Industry); Hon. A. S. Mohale, Minister of Education, Sports, Youth and Culture, and Chairman of the Board of LEHCO-OP; The Right Honorable Dr. Lebua Jonathan, Prime Minister of the Kingdom of Lesotho; Vincent Makhele, Program Director, LEHCO-OP; P. Phamoli, Treasurer of Mohalalitoe Housing Cooperative, holding his son; Margaret Mokhoto, Senior Community Organizer, LEHCO-OP; and Eduardo Galindo, LEHCO-OP Advisor.

CHAPTER 9

CONSTRUCTION AND SELF-HELP

When the community and technical sections of LEHCO-OP were satisfied that beneficiaries had been reasonably trained in the workings of a cooperative society, understanding of their responsibilities and basic skills in construction, then construction of the houses started.

The Family and the Cluster System

The organization of construction was on the cluster basis. This means that those forming a cluster were to start construction the same week. Members were always encouraged to work as a team to accelerate progress and maximize self-help providing people with skills in construction in their respective clusters. Initially this worked very well and it was interesting to watch some of the LEHCO-OP staff actually helping members dig and fill their foundations. However, as time went on, this spirit of "do it together" fizzled out and people started to be individualists and hence requiring more dependence on LEHCO-OP skilled labor. Because of the relatively small numbers of such skilled labor, serious problems resulted with families giving less and less self-help every day. Although steps were taken to solve the problem, LEHCO-OP never did fully solve it until we defined very clearly what tasks would be performed by LEHCO-OP labor while the families perform the rest. Although many families did their share of the work, the assessment is that more work could be done to increase the self-help input from families. LEHCO-OP is currently reviewing this policy issue very seriously and it looks like the option is for at least 90 percent self-help starting with the CIDA project. Already steps have been taken to release all the site labor leaving a few skilled teachers and supervisors.

Issue of Materials to Families

The issuing of materials to families was handled by the site clerk who issued waybills itemizing all materials needed by the families. The waybill, among other things, had the name of the family, site number, name of the brigade foreman and signature of both the clerk and that of the family. All the physical issues were handled by the storekeeper and his assistants from LEHCO-OP stores. The Gatekeeper checked all the goods at the gate by counterchecking with the copy of the waybill.

The waybills are later entered on house cost cards for each individual member by a clerk employed specially for this task. The house cost card forms the basis for future analysis of the actual cost of each housing unit. Both the waybill and the house cost cards are attached.

The issuing of materials to families was one of the major problems This necessitated the employment of a separate consultant who produced a store's warehouse or supply depot manual which was to guide the handling of supplies. Prior to this, handling and issuing of materials was hard to control, especially when it came to bulk materials such as sand, crushed stone, bricks, etc. The difficulty with these was that they usually off-loaded straight on site for fear of double handling. Also they were originally off-loaded everywhere on site where there was activity. This type of system resulted in abuse and was difficult to control because families could easily use materials such as sand, crushed stone, bricks, etc., on off-hours. This problem was later solved by actually having a fenced site compound in which all bulk materials were off-loaded.

Loans to Families

According to the Project Document which was written in 1974, loans to the families were to be limited to R1000 ($1200). An analysis of the economic situation as soon as the Project Director arrived in Lesotho in May 1975 showed that for the size of units anticipated to be built, the loan had to be raised to R1300 ($1560) for materials in order to absorb the effects of inflation. So when construction started in January 1976 families were entitled to draw material loans of up to R1300 ($1560). Labor was expected to be not so high because families were expected to put in labor estimated at R250 ($300) per unit. The loan of R1300 ($1560) was to be repaid in 10 years at 9% per annum which is R16.47 per month rounded up to R16.50 ($19.80). This is what families are paying back now. Even with this upward revision it was still not possible to cope with inflation which up to now is estimated at 40% or approximately R2000 ($2400) on the average including labor. This means that both material and labor costs rose higher than budgeted. An upward revision of monthly repayments will have to take place and, in fact, the exercise is well underway. It is expected that the loan will now be repaid in 15 years at 9% per annum. The monthly repayment resulting thereof is R19.20 ($23.04) which will still be relatively affordable to the families.

Apart from the effects of inflation it must be realized that estimating costs for self-help is very difficult. Wastage and misdirection of materials results in more materials being issued to each family than was estimated. Where a contingent of skilled labor is provided, it is hard to control rising costs of labor because they say that it is more difficult to help families build rather than building outright for them. As a result, it has been extremely difficult to draw a line between what was done by families and by our skilled labor. Families did not put up their best knowing that skilled labor was there to build when they did not turn up. It was again costly to keep the labor idle when families did not turn up for self-help. Inevitably, this ended up in increased costs both for material and labor.

Because of these considerations, it has now been decided to cut down skilled labor so that families will be expected to produce almost 100 percent self-help. It is hard to assess whether this will succeed or not because it has not been tried before in Lesotho.

Repayment by Families

As stated above families now in occupancy are expected to pay back R16.50 ($19.80) per month as amortization of a R1300 ($1560) loan for ten years. Families were expected to start repayment of the loan as soon as they moved in. This meant that families started repaying at different periods. The cooperative also started to repay the global loan into the revolving funds as soon as families started repaying. All this was done in order to avoid having families sta in their houses for free until the official repayment of the loan started. This was scheduled for August 1, 1978, which was the time that all the 200 units were expected to be completed.

During the initial stages when LEHCO-OP was in full control of all financial matters repayments by families and the coop were very good. This was because the community organizers spent most of the time educating and guiding families by sending reminders on time. Also, since families often occupied their houses before they were completely finished, LEHCO-OP used to enforce repayments by not issuing materials and service until a member was up-to-date in his or her monthly payments.

The Problem of Delinquencies and Its Solution

But the above picture changed drastically when disagreements between the TSO and Mohalalitoe started to emerge late in 1977. This was when the present committee attempted to take power from the former committee, accusing the former committee of too much allegiance to LEHCO-OP. They first got themselves elected illegally but this was rectified. This was not without cost. A lot of people were confused and felt insecure while others took advantage of the conflict between LEHCO-OP and the coop by not paying anything. As a result, the default rate rocketed. It had always been possible to keep default below the 20 percent mark but as the confusion spread, the default rate jumped to the 70 percent mark within a matter of two months, i.e., between March and April when the committee decided not to pay anything into LEHCO-OP revolving fund.

However, the LEHCO-OP Board of Directors on which the Commissioner of Cooperatives serves, took a firm stand to have the problem solved. Long regular meetings were held between LEHCO-OP and the cooperative committee to try to iron out differences. It took a long time to resolve the problems. At this point it is worth mentioning that the March/April problem was the peak of a year-old problem between the cooperative and LEHCO-OP. It is now gratifying to mention that by the end of September, 1978, all major grievances between the two organizations were resolved. The cooperative has paid all the arrears into the revolving fund and the default rate is declining. A sense of confidence between the committee and LEHCO-OP management is developing very fast and there is stronger cooperation in many aspects of the project.

Education as a Basis for Cooperation

It is indeed true that education takes a long time to get into people's heads but once it has, it stays. This is true of Mohalalitoe. The struggles were nothing but a slow process of education which is now solidly planted in the hearts and minds of all cooperators at Mohalalitoe. After these struggles, they have emerged as mature men and women capable of running their affairs with minimum assistance from LEHCO-OP and the Department of Cooperatives. It is indeed an achievement for the cooperative movement.

CHAPTER 10

THE CONSTRUCTION EXPERIENCE

Lessons from the Construction Experience

The pilot project in Maseru produced some interesting experiences from which we draw several lessons for later use. The major experiences have led to organizational changes in the following fields:

a) allocation of skilled labor;
b) allocation of materials;
c) house design;
d) pre-construction education.

The remainder of this section deals with how these changes were made.

a) Changes in Skilled Labor Allocation

The first group of families went through the procedure which was adopted as standard. On site they became part of a brigade of other families who were led by the brigade foreman. Each brigade consisted of this group of families, their self-help input, and the skilled worker assisting them to do the more difficult jobs. Skilled labor only helped families if they were present, which was mostly over weekends, with a few present during the week. Families simply asked the brigade foreman for skilled labor assistance. Labor used was recorded.

On the surface this all seems quite straight forward, but there were problems hidden beneath the simplicity. These began to show themselves especially when LEHCO-OP had gotten over the hectic start and had time to stand back to see what had happened.

The first observation had to do with the efficiency of our skilled labor. They were tremendously busy over weekends and harassed by families all wanting assistance at the same time. They did not have much to do during the week when there was an understandably poor attendance from working families. The conclusion was to work on the corners of the brickwork, or do other difficult jobs during the week in the families' absence, and get the families to fill in between corners during the weekend. They had to sign the record sheet to agree that the work had been done.

The problem should have been obvious but wasn't fully appreciated until sometime later. As soon as families saw their house progressing without their effort, they relaxed. The initiative now was no longer with them, but with the skilled labor. The result was a general fall off in self-help input. One can imagine that if the family did not see their house progress they now could blame the skilled labor and not themselves. Lack of progress did not drive them to put in more intensive self-help efforts but to push skilled labor to work more on their houses.

This led to the first major change: a re-organization of the allocation of skilled labor with a view to increasing the self-help input. Clearly what had to be done was to transfer the initiative for progress back to the families.

Somehow they had to take the decision that their own work was the way to progress; but LEHCO-OP still had to use its skilled labor efficiently. The system developed was using coupons.. As a family pays their deposit they get coupons to that value. As the total deposit is R250, this is the total value of the coupons that they may obtain. This gives them something like a check, or travellers check, which they can exchange for skilled labor jobs on their house. Coupons are limited, and are kept by the family. This system transfers the conflict of value for money and the initiative for progress of construction back to the families.

b) Changes in the Allocation of Material

Giving the members the opportunity to push LEHCO-OP skilled labor to get their house built faster, naturally gave them the opportunity of exercising certain power in conflict with LEHCO-OP. It took time to deal with the skilled labor allocation problem in the way that has been described. In the meantime, it caused polarization of members versus LEHCO-OP and a "we-they" situation resulted. The very basic conflict was the members on the one hand wanting to obtain the house of their dreams as soon as possible, and LEHCO-OP on the other hand trying to restrict expenditures to within the budget.

Families began to want more materials, and material of what we might call "dream value. For instance, families wanted more doors, bigger windows, special roofin patterns and so on. The conflict situation arose out of this because of two factors. One was the fact that the members had been given a choice of designs and they were led to believe that there would be choices of materials because it was believed important for people to decide for themselves. The other was the fact that when offering a choice of materials LEHCO-OP had been unable to control material supply effectively or to keep individual records efficiently. The system worked for the choice but not for the cost records. Consequently the member was not presented with the house cost statement that would have contr his choice by making him conscious of the limit of his budget. The member was given the power to choose freely but not the responsibility for choosing within the budget. The system would have worked well if the family had been made to struggle with their budget limitation.

This pointed the way to a stricter solution wherein the materials for the basic house form a quota. The amounts of material are accurately specified and are delivered in carefully counted batches. This is a firm-handed solution and yet one which provides certain choices of finishes, color, etc. as well as the choice of where to place windows, doors, etc. For those who can afford the "more," "bigger" or "better" materials they can pay the difference between what they want and the standard item.

c) Changes in House Designs

Through the skilled labor allocation experience and the material allocation experience LEHCO-OP began to know what real needs of the members could be satisfied. Of course they needed a house and that was being provided. But within these there were other needs. They wanted early occupancy; they wanted a smooth supply of material and they wanted a simple building system. Sympathy with their problems led to a reevaluation of the house designs that had been initially used in terms of both the members' and LEHCO-OP's needs. The six house types had some faults. These were mainly an inefficie.

wall-to-area ratio, a roofing system that could be improved, and a problem that no room could be used to store material during the construction process. Construction was slow because of these failings.

The revision of the design was made by the architect and tested on the future occupants. (Remember in the first deisgns the ideas came from the members.) They all approved. It had a number of advantages by incorporating both less construction problems than the first types, and a solution to the members' needs. Its main advantages were: the switch to blocks from bricks which speeded up construction considerably; a modular self-pinning roof system that was quickly erected; the option to build the "shell" first and move in; and a phased construction process whereby the bathroom was built first and used as a storeplace for materials.

The choice of design was also incorporated. Once the family built the outside walls and had the roof on, then they decided what internal partitions arrangement they needed. The options were two, three, or four rooms in various arrangements. One organizational change which increased construction progress was that a family was encouraged to take leave during the stage of external wall and roof construction. Construction time from start to occupancy was reduced to a possible 9 to 12 weeks.

d) Changes in Pre-construction Education

The last reflection that will be dealt with in this report is something which stems from all three experiences just described: Allocation of skilled labor; allocation of materials; and speed of construction related to house design. All three problems pointed to gaps in the pre-construction education. Families did not fully understand the building process. They didn't understand fully that there was a limit to the budget. So LEHCO-OP had to revise the lecturer-type education system (where they had been told about these things), and get the ideas across in a more effective way before the families started building.

What LEHCO-OP did was to go through the whole construction process beforehand, using game form. Families obtained loans of paper money which they used to buy materials from the storehouses and pay for skilled labor help while they build a house out of Logo blocks. The exercise proved to be most valuable.

We realized that the technical aspects of organizing a self-help project are not only technical. They are interwoven with community dynamics and personal psychology. The results produced are also not only technical assistance in helping the families to suffer through sweat and work, to get past their oppressive housing problem but also build personal and family fulfillment, the basis of community.

Pictured here is one of the Mohalalitoe co-op members putti the finishing touches on an exterior wall of his co-op uni

Above is another member of the co-op working on her unit. Self-help takes place in late afternoons and on weekends.

This co-op member is shown learning new skills. Many members are women heads-of-households whose husbands are working as contract labor in the mines in the Republic of South Africa.

CHAPTER 11

RELATIONS WITH THE GOVERNMENT OF LESOTHO

The Government of Lesotho initiated the low-cost housing project and elements of the Government working with the people followed the project through to its completion and to the extension of the project into other programs.

Departments Involved in Pilot Project

The full and complete cooperation of the Government of Lesotho is illustrat by the fact that various high level officials of the Government serve on the Board of Directors of LEHCO-OP; and the Minister of Education, the Honorable A. S. Mohale, serves as Chairman.

The King of Lesotho dedicated the first six prototype houses completed in the project in 1976. The Prime Minister and his Cabinet made a formal visit to the project when it was nearing completion in 1978. Among the Government agencies which worked with the ICHDA resident specialist and LEHCO-OP were the Lesotho National Development Corporation, the Lesotho National Bank, the Ministry of Commerce and Industry, the Ministry of Financ and the Ministry of Agriculture, Cooperatives and Marketing. All of these have played vital roles in the achieving of the success of the venture.

The Ministry of the Interior, which was also involved in the development of the project, has now established a Housing Section whose responsibilities ar to coordinate the various shelter and development aspects for the government.

Assistance at the Highest Level

The Prime Minister met with the President of ICHDA during his visit to Lesotho in May of 1978. During these conversations the Prime Minister declared that he was proud of the cooperative housing project and that the people developing the program could count on his complete support in carrying it through to the point of completion.

Evaluation of Support and Cooperation

One of the few disappointments was the lack of cooperation with the Registrar of Cooperatives, later renamed the Cooperative Development Commission, during the early days of the project. This lack of cooperation stemmed from the fact that the major work of the Ministry was in the field of agriculture. The specialists in cooperatives were specialists in agricultural cooperatives with no previous experience in cooperative housing. As a result the develop- ment of full and complete cooperation in the Mohalalitoe had to grow as the cooperative grew. Training programs were slow in starting and there may have been a temptation to undertake more familiar tasks, particularly when they seemed to have more immediate results.

By the time the project was completed the Commission on Cooperative Develop- ment was playing an active role and may be equipped to undertake the housing cooperative role along with its knowledge and experience in the agricultural cooperative field.

CHAPTER 12

ACTIVITIES OUTSIDE THE PROJECT

In the project document the TSO Project Director's terms of reference called for extensive work in housing above and beyond the pilot low-cost housing project.

Activities Growing out of the Pilot Project

The Project Director followed his terms of reference as they were spelled out. Probably the major achievement besides the setting up of a permanent organization was (a) pushing for formation of a national housing policy, and (b) creating an institution for building materials production. The ICHDA Project Director has also been engaged in other areas, e.g., (c) coordinating and preparing a master plan for the second industrial town, Maputsoe, completed in May 1978; (d) full participation including a "paper" in the 1977 seminar on low-cost housing sponsored by the UN Economic Commission for Africa and by ICHDA; (e) preparation of the proposal for USAID/FCH for funding of Production Systems; (f) collaboration with the USAID team in the shelter sector analysis in 1976. The Project Director also assisted in (g) obtaining funding of R500,000 ($600,000) for the Lesotho Building Finance Corporation; and (h) putting together with Government a proposal to the World Bank for site-and-services project of R4.5 million ($5,400,000).

Continuing Services of the TSO

LEHCO-OP has also emerged as an organization capable of providing services in the field of planning and architecture not only to LEHCO-OP projects but to the public as a whole. As of the date of this report it is busy doing jobs for CARE, World University Services, etc.

Other activities at the moment are the coordinating role to prepare a joint program for housing and employment generation in the rural areas with CARE and LCCUL (Lesotho Cooperative Credit Union League); also assisting in preparing a plan the CARE/GOL joinery shop for manufacture of school desks formerly manufactured in South Africa.

CHAPTER 13

PROBLEMS AND LESSONS FOR FUTURE PROJECTS

In this summary report it is useful to take a look at the problems as well as the accomplishments and see what was done to correct some of the problems and to project the lessons that can be learned from the problems that were encountered in Lesotho.

The World Problem of Inflation and Its Effect on the Pilot Project

At this writing, inflation is such a common problem world-wide that it might be brushed off as commonplace, but its impact was such tha many families who would otherwise be living in their own homes in Maseru are without housing.

The original grant was so structured that 210 homes were to have been completed in the first section of the Mohalalitoe Cooperative and an additional 70 homes lower in cost, were to be produced in a second section. Inflation was a principal factor in holding down production to 190 homes instead of the planned 280.

Inflation, of course, was not the only factor. The people who build their own homes almost automatically escalate the level of those homes making everythir a little better than was intended because they are confident they can carry the costs. In the developing world it seems to be a fact of life that the lower cost homes wind up being a little more costly than planned.

With inflation rampant and worldwide, very little can be done by a group of people in a land so far off from the basic causes of inflation; but undoubtedly there could be tighter controls holding down the level of the housing if this were made a high priority.

Lack of a National Housing Policy

Some of the difficulties encountered in Lesotho grew out of the fact that there was no strong counterpart housing agency in the national government. Several of the ministries were concerned about housing but no determination had been made at the highest level as to the point or points of chi responsibility.

During the time that the ICHDA pilot project was underway AID sent a specialist to draft a proposed national housing policy. (er outside agencies have assisted and a policy determination within the goven nt has moved low-c housing to a high priority and outside agencies have been brought in to assist with financing of an extensive housing program in this field.

Problems with the System of Land Tenure

Under the constitution of the independent state of Lesotho the land is owned by the state. Use of land in the early days was passed out fairly easily with a result that more plots of land for housing were much larger than might have been necessary had there been a land-use plan withi national housing policy. Fortunately, the government held land which was almost ideal for the pilot cooperative housing project. However, a great deal needs to be done in the land-use field. If there is to be adequate land for the homes needed in the urban areas; and if effective use of land for agriculture and industry is to be possible in accessible sections of Lesotho a firm policy and effective implementation is necessary.

Reaching the Lowest Income Families
One of the top priorities within the United Nations and within the national assistance agencies is the priority for serving the lowest income families in the poorest nations of the world. The pilot project in Lesotho was aimed at reaching low income families, but because it was designed as a self-supporting project the families selected had to be capable of making repayment on the mortgage funds loaned to them for their housing construction. This automatically eliminated the lowest of the low income families who are without a continuing source of income to make payments no matter how small. Many families who would otherwise be eligible felt that their source of income was so undependable that they could not make a long-term mortgage commitment.

Under a "minimum shelter plan" or a "sites and services plan" it is possible to start a project for very low income families whose only resource may be the manpower to build a simple shelter and over the years to maintain and improve their dwelling. This may have to replace the aided self-help approach used effectively in Lesotho if the "poorest of the poor" are to be served.

Cooperative Education
No matter how effective is the planning and construction of the homes in a pilot cooperative project, this still can be an ineffective project if people do not have a thorough and continuing education in their opportunities and responsibilities as members of the cooperative. Not only does the spirit of the cooperative sag, but opportunities are lost for the many correlary projects that can be undertaken if the cooperative is effective. These include small income-producing enterprises, community facilities for better recreation and health, handicraft projects, and individual or group gardens and other enterprises.

Fortunately, LEHCO-OP and the government representatives on the Board of Directors stimulated and undertook extensive education programs. So Mohalalitoe is quite well-established and can be expected to grow in importance and influence in the community.

Financial Control in Management
Almost from the beginning the ICHDA advisor and his counterpart called for assistance in the field of financial controls. The ICHDA representative was an architect who realized his lack of expertise in financial controls. But the hiring of specialized financial management had not been authorized in the basic grant. Arrangements were made part-way through the program to squeeze out funds for short-term financial assistance, but this fell through for personal reasons with the expert then currently available. A short-term consultant who did assist to some extent in this field was a specialist in management and community development. Finally the advisor sent by FCH through an AID grant to assist with the development of Production Systems brought some financial expertise to the situation.

Legal Form of a Corporation

One of the problems of LEHCO-OP was created when the organization was established and the form of ownership of the project was not thought to be a problem of overriding importance.

LEHCO-OP, as the technical service organization, was planned as a parastatal organization under state ownership and control, but with freedom of operation and eventual cooperative participation in ownership which could give it the combined strength and freedom needed for a continuing program of technical assistance. When the legal work was done it was deemed essential for speed of operation to turn the two shares of ownership over to a representative of a government agency and to the housing advisor provided by ICHDA as initial project manager.

Two years after incorporation the question was raised as to the suitability of this arrangement and after lengthy discussions the shares were turned over to the minister and the permanent secretary of Ministry of Commerce and Industry.

The rumors that the organization was privately owned and was organized for the benefit of two individuals was quite destructive to the reputation of the organization. It is clear, with 20/20 hindsight, that a little more time addressed to the legal organization structure would have saved time and eliminated problems in the long run.

The Use of Housing Funds for Building Materials Production

Earlier in this report much has been said about Production Systems, Ltd., whi was set up by LEHCO-OP to produce building materials for use in housing construction for the Mohalalitoe Cooperative. The experience of housing cooperatives in both the developed and newly developing countries has indicated the importance of building materials production with continuing assurance of adequate supplies under the control of the cooperative.

Such production systems not only are a factor in lowering the cost of materials but they also assure their ready availability.
They also produce jobs.

In Lesotho the problem was lack of advance consultation with UNCDF in New York ar this created strained relations and exacerbated problems of cash flow. Regardless of the overall success of the project, the matter could have been handled more effectively with better communications. However, the results seem to warrant the initiative that was taken.

It is hoped that the problems encountered in Lesotho and the steps taken to overcome them may be useful in other projects and in other countries as steps are taken to encourage further development of cooperative, self-help, low-cost housing construction.

SHELTER SECTOR WORKSHOP: WEEK #4 LOGISTIC NOTES
November 26-30, 1979

Day and Date	Time	Code	Program Event	Person Responsible	Location	Notes
Monday Nov 26	9-12		WORKSHOP IV	Alfred Van Huyck	George Washington University 800 21st Street, N.W. Marvan Center, Room 413 & 414	Thailand, Jamaica, Barbados, Ghana
	2-5	53.TW/SE	Team Exercise	David Oakley	Team 1, Rm 413 Team 2, Rm 414 Team 3, Rm 401 Team 4, Rm 407 Team 5, Rm 409 Team 6, Rm 418	George Washington University Marvan Center 800 21st Street, N.W.
	7:30		Film Night	Alfred Van Huyck	Park Central Hotel Room 1101	Jamaica, Barbados
Tuesday Nov 27	9-10:30	54.I	Scheduling and Construction Management	Charles Dean	Marvan Center, Room 413 & 414	
	10:30-12:00	56.I	Community Participation in the Management of Low-Income Projects	Theodore Priftis	Marvan Center, Room 413 & 414	
	12-2		Lunch with Congressional Leaders		Marvan Center, Room 405	
	2-3		Meeting with AID Officials		Marvan Center, Room 405	
	3-5	55.TW/SE	Team Exercise	David Oakley	SAME TEAM ASSIGNMENTS OF ROOMS AS SHOWN ON MONDAY	
	5:30-7:30		FCH Reception	Charles Dean	Foundation for Cooperative Housing 2101 L Street, N.W. Suite 409	Out of Marvan Center to the left, up 21st Street. FCH is on 21st Street, just past L Street, on the left side of 21st Street.
Wednesday Nov 28	9-11	52.I	Project Performance Tracking Network	Edward Robbins	Marvan Center, Room 413 & 414	
	11-1		Country Presentations	Alfred Van Huyck	Marvan Center, Room 413 & 414	Somalia, Indonesia
	3-5	57.TW/SE	Team Exercise	David Oakley	SAME TEAM ASSIGNMENTS OF ROOMS AS SHOWN ON MONDAY	
	6:30-9:00		Year 2000 Dinner	Roy Mason	George Washington University Club, Marvan Center	Main Dining Room Third Floor
Thursday Nov 29	9-12	59.TW/SE	Team Exercise Presentations	Dorn McGrath	Marvan Center, Room 413 & 414	
	3-5	60.TW/SE	Team Exercise Evaluations	Dorn McGrath	Marvan Center, Room 413 & 414	
Friday Nov 30	9-10:30	61.S	Workshop Evaluation by Participants	Participants	Park Central Hotel Room 1104	
	10:30-12:00	62.S	Report to Faculty of Workshop Evaluation	Participants	Park Central Hotel Room 1104	
	12-3	63.S	Closing Luncheon Address	Peter Kimm	International Club 800 K Street, N.W.	Room to be announced. Ambassador of Kenya to speak.
	3--		DEPARTURES			

Office of Housing
Agency for International Development

SHELTER TRAINING WORKSHOP

November 5-30, 1979

PROJECT PERFORMANCE TRACKING NETWORK

Wednesday, November 28, 1979

9:00-11:00 a.m.   Code 52.I

Presented by:

Edward H. Robbins

SHELTER
TRAINING
WORKSHOP

November 5-30, 1979

PROJECT
EVALUATION AND MONITORING

A. POLICY FRAMEWORK

It is a central purpose of this workshop to consider ways to affect government policy so that new institutions are created or existing ones adapted to mobilize and apply resources in increasing proportions to the shelter problems of low-income people. Around this fundamental purpose programs will be designed. To be able to determine, quantitatively, the progress made toward full or partial achievement of an institution's (or government's) objectives and policy goals, these programs must regularly be monitored and evaluated.

Monitoring and evaluation are important tools for effective management of shelter delivery programs. Beyond their beneficial effects on management effectiveness, monitoring and evaluation also serve to generate an organized body of information upon which improvements in the design and implementation of future programs can be based.

B. UTILITY IN HOUSING PROGRAMS

The processes suggested here form the nucleus of a standardized evaluation system for housing or shelter programs. When applied, these tools will provide for an orderly system of recording information that is critical to

- appropriate and rational program design;
- efficient and economical program implementation; and
- generation of quantitative data against which to measure project success.

Specifically, monitoring will provide an almost continuous flow of information about the financial and physical progress of the project; evaluation will provide periodic information on progress toward the achievement of goals or objectives. Both can help identify the need for adjustments in technology or approach on a timely basis, before serious problems develop.

When adapted and made operational, evaluation and monitoring techniques can further ensure the development within an institution of the capacity to replicate effective shelter schemes for low-income populations.

C. RESPONSIBILITY FOR MONITORING AND EVALUATION

The responsibility for an effective monitoring and evaluation program lies as much with senior management as does contract negotiation, major purchasing decisions, and personnel selection. If the monitoring and evaluating tasks are left as lower priorities, they are forgotten, or considered bothersome; as a result project implementation proceeds on an "ad hoc" basis with scheduling changes and financial adjustments compounding in such a way as to make recovery of control very difficult.

D. MONITORING AND EVALUATION ELEMENTS OF THE PROJECT DEVELOPMENT PHASE

Monitoring and regular evaluation begin in the formative stages of a project. Each step establishes with increasing specificity:

- the goals and objectives that are sought in the project;
- the benchmarks (expressed quantitatively) against which progress toward achievement of goals and objectives is to be monitored and evaluated;
- the time during which these functions are to be performed; and
- the required completion dates.

The documents to be prepared in the project development phase are outlined below, with reference given to those points critical to evaluation and monitoring.

1. Logical Framework

The Logical Framework is a technique employed in the development of AID projects. In a general form, it is a technique which can be easily adapted to all manner of project design and can become, from the point of view of program design, monitoring, and evaluation, one of the two most important tools available to agency managers. A "Logframe" may set forth the overall Goal or Goals and objectives of a project, the Outputs of the project, and the Inputs required to achieve those Outputs. Arrayed against each of these categories of information are the quantitative dimensions of Inputs and the quantitative targets which the project seeks to achieve. Arrayed against each of these dimensions of the project are their means of verification. Finally, the Logical Framework attempts to identify those events beyond the control of management which must occur to assure the success of the project. These are called assumptions.

The relationship of the quantitative expression of the End-of-Project Status Indicators to the project's objectives forms the base for project design and project management (monitoring) as well as project evaluation. For project evaluation, the quantification of these indicators provides an unambiguous and noncontroversial standard against which to measure the success of a project. Moreover, a clear statement (or publication) of these indicators makes them the fully sanctioned standard against which the project is to be evaluated.

The End-of-Project Status Indicators are, moreover critically important to the development of a Project Performance Tracking Network (PPTN).

The sample "Logframes" which have been developed draw on the experience of the Office of Housing. As mentioned earlier, Office of Housing projects are drawn up to deal with problems of a national scale and therefore have a broad scope. The process of considering a project not only in terms of the specific acts of building and financing shelter solutions, but also in terms of the project's impact on institutions and the potential for generation of processes which may be applied over and over again, is appropriate for projects of a more narrow scope as well. The "Logframe" and the PPTN, when supported by regular evaluation, will permit the design of more comprehensive projects whose impact goes deeper than the one-shot effort of constructing and selling units on a certain site.

It is hoped that the examples drawn up for this presentation will be studied in this context.

In broad terms, the objective of every AID shelter program is to improve the efficiency and effectiveness of the shelter delivery system in providing decent shelter for lower-income families. More specifically, AID shelter programs are designed to streghthen institutions and to demonstrate techniques of delivery which can ultimately be replicated by the host country institutions without continued reliance on development assistance. The sample Logical Frameworks of hypothetical projects attempt to reflect these considerations in program design.

In each of these examples, it should be noted that attention has been given to developing or expanding the shelter sector institutions that would be primarily responsible for replicating the particular type of shelter solution being demonstrated by the project. Moreover, the project objectives and the End-of-Project Status Indicators are structured to reflect the extent to which host country institutions have incorporated the concepts and techniques developed for the project into their regular operations.

Most of the Outputs and End-of-Project Status Indicators are given time dimensions to indicate the time when the targets are expected to be achieved. These time dimensions must coincide with those contained in the PPTN.

Virtually all of the Objectively Verifiable Indicators (column 2 of the Logical Framework) are expressed in quantitative dimensions in order to facilitate:

- The assessment of the adequacy of Inputs.
- The determination of project feasibility.
- The conduct of monitoring and evaluation.

The particular quantities expressed in the sample Logical Frameworks must <u>not</u> be taken as standards; these quantities are hypothetical and illustrative. First and foremost, they illustrate that with few exceptions all of the Objectively Verifiable Indicators of project performance can be expressed quantitatively.

The three sample Logical Frameworks are designed to depict the principal types of shelter programs sponsored by the Office of Housing. Example 1 is applicable to projects employing either core units or serviced sites as the physical solution to be demonstrated and employs a National Housing Authority (NHA) and a National Housing Bank (NHB) as generic institutions; other types of institutions, such as credit unions or cooperatives, might well perform the role of shelter development and shelter finance.

Similarly, in Example 2, which is a prototype for upgrading projects, the Sewer and Water Authority (SWA) is the generic name for the agency responsible for the installation, maintenance, and collection of user charges for the sewer and water system. Applied to a particular project, the SWA could be the Ministry of Public Works, public utility companies, or several municipal authorities.

Example 3 depicts the type of Logical Framework which might be prepared for a country almost totally lacking in shelter-related institutional infrastructure. The hypothetical project addresses the need to prepare and adopt a national housing policy and to establish the principal operating agencies responsible for shelter delivery.

The sample "Logframes" are least detailed in specifying the Means of Verification. Nevertheless, the project managers must determine at the program design stage whether or not the information required to verify the achievement of Outputs, Objectives, and Goals is regularly collected and readily available. If such information is not available, the project management must make provisions for its collection and be prepared to monitor the cognizant institutions to assure that the the information is, in fact, being collected. Alternatively, the management must restate the performance indicator in terms of data which are available and which would reflect essentially the same level or quality of performance.

Particular attention should be given to the Assumptions column. For purposes of monitoring and evaluation, the failure of Assumptions to be realized is likely to be the principal reason for a project's failure to achieve its stated objectives. Comprehensive and explicit statement in the "Logframe" of all the project's Assumptions strengthens program design by identifying for management those actions to which they must be sensitive in determining the adequacy of Inputs and in estimating the time required to go forward with interdependent phases of the project. Moreover,

Example 1

LOGICAL FRAMEWORK

PROJECT TITLE AND NUMBER: ______________

TOTAL U.S. FUNDING: ______________

TYPE OF PROJECT: Core Housing, Serviced Sites; Institutional Development

DATE PREPARED: ______________

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
GOAL:	MEASURES OF GOAL ACHIEVEMENT:		
Increase the availability of safe, sanitary shelter affordable by low-income families.	Production of low-income shelter units reaches 30% of total shelter unit production by 1988.	Records of Ministry of Housing and Ministry of Planning.	National Housing Policy accords necessary priority to low-income shelter.
PROJECT PURPOSES:	END-OF-PROJECT STATUS INDICATORS:		
1. Expand the production of low-income shelter.	1. 15,000 units per year of low-income shelter, including serviced sites, produced by 1985.	1. Records of the Ministry of Housing and Ministry of Planning.	1a. Demonstration project is successful and persuasive to host country government. b. Adequate land, labor, and capital available. c. Sufficient effective demand exists.
2. Increase the flow of financing for low-income shelter.	2a. 25% of the mortgage portfolio of the NHB devoted to low-income shelter financing by 1985.	2a. Records of NHB.	2a. (1) Delinquency rates and administrative costs on low-income loans comparable to those on middle-income loans. (2) Sufficient qualified loan demand exists. (3) Appropriate number of low-income units produced and available for financing.
	b. Savings base of NHB expanded to 100,000 accounts by 1985.	b. Records of NHB.	b. (1) Real economic growth continues in the range of 5-6% per year. (2) NHB savings mobilization program continues.
3. Reduce direct subsidization of low-income shelter.	3. Direct subsidization of low-income shelter reduced to 5% of unit cost by 1985.	3. Records of Ministry of Housing, Ministry of Planning, and Ministry of Finance.	3. National Housing Policy revised to employ minimum subsidy approach to low-income shelter.

EXAMPLE 1 (continued)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
OUTPUTS:	**MAGNITUDE OF OUTPUTS:**		
1. Low-income shelter demonstration projects.	1a. 10,000 low-income shelter solutions completed and occupied by 1982.	1a. AID and NHA records.	1a. (1) Suitable land acquired by NHA. (2) Local contractors complete work in accordance with specifications and advertised prices. (3) Sufficient effective demand exists among the low-income population.
	b. 10,000 home mortgages granted by NHB by 1982.	b. AID and NHB records.	b. (1) NHB has adequate administrative capacity to originate and service loans. (2) Sufficient loan demand exists among qualified low-income families.
2. Expanded branch network for NHB.	2a. 10 new branches of NHB established by 1981.	2a. NHB records.	2a. (1) Suitable branch locations identified and acquired. (2) Sufficient equipment and staff available to operate branches. (3) NHB commits resources to branch expansion.
	b. 20 NHB staff members successfully complete training program by 1980.	b. AID records.	
3. Expanded planning and production capability for NHA.	3. 20 NHA staff members successfully complete training program by 1980.	3. AID records.	
INPUTS:	**IMPLEMENTATION TARGET:**		
1. HG Program loan.	1. US$15 million HG loan: US$14.9 million for shelter; US$100,000 for technical assistance.	1. AID records.	1a. HG loan authorized by Regional Bureau. b. Host country signs loan agreement with U.S. lender by end of FY 79.
2. DG for training.	2. US$500,000 DG.	2. AID records.	2. DG resources available and are committed to project by end of FY 79.
3. Host country capital.	3. US$5 million host country capital.	3. Records of Ministry of Finance, NHA, and NHB.	3. Host country resources available and are committed to project by end of FY 79.
4. Technical assistance.	4a. 90 man-days shelter planning and production specialist. b. 90 man-days shelter finance specialist.	4. AID records.	4. Technicians available.
5. Training.	5a. 60-day program in low-income shelter planning and production. b. 60-day program in management of low-income shelter financing.	5. AID records.	5. Qualified candidates and instructors available.

Example 2

LOGICAL FRAMEWORK

PROJECT TITLE AND NUMBER: ______________________________ TOTAL U.S. FUNDING: ____________________

TYPE OF PROJECT: Urban Upgrading; Institutional Development DATE PREPARED: ____________________

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
GOAL:	MEASURES OF GOAL ACHIEVEMENT:		
Improve living conditions in existing low-income settlements.	1. Potable water, sanitary sewerage, and drainage available to 75% of low-income urban population by 1988.	1. Records of Ministry of Public Works.	National Housing Policy remains in effect and continues to be conscientiously implemented, giving priority to upgrading solutions.
	2. 75% of low-income dwellings constructed of durable materials.	2. Records of Ministry of Housing.	
PURPOSES:	END-OF-PROJECT STATUS INDICATORS:		
1. Expand availability of potable water, sanitary sewerage, and drainage among low-income urban population.	1. Potable water, sanitary sewerage, and drainage available to 50% of low-income urban population by 1985.	1. Records of Ministry Public Works and Ministry of Health.	1a. SWA upgrading program obtains necessary financial support. b. Mechanism established to assure acquisition of rights of way on a routine basis.
2. Expand and improve administrative capacity and financial viability of SWA.	2a. SWA user charge delinquency reduced to 5% of monthly billings by 1985. b. SWA generates net cash flow of US$5 million per year by 1985.	2. Records of SWA.	2a. SWA collection procedures diligently enforced. b. SWA fee structure remains consistent with objective of financial viability.
3. Improve access to existing settlements.	3. 50% of existing low-income settlements accessible to garbage collection and emergency equipment by 1985.	3. Records of municipality.	3a. Municipality acquires and installs necessary equipment. b. Municipality provides necessary staff to assure frequent, regular collection. c. Emergency equipment (fire, rescue, police) obtained and staffed by host country.

EXAMPLE 2 (continued)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
PURPOSES (cont.):	END-OF-PROJECT STATUS INDICATORS (cont.):		
4. Improve the durability of existing low-income shelter.	4a. 50% of existing low-income shelter constructed of durable materials by 1985.	4a. Records of Ministry of Housing.	4a. (1) Self-help community groups and small contractors become and remain effective. (2) Adequate supply of building materials available at costs affordable by low-income families.
	b. 10,000 home improvement loans granted by NHB per year by 1985.	b. Records of NHB.	b. (1) Sufficient qualified loan demand exists. (2) NHB has sufficient financial resources.
5. Expand NHB financial resources and improve access of low-income families to home improvement loans.	5a. 10,000 new savings accounts opened by NHB in low-income settlements by 1985.	5. Records of NHB.	5a. (1) NHB expands branch network and continues savings mobilization campaign. (2) Real economic growth continues in the range of 4-5% per year.
	b. 5,000 home improvement loans made by NHB to low-income families per year by 1985.		b. (1) Sufficient qualified low-income loan demand exists. (2) Delinquency rates and administrative costs of low-income home improvement loans below levels which would induce losses.
6. Improve efficiency of land transfer and title registration procedures applied to low-income families.	6a. 10,000 land transfers per year effected by land authority by 1985.	6. Records of land authority.	6a. Legal mechanisms for land transfer streamlined.
	b. Average processing time of land transfer and title registration reduced to 3 months by 1985.		b. Land authority formulates and implements a reorganization plan.

EXAMPLE 2 (continued)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
OUTPUTS:	MAGNITUDE OF OUTPUTS:		
1a. Potable water and sanitary sewer connections.	1a. 5,000 potable water and sanitary sewer connections in target areas by 1981.	1a. AID and SWA records.	1a. (1) Rights of way are obtained by SWA. (2) Local contractors complete work on schedule according to specifications and advertised prices.
b. Storm water drainage.	b. 50,000 feet of storm sewers and drainage canals installed in target areas by 1981.	b. AID and SWA records.	b. (1) Rights of way are obtained by SWA. (2) Local contractors complete work on schedule according to specifications and advertised prices.
2. Improvements in SWA administrative capacity.	2a. SWA user charge delinquency reduced to 10% of monthly billings by 1981.	2a. SWA records.	2a. (1) SWA reorganizes collections department. (2) Courts enforce SWA authority to discontinue service because of non-payment.
	b. SWA operating deficits eliminated by 1981.	b. SWA records.	b. (1) SWA prepares and implements reorganization plan. (2) SWA fee structure revised to provide for full lost recovery.
3. Improved access to target area settlements.	3a. 50,000 feet of paved walkways (5 feet wide) installed by 1981 in target areas.	3a. AID and SWA records.	3a. (1) Rights of way are obtained. (2) Community groups organized to carry out self-help operations. (3) Paving materials and equipment made available to community groups.
	b. 200 garbage collection facilities installed in target areas by 1981.	b. AID and SWA records.	b. Host country purchases necessary equipment and provides staffing for regular collection.
4. Home improvements.	4a. 5,000 low-income units in target areas improved with permanent materials by 1981.	4a. AID records.	4a. (1) Community groups organized to carry out self-help operations. (2) Competent small contracting firms available. (3) Sufficient effective demand exists for home improvement among low-income population in target areas.
	b. 5,000 home improvement loans granted to low-income families in target areas by NHB by 1981.	b. NHB records.	b. Sufficient qualified loan demand exists.

EXAMPLE 2 (continued)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
OUTPUTS (cont.):	**MAGNITUDE OF OUTPUTS (cont.):**		
5. Expanded NHB facilities and financial resources.	5a. Two NHB branch offices established in the target areas by 1979.	5a. NHB records.	5a. (1) Suitable branch locations identified and acquired. (2) Sufficient equipment and staff available to operate branches. (3) NHB commits resources to branch expansion.
	b. NHB opens 10,000 savings accounts in the target areas by 1979.	b. NHB records.	b. (1) Real economic growth continues in the range of 4-5% per year. (2) NHB formulates and implements savings mobilization campaign geared to low-income families.
	c. 20 NHB staff members complete training program in low-income financial administration and savings mobilization by 1979.	c. AID records.	c. Trainees successfully complete training program and remain in the employ of NHB.
6. Secure land tenure for target area beneficiaries.	6. 5,000 land titles registered to low-income residents of target areas by 1980.	6. Land authority records.	6. Legal restrictions on title transfer modified to facilitate low-income land acquisition.
INPUTS:	**IMPLEMENTATION TARGETS:**		
1. HG Program loan.	1. US$15 million HG loan: US$14.7 million for shelter; US$200,000 for technical; US$100,000 for training.	1. AID records.	1a. HG loan authorized by Regional Bureau. b. Host country signs loans agreement with U.S. lender by end of FY 79.
2. Host country capital contribution.	2. US$5 million host country capital for right-of-way acquisition.	2. Records of Ministry of Finance and SWA.	2. Host country resources available and are committed to project by end of FY 79.
3. Technical assistance.	3a. 120 man-days urban planning specialist. b. 120 man-days self-help construction specialist. c. 90 man-days public utility management specialist. d. 90 man-days socio-economic and survey research specialist. e. 60 man-days land law specialist. f. 60 man-days shelter finance specialist.	3. AID records.	3. Technicians available.
4. Training.	4a. 60-day program in management of low-income shelter financing. b. 30-day program in low-income savings mobilization and administration	4. AID records.	4. Qualified candidates and instructors available.

Example 3

LOGICAL FRAMEWORK

PROJECT TITLE AND NUMBER: ______________________

TYPE OF PROJECT: National Housing Policy & Institutional Development

TOTAL U.S. FUNDING: ______________________

DATE PREPARED: ______________________

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
GOAL:	MEASURES OF GOAL ACHIEVEMENT:		
Increase the flow of resources devoted to improving shelter conditions for low-income families.	1. 50% of resources available to NHA devoted to low-income shelter production.	1. Records of NHA.	National Housing Policy remains in effect and continues to be conscientiously implemented.
	2. 30% of resources available to NHB devoted to low-income shelter finance.	2. Records of NHB.	
PURPOSES:	END-OF-PROJECT STATUS INDICATORS:		
1. Establish a rational National Housing Policy.	1. National Housing Policy adopted by 1980.	1. Official gazette or records of Ministry of Construction.	1. Host country government perceives the policy to be politically and economically feasible.
2. Establish the institutional infrastructure through which the National Housing Policy is to be implemented.	2a. 2,000 nonsubsidized low-income shelter solutions completed by NHA and occupied by 1982.	2a. Records of NHA.	2a. (1) Demonstration projects are successful. (2) Adequate land, labor, and capital available. (3) Sufficient effective demand exists.
	b. 5,000 savings accounts opened by NHB by 1982.	b. Records of NHB.	b. (1) Real economic growth continues in the range of 4-5% per year. (2) NHB savings mobilization program continues.
	c. 2,000 mortgage loans granted by NHB by 1982.	c. Records of NHB.	c. (1) Savings mobilization effort is successful. (2) Sufficient qualified loan demand exists.
	d. 15% of the total number of NHB loans granted to low-income families by 1982.	d. Records of NHB.	d. Delinquency rates and administrative costs on low-income loans comparable to those on middle-income loans.

EXAMPLE 3 (continued)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
OUTPUTS:	**MAGNITUDE OF OUTPUTS:**		
1. National Housing Policy document.	1. Final draft of National Housing Policy document presented to host country government by 1979.	1. RHUDO certification.	1. Policy document completed on schedule.
2. Operational National Housing Authority and operational National Housing Bank.	2a. NHA staffed by core of 25 trained professionals by 1980.	2a. AID and NHA records.	2a. Trainees successfully complete training program and continue in the employ of NHA.
	b. NHB staffed by core of 10 trained professionals by 1980.	b. AID and NHB records.	b. Trainees successfully complete training program and continue in the employ of NHB.
	c. Low-income shelter planning and production unit of NHA staffed by 10 trained professionals by 1980.	c. AID and NHA records.	c. Unit established and appropriately staffed by NHA.
	d. Low-income shelter financing unit of NHB staffed by 5 trained professionals by 1980.	d. AID and NHB records.	d. Unit established and appropriately staffed by NHB.
	e. 3 shelter projects totaling 750 units, 200 of which are nonsubsidized low-income solutions, designed and implemented by NHA by 1981.	e. NHA records.	e. (1) Suitable land available and acquired by NHA. (2) Local contractors complete work according to specifications and advertised prices.
	f. 3,000 savings accounts opened by NHB by 1981.	f. NHB records.	f. (1) NHB implements successful savings mobilization campaign. (2) Real economic growth continues in the range of 4-5% per year.
	g. 1,000 mortgage loans, of which 200 are for low-income families, granted by NHB by 1981.	g. NHB records.	g. (1) Appropriate types of units produced and available for financing. (2) Sufficient qualified loan demand exists.

comprehensive specification of events outside the project manager's control or influence (Assumptions) which must occur to produce a successful project provides convenient points of inquiry in determining the causes of shortfalls in project performance

2. <u>The Project Performance Tracking Network</u>

The PPTN is the master overlay of the project's planned performance. It provides the quantitative basis for monitoring, or tracking, the actual progress of all of the elements of the project toward the achievement of its Outputs, Objectives, and Goals according to the preestablished benchmarks.

The PPTN is intimately connected to the Logical Framework in that, using Critical Performance Indicators (CPIs), it schedules the sequence and timing of the events, including evaluations, that must take place to achieve the targets specified in the Logical Framework. The PPTN is prepared as follows:

a. <u>Select the most critical indicators of performance for the project</u>: Survey and select those events or circumstances that will most realistically show the progress of the project. Here the Logical Framework and the PPTN tie closely together, with the "Logframe" focusing on the Goals, Objectives, Outputs, and Inputs, and the PPTN laying out intermediate indicators of performance. These could be described as "strategic control points" where performance can be measured. They must account for at least the principal financial activities (e.g., loan disbursements) and are important elements of monitoring and evaluation.

b. Estimate the date at which each CPI is critical to the success of the project: The next step is to consider the timing of each CPI. It is the date when the CPI is scheduled or expected to occur.

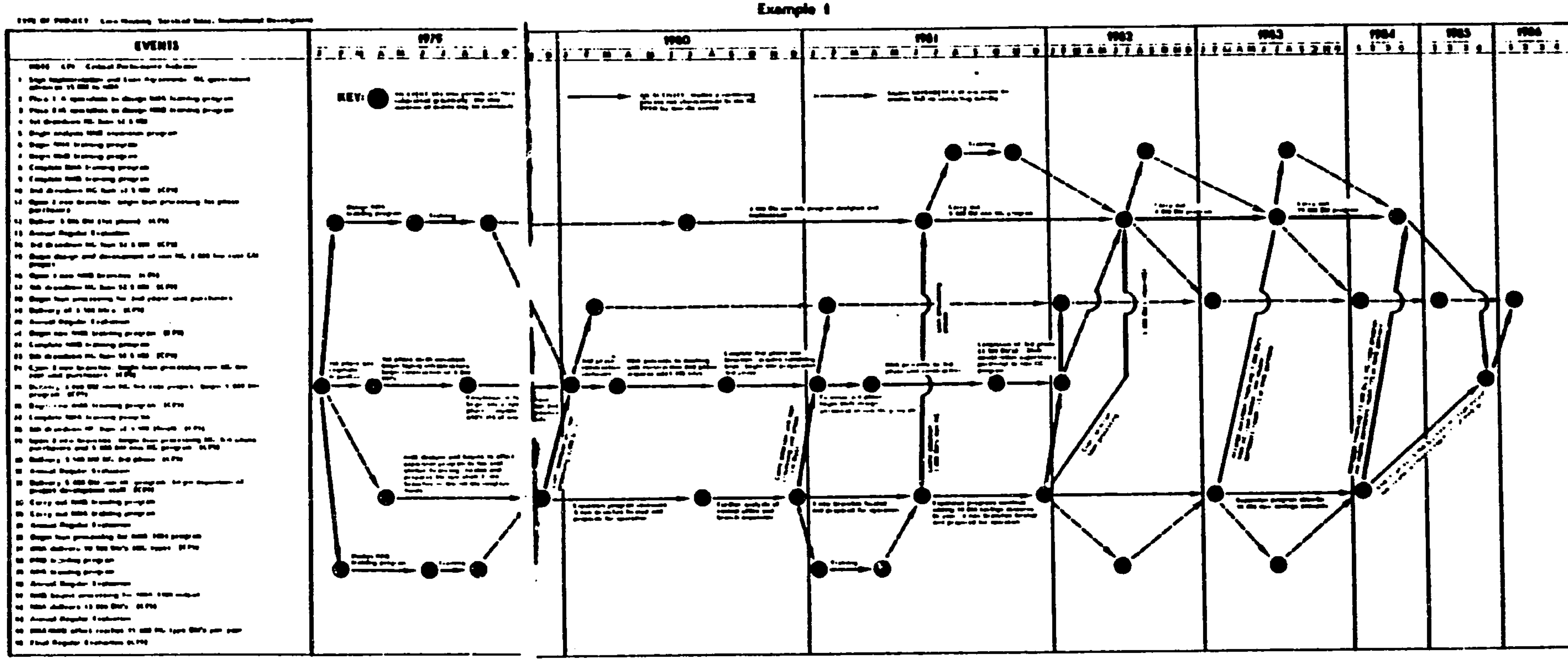
c. Put these planned performance indicators onto a graphic format: The PPTN should be drawn up to make clear the events and activities which are of particular interest to project managers. Care should be taken to avoid plotting events and activities which are not of vital importance to the project monitoring effort.

The events are specific points at which an objective may be reached or an important action set in motion. They are the essential time points in project progress. All CPIs are events. The events mark the points at which project management may make a formal evaluation of project progress.

Activities are of a more general character. They indicate general movement from event to event and are less

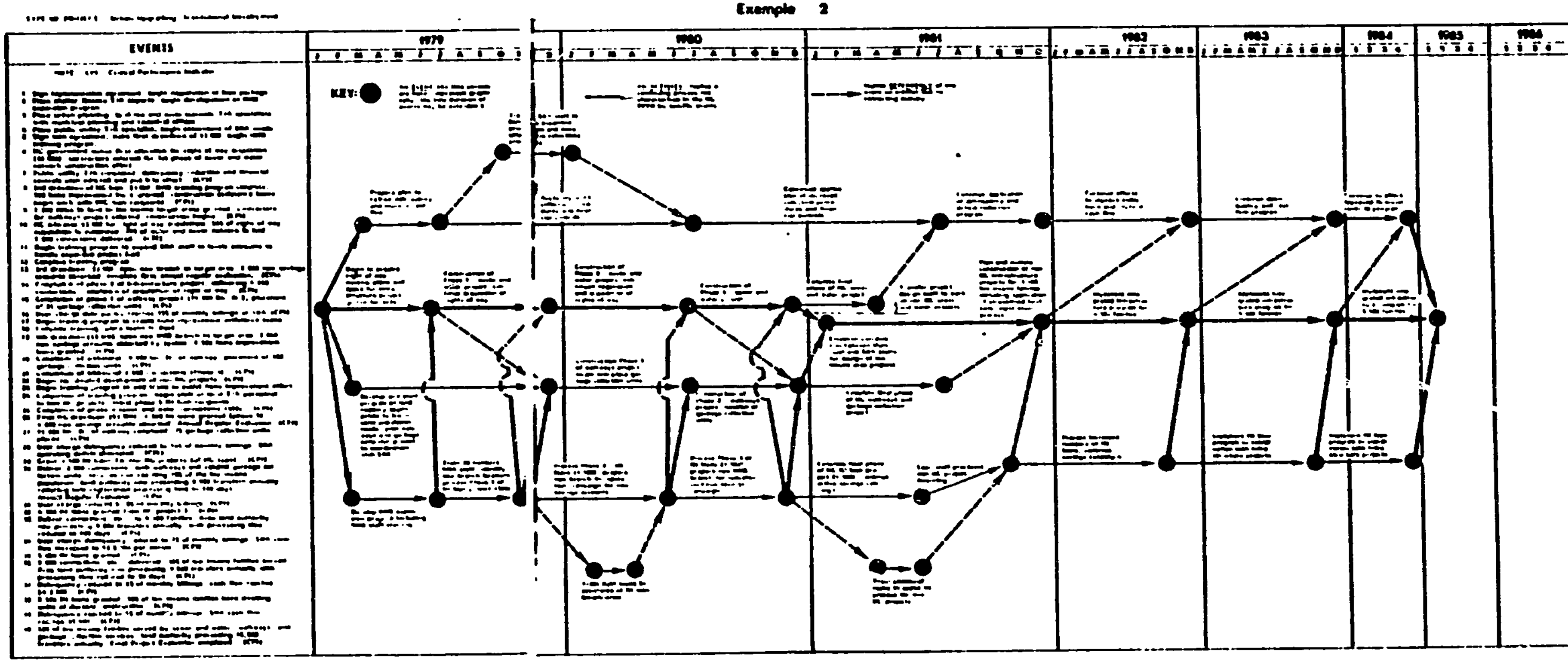
PLANNED PERFORMANCE TRACKING NETWORK

Example 1

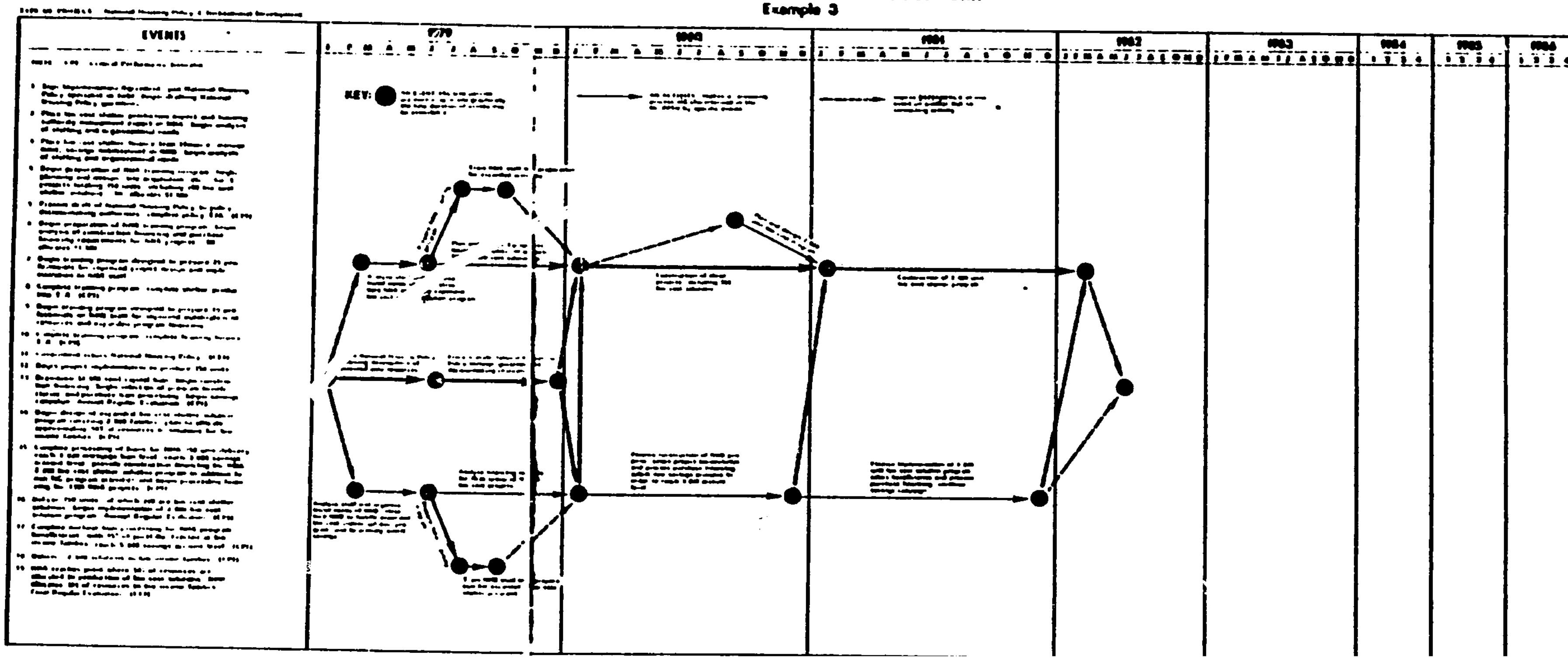


PLANNED PERFORMANCE TRACKING NETWORK

Example 2



PLANNED PERFORMANCE TRACKING NETWORK
Example 3



time critical. (A PPTN could be run for each component of a project--unit construction, for example--but such an effort should be employed only by the manager of a specific component lest it obscure the project flow.)

E. EVALUATION DURING IMPLEMENTATION

Regular evaluation of project performance must be carried out if the planning tools (the "Logframe" and tl PPTN) are to be of any value. Plans are inevitably sub, to adjustment. Evaluations give project managers the opportunity to keep project plans and schedules realist: and up-to-date. No evaluation means no plan updating, ; consequently the trees obscure management's view of the forest.

Evaluations must be scheduled according to project design. Critical decision-making moments (identified as "events" on the PPTN) should follow an evaluation that provides the base data required if management is to determine the need for adjustment to project plans.

A form of regular evaluation may be accompanied by special evaluations as deemed necessary. A final evaluation may also be scheduled following project completion.

1. <u>The Regular Evaluation</u>

Basically, the Regular Evaluation will contain two levels of analysis:

- The progressive impact of the project on target populations; and
- Qualitative and quantitative measurement of the performance of the shelter and related service delivery system.

The Regular Evaluation provides a detailed summary an analysis of the progress of the project in the context of the Critical Performance Indicators contained in the PPTN.

The quantitative elements of the Regular Evaluation, keyed to the PPTN provide the objectively verifiable frame work of the evaluation. The evaluation must, however, go beyond the collection and presentation of data. It must also explain, insofar as possible, the deviations of the project's actual performance from its planned performance and present a detailed, factual basis for such revisions of the project Inputs as may be necessary.

The Regular Evaluation thus enables management to reflect systematically on the performance of the project and to determine revisions in the course of action in the year ahead. For example, some elements of the project may have performed above expected levels while others may have performed below expectations, thus warranting a reallocation of project resource Inputs. External events may have rendered some Assumptions of the "Logframe" invalid. The effect of such events on the project must be assessed in the evaluation and new Assumptions formulated to guide the future progress of the project.

Each Regular Evaluation should result in a revised PPTN, simply because no project is ever likely to perform exactly as planned. Note, however, that the stated Outputs, Objectives, and Goals of the project and the quantitative target levels of achievement of each of these, which are given in the "Logframe" and reflected in the PPTN, may not be revised. These targets are parameters of the project and represent the permanent standards against which the success of the project is to be judged.

In this context, the Regular Evaluation and the PPTN revisions which result therefrom are designed to maximize the degree to which the originally stated objectives of the project are achieved while minimizing project costs.

2. Special Evaluations

The concept and purpose of evaluation extend beyond systematic and effective project management. The Regular Evaluations provide the basic information for generalizing experience and advancing the state of the art. From time to time, however, certain projects, or components of a project, will be the focus of a specialized evaluation. Such evaluations would be called for if, for example, it became clear the project was having unexpected side effects (positive or negative) and a more exact understanding was needed to chart the future course.

3. Final Evaluation

The Final Evaluation comprises a comprehensive assessment of the success of the project in achieving its stated Outputs, Objectives, and Goals. It should be scheduled to coincide with the estimated date of the End of the Project.

In addition to summarizing the events described in, and actions resulting from, the series of Regular Evaluations and PPTN revisions, the Final Evaluation will focus on the overall institutional and beneficiary impacts of the project. Beneficiary questionnaires administered during the initial stage of project implementation should be readministered on a sample basis and the data derived therefrom compared with the baseline data obtained from the initial questionnaire. Similarly, current data will be developed on the performance of the target institutions and be compared with the baseline data presented in the original project design documents.

These data and such other quantitative indicators as may be shown in the "Logframe" as End-of-Project Indicators will then be compared against the quantitative targets expressed in the "Logframe" to provide concise statements about the success of the project. For example, the Final Evaluation should state the percent of anticipated, or planned, achievement of the project actually accomplished--e.g., 110 percent of Objective One, 75 percent of Objective Two, etc.

The Final Evaluation should also report on the level of Inputs actually required to achieve these performance levels to provide the basis for an assessment of the project's cost efficiency.

SHELTER
TRAINING
WORKSHOP

November 5-30, 1979

SCHEDULING AND CONSTRUCTION MANAGEMENT

IMPLEMENTATION TECHNIQUES FOR SITE AND SERVICE AND SELF-HELP SHELTER PROJECTS

Tuesday, November 27, 1979

9:00-10:30 a.m. Code 54.I

Presented by:

Charles F. Dean

Office of Housing
Agency for International Development

SHELTER TRAINING WORKSHOP

November 5-30, 1979

IMPLEMENTATION TECHNIQUES FOR SITE AND SERVICE AND SELF-HELP SHELTER PROJECTS

Prepared by: C.F. Dean
Foundation for Cooperative Housing

I. COMPARISON OF "SITE & SERVICE" WITH CONVENTIONAL SYSTEMS

It is important to recognize that the physical implementation of "site and service" and self-help shelter programs differs greatly from the implementation of conventional "low cost" housing projects.

A. Conventional Low Cost Housing Projects

1. The basic approach is to design and construct a standard house which meets pre-determined technical standards and has a minimum number of rooms, minimum room size and includes standard utilities, all at the lowest possible costs. However, total costs are usually higher than the very poor can afford so conventional housing is heavily subsidized for the poor or sold to middle income families.

2. Design and construction procedures are relatively simple. The sponsoring agency calls for competitive bids, selects a construction contractor, then awards the houses when construction is complete.

3. Because the conventional system is simple, and the role of the sponsoring agency can be minimal, local architects, engineers and construction contractors are familiar with the system and look favorably upon it.

B. Site & Service and Self-Help Shelter Projects

1. The site & service approach is based upon the idea that because the participants are poor they can afford very little for shelter. The objective is to help them improve their own shelter over a period of time by providing a lot, minimum services, a core unit and access to building materials. The participants are given maximum responsibility for the actual construction either by their own self-help or by hiring their own skilled labor.

2. Costs must be kept low and conventional construction standards and building codes should not be applied. The sponsoring agency should be concerned with the <u>safety</u> or the construction and with conformance to lot lines, set backs, etc. The exterior appearance should not be a major concern of the sponsoring agency.

3. The time frame for a site & service project is quite different from that required in the construction of a conventional housing project. In a new site & service project, installation of infrastructure and construction of expandable core units may be done in a period of 1 to 2 years allowing initial occupancy fairly quickly. The residents must then start the self-help construction process with support from the sponsoring agency. This process is continuous and 3 to 5 years is a normal time period before the houses and community begin to look complete and exterior appearance improves.

4. The sponsoring agency will normally contract out installation of infrastructure and construction of expandable core houses as well as community buildings. After occupancy, a building materials credit and distribution system must be established along with provision for technical advice, control and monitoring of the self-help shelter construction process.

5. Site & Service projects often have additional goals such as employment generation which must be taken into consideration during the design and construction process.

6. Site & Service projects are often initially more difficult for a sponsoring agency to develop and implement than conventional housing projects Local architects, engineers and contractors may be negative on this approach because it reduces their potential for profit, and projects initially do not look attractive. For this reason it is important that the sponsoring agency conduct a "public information" program during the planning and design phase to convince the local construction industry and the policy level officials of the validity of the approach.

II. ALTERNATE APPROACHES WITHIN "SITE AND SERVICE" SYSTEMS

The "Site & Services" lable has been used on a number of different types of projects.

A. New Sites

Site and Service projects are normally located on relatively inexpensive land on the edge of a large metropolitan area, but near major employment centers. Lots may simply be staked out and awarded by the sponsoring agency with a bare minimum of services initially, such as public water taps. Residents may be left on their own to obtain materials and build a house, in much the same way they do in illegal squatter settlements. At a later date, the sponsoring agency will install water, sewer and electrical systems. In other projects, utilities are provided initially along with core houses or building material loans and community facilities such as schools and health centers.

B. Upgrading Existing Areas

Another approach is to provide services to existing dwelling ("sites") in established squatter settlements which have been designated for upgrading by the sponsoring agency. The area is first mapped, locating each house and then replanned to lower densities and to introduce streets, utilities and community buildings. Legal land tenure is arranged for the residents and then building material loans are provided for self-help dwelling construction or expansion.

C. Scattered Sites

Another approach under study but not yet widely used is a "scattered site" approach whereby the sponsoring agency would establish a city-wide system of credit for building materials, distribution of materials and some technical help. Residents from any neighborhood could apply for a loan and arrange for their own construction.

III. DESIGN & CONSTRUCTION RELATED TO PROJECT GOALS

A. Affordability

Because "affordability" is a major project goal, the design must produce solutions which fit the a'ility to pay of the residents. This may dictate latrines instead of water born sewage, public water taps and unpaved streets initially. Only one room or a sanitary core may be all that can be provided for a dwelling at occupancy.

B. Incremental Improvement

The design of the infrastructure, the site plan and tl should all allow for incremental improvement in a planned way in the future.

C. Resident Participation and Design Flexability

Designs should reflect the culture living patterns of the residents using familiar materials and construction systems. Residents "participate" in the design process by expressing their views of model houses and by demonstrating what they want in construction of their own houses in nearby areas. Project architects should seek to make gradual improvements over the existing dwelling designs and avoid introduction of radically new shapes and materials. Designs and construction systems should allow maximum flexability so that each individual family can vary its house to fit its needs and desires.

D. Employment Generation

Residents can be hired to produce building materials and for work in installing water, sewer and other community facilities. The sponsoring agency can specify that contractors hire unskilled labor from the community and minimize use of heavy machinery in favor of a "pick and shovel" approach.

E. Training of Small Contractors and Skilled Labor

The construction program can include a training program for small contractors and for skilled labor hired from the community. After completion of project construction, they can use the experience for employment elsewhere.

IV. DESIGN & CONSTRUCTION OF "TYPICAL" SITE AND SERVICE PROJECT

Following is a description of the design and construction process for a "typical" project on a new site. Clearly, many adjustments are needed in each actual project to fit local conditions.

A. Planning & Design Phase

1. Workshops: The sponsoring agency should hold a series of planning workshops to explain the site and service concept to local architects and engineers, contractors, community groups and representatives of cooperating government agencies (Health, Education Ministry, etc.)
2. Training: Local architects & technicians as well as officials of the sponsoring agency should receive training in the site and service approach and should visit projects in other countries to learn from past experience.
3. Construction Standards: Conventional construction standards and building codes should be reviewed and modified to fit the site & service approach.
4. Institutional Framework: Because an "integrated approach" is needed, the sponsoring agency may need to reorganize its departments to relate the physical design and construction offices more closely with the community development, social and management offices. There may also be a need for an inter-ministerial committee to coordinate inputs of health and education facilities, credit services, etc.
5. Implementation Plan & Scheduling: The sponsoring agency should prepare a detailed implementation plan showing the responsibilities of each department and related agencies. The plan includes cost estimates and schedules. It should be revised quarterly to reflect changes and adjustments. Construction contracts should be written in such a way as to allow for design modifications after each section of 50 to 100 core units has been completed.

6. Community Organizations & Surveys: Detailed social-economic surveys of the future residents of the site & service projects are essential. In new projects, some form of community organization should be established, either a housing cooperative, a homeowners association or other resident groups which will be democratically controlled and assume major responsibilities in project development and management. During the planning phase, leaders need to be trained and involved in the planning of the project. They in turn should hold meetings with future residents to get their inputs on house design, materials preference and priorities for community services.

7. Design: Site plans and core house designs should be prepared by local architects & engineers with back-up assistance from others with experience in similar projects.

8. Design & Costs Pre-Test: In a large project, a small pre-test of the core house designs should be done by construction of 20 to 100 units and allowing immediate occupancy to get resident reactions & cost data for modification of the designs before letting contracts on larger sections. Data on material costs and labor should be precisely recorded during the pre-test.

B. Construction Phase

1. Infrastructure: Infrastructure (water-sewer-streets-electricity) contracts should be let for the whole project or large sections of 500 to 1000 units. Each component should be planned for expansion and improvement in the future, i.e., gravel streets to be paved later, public water taps to be converted to individual service later, small simple schools planned for expansion, etc. Community self-help should be encouraged. For example, the extension of the water system to a new block might require that block residents first dig the trench for the

2. Core Houses: Most projects will include the construction of some type of expandable core house by a contractor to allow residents to move onto their lot and live there while self-help expansion and improvement takes place. Small contractors who hire from the community should be included in the construction of the core houses. Responsibility for completion of each core house should rest with the individual family. Mutual self-help systems should be encouraged but not imposed on the residents. Often the individual owner will prefer to pay for skilled labor so that he may pursue his normal job to earn a living.

3. Production and Distribution of Building Materials: In large projects, on site production, storage and distribution of building materials should be seriously considered. Materials should be available for delivery in small quantities and on weekends to fit self-help construction patterns. A number of different systems have been used for providing building materials on credit for self-help construction:

a. Sponsoring agency provides cash or purchase orders to participants to buy their own materials from private sources.

b. Sponsoring agency furnishes materials and delivers to each lot.

c. Sponsoring agency provides funds to intermediate organization such as a credit cooperative or housing cooperative to purchase, store and distribute materials.

d. Sponsoring agency provides area within project for private profit motivated business to store, sell and deliver materials.

Before starting a new program, sponsoring agencies should carefully study the experience of others to adapt the most successful techniques.

4. Monitoring and Controls during Self-Help Construction: The sponsoring agency should establish a construction monitoring and control

system.(inspection) The major concerns should be control for safety and location (set backs). The tendancy to impose very strict controls over the self-help design and construction process should be avoided. Design considerations which relate to appearance should be left up to the residents. This approach produces greater variety and avoids the "housing project" look. It also allows people to build to fit their needs and produces a much higher level of "user satisfaction".

5. Evaluation--Phasing of Work and Modifications: The implementation plan should include funding and staffing for a full time evaluation unit within the sponsoring agency. The primary goals of the evaluation work should be to measure the impact of project on the residents, to verify true costs, to identify bottlenecks and discover more efficient techniques. Checkpoints should be established between work phases in the project schedule to allow for modifications in design and construction as a result of evaluation feedback.

V. DESIGN & CONSTRUCTION OF TYPICAL UPGRADING PROJECT

There are some important differences to be considered in upgrading existing squatter settlements compared to construction of new site & service projects.

A. Planning & Design Phase

1. Institutional Framework: Local community based organizations should be linked into the institutional framework for the project. There may also be a need to strengthen these existing organizations or to help establish new ones during the planning phase.

2. Site Planning: Detailed mapping of the area should be done by aerial photographs and by on-site survey crews. Residents should then be consulted on changes proposed in new site plans.

3. Priorities of Residents: Detailed house by house surveys should be conducted to determine priorities of the residents before assumptions are made on the physical components of the upgrading program.

4. Densities & Relocation: If densities must be reduced, incentives should be used to encourage voluntary relocation. An alternate approach is to design the project for increased vertical expansion, allowing the same or higher densities and at the same time, creating open space for streets and community facilities.

5. Self-Help Pre-Test: The interest and capacity of the community to carry out self-help improvement projects should be tested by small projects such as a new community center or sports field prior to any attempt at a large-scale program.

6. Hire from the Community: Hiring residents from the community to participate in the project can be a key element in obtaining community approval and in developing an appropriate implementation plan. Residents can be hired and trained to help with social & physical survey work, as employees in new community facilities and to begin training for the construction and maintenance activities.

B. Construction Phase (upgrading)

1. Infrastructure: Water, sewer and electrical systems must be designed and installed to allow for individual "hook-ups" over a long period of time. For example, water and sewer lines should be located beside the roadway and not under the street itself to avoid constantly disrupting traffic. The sponsoring agency may want to consider direct construction of infrastructure by "force account" system instead of letting contracts to private contractors. This allows greater use of community self-help and more flexability during construction.

2. New dwelling construction: In some projects, lot sizes are large enough for a new core unit to be constructed next to the old dwelling, which might later be torn down or improved. "Model" core units might be constructed by the sponsoring agency on each block for self-help builders to imitate. In other projects, self-help construction takes

place around the old hut, which is then torn down.

3. Home Improvement & Expansion: A building materials storage & distribution system must be established as with new site & service projects. Controls should be established for safety and conformance with set-back lines.

4. Community Facilities: New schools, health clinics, market places, etc. built by private contractors within upgrading projects should also be designed for future expansion and improvement by community self-help.

Office of Housing
Agency for International Development

SHELTER TRAINING WORKSHOP

November 5-30, 1

COMMUNITY PARTICIPATION IN THE MANAGEMENT OF LOW-INCOME PROJECTS

Tuesday, November 27, 1979

10:30 a.m. - 12:00 noon   Code 56.I

Presented by:

Theodore Priftis

SHELTER
TRAINING
WORKSHOP

November 5-30, 1979

COMMUNITY PARTICIPATION IN THE MANAGEMENT OF LOW-INCOME PROJECTS

Prepared by:
Foundation for Cooperative Housing

I. NEED FOR PARTICIPATION

In conventional low-cost housing projects, beneficiaries rarely participate in a meaningful way either in project development or management. This paternalistic approach often results in poorly maintained projects with low recovery rates of monthly payments and a number of related social problems. When residents are allowed to participate and take major responsibilities for management, dramatic improvements have occurred. The need for participation in self-help and site and service projects is even more evident.

II. FORMS OF PARTICIPATION

A. Informal Participation

In most site and service projects, residents participate at least informally in community meetings and through their self-help construction efforts. After moving into the project, an informal process often takes place where groups are formed to solve specific problems or to voice community concerns to this sponsoring agency and other government agency.

Sometimes this informal process works well, in other cases the groups become negative factors in project development.

B. Formal Participation Through Housing Cooperatives and Homeowners Association

Housing cooperatives and homeowners associations are the main formal methods for transferring maximum responsibility to residents in conventional low-cost houwing projects. Housing cooperatives have also been used in a number of self-help, minimum shelter projects.

III. TYPES OF HOUSING COOPERATIVES

A cooperative is a non-profit enterprise formed to supply its members with goods or services at the most reasonable cost and in the most effective manner. The essential feature of a cooperative is that it is owned by its members and operated on their behalf. Based on this concept, a housing cooperative is a non-profit organization formed by a group of people to acquire mutual ownership of a housing project.

There are many types of housing cooperatives and variations on the cooperative housing system, but all of them have certain things in common.

The forms that housing cooperatives have taken in different countries have been influenced by local customs, laws and social and economic factors. Housing cooperatives can generally be grouped under the following classifications:

A. "Limited Objective" Cooperatives

These are organized to perform certain specific services on behalf of the members. This often involves only acquiring and subdividing land with title to the lots given to the individual members.

In some cases, the cooperative may go further and arrange for the installation of streets and utilities and even the design and construction of the dwellings. However, once the members' objectives have been met, the cooperative usually dissolves.

B. "Mutual-Ownership" Cooperatives

These are sometimes known as "single mortgage" cooperatives and are those in which the cooperative may perform all the services described under A, but in addition retains title to the land, dwellings and facilities. In this case, the cooperative, which is mutually owned by the members, manages and maintains the property on behalf of the members after it has been completed.

C. "Multiple-Mortgage" Cooperatives

These are a type found in some Latin American countries and in Israel. They are a form of condominium or "horizontal peroperty", in which the members hold legal title to their individual apartments or dwelling units but with all common property and facilities owned in condominium by the owners of the dwelling units.

D. "Tenant" Cooperatives

These are found in Europe particularly in France and some Eastern European countries, but are less well-known elsewhere. In this type, a non-profit cooperative builds dwellings and leases them to its members. The occupants do not have equity in, or own any share in the property but do have a voice in its day-to-day management.

IV HOMEOWNERS ASSOCIATION

It is an incorporated, non-profit organization comprised of residents owners in a described land area or community.

A. Primary objective of a homeowners association is to conduct and and regulate the use of property in the community, including any lands or facilities owned in common by all the residents.

B. The association operations are financed by a charge for expenses by virtue of recorded land agreements and covenants.

C. Within the association framework it is possible to include various types of housing and ownership. This has become an extremely beneficial tool for owners of condominiums in meeting common needs for services.

ROLE OF TECHNICAL ASSISTANCE

Frequently, community residents are not organized, or the organization is weak or embryonic. Assistance is frequently required to accelerate the process of community organization and development.

A. Motivation of the organizers should be clear; namely, the group is being organized to facilitate their participation and heighten their effectiveness in satisfying common needs and goals. Collaborating agencies must avoid creating the impression that the group is being organized solely to perform an unpaid construction role or task programmed by the developing agency engineering staff.

B. Assistance available to the group should be multi-faceted, depending on the group needs; e.g. legal, group organization, task orientation, leadership training, group dynamics and procedures, etc.

C. Technical assistance should continue long enough to assure a sound organization. It is not sufficient to create the form alone, and cut the organization loose prematurely.

VI PROPERTY MANAGEMENT WITH PARTICIPATION

While the degree to which the participation is legally organized and established will vary from case to case, ranging from legally constituted and registered cooperative at one end of the spectrum, to the informally constituted neighborhood committee with no juridical standing whatsoever, at the other end, the thrust of community participation is usually along three main arteries: community development, property maintenance, and financial administration.

A. <u>Community development</u>

1. Looking inwardly, committees of indigenous leaders and concerned beneficiaries can be extremely useful at the point of project design or design of upgrading, in focusing and surfacing target group priorities,

desires, and the relevant form such solutions should take.

2. Committees can be organized to work around specific needs or desires, e.g. need for child care center, sports facilities, health facilities and/or programs, community mass purchasing, credit union lending, etc.

3. Self policing of the larger habitat to avoid types of economic or social behavior considered unacceptable to the larger community is more easily, more economically, and more successfully managed than when attempted by outside institutions.

4. The organized community can more accurately articulate its own needs and wants before interfacing public and private entities. It can act as a channel and facilitator of public and local government inputs to the community.

B. Building Operations and Property Maintenance

1. During the various stages of the incremental construction process, individual family self-help, and community participation in certainforms of mutual and/or aided self-help results in significant cost economies, and more importantly for the beneficiaries, either reduces the actual cash outlay or avoids costs being monetized. Community collaboration or loose monitoring of the process also results in significant local employment by assisting in placing local unskilled or semi-skilled labor with small contractors operating on site.

2. Community orientation and participation in the development process can produce enhancement and maintenance of common areas and community property.

3. Community participation, with specific leadership assigned to committees conducting orientation on the subject, can produce lower levels of property abuse, theft, cannibalizing of equipment, vandalism

and general abuse of physical plant.

4. Participation by residents in the determination of type, level and form of execution of property maintenance increases effectiveness and level of satisfaction with the habitat.

5. Participation of the community, via committees or individuals, in monitoring performance by hired maintenance or cleaning staff, can also assist management and reduce administrative costs.

6. Receiving and processing of maintenance/service requests can also be more effectively and economically handled by residents.

C. <u>Cost Recovery and Debt Collections</u>

1. The period between project promotion and actual occupancy must be utilized to match client and solution in a financially viable and realistic arrangement. Though selection and subsequent orientation/ education of the applicants, attitudes and performance relative to debt amortization or rent payment can be made more positive, with obvious benefits for collections and replicability.

   a. Socio-economic studies of applicant families should provide the basis for the design and adoption of family income criteria which produce reasonable payments and predictable compliance.

   b. Orientation sessions must convince applicants of the financial seriousness of the proposal; i.e. that payments are intended to be collected, and that the terms stated are in effect the only terms.

   c. The orientation/education program message regarding financial seriousness, must be reinforced by consistency on the part of the project developer regarding applicant compliance with the conditions of participation. This might take the form of carefully monitoring attendance at the orientation sessions, or periodic savings towards a down payment, etc. These are opportunities to demonstrate that compliance with the conditions of participation is a serious matter, and that failure to comply brings penalties, perhaps even expulsion from the program.

2. Prior to commencement of the amortization or rent schedule, the machinery to effect collections must be in place and the respective obligations of all participating institutions and individuals clearly defined and communicated.

Given the tremendous pressures on the very limited monetary family budgets of the target-group families, ease and the possibility of prompt payment must be designed into the system.

a. Payment responsibilities must commence punctually with occupancy, or in the instance of materials or infrastructure services loans, as contracted. The object here is to incorporate the obligation into the family budget together with enjoyment, or receipt of the service, or benefit.

b. Billing, receipt procedures and data processing must be sufficiently synchronized to avoid the creation of fictitious arrears.

c. Offices where payments can be made must be accessible, both in terms of location and hours of operation.

3. In some instances, public or private utility companies under contract to the financing entity may be making collections to amortize service or utility upgrading loans employing the same billing system as that to collect for service comsumption. In these instances of multiple institutional layers, care must be taken to get effective reporting, and

agreement on arrears policy and treatment.

4. High unit cost of collection, or the existence of a housing cooperative of the beneficiaries would point to employing an intermediate institution to effect collections. In the instance of a housing cooperative of the beneficiaries, cost of collection will probably compare favorably, even after payment of a fee for such service.

5. Housing cooperatives, home owners associations and similar community institutions not merely represent a potential for increased cost effectiveness, but through their very nature, permit a greater variety of payment forms, and the formation and use of reserves to smooth out and compensate for irregular income on the part of their membership.

6. Community institutions involved in debt collections and administration frequently produce better results because the operation is now viewed as a form of self government, the debt a common obligation, and peer pressure a potent factor in budget allocations.

Office of Housing
Agency for International Development

SHELTER TRAINING WORKSHOP

November 5-30, 1979

TUNIS CASE STUDY

Friday, November 23, 1979

2:30-4:00 p.m. Code 48.TW/SE

Presented by:

Edward H. Robbins

Office of Housing
Agency for International Development

SHELTER
TRAINING
WORKSHOP

November 5-30, 1979

I. URBAN GEOGRAPHY

A) Geographic Setting

The city of Tunis is located on a narrow neck of land between two bodies of water: the Sebkhet of Sedjoumi to the west, an interior salt water lake filled during the rainy season in the winter; and the Lake of Tunis to the east. The lake is separated from the Mediterranean by a highway between Tunis and La Goulette, a distance of about 13 km.

B) Population-size

In 1975, the population of the city of Tunis was 925,000, but at an annual growth rate of 3.2% s certainly in excess of 1 million. The city occupies an area of .,080 square km or 803 square miles.

C) Central Tunis

The patterns of settlement resemble an hour glass fanning out from the neck or centr'l city to the northwest and southeast. Within the central neck ar. located three distinct areas: the ancient city or Medina in the center and a string of low income or spontaneous housing settlements along the Sebkhet of Sedjoumi. The principal settlements are Melassine to the north and Saida Manoubia to the south. To the east along the Lake of Tunis is located the principal commercial and administrative center.

The largest spontaneous settlement, Melassine, was settled in the period 1945-1954 and in 1975 contained 55,000 people while Saida Manoubia which was settled primarily between 1956-1966, has a population of 35,000. There two areas comprise fully 9.7% of Tunis' population. Melassine in particular has received a great deal of attention over the past years as an area sorely in need of upgrading. Due to the area's proximity to the lake, the land is undesirable for any other type of activity save squatting. The area is often subject to flooding, due to a high water table, and to pollution. City sewers quite literally dump into the backyards of the Melassine residents.

The Medina with 160m people or 17% of Tunis 1975 population is the Historic Center of the city occupying 8% of the land area. The area is heavily built up, conjested and serviced primarily by walkways. At the present time the Medina is in the process of a loss of functions to the new urban center along the Lake of Tunis with a consequent depreciation of the commercial and residential stock. As a result, the area is becoming a major receiver of new migrants.

D) Northern Tunis

The upper globe of the hour glass is a broad expanse of middle income housing stretching from the north shore of the Sebkhet of Sedjoumi above Melassine and the Medina; bordered to the northwest by the third major spontaneous settlement area, Djebel Lamar. This northern middle income area which centers around the government complex at Le Bardo is the major middle income area of Tunis in terms of size. Other middle income areas are located to the northeast towards the airport; in the southern globe of the hour glass and across the lake along the shore road to Carthage.

Djebel Lamar, the third major and newest of the large spontaneous settelements draws its name from the hill to the north of Tunis near the university overlooking the city. The population was 39,000 in 1964, but had grown to 57,000 by 1975 deriving its origins largely from the north of Tunisia.

Djebel Lamar is bordered by the Parc Belvedere to the east, beyond which stretches a large high income area towards the airport. As mentioned earlier this area encompassing the north central globe of the Tunisian hour glass contains several fairly sizeable middle income districts as well. Beyond these middle income areas and the airport itself is an industrial park. This zone with developed infrastructure and employment opportunities has attracted new resettlement dwellers and offers considerable room for future development as a low income area.

E) Southern Tunis

To the south of the center city there are scattered middle and high income areas centered in the vicinity of Beh Argus and Megrine. This area is the major industrial area of Tunis and again offers excellent sites for future development of low income housing.

Across the causeway, the coastal road to Carthage, once the center of summer homes, has developed into a major enclosure of middle and upper income homes.

II. POPULATION - DENSITY

The average density in Tunis for all systems of housing is approximately 219 inhabitans per hectare. There are however, wide discrepancies due to the variance in the socio-economic character of the neighborhoods. The spontaneous settlements of Melassine and Saida Man ibia combined with the urban center occupy approximately 764 hectares or 19% of the total area occupied by housing but contain almost 50% of the city's population. Densities in the city center approach 457 persons per hectare while to the north where one finds the high and middle income areas north of the Parc Belvedere densities are 126. To the west which is predominantly middle income bordered by resettlement, densities are at 229 and in the south which is largely industrial and middle income they are 182. In the Melassine densities are as high as 636.

Upper and middle income areas comprise 61% of Tunis' land area and 31% of its population. The spontaneous and resettlement areas comprise 23% of the available land area and 42% of the population. If one adds the Medina to this figure, Tunis' lower income group would inhabit 31% of the land area with 60% of the population. The upper and middle income group with 31% of the population inhabits 38% of the available dwellings with a density of 13 people per hectare for upper income and 23 for middle income. The poor occupy 48% of available dwellings with 60% of the population. Densities in the spontaneous settlements are 385 persons per hectare, in the resettlement areas 281 and in the Medina 550.

III. POPULATION - DEMOGRAPHICS

Two salient facts about the population of Tunis are its youth and the preponderance of migrants. According to official statistics over half of the population is under 20 and, as mentioned earlier, 42% of the population lives in either spontaneous settlements or relocation areas.

Tunis with 14% of Tunisia's population and 50% of the county's jobs in commerce and industry is a natural magnet for migration. Fully 2.5% of the population growth comes from new migration.

Tunis has tended to attract migrants from the north with the majority coming from the three provinces of Beja, Jendouba and Kef.

At any given time 12% of the city's population is comprised of recent migrants living with friends and relations.

Medina and spontaneous settlement population patterns reflect a greater number of males than the average for the whole district. This is not surprising in view of the fact that a high proportion of migrants will bring their families only after a period of time has elapsed. The average number of dependent children for those that have their families with them is 3.4.

Household size in these areas is largely a function of the number of dependent children because their structure is characterized by conjugal families (85%), and living conditions in such districts are not conducive to more complete households. Here the average household size is 5.5, the same as for the city as a whole. Whereas households are not different from city averages, their distribution is different when taking into account the number of households per housing units - and such households are often related by blood - 1.4 as against 1.2 in the district. In Melassine this figure reachs 1.9 households per housing unit.

V. INCOME

The monthly median income in 1975 for the district of Tunis was D91 (estimated at D115 in 1978). A survey completed in 1976 for the Melassine area indicated that 25% of all of the residents earned less than D30 per month with 60% between D30-D80 and 16% over D80. Median monthly income in the area was D46 and 95% of the households earned less than the average median for the district as a whole.

For 1976 income ranges fromthe first 25% to the 75% range of each area was as follows:

Spontaneous Settlements	D32 - D75
Resettlement Areas	D52 - D97
Medina	D40 - D89
Middle Income	D57 - D147
Upper Income	D201 - D333
Tunis District	D46 - D120

V. EMPLOYMENT

Despite its urban context economic life in Tunis centers around agricultural trade and production. Olives, and cereals are the principal crops grown in the vicinity of Tunis. Much of the light industry is concentrated in the manufacture of olive oil and various foodstuffs though textiles, carpets and cement are also produced. There are in addition chemical, metalurgical and electrical plants as well. Tourism is also becoming increasingly important accounting for the bulk of Tunisia's foregin exchange generation.

For Tunisia as a whole as of 1973, there were some 18,000 manufacturing entities with 1,116 employing more than 5 workers and 285 employing more than 50. 43% of the firms were in the food processing area with 19% in textiles and 13% in the mechancial and electrical areas. (60% of these firms are in the Tunis area with 71% in the northeast corner, a further inducement to immigration from the southern cities.)

Government is by far the predominant employer in the country. Fully one-half of 1976 GPD of 1.4 bil. Dinars was in the service industry of which 25% consisted of the civil service. Beyond this, according to the World Bank, the public sector has retained control of a sizeable number of large industries and will participate either alone or in joint ventures in the majority of large projects in the 5th Plan. (Cement, refineries, fertilizers, steel, textiles).

The labor force for Tunisia as a whole was 1.9 mm in 1979, or 33% of the population. This is expected to grow to 2.2 mm by 1981. Despite impressive growth in the industrial and agricultural sectors, unemployment remains a serious problem, in 1975 some 14% of the labor force was unemployed with underemployment in agriculture running at 40%. In the non-agricultural sector unemployment in 1976 amounted to 22% of the registered work force. Of this number some 54% were young persons looking for their first job.

This problem is exacerbated due to the closure of many of the European outlets for surplus labor coupled with an increasing number of women searching for work.

The outlook for amelioration of this situation is not good as the 5th development plan envisages the creation of 263,000 jobs as against a growth in the labor force of 304,000 through 1981.

Within the District of Tunis itself the active labor force was some 300-325m in 1975, with 76m unemployed or 25%. Fully half of the heads of households within the resettlement areas are employed on a non-permanent basis. This classification includes laborers, self-employed tradesmen and craftsmen. The working population consists essentially of skilled and semi-skilled workers in industry, transportation and construction, service sector personnel, small tradesmen and craftsmen.

Employment opportunities available to the residents are located outside of the communities. For example, only 14% of those employed work within the Melassine area while 71% work in the center of town and the Medina. Women account for 7% of the regularly employed population and many of the households are supported by a member employed abroad.

VI. GOVERNMENT

The city of Tunis itself is composed of nine administrative units called delegations and 22 communes. It has at its head a governor, appointed by the central government and funded through the Ministry of Interior who presides over the municipal council of the city of Tunis. The communes have financial resources of their own, funded from local taxes but these are very limited.

VII. PUBLIC FACILITIES

The provision of infrastructure to new urban residential settlements is coordinated and carried out for nearly all Tunisian towns by means of municipal master plans prepared by the Direction d'Amenagement du Territoire in M.O.E.

This planning process requires input from a broad range of institutions concerned with urban development activities, and involves not only the towns themselves but also government agencies, including, among the most important, the STEG for gas and electricity, the SONEDE for water and the ONAS for sewers.

A) Sewerage

The Metropolitan area of Tunis has pumping stations, one treatment plant and two drainage networks. In principle; one of these networks collects rain water and empties into Lake Tunis; the other one collects waste water which is treated by the Cherguia treatment plant. The system is old and inadequate. Approximately 65% of the homes in the commune of Tunis and 50% of the metropolitan area are served by the main sewer system.

Within the areas of the spontaneous settlements the need for additional sewerage capacity is acute. Fully 90% of the homes are without adequate sewerage. Melassine, which is located along the lake is very vulnerable to unsanitary conditions as the sewer outlets of nearby middle income areas are located along its lake front. A limited sewerage system does exist, however, it serves little purpose as pipes have been placed in a maze draining from one part of the area into another. A pumping station has been installed but as of 1975 was not functional nor had it been for some time previously.

ONAS is undertaking to upgrade the sewer network of the city but will have severe problems in coping with additional units. Sewerage capacity is clearly the most pressing problem in Tunis' low income area.

B) Health Services

Health services are primarily provided by the Ministry of Health and secondarily by the communes and the private sector. In 1975, there were 10 hospitals, 2 auxiliary hospitals, 25 local and 21 rural dispensaries. Tunis has an average of 5.56 hospital beds per person as against the national average of 2.4.

C) Transportation

Mass transit is extremely important to Tunis. About 76% of all journey's in the metropolitan areas are by bus or train, 10% by taxi, motor cycle or bicycle and only 14% by private car. Public transportation is handled by two companies (1) Societe Nationale des Transports (SNT) which operates a fleet of buses and a railway and (2) Societe Nationale Chemins de Fer Tunisians (SNCFT) which operates a railway. The SNT is state-owned. It was formed in 1962 and in 1975 operated a fleet of 350 buses and a 9 km railway from Tunis to La Marsa via La Goulette.

The SNCFT is state-owned. One line in their national network serves as the major commuter line to Hamman Lif along the eastern shore.

A new harbor complex was created at Halq al Wade in 1967, by cutting a canal from Tunis itself through the Lake of Tunis. According to the World Bank, capacity should be adequate for the next 5-10 years.

During the 4th development plan the government made large expenditures in the area of developing transportation infrastructure. Again according to the World Bank the present road and rail network for the country as a whole appears to be adequate. Unfortunately, urban transport needs, particularly in the Tunis area are lagging behing population growth. In particular, rapid growth in private car registrations despite government attempts to limit it is placing considerable strain on the road systems of the metropolitan area.

D) Water Supply

Tunis' water is supplied from an artifical lake and various wells, springs and subterranean sources from as far away as 60 miles to the south. It is carried by pipeline to a reservoir in the Bab al Jazirah quarter. Approximately [illegible]0 of the households in Tunis have running water while the remainder have access to wells.

SONEDE has in the past required title deeds as proof of ownership before hooking up units to the water system. This had created problems in the spontaneous settlements due to the high level of illegal occupancy.

This has been alleviated in recent years as the municipalities have issued occupation permits which SONEDE accepts in lieu of a deed thus permitting squatters access to water supplies.

In addition, those homes which cannot gain access to individual water supply do have access to public water fountains. These are common in the resettlement areas and are paid for by the municipality though they are considered a sign of low status.

ONAS (The Waste Removal Agency) has concluded that the country's present sources of water and waste removal are at present over exploited making cooperation between SONEDE and ONAS critical. The two agencies are at present embarked on a major program to further exploit the Medjerdah River, Tunisia's best water resource.

VIII. SHELTER SECTOR

A) Present Housing Stock

Tunis in 1975 contained 174,000 households occupying 147,000 dwellings: 45% of which were individual homes; 19% apartments; 24% collective houses and 12% Ghourbis.

Thirty-seven per cent of the total number of units were located in the upper and middle income areas with 31% of the population while 47% were located in the poorer areas of the city and the Medina with 60% of the population. The remainder consisted of the urban center and rural areas within the district.

Twenty-two per cent of the houses have no electricity, 23% no kitchen, 29% no running water and fully 35% were not connected with the sewerage system. The majority of these units are to be found in the spontaneous housing areas. Some 12% drew water from a well or cistern while 17% had no direct access to water.

Dwellings with only one or two rooms made up 47% of the total and they were occupied by 3-5 persons per room.

OCCUPANCY BY HOUSING TYPE

	Household Per Unit	Occupancy Per Unit	Occupants Per Room
Upper Income	1.03	5.1	.75
Middle Income	1.1	6.2	1.7
Resettlement Proj.	1.2	7.2	2.5
Spontaneous Settlement	1.4	8.2	3.8
Urban Center	1.1	3.9	1.6
Historic Center	1.3	6.6	1.7
Rural Housing	1.2	6.6	3.3
Average	1.2	6.6	2.06

Within the spontaneous settlements 49% of the occupants hold title to their home while 18% are illegal occupants who have built their own shelters without a building permit. Most of the illegal structures are however on government-owned land.

B) Housing Plans

Tunis itself has almost tripled in size since 1956, with about 35,000 new migrants arriving each year. The net effect has been a densification of the old city, new squatter communities and resettlement projects, high levels of rent and strain on existing public utilities and transportation.

By 1985 AID estimates that there will be 207,030 households in Tunis with 85,600 remaining units from the present stock of 100,000 units of minimal and above housing. This excludes substandard and temporary units. Non-replacement of Tunis' current stock would increase the number of substandard/temporary units from 47,000 to 116,000. On the other hand a program to upgrade all units to minimum standards would involve the upgrading or new creation of 157,000 units by 1985.

For the county as a whole there is an estimated need of 503,000 new units through 1989 if everyone in an urban area is to live in a minimally acceptable dwelling.

Against this the 4th and 5th development plans will have involved the construction of 198,000 new units with the 5th and 6th plans producing 339,000 units in total for the country as a whole.

The 4th plan target of 71,000 new units was in fact exceeded by 4% but overall demand was of course still not met. The most important difficulties encountered by the sector were shortages of building materials, and the limited capacity of the construction industry. In addition, there were financing bottlenecks that were only partly relieved by government subsidies. About 58% of the new units were constructed by the private sector.

According to the World Bank, subsidized conventional housing continued to be the cornerstone of shelter programs although major institutional changes have been undertaken. In 1973, the Government established a land development agency for housing (AFH), endowed with wide powers of land acquisition, expropriation and infrastructure development. In 1974, the Government also established in Caisse Nationale d'Epargne Logement (CNEL) as the main financing institution for public housing programs and instituted a savings and loan scheme for individuals seeking to finance their housing. These two institutional changes somewhat diminished the former predominant role of the SNIT (Societe Nationale Immobiliere de Tunisie), the public housing developer. SNIT should act mostly as any other housing building buying serviced land from the AFH and having other institutions finance mortgages to individuals.

The 5th Plan foresees an investment program of D600 million for the construction of 125 thousand new housing units, 64 percent of which are planned to be executed by the public sector. However, investments amounting to some D500 million of the program have not yet been identified. Tunisia's new housing policy, as reflected in the 5th Plan, basically consists of shifting the bulk of public sector housing to the lowest two categories, known in Tunisia as "logements ruraux et suburbains". In contract to the 4th Plan, when these two categories together accounted for 58 percent of all public sector units built, the 5th Plan would raise this proportion to 81 percent. This shift would take place at the expense of the so-called "logements economiques" and "logements standing", addressed to higher income groups.

The shift away from housing programs for higher to lower income urban groups and the increased stress on "rural" housing, represents a major step in meeting perceived demand pressure and social needs. It seems, however, that the housing needs of urban low income group have not yet been fully recognized by the Plan. Instead, the Plan apparently approaches the problem in terms of shifting low income urban residents back to rural areas as reflected in the sharp increase in "rural" housing.

CONCLUSION

Despite a tremendous increase in the population of the urban poor in the district of Tunis the government's approach to sheter solutions in the city and in the country as a whole in the past has been geared more towards the middle income groups rather than to the 50% of the urban families nationwide whose income are estimated to be below 77D per months.

Given the approaching saturation of existing poor areas and the tremendous inadequacies in existing infrastructure far more attention will have to be paid to the specific shelter needs of this group. In the present five year plan the Tunisian Government has indicated a willingness to shift the scope of its programs in this direction. In order to serve these families in increasing numbers GOT shelter programs in urban areas will need to be designed to lower standards, which may mean less habitable space or minimal levels of public utilities in order to result in lower initial costs. Greater reliance on self-help construction and gradual community development must be considered.

Office of Housing
Agency for International Development

SHELTER TRAINING WORKSHOP

November 5-30, 1979

INTRODUCTION TO THE WORK STUDY EXERCISE

Friday, November 23, 1979

4:00-5:00 p.m. Code 49.TW/SE

Presented by:

David Oakley

SHELTER
TRAINING
WORKSHOP

November 5-30, 1979

INTRODUCTION TO THE WORK STUDY EXERCISE

The objective of the work study exercise is to provide an opportunity for the participants working in six small multi-disciplinary teams to prepare a project brief for a sites and services project utilizing the basic data and maps from the Tunis Case Study. Each group is asked to establish the shelter sector policy framework, set appropriate physical standards, select a site, prepare a sketch outline physical plan, identify the shelter solution, indicate appropriate social and economic program components, and prepare a financial and administrative plan.

A Project Brief

In essence, the objective can be summarized as being the production of a project brief. The constituents of this have been reviewed during the presentation and seminars of the course but are listed in skeleton form in an accompanying paper, "Items to be Presented in the Final Presentation of the Tunis Case Study."

References

The material presented to date in the Shelter Workshop is the basic resource. Additional references issued with the exercise, in addition to the Tunis Case Study by Edward Robbins are:

Study Note 1: Housing Market Information

Study Note 2: Housing Finance Policy Information

Study Note 3: Unit Cost Information

Maps of Tunis

Where there is any inconsistency between data in the Study Notes and the paper by Edward Robbins, then, for the purposes of the exercise, accept the figures given in the Study Notes.

Organization of the Exercise

The exercise is conceived as a group study to give opportunity to:

Apply concepts offered in presented papers to a simulated problem: a sites and services project.

Share participants' knowledge within work groups to increase overall and personal effectiveness.

Work through the project preparation process in outline form so to gain an appreciation of the parameters to be considered and of the nature of their interaction.

Faculty members will be in attendance at announced times during the exercise period. Each member of the faculty will be allocated as tutor to two working groups: Malcolm Rivkin, Alfred Van Huyck, and Edward Robbins. David Oakley will visit all six groups during work sessions.

Products to be Produced

The project brief that each group devises is to be presented as follows:

1. An overview statement of project development policy covering selection of target group, financing, unit costs, environmental standards, etc.
2. A declaration of the housing market and finance policy.
3. A declaration on site selection.
4. Site plan layout.

These items are expanded in the paper "Items to be Presented in the Final Presentation of the Tunis Case Study." No lengthy written paper is looked for. Many elements of the scheme can be presented by the completion of questionnaires and statement sheets which are issued with Study Notes 1, 2, and 3. There is no right answer to the Tunis Study. What is looked for is a clear presentation of a project brief that is supported by policy decision, data, and supporting evidence. The layout of the scheme can be presented schematically. Written and drawn presentation material should be completed by 5:00 p.m., Wednesday, November 28.

Presentation and Evaluation of the Final Presentation

This will take place commencing at 9:00 a.m., Thursday, November 29. Details will be given later, but groups should plan their verbal presentation to take place in a period of 30 minutes before a committee that will be constituted to behave "as if" it is the project approval committee of a housing ministry or corporation. A final 30 minutes will be available for the committee to question the presenters.

How to Proceed

Groups should meet under their chairpersons and then plan work time and the allocation of tasks within the group. David Oakley will attend a meeting of chairpersons at the commencement of the exercise. The Daily Bulletin will give place and time.

One item to discuss will be the benefit or disbenefit of holding interim mini-presentations, one group to another, during the period of the exercise. Such interim presentations might review:

1. Alternative development policies.

2. Analyze and describe trade-offs between finance, standards, and land use.

3. Target groups and unit costs.

Details of rooms available for group use will be posted in the Daily Bulletin.

Equipment to aid site planning work will be available from a room as described in the Daily Bulletin.

ITEMS TO BE PRESENTED IN THE FINAL PRESENTATION OF THE TUNIS CASE STUDY

A. Project Brief

The prime product of the study exercise focused on Tunis is the preparation of a project brief. For ease of reference the main elements of a project brief are listed below and can form the structure of the overview statement. The four other products asked for in the presentation are specially featured aspects of this brief:

Housing market and financial policy

Site selection

Site plan plus land use summary

Cost estimates

Elements of the Project Brief

1. Description of the project area
   - data review
   - maps
   - surrounding urban context

2. Physical plan
   - proposed land use map
   - site plan
   - plot plan
   - engineering services provision
   - cost estimate specifications

3. Social and economic program components
   - selection of social and economic components
   - objectives
   - program content
   - expected benefits to target group
   - timing of installation
   - physical structure and equipment required

4. Administrative plan
   - relationship to overall administrative procedures
   - implementation scheduling

5. Finance plan
    - cost estimates
    - recovery projections
    - subsidy elements if any

6. Maintenance and estate management factors of importance

7. Special factors to be considered

B. A Declaration of Housing Market and Finance Policy

The housing market and finance policy declaration of each team should address the following questions:

1. The range of income groups that should be reached by the project.

2. The percentage of household monthly income these groups can be expected to dedicate to financing the purchase of sites and services plots.

3. The financial terms to be offered for plot purchase (interest rate, repayment period, downpayment).

4. The types and levels of subsidy that this might imply.

5. If a subsidy is used, how can it be justified?

6. Should a cross-subsidy be considered to reduce the cost to the lowest-income groups?

Elements to be Reviewed in Preparing Project Marketing and Finance Policy

1. Trade-offs between monthly payments, financial terms, standards, unit costs, and gross residential densities
    - characteristics of target households
    - financial terms
    - total recoverable capital per household
    - allocating capital among various costs
    - selection of standards and unit costs
    - selection of the dependent variables

2. Trade-offs between gross residential densities and land use parameters
   - selection of land use parameters
   - plot size as a dependent variable

3. A precise determination of design standards and infrastructure costs
   - the specification of design standards
   - specification of infrastructure costs

4. Project identification: the selection of standards and site location
   - target groups and financial terms
   - alternative land use standards
   - alternative infrastructure standards
   - unit costs for alternative standards
   - plot size affordable with each combination
   - selection of a combination of location and standards

5. Project preparation and layout design
   - plot distribution between target population income groups
   - site potential and calculation of differential land prices
   - differential land prices for new standards
   - preliminary layout design
   - standard adjustment for each group:
     land distribution parameters
     basic land costs
     infrastructure costs

Elements that Relate Directly to Site and Project Proposals

1. Means of extending financing to low-income areas
   - the instruments such as variable payment mortgages
   - mechanisms such as payroll deductions
   - use of formal sector housing finance entities as collection agents to familiarize low-income households with housing finance
   - mortgage insurance: possibilities for wide use
   - housing cooperatives as means of community organization, credit processing, education, and debt recuperation.

2. Specific financial arrangements for sites and services
   - building materials loans
   - separate ground rents
   - financing of infrastructure/utility payments through user charges
   - land taxes and rents

3. Specific financial arrangements for urban improvement
    - direct allocation of capital costs and loans to beneficiaries and/or community organizations for repayment
    - user charges (electricity, water, street lighting, sewerage)
    - land taxes and financing through local governments

4. Use of cross-subsidy mechanisms for allocation of project costs

C. A Site Selection Declaration

The maps distributed to the working groups indicate eight possible sites for sites and services development. The Minister has already decided that four of these sites could not be acquired because the owners are not willing to sell. The following data has been collected on the remaining sites which are still open for consideration:

Site Number	Cost of Land/m^2	Cost of Site Preparation/m^2	Cost of Trunk Infrastructure/m^2		Monthly Cost of Commuting to Employment*
			Water		
1	2.70	0.50	0.25	0.35	3.20
3	8.00	1.25			
5	5.50	0.50			
7	5.20	1.00	0.20		5.00

*Assumes an average of one weekly transport ticket per family.

The site chosen should be justified on the basis of site selection criteria presented earlier in the training seminar. The advantage of relatively low cost land in some sites but high trunk infrastructure and commuting costs should be weighed against the advantage of more centrally located, more expensive land. The potential of using a cross-subsidy in each site should also be considered.

Elements to Be Reviewed When Making a Site Selection

Stage 1: The Preliminary Selection

Preliminary selection should be conducted well in advance of the year in which a shelter project enters the program. This has been done for you and presented on a map. Four of the marked sites remain available.

The preselection discussion should identify the target groups for which each site is appropriate.

Stage 2: Site Selection

The choice from among identified possibilities is a more precise exercise. For the Tunis study, it has been reduced to a choice among four sites.

The site selected should be ripe for development and as close (in time and cost of travel) as possible to downtown activity and employment. The primary criteria include:

1. Readiness for development

2. Closeness to job opportunities

3. Access to downtown or other centers

4. Closeness to existing (and planned) roads and utilities

5. Integration potential with other low-income neighborhoods nearby

6. Developable topography

7. Evidence of pressure for early development

8. Unencumbered land ownership and ease of acquisition

9. Free exposure to hazards such as hurricane winds, flooding, industrial nuisance (such as noice or cement factory dust)

Economy of Site Selection

After it has been established that the site contains building land of a suitable kind and is well located for shelter use, a preliminary appraisal of the inherent economy of the development proposed should be made. Establish whether the cost of the land that is to be charged to the shelter development will be low, medium, or high, compared with similar schemes, undertaken or proposed.

Consider if the land is such a nature, swampy or rocky, that utility costs will be above average despite engineering economy in concept and detail design.

D. Site Plan

A rough site layout plan should be developed by each team in accordance with the methodology presented earlier in the seminar. A land use summary should be prepared. A format for this is attached as page 49.TW/SE 12.

Elements to be Considered When Preparing a Site Layout Plan

Layout Plan

The layout plan is perhaps the single most important step in project preparation since it must reflect how people live and provide a framework for all activities on the site. The layout plan must be suited to the topography and other physical characteristics of each site. It is a key determinant of the costs of each project. The main organizing ideas for shelter layouts are:

1. An appreciation of family life
2. An appreciation of social life (i.e., interaction between individuals and families)
3. The cultural pattern
4. The organization of economic activities (i.e., small industry, shops, cabins, hawkers, storage)
5. Building with nature and topography
6. Geometrical arrangements that reflect or influence social and cultural patterns
7. Geometrical clarity and sense of place
8. Ideas expressive of themes (i.e., closeness or apartness)
9. Three-dimensional ideas (i.e., apartness, proximity, shade, balance, etc.)

10. Buildings arranged to form an outdoor room or precinct; roads and footpaths as corridors

11. Symbolism, particularly in the relationship between plots (i.e., small plots in less preferred locations imply something about status; alternatively, all plots in equally desirable locations says something about status)

12. Economy of development

Standards

Standards measure the quantitative and qualitative relationships between the various components of each shelter layout, particularly as they affect project effectiveness. They are the basic means of describing the project and may be organized under the following headings:

1. Land and its use

2. Community planning standards

3. Residential planning standards: plot size

4. Dwelling planning standards

5. Building design standards

6. Control of building development

7. Water supply and distribution

8. Sanitation and drainage

9. Economy

The approach to achieving standards may have to be evolutionary and profit from incremental experience. It must be adaptable to permit variations for different groups. If standards are set too high, they will fail to meet the needs of people most in need. If set too low, nothing is achieved.

Infrastructure or Engineering Standards

These are so significant to improving living standards, and in the cost build up of the project, that they are specially detailed here.

1. Identify the elements of infrastructure to be provided.

2. Allocate available budget to infrastructure costs and establish the essential trade-offs with other elements of a project.

3. Define objectives of infrastructure in projects.

4. Sewage solutions: a wide range of alternatives
   - conventional sewer systems
   - treated alternatives:
     ponds and lagoon systems
     septic tanks, aqua tanks, and package units
   - untreated alternatives (pit privies)
     wet
     dry

5. Water supply
   - conventional house-to-house connections
   - communal supply (water stand pipes)
   - trucked water and water vendors
   - wells (deep and shallow)

6. Drainage
   - degrees of protection
   - open and closed drains
   - lined and unlined drains

7. Solid waste collection

8. Roads, footpaths, and bridges
   - determining appropriate standard required
   - alternative materials

E. Cost Estimates

Suggested formats for cost estimates are attached as pages 49.TW/SE 14 through 17. These illustrate the types of information that would be required by financial institutions interested in financing the project. For convenience of reference the types of issues that might be reviewed in preparing a cost plan are given below. Not all can be considered during the time available for the exercise.

1. Define project costs
   - land
   - site preparation
   - on-site infrastructure
   - off-site infrastructure

SUMMARY OF LAND USE

	Area (m^2)	Percent of Total Area
A. Marketable land (to which costs are allocated)		
1. Residential*		
Zone A		
Zone B		
Zone C		
2. Small-scale commercial/industry		
3. Community Facilities		
TOTAL MARKETABLE LAND		
B. Nonmarketable land		
1. Park and open space		
2. Vehicular and pedestrian circulation space		
TOTAL NONMARKETABLE LAND		
TOTAL LAND USE		

*Classified in terms of the income levels of households.

- on-plot development
- community facilities
- other (e.g., materials loans, loans for small enterprise, etc.)
- administration, design, and supervision costs
- contingencies

A format or formats should be presented which show the above costs on a per square meter basis and apportion them to each type of plot. (A breakdown of locally-financed versus foreign-financed costs is also useful for international lending agencies.)

2. Financing plan

This should show the details of the expected disbursements of funds during the project implementation stage. It should clearly identify the types of expenditure anticipated, the time period of the expenditure, and the anticipated sources of the funds.

3. Project cash flows

This should show the projected cash flows resulting from the project both during the implementation period and during the period of project financing. (If time is available.)

UNIT COSTS AND AFFORDABILITY

	Household or Cross-Subsidy Groups or Range of Plot Sizes Related to Income		
	Group A	Group B	Group C
A. Costs per plot 1/			
Land cost 2/ 3/ (average cost of land)			
Infrastructure cost 2/			
Core house cost			
Connection cost			
Special feature cost (e.g. pit latrine)			
Community facilities 4/			
TOTAL			
Building materials loans			
B. Downpayments required			
C. Monthly payments			
For plot			
For capital cost of utilities			
For materials loan			
TOTAL			
D. Affordability			
Percent of income spent on housing			
Monthly income			
Percentile reached			
Number of plots			
Percent of plots per type			

1/ Should include prorated physical contingencies, management costs, interest during construction.

2/ Should include prorated costs applicable to nonmarketable land.

3/ Any cross-subsidies can be allocated to land cost (see separate cross-subsidy table).

4/ Cost of facilities divided by the number of families sharing them. Only if paid by beneficiaries.

DETAILED COST ESTIMATES

A. Land acquisition

B. Off-site infrastructure

C. On-site infrastructure

D. Connections

   1. Water
   2. Sewerage
   3. Electricity

E. Core units

F. Building materials loans

G. Community facilities

   1. Schools
   2. Health centers
   3. Markets

H. Design and supervision

I. Base cost

J. Project management

K. Interest during construction

L. Physical contingencies

M. Price contingencies

N. Total Cost

useful but not essential for
this exercise

SOURCES AND APPLICATION OF FUNDS
Format for cash flow projection

	1980	1981	1982	1983	Total 1980-1983	1984	1985	1986
I. SOURCES OF FUNDS								
A. Government funds								
1. National government (by agency)								
2. Local government								
B. Borrowed funds								
1. Local borrowing								
2. International borrowing								
C. Loan repayments								
TOTAL SOURCES								
II. APPLICATION OF FUNDS								
A. Project dispersals								
B. Loan repayments								
C. Administration								
TOTAL APPLICATION								
III. SURPLUS (DEFICIT)								
A. By year								
B. Cumulative								

CALCULATION OF CROSS-SUBSIDY
(if proposed by working group)

Target Group/ Land Use	Plot Size (m^2)	No. of Plots	Total Area (m^2) (1x2)	Cost of Land[2/] per m^2 (TD)	Cost per Plot (TD) (1x4)	Total Cost (TD) (2x5)	Price per m^2 of Plots Generating Surplus (TD)	Total Price of Plots Generating Surplus (TD) (3x7)	Surplus (TD) (8-6)	Proposed Distribution of Total Surplus Among Low Income Plots (%)	Distribution of Surplus (Total of 9x10)	Total Price of Low Income Plots (TD) (5-11)	Cost per Plot of Low Income Plots (12÷2)	Cost per m^2 of Low Income Plots (13÷1)
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Low Income:														
A														
B														
Surplus Generating:														
C														
C														
Commercial/ Industrial														
Community Facilities[1/]														

1/ If marketable. If these are sold, they are usually sold at cost to public authorities.

2/ Should include pro rata share of non-marketable land.

STUDY NOTE 1
HOUSING MARKET INFORMATION FOR THE TUNIS CASE STUDY

1. Population

Forty-seven percent of Tunisia's 5.6 million inhabitants lived in urban areas according to the latest Census conducted in 1975. The median age is 18.3 years and the distribution between males and females is almost equal. Life expectancy is estimated at 57 years for men and 58 years for women. The 2.7 percent rate of natural increase between 1966 and 1975 was somewhat offset by the emigration of about a quarter of a million workers to European and Arab countries resulting in a net average annual growth rate of 2.3 percent. Demographic development has also been characterized by large rural to urban migration as under-employed rural workers seek jobs in the cities. Between 1966 and 1975 the rural population increased at an average annual rate of 0.5 percent while the urban population increased by 4.7 percent. In 1975 one-third of the population was in the four largest urban centers -- Greater Tunis, Sousse, Sfax, and Bizerte. The District of Tunis, with a population of 925,000 accounts for 17.3 percent of the national population and 38 percent of the urban population. It's population is growing at a rate of about 3.2 percent per year. The average household size in Tunis is 5.5 persons.

1/ Most of the data presented here is actual or approximated for this example. This sites and services example is, however, hypothetical.

2. Income Distribution and Expenditure Patterns

It can be seen from Table 1 and Figure 1 that 11 percent of the population of Greater Tunis is below the 1978 World Bank defined urban poverty threshold of TD45 per month.[2] It is interesting to note the wide income range of the spontaneous settlement zones of Saida Manoubia and Jebel Lahmar. Some medium income families are forced to live in these areas by the acute housing shortage.

The "Budget/Consommation" survey carried out in 1975 by the Institut National de Statistique reports that the average Tunisian household devotes 27.9 percent of its income to housing; the percentage spent by rural households (23.9%) is slightly below the urban percentage (29.0%). The average expenditure for housing in the Tunis District is 31.3 percent of household income. Rent and acquisition expenses alone consumed 19.3 percent of the household budgets in Tunis District in 1978 according to USAID estimates. (See Table 2 for 1975 figures.)

Mortgage amortization payments may not exceed one-third of the client's income a-cording to CNEL regulations. When a family accepts a mortgage payment of 30 percent of its income, actual housing expenditure may reach 45 percent when the other costs of utilities, mainentance, etc. are included.

The percentage of income spent on housing is higher for the lower income groups as can be seen in Table 3.

---

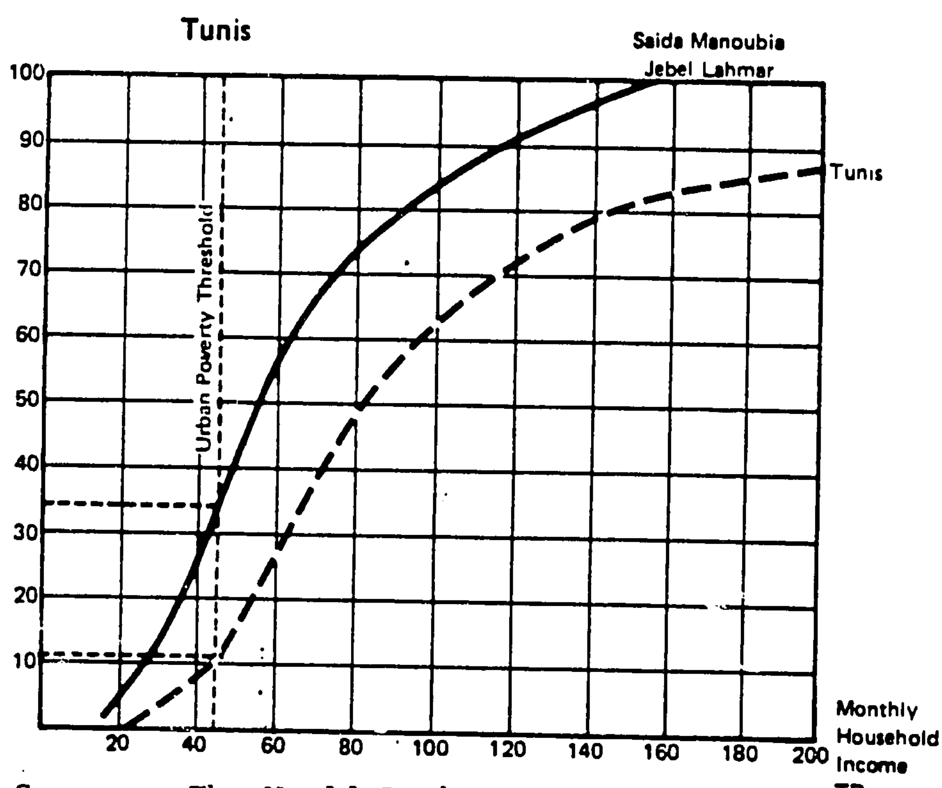
[2] The absolute poverty threshold is calculated by taking the cost of a basic diet for the average adult male -- 2,000 calories per day -- and multiplying it by 2.5. (US$1 = TD 0.42.)

Table 1
Tunis Income Distribution, 1978

Monthly Income Range (Tunisian Dinars)	Percent	Cumulative Percent	Number of Households (Thousands)
0 - 39	8	8	13.4
40 - 59	19	27	37.0
60 - 79	23	50	38.7
80 - 99	13	63	21.9
100 - 119	9	72	15.1
120 - 159	11	83	18.5
160 - 199	4	87	6.7
200 +	13	100	21.9
Total	100		168.2

Exchange rate: US$1 = TD 0.42

Figure 1
Tunis Income Distribution, 1978



Source: The World Bank

Table 2
Detailed Breakdown of Household Budget
(in percents of total budget)

PRINCIPAL EXPENSE CATEGORIES	LARGE CITIES	URBAN AREAS	RURAL AREAS
FOOD:	36,6	40,6	47,6
HOUSING:	31,3	29,0	23,9
Rent	13,0	7,5	7,3
Energy	4,7	4,3	2,6
Repairs	5,0	7,7	6,9
Furniture	2,1	2,5	1,6
Appliances	0,8	0,6	0,3
Kitchen Utensils	0,4	0,5	0,7
Linen	0,5	0,7	0,7
Other	0,6	0,2	0,3
Acquisition of a home	4,2	5,0	3,5
CLOTHING:	8,3	8,5	9,6
HYGIENE:	5,9	5,7	4,6
TRANSPORT. & COMMUNICA.:	6,3	8,0	6,9
ENTERTAINMENT:	9,1	8,0	6,9
OTHER	2,4	4,2	3,9
TOTAL	100,0	100,0	100,0

Source: Institut National de la Statistique, Ministere du Plan, Recessement General de la Population et des Logements du 8 mae 1975, Tunis 1976.

Table 3
District of Tunis,
Housing Expenses as a Percentage of the Total -- By Type of Housing

Type of Housing / Percent of Total	0-4%	5-10%	11-15%	16-20%	21-30%	31-40%	40%	TOTAL
Expensive	-	63.8%	6.3%	4.5%	4.2%	8.5%	12.7%	100%
Middle Income	13.5	27.3	12.4	9.3	14.0	10.2	13.3	100
Resettlement Areas	1.2	24.9	14.5	10.5	17.4	12.2	16.3	100
Slums	16.0	31.6	20.0	15.0	17.2	6.3	10.0	100
Medina	0.3	26.4	16.3	13.3	23.5	7.4	12.8	100
Downtown	-	36.2	20.8	10.7	15.5	8.1	8.7	100
Rural	5.2	42.2	5.2	26.4	5.2	5.2	10.6	100
TOTAL	4.14	30.7	15.6	11.5	16.7	8.7	12.4	100

3. Employment

The major problem facing the Tunisian economy is open and hidden unemployment. Some form of unemployment or underemployment still affects close to one-third of the labor force. Twenty-two percent of the registered non-agricultural labor force was unemployed in 1976. Of these 265,000 registered unemployed, more than half were young people seeking their first job.

It is difficult to assess the employment opportunities of the low income population because a significant proportion work in the informal sector. A survey conducted in the Tunis District in the early 1970s found that about half of the household heads in the spontaneous settlement zones were employed on a non-permanent basis. A 1976 study shows that 42 percent of the heads of households in the spontaneous settlements are industrial workers, day laborers and unskilled laborers, while another 17.7 percent are service employees.

Most employment for the residents of squatter settlements is located outside of the area of residence. For example, only 14 percent of the employed residents of Melassine work in the Melassine area itself, 71 percent work in the center of town and in the Medina and the remaining 15 percent are employed in various other peripheral sections of town. Employment in Melassine consists primarily of small scale trade and artisan activities located along the main thoroughfares in addition to a large central market. Business and industrial operations provide 680 jobs while government agencies supply 180-200. It should be noted that the spontaneous settlement zones are located relatively near to employment centers. If the new sites and services project is developed far from existing employment centers, round-trip commuting must be affordable to the residents. In addition, new low income settlements should be designed to enable some informal employment on-site.

4. Housing Occupancy

The Medina, or "Old City," its two suburbs and the spontaneous settlement zones contain the majority of the Tunis poor. These areas, which include 45 percent of the Tunis population and cover one-fifth of the inhabitable area of the District, are the main receiving areas for migrants. The fast pace of population growth has resulted in high densities. Densities have reached 550 persons per hectare (in the Medina) and 630 persons per hectare in Melassine, the largest squatter area. By comparison, the density for the District as a whole is about 220. Table 4 shows population area and densities in Tunis by housing type.

In the low income areas there is a greater proportion of males than the District average because many migrants move to the city without their families. Eighty-five percent of the families in the spontaneous settlement zones are nuclear as living conditions are not conducive to extended family patterns. The average household size is 5.5, the same as for the District, but the number of households per housing unit is 1.4 as against 1.2 in

Table 4: Population, Area, and Densitites by Tunis Housing Type

HOUSING TYPES / SYSTEMES	POPULATION SIZE / EFFECTIFS DE POPULATION		OCCUPIED AREAS / SUPERFICIES		DENSITIES BY TYPE / DENSITES PAR SYSTEMES		POPULATION AND AREA / POPULATION ET SUPERFICIE		DWELLING UNITS / LOGEMENT	
	Population size / Effectifs de population	% / %	Area/ha / Superficie	Total % / %	Population density/ha / Densite habitant	Housing density/ha / Densite logement	Population / Population	Area / Superficie	Number of D.U. / Parc logement	% / %
HIGH INCOME / HAUT REVENU	29,675	3	540	13,4	58,5	13	3	13,4	7,782	5,4
MIDDLE INCOME / REVENU MOYEN	270,000	27,8	1,930	48	133,9	23	27,8	48	43,743	30,3
SPONTANEOUS SETTLEMENTS / HABITAT SPONTANE	275,000	28,31	452	11,2	384,8	47	28,6	11,2	17,743	12,2
RESETTLEMENT PROJECTS / CITES DE RECASEMENT	133,376	13,73	460	11,4	281,8	40	13,7	11,4	20,034	20,4
NEW URBAN CENTER / CENTRE URBAIN	83,312	8,57	230	5,7	401,3	102,7	8,6	5,7	20,852	14,3
HISTORICAL CENTER / CENTRE HISTORIQUE	160,469	16,52	312	7,8	550	90	16,5	7,8	22,000	15,2
RURAL HOUSING / HABITAT RURAL	19,350	2,00	102	2,5	121	16	2	2,5	13,106	2,2
TOTAL	971,182	100%	4,026 ha	100%	---	---	100%	100%	145,260	100%

Source: PADCO. A prefeasibility Study for Upgrading the Spontaneous Settlements of Tunis, Tunisia, Washington, D.C.

the District. In Melassine there are 1.9 households per housing unit. Households in the Medina are more complex and older than those in the squatter settlements. The number of dependent children is lower and 25 percent of the households are extended families.

Table 5 shows a rough correlation of 1975 household incomes and the types of housing occupied. Households beneath the 50th percentile live in "sub-standard" or "minimal" housing. Table 6 shows a rough breakdown of the principal characteristics of each housing type.

In addition to providing for expected increases in population new sites and services developments should strive to eventually relieve some of the current overcrowding and poor conditions in low income settlements.

5. Spontaneous Development

The present system of spontaneous development provides an indication of how sites and services communities could develop. The traditional Arab house with interior courtyard is still the predominant dwelling unit in the spontaneous settlement zones. The basic plan, three or four rooms around an inner courtyard, is the same building that composes the medina. The difference is simply evolution. Those in the older sections have often been raised to two or more stories to maximize space usage.

In the spontaneous settlement zones the older units are usually of stone and mortar, while the newer ones are of concrete

Table 5
Summary of the Housing Situation in
the District of Tunis, 1975

Stylized Cross-Tabulation of Households by Income
Dwellings by Quality

Dwellings / Households (monthly income)	H_0 Substan Temp.	H_1 Min-imal	H_2 Basic	H_3 Modest	$H_{4/5}$ Good/ Luxury	F	Index
F_0 Below 46 D	28,900					28,900 19.6%	
F_1 46-91 D	18,280	27,870				46,150 31.3%	80
F_2 92-183 D		21,520	22,860			44,380 30.1%	76
F_3 184-367 D			2,500	16,670		19,170 13.0%	93
$F_{4/5}$ 368 D or more				1,910	6,930	8,840 6.0%	89
H	47,180 32.0%	49,390 33.5%	25,360 17.2%	18,580 12.6%	6.930 4.7%	TOTAL 147,440	81

Source: Tunisia Shelter Sector Assessment. Agency for International Development, Office of Housing, January 1979.

Table 6
Characteristics of Major Housing Types in Tunisia, 1975

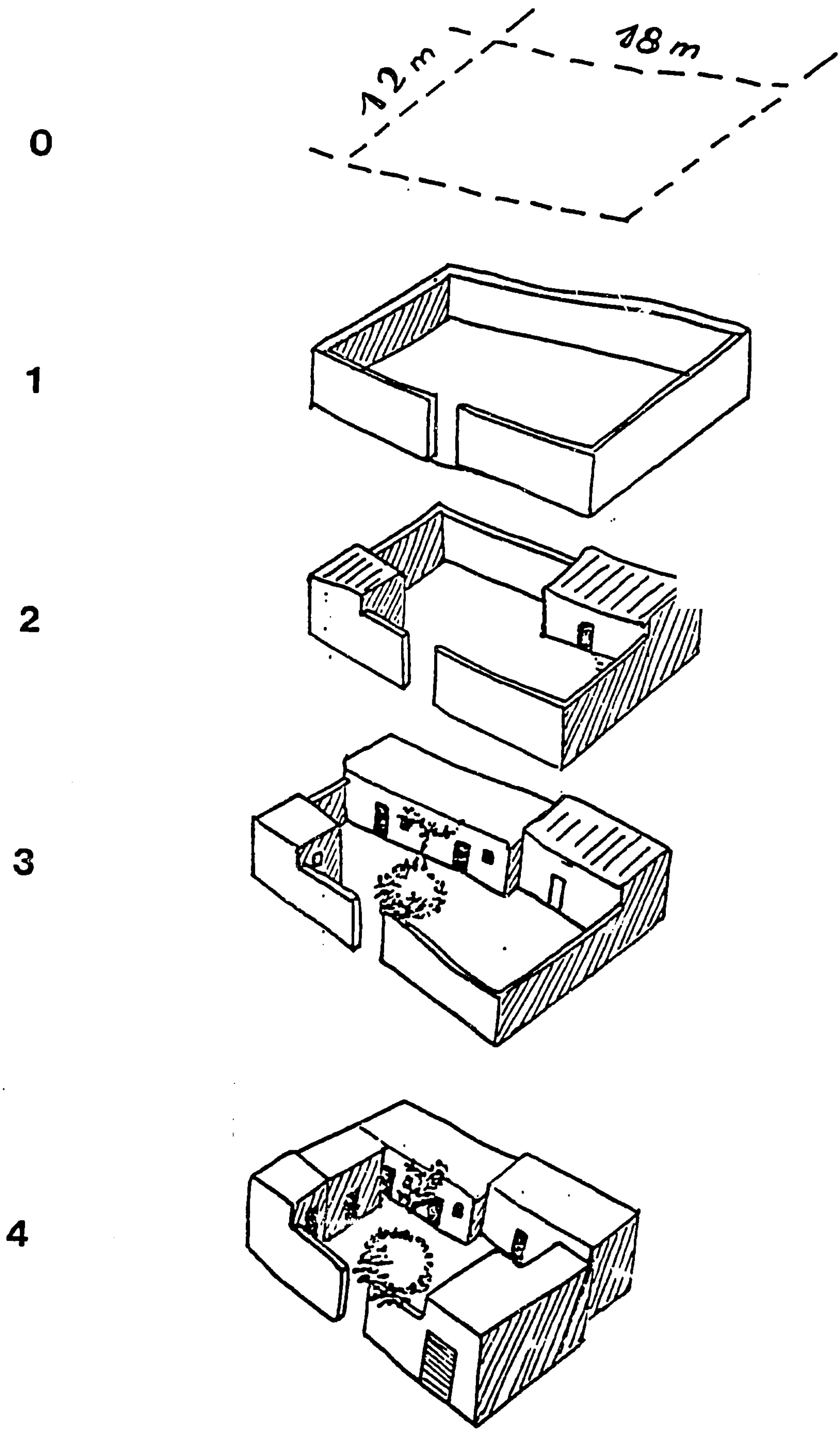
		H0 Substandard or Temporary	H1 Minimal	H2 Basic Low-Cost	H3 Modest	H4/5 Good/Luxury
1	Construction cost without the site 1975 dinars	TD500	TD800-1200	TD1,500-2,500	TD3,000-5,000	Over TD8,000
2.	Number of rooms	1-2	1-2	3-4	3-5	5 or more
3.	Plumbing	Well, cistern or no water No sewage connec	Piped water, WC, Severage. Some rudimentary	W.C. or bathroom, incomplete	Finished bathroom and all utilities	Finished bathroom, all utilities, some central heat
4.	Electricity	About half have electricity	Almost all	All	All	All
5.	Materials	About 1/3 sticks, clay, sheet roofs, etc.	Permanent materials	Permanent materials	Permanent materials	Permanent materials
6.	Typical floorspace M^2	30	30	45	67	Over 100
7.	Construction cost per M^2, estimate	TD17	TD33	TD45	TD60	TD80 or more

block. The older ones often have flat roofs covered with a coat of cement or mortar. Newer units often have a roof of poured concrete or are built with tile held in place by reenforced concrete.

The pace of the building process in the informal sector depends on the income of the family. Figure 2 illustrates the typical phases. However, smaller plots may be necessary in this project than that illustrated here in order to reduce costs.

Census statistics show that 77 percent of urban units had three rooms or less. In rural areas, 84 percent had two or less rooms. One-room units comprise 19 percent of urban area totals and 57 percent of national totals.

Figure 2 : Phases of Construction



STUDY NOTE 2
HOUSING FINANCE POLICY INFORMATION FOR THE TUNIS CASE STUDY

The government is the major source of housing finance, accounting for 52 percent of the total planned for the Fifth Plan period. Caisse Nationale d'Epargne Logement (CNEL) is the most important housing finance agency. Initiated in 1974 it is supposed to finance the purchase of housing and the expansion of existing units and programs for real estate developers. CNEL provides most of the financing for SNIT's projects. It is anticipated that CNEL will provide the short and long term financing for the sites and services program.

CNEL's cost of funds varies from the 4 percent it pays for contract savings to 8.3 percent for HIG loans, an average cost of about 5 percent. Its administrative costs require a 2 percent spread. With housing loans being made at 5.5 percent, it operates at a deficit. Because most of the beneficiaries of the sites and services program are not participants in the contract savings program, it is estimated that the average cost of funds for that program will be 6 percent plus a 2.5 percent spread for administration,1/ a total of 8.5 percent. Funds for subsidies are extremely limited. The Government would like to eliminate the annual deficits caused by the interest rate subsidy. If possible, the new project should be planned to accomplish this goal, but all arguments for and against subsidies should be thoroughly considered.

1/ This is greater than present costs because of the additional cost of processing a large number of small loans.

CNEL is also the principal source of construction financing. As of March 1978 it had lent nearly 300 million for pre-financing of real estate development projects, of which 95 percent was borrowed by SNIT. Interest is 7.5 percent and the average repayment period is 18 months.

STUDY NOTE 3

UNIT COST ESTIMATES FOR CONSTRUCTION FOR THE TUNIS CASE STUDY

I. Infrastructure Costs	Cost per m^2 (Tunisian Dinars)
Standard 1	1.49

Circulation -- 25% asphalt; 50% compacted stone/asphalt spray; 25% graded and compacted.
Water -- Individual connections.
Sewerage -- Individual water borne system.
Drainage -- Stormwater drainage with open ditches.
Electricity -- Individual electricity connections.
Street lighting -- Light and pole every 50 meters on main roads.

Standard 2	0.72

Circulation -- 25% compacted stone/asphalt spray; 75% graded and compacted.
Water -- Individual connections.
Sewerage -- No system (requires individual pit latrines).
Drainage -- Stormwater drainage with open ditches.
Electricity -- Individual electricity connections.
Street lighting -- Light and pole every 50 meters on main roads.

Standard 3	0.45

Circulation -- 25% compacted stone/asphalt spray; 75% graded and compacted.
Water -- Community standpipe for every 10 families.
Sewerage -- No system (requires individual pit latrines).
Drainage -- Sotrmwater drainage with open ditches.
Electricity -- No individual connections.
Street lighting -- Light and pole every 100 meters.

Unit costs include estimates for design and supervision (3.3 percent), project management (2.5 percent), and physical contingencies (5.0 percent).

II. House Construction Costs*

	Size (m^2)	Cost/m^2 (Tunisian Dinars)	Total Cost
No house			
Sanitary core	10	56	560
Cost/additional square meter		45	
Building materials loans			250-500

III. Connection Costs

Sewerage	93
Water	51
Electricity	35
Total (if all 3 used)	179

IV Special Features and Community Facilities

Pit latrine	60
Community fountain	125
Schools	850/room (each room for 40 pupils and operating on double shifts). Cost of building paid by Ministry of Education.
Health centers	20,000 each to serve 8,000 families. Cost of building paid by Ministry of Health.

*All overheads included, i.e., unit costs include estimates for design and supervision (3.3 percent), project management (2.5 percent), and physical contingencies (5.0 percent).