PN-ABD-912
63470

Draft: October 1989
Revised draft: November 1989

URBANIZATION AND ENVIRONMENTAL QUALITY

The Conservation Foundation
Washington, D.C.

Table of Contents

Preface 2

Introduction 2

Driving Forces of Urbanization in Developing Countries 7

Adverse Environmental Effects of Urbanization 12

Governmental Responses to Environmental Deterioration 20

Factors Affecting Capacity of Urban Areas to Manage Environmental Quality 26

Donor Programs: Environment and Urbanization 35

Implications for AID Urban Programs 39

Concluding Comment 42

References 43

Annex A: An Assessment of A.I.D. Activities and Procedures Affecting Urban Environmental Quality

Annex B: World Bank Urban Sector Activities

URBANIZATION AND ENVIRONMENTAL QUALITY**

PREFACE

The purpose of this report is not to compile details on trends of urbanization in developing countries. Such compilations have been amply done in various reports by AID, IBRD, and other entities. Nor is the purpose to provide an inventory of ambient environmental quality, however measured, in urban areas of various countries. Various sources of such information exist, such as Hills and Whitney (1988) with respect to several Asian countries.

Rather, the objectives of the paper are:

(1) to identify the types of adverse environmental effects typically stemming from urbanization in developing countries;

(2) to indicate the types of responses governments have made in attempting to cope with the adverse environmental effects of urbanization, and the efficacy---or lack thereof---of those attempts;

(3) to indicate the factors which affect the capacity of governments in urban areas to manage environmental quality;

(4) to review the role of major donors in assisting, or not, governments of developing countries to address the adverse environmental effects of urbanization.

INTRODUCTION

The rapid urbanization in developing countries (DCs) in the latter half of the twentieth century is a well-documented phenomenon. All analyses project a continuation of the trend. Table 1 shows the projected growth in urban population between 1988 and 2000 for four World Bank regions. Table 2 shows

---

**This report draws on work done in Project Ecoville, headed by Dr. Rodney R. White, at the Institute of Environmental Studies, University of Toronto, Toronto, Canada. Comments by Dr. White have been incorporated in the report. The analyses of urbanization programs of AID and of the World Bank were done by Dr. Eric Hyman. A search of the literature was done by

Barbara Rodes.

urban population growth in relation to total population growth in countries in the AID Asia and Near East Region. Figures 1A, 1B, and 1C show the estimated levels of urbanization for 1950 and 1987 and projected for 2025 for AID regions Africa, Asia and Near East, and Latin America and Carribean, respectively. The projections represent the mid-range variant developed by the U.N. Department of International Economic and Social Affairs (1987).

Table 1. Estimated and Projected Population by Region

Region	Estimated urban population, 1988 billions	Projected urban population, 2000 Growth rate,%	Pop., billions
Africa	0.13	5.4	0.25
Asia	0.59	3.3	0.88
EMENA	0.18	2.8	0.25
LAC	0.29	2.8	0.40
Totals	1.19		1.78

Source: Policy, Planning and Research Staff (1989)

The actual extent of urbanization among countries is clouded by differences in definitions of urban areas and inaccurate and/or nonexistent censuses of population. For example, the last census in Nigeria was in 1973. Definitions of what comprises an urban area have changed and boundary changes have occurred as a result of political decisions, typically resulting in areal expansion. In some cases, the boundaries of a metropolitan area have become contiguous with the boundaries of a province or an state.

Virtually all statistics and projections of population in DCs, in whatever agency reports they are found, are based on analyses by the United Nations Department of International Economic and Social Affairs, e.g., (1987). As those involved in population projections in developed countries, such as the U.S., are wont to state, the only certainty about the projections is that they will be wrong. However, it makes little difference if the rate of increase is 2.8%, 3.1%, or 3.3%; the problem of managing environmental quality in urban areas will continue, and environmental quality conditions in urban areas will continue to decrease unless such management programs can be put in place and maintained.

Much of the analysis, planning, and development aid has been oriented to primate cities and to megacities. Yet the

phenomenon of urbanization extends far beyond those foci. For example, according to Jordan (1986, p. 11), if present trends

continue, by 2000 between 60% and 70% of the population of Latin America will reside in about 2000 areas with 20 thousand or more inhabitants in each, and that at least 50% of this urban population will be in about 46 major metropolitan areas.

With respect to the spatial distribution of the remainder of the population in Latin America, it is useful, as pointed out by Jordan (1986, p. 12), to distinguish between transitional population settlements, referred to as "rural-urban settlements", and "clearly rural settlements". Between 10% and 15% of the total population of Latin America in 1980 was estimated to reside in settlements which had between 2,000 and 19,999 inhabitants, i.e., the rural-urban settlements. It was estimated that, between 1950 and 1970, approximately 430 settlements of this size "achieved" reclassification to urban areas, because their populations reached the magic number of 20,000. The increase in these settlements was a function of natural increase and in-migration.

With respect to settlements with populations less than 2,000, it was estimated that about one-third of the 1980 population in Latin America resided in settlements in this size category. For these settlements it is useful to distinguish between two types, based on size of population. The first type consists of settlements or small centers with between 500 and 1,999 inhabitants. In such settlements, some service, transport, and communication functions tend to be established. About one-fourth of the clearly rural population in Latin America was estimated to have resided in these settlements in 1980. The other type, accounting for about three-fourths of the clearly rural population, consists of small villages, hamlets, and dispersed inhabitants.

In analyzing environmental quality in relation to urbanization, the multiple foci of urbanization should be explicitly considered.

Characterizing Urbanization in Developing Countries

Based on a variety of analyses, the following conclusions with respect to urbanization in DCs appear valid.

o Urbanization in DCs is irreversible. "What cannot be denied is that rural people are choosing to move to the cities and that the majority choose to remain there, despite what are often atrocious conditions, in the expectation that opportunities will materialize to enable them to improve their lot" (Miles, 1983, p. 19). In addition, urban areas---especially the "mega" cities---are sufficiently large so that the natural increase itself

in those areas will ensure an increasingly urban population over time, given that migration is an age-selective process, with most migrants being in the child-bearing age range. Net out-migration from urban areas to rural areas is highly unlikely.

o The inability of governments of urban areas to provide adequate services, e.g., water supply, sanitation, transport, solid wastes disposal, has contributed significantly to the development of the "informal" sector of economies in many, if not most, DCs. The informal sector has become an increasingly important part of the overall economy, in terms of outputs, employment, utilization of available natural resources. Although the informal sector has been able to provide some services to areas of cities not otherwise served, the existence of such efforts has added to the fragmentation---and hence to the inefficiency---of the provision of urban services.

One index of the inability of governments to provide infrastructure services is the nonachievement of the goals of the International Drinking Water Supply and Sanitation Decade.

o Although urban areas on the average have been estimated to contribute on the order of two-thirds of gross domestic product (GDP), an increasing portion of that contribution to GDP represents expenditures to cope with the adverse effects of, or to prevent the adverse effects of, discharges to the three environmental media. In addition, traffic congestion and the unreliability of utility systems often associated with rapid urbanization add to costs of producing goods and services. Further, national accounts and the calculations of GDP, do not take into account the monetary damages resulting from water and air pollution in urban areas. (This point is amplified in a later section.)

o "Neither theory nor practice from the industrial world provides any clue as how best to manage the phenomenon of rapid urban sprawl and economic stagnation" (White and Burton, 1983, p. 39). Yet both sprawl and economic stagnation are endemic in almost all cities in DCs.

o Urbanization and the environmental effects related to urbanization cannot be analyzed, and measures to cope with urbanization and related envionmental problems cannot be implemented, in isolation from the international, national, and regional contexts of urbanization. Thus, urban development, if there is to be development, must be an integral part of national development. The relevant multiple contexts are shown in Figure 2.

o Putting more money into the types of urban projects typical of the last decade, i.e., "sites and services", is not likely to result in long-term net benefits. What is needed is

better understanding of how different strategies and emphases would affect outcomes and how strategies are sensitive to different levels and types of financing. The recent shift in the programs of some donors toward institution building and longer-term, consistent technical assistance reflect these facts.

o The "urban bias" in the policies and programs of many governments of DCs, which exists and has existed for some time, has been a major factor in stimulating migration from rural to urban areas. (See the discussion in Stren and White, 1989.) This bias is reflected particularly in the subsidization of food prices, and often housing prices, in urban areas and maintenance of a fixed rate of foreign exchange above---often substantially above---the market level. The result has been a continued decline in the domestic rural-urban terms of trade, in turn leading to undercutting of domestic agriculture and the importing of artificially lower-priced food. In effect, rural areas are subsidizing urban areas.

o Achieving a stationary world population is not likely to be accomplished for at least another generation, e.g., by about 2135, according to the World Bank (1981). Thus, as urbanization continues, the problems of managing environmental quality within urban areas will be exacerbated.

The basic point is, regardless of the past configuration of factors leading to rapid urbanization, the growth of urban areas will continue. The fundamental problem then is how to improve the management of environmental quality in those urban areas.

DRIVING FORCES OF URBANIZATION IN DEVELOPING COUNTRIES

The rapid increase in urbanization in DCs has been fueled primarily by rural to urban migration. That migration is stimulated by "pull" of presumed more desirable conditions in urban areas combined with the "push" because of deteriorating conditions in rural areas. Thus, migration is a function of the perceived difference in opportunities and quality of life between urban and rural areas, regardless of reality. In some cases in-migration to a designated urban area occurred even before streets were laid out and before services were available, e.g., water, sewer, electricity, as in the case of Santo Tome de Guayana.

The "driving forces" of urbanization in DCs can usefully be discussed in relation to: (1) attractions of and developments in urban areas; and (2) deterioration of conditions in rural areas.

Attractions of Urban Areas

Urban areas have traditionally been centers where manufacturing, financial, and governmental activities of

region or a country are concentrated. August Losch pioneered the development of location theory, i.e., the allocation of activities in space, including the growth of cities and the evolution of urban hierarchies. Regional science begin to evolve after World War II, fathered by Isard (1956). Since the early work of Isard and his students, much effort has been directed toward trying to understand the factors affecting and determining the spatial patterns of human activities: in an overall sense; with respect to individual economic sectors, such as pulp and paper manufacture; and as affected by public policies, e.g., Coppock and Sewell (1976). A review of the abundant literature in the field is outside the scope of this report.

The advantages of an urban area stem from at least three characteristics. One is the synergism which stems from the variety of services (and products) available. This variety enables producing "packages" of inputs to different activities. For some types of activities, interaction among sources of different inputs is essential, which requires proximity.

Two urban areas represent concentrated centers of markets for goods and services. These markets in turn stimulate the development of additional, often more specialized, activities. As the complexity of an urban area increases, there are more "niches" for be developed and occupied by entrepreneurs.

Three, concentrated markets enable development of economies of scale, both within the urban area and in relation to activities outside of, but supplying, the urban area. However, there are limits to agglomeration economies. At some level, diseconomies begin to be significant, e.g., congestion and deterioration of environmental quality. The size of urban area at which diseconomies begin is a function of the capacity of the urban government to provide services and maintain adequate levels of environmental quality.

Advantages of an urban area represent attractions in terms of perceived opportunities. The wide range of activities yields demands for a wider range of skills than is the case in rural areas. On the supply side, urban areas offer a wider range of goods and service than do rural areas.

A very important attractant is the fact that, in most societies, the dominant power structure for decisions for allocation of resources is located in whatever urban area is the capital of the country. National governments concentrate activities in capital cities. Given that the structure of government of most DCs is highly centralized, the capital typically is the prime locus of activity. Concentration of governmental activities in turn draws private sector activities. A few regional cities may achieve substantial status, usually when based on exploitation of a natural resource of the region,

e.g., Maracaibo, Santo Tome de Guayana.

Deterioration of Conditions in Rural Areas

The factors resulting in deterioration of conditions in rural areas can operationally be divided into two categories. One consists of those factors which reduce productivity of existing systems on agricultural, pastoral, and forest lands. The other consists of those factors which have resulted in change of existing production systems.

Factors Resulting in Reduced Productivity

The following order of listing does not imply order of importance.

o Population increase in the twentieth century in rural areas in many DCs has resulted from decreases in mortality, in turn as a result of reduction in the prevalence of malaria and other vector-transmitted diseases. As mortality declines, and birth rates remain approximately the same, population increases to the level where it exceeds the carrying capacity of the land under traditional agricultural systems. (This is not to imply that "modern" agriculture would improve on the situation. The contrary is often the case, as indicated below.) "Pushing" the systems beyond the sustained yield level typically results in reducing productive capacity, e.g., because of soil loss. Population increase in some forested areas in sections of Nepal, reached a level about two decades ago where the demand on the forest resources for fuel, grazing, and building materials exceeded the sustained yield of the forests. The basic trend has not changed.

o The development of irrigation technology, e.g., tube wells, methods of irrigation, dam construction for water storage, has resulted in large increases in irrigated area around the world in the last half century. Irrigated acreage continues to increase, but at a slower rate. At the same time, as much acreage or more acreage is going out of production or has sharply reduced yield because of improper irrigation practices leading to waterlogging and salination of soils on irrigated lands.

o The "Green Revolution" spawned a shift from extensive to intensive agriculture, with concomitant increases in required factor inputs---water, fertilizer, pesticides---in order to achieve the high outputs associated with the new varieties. Often this also meant continuous monoculture, rather than crop rotations and crop-fallow systems. This in turn results in many cases in reduced yields over time, particularly as resistance to pesticides evolved, again reducing the carrying capacity of the land, and reducing the capacity to support population.

o Where farm land has been divided among a number of family members, the resulting size of parcels has sometimes become too small so that farming is no longer economically viable.

o More frequent and longer periods of drought have perhaps occurred in areas such as the Sahel of Africa, reducing available grazing lands because of desertification. With no or little reduction in the demand for animal unit months for grazing, productivity decreases, and correspondingly carrying capacity decreases.

o A major factor which has affected, and affects, the economic feasibility of agriculture in rural areas is the all too prevalent inefficient storage, collection, transport, and marketing system, or lack thereof, for outputs. A substantial portion of output at the farm level never reaches consumers in urban areas, thereby reducing returns to farmer effort.

o Although not directly related to changing productivity of agriculture, two aspects of demand for agricultural products have significant impacts. One is the "urban bias" on the part of many governments in DCs---subsidized prices for agricultural products for urban dwellers combined with fixed prices to farmers---which has stimulated out-migration. As prices of factor inputs to farmers have increased, especially fuel and fertilizers after the oil price increase in the mid-1970s, with essentially fixed prices for outputs, farming becomes increasingly less economically feasible.

Another factor on the demand side is the change in tastes in urban areas, partly or predominantly as a byproduct of urbanization. For example, in some places in Africa, demand has shifted from maize, cassava, and other traditional crops to rice and wheat. The latter are less amenable to cultivation by traditional modes and more amenable to large scale agriculture with consequent reduction in labor requirements. Similarly, a concomitant of urbanization has been the increasing substitution of nonbiodegradable materials, e.g., plastics and metals, for more biodegradable materials, e.g., wood and local ceramics (Foster, 1989). The durability of these materials can result in adverse impacts on the environment, if they are not disposed of properly.

Factors Resulting in Changed
Production Systems

o Factors operating at international and national levels have resulted in drastic changes on agricultural lands in some, or many, areas, resulting in depriving substantial segments of rural populations of livelihoods. Agribusiness operates on an international scale, with capital moving to locations where

larger profits can be generated by shifting the technology of agricultural systems or utilization of forest lands. (For pertinent discussion, see Garcia, 1988, Chapter 3).

Mexico provides clear examples of such shifts. In the La Laguna region, a shift from subsistence agriculture with some marketing of output to surrounding areas began at the end of the 1950s. Capital external to the region outbid the local farmers for land on which to grow sorghum for animal feed. This output was produced by intensive monculture, with improved seeds, wew types of fertilizers, pesticides, and mechanization. The shifts were aided by actions of the national government. By the beginning of the 1980s, the acreage of production of maize---the typical crop from local agriculture---had declined by about two-thirds, as shown in Figure 3. Acreage of production of sorghum had increased from essentially zero in 1960 almost to the level of maize acreage in 1950. By 1982, sorghum was grown on 90% of the lowlands and 50% of the highlands.

Adverse consequences resulted for both human populations and natural systems in the region. The "advance" of sorghum production increased the rate of migration to urban areas in the region, as implied in Figure 4. The farmers remaining in the area were forced from the bottom lands and from the plateaus, to relatively steep and much more erodible lands. Soil erosion increased. Returns to farming efforts declined substantially, and with that decline there was a decline in nutritional level and in access to capital. A downward spiral began, and still continues, with the remaining population moving to more and more marginal land.

In the Tabasco region of Mexico, an analogous trend occurred, also stimulated by external capital. In this case the shift in production system was from traditional annual and biannual crops and forest lands, both providing a livelihood for local peoples, to cattle raising. By 1980, virtually all forest lands and annual and biannual crop lands had been eliminated, as shown in Figure 5.

In addition to technological changes which have displaced rural labor, "many agrarian reform schemes seem to have resulted in a reduction in employment opportunities" (Ricardo, 1986, p. 15). Technological changes and counterproductive agrarian reform schemes "have had the net effect of tending to restrict the supply of jobs in the agricultural sector, an effect which has not been sufficiently counterbalanced by plans and programmes for the settlement of new lands. As a result, seeing their employment expectations reduced, large groups of population have moved to urban areas" (Ibid.).

o Areas of prime agricultural land have been inundated by reservoirs developed primarily for hydroelectric energy

generation, flood damage reduction, and water supply for urban areas, usually areas which are far downstream. Even where some of the "managed" water is allocated to irrigation, the alternative areas are less productive than the inundated lands, and hence support fewer families or require movement of the population to unknown areas with corresponding social dislocation.

ADVERSE ENVIRONMENTAL EFFECTS OF URBANIZATION

Urban areas exert two types of demands on the environment: (1) for disposal of residuals (wastes) from activities in urban areas; and (2) for inputs into activities in urban areas, e.g., food, fuel, land. These two types of demands are shown in Figure 6. The environmental effects of the former occur both within the urban area and downstream and downwind from the urban area. The "off-site" environmental effects can occur very long distances away, as a result of transport processes in the atmosphere and in water bodies.

Environmental effects related to residuals discharges, as discussed herein, refer primarily to effects on "ambient environmental quality" (AEQ), as measured by such indicators as concentrations of: particulates (TSP), sulphur oxides (SOx), hydrocarbons (HCs), and carbon monoxide (CO) in the atmosphere; dissolved oxygen (DO), total dissolved solids (TDS), total suspended solids (TSS), nitrates, phosphates, pesticides, metals, synthetic organic compounds, algae in surface water bodies; TDS, nitrates, phosphates, pesticides, metals, synthetic organic compounds in ground water aquifers; noise levels in terms of dBA; and litter/refuse/garbage/obsolete vehicles and appliances indiscriminantly dumped on land and in stream channels.

Concentrations in the environment impinge upon receptors, i.e., humans, plants, animals, buildings. In the case of humans and for some other species, exposure is through multiple pathways, e.g., inhalation, ingestion, imbibing, dermal contact. The results of exposure are, for example, morbidity, mortality, reduced capacity for physical activity and reproduction.

Environmental effects can also be considered in relation to: (a) occupational health or industrial hygiene; and (b) so-called "indoor" pollution. The former relates to exposure to various materials in the work place, through inhalation, dermal contact, and audio pathways. To the extent that agricultural operations occur in urban areas, work place includes such agricultural operations, where exposure can be to pesticides in their application to crops, or to pathogenic organisms in water used in irrigating truck crops. Indoor pollution refers to exposure within residences or other non-work locations, e.g., as a result of residuals generated by fuel combustion. Although these effects do not comprise foci of the paper, the interrelationship

between ambient environmental quality and occupational health in terms of management measures is indicated explicitly.

Figure 7 shows a simplified schema of the relationship among activities, residuals generated and discharged, and effects on ambient environmental quality.

Demands for Disposal of Residuals

Effects Within the Immediate Urban Area

Residuals are generated and discharged within urban areas by all types of activities in urban areas, e.g., residential, commercial, institutional, industrial, agricultural, transportation, and by the urban area as a whole in the form of urban storm runoff. The effects on ambient environmental quality resulting from the discharges are a function of: the types and quantities of residuals discharged; the time pattern of discharges, i.e., daily, weekly, seasonally, from year to year; the topographic setting; and the meteorological and hydrologic conditions. Some examples of sources, residuals discharged, and effects follow.

o The "built environment" of urban areas transforms the natural environment into large or larger impermeable areas which preclude infiltration of precipitation. For the <u>same</u> distribution of precipitation events, the increase in impermeability increases the magnitude and frequency of flood flows, increases discharges of suspended sediment and dissolved constituents into water bodies, changes the time pattern and water quality characteristics of streams within the urban area, and reduces the recharge of ground water aquifers within the urban area.

o In many, if not most, urban areas urban storm runoff is a major contributor of discharges to water courses and hence to deterioration of ambient water quality. This is true even in many arid areas because such areas often are characterized by high intensity precipitation events, even though such events are relatively rare. The adverse environmental effects of urban storm runoff are exacerbated by inadequate management of solid wastes, with the resulting availability of litter, human and animal defecation, septic tank overflows, disposal of garbage in street gutters, for transport by the increased runoff.

o Inadequate transport systems in most urban areas result in a proliferation of thousands of private vehicles, which---as with the vehicles of public transport systems---typically have no devices to reduce gaseous discharges to the atmosphere. Lack of maintenance and operation of vehicles until they literally fall apart, results in high unit emission coefficients. (For example, it was estimated that in Quito,

Ecuador, between 55% and 60% of the vehicles operating in the urban area were more than ten years old [Carrion, 1986, p. 3].) Typically there are no vehicle emission standards and no inspection/testing facilities. These characteristics of vehicle fleets, combined with traffic congestion, result in high concentrations of TSP, CO, HCs, NOx within urban areas, plus high ozone concentrations under certain atmospheric conditions.

o Residential, commercial, industrial, institutional activities discharge gaseous residuals---TSP, NOx, SOx, metals, ---into atmospheres of urban areas from fuel combustion for space heating, process steam, energy generation, cooking, incineration of infectious materials.

o Various industrial and institutional activities discharge oils and grease, organic materials, synthetic organic compounds, heavy metals in liquid wastewaters to water courses.

o Where urban areas are located on estuaries, major rivers, sounds, bays, significant discharges of various liquid, solid, and gaseous residuals occur from vessels anchored along shores or moving through navigation channels. Discharges from point and nonpoint sources occur directly into the coastal waters.

o The provision of infrastructure services, e.g., water supply, sewerage, solid wastes management, in many urban areas is inefficient. Poor construction of water supply distribution systems results in large leaks, e.g., 30%-40% of gross input to system, which means that more materials and energy are required for the same level of service provided. Those materials and energy in turn require inputs and residuals disposal to produce. Inadequate construction of water supply systems, e.g., pipes on the surface of the ground and inadequate connections, result in infiltration of contaminants into the water supply system. Inadequate construction and management of landfills can result in leaching of chemicals into ground water aquifers.

In sum, the effects on ambient environmental quality within a given urban area are a function of: the mix of activities within the urban area; production processes and raw materials used and nature of products produced; constraints imposed on discharges, if any, and methods of managing solid wastes; fuel types used; topography and elevation; and meteorological and hydrologic conditions. The effects are reflected in the spatial and temporal pattern of concentrations in the urban airshed and in the spatial and temporal patterns of concentrations in surface and ground water bodies in the urban area. These effects on AEQ within the urban area have impacts on activities within the urban area, e.g., exposure to high levels of TSP, water quality from wells such that additional treatment is necessary before use, increased morbidity resulting from

exposure to septic tank overflows.

Effects External to the Urban Area

Gaseous residuals discharged in an urban area are often carried substantial distances downwind. Dry or wet deposition occurs on land and on water bodies. If the former, subsequent precipitation and resulting runoff transport the materials into water bodies. Acid precipitation can have adverse effects on vegetation and fish species. Deposition of airborne phosphates can contribute to increased eutrophication in water bodies. Ozone and NOx can reduce yields of agricultural crops. The geographic scope of the environmental effects of discharges of gaseous residuals depends on the type of residuals, the topographic and elevation setting of the discharges, and the meteorological conditions.

Discharges of liquid residuals from urban areas include organic materials, suspended sediment, heavy metals, oils, synthetic organic compounds, plastic, acids. Either singly or in combination organic materials, oils, grease, and some chemicals can reduce dissolved oxygen in streams to zero, thereby virtually eliminating aquatic life. Deteriorated water quality affects in-stream uses such as recreation and fisheries, and withdrawal uses such as irrigation and water supply for municipal and industrial purposes, thereby imposing additional costs for intake water treatment before use. Untreated wastewater discharged from urban areas is often only slightly diluted by existing streamflow, so that when withdrawn and used for irrigation downstream, adverse impacts on humans occur from concentrations of pathogenic organisms on the food crops.

Suspended sediment discharged into water bodies from urban areas typically results in sedimentation downstream. This in turn may reduce fish populations both by increased turbidity and by covering habitat, impose additional costs for dredging, exacerbate flooding because of aggradation in stream channels, and smother riparian vegetation.

Where urban areas are located directly on estuaries or bays, e.g., Jakarta, Dakar, Maracaibo, discharges enter coastal waters directly, without the decomposition which can occur in river channels between urban areas and downstream coastal waters. High concentrations of heavy metals, synthetic organic compounds, pesticides are often found in the water column, the sediments, and shellfish and finfish in coastal water bodies directly receiving discharges from urban areas.

Demands for Inputs to Urban Area

From Upstream Areas

As Figure 6 indicates, demands for inputs to activities in urban areas are imposed on "upstream" areas, on "downstream" areas, and on the urban area itself. With respect to the first, examples are demands for: wood for fuel, either as roundwood or as charcoal; wood for building materials; sand and gravel for building materials including roads; coal for combustion for process steam, energy generation, space heating; fiber for textile manufacturing activities; hides for clothing manufacturing; crops and livestock for food. Urban areas also impose demands on upstream areas for land for reservoirs for generation of hydroelectric energy, for flood damage reduction, and for water supply. Indirectly urban areas impose demands on upstream areas for crops and raw materials for export in order to provide foreign exchange for supporting activities in urban areas.

The typical results of these demands are the exceeding of the sustained yield capacity of renewable natural resources, e.g., crop lands, pasture lands, and forests, leading to increased soil erosion, lower productivity (site quality shifting from Class I land to Class II land), and deterioration of water quality in streams, lakes, and ground water aquifers. These adverse environmental effects affect: the upstream areas where the natural resources are exploited, as noted immediately above; the transition areas between the source areas and the urban areas, as a function of deteriorated water quality in the streams in the transition area; the "demanding" urban areas, as a result of the "import" of deteriorated water quality from upstream areas where production takes place to meet the demands of the urban area; and areas downstream from the urban areas. Major "contributions" from upstream areas to the urban areas include suspended sediment, nitrates, phosphates, and pesticides.

The construction and operation of reservoirs upstream from an urban area can have major, adverse environmental effects, both in the reservoir area and downstream from the reservoir. Increased prevalence of vector-related problems, e.g., schistosomiasis and malaria, have occurred in reservoir areas. Operation of a reservoir results in some degree of change in the natural flow regime of the river, a small change or a major change depending on the size of the reservoir in relation to mean annual streamflow and to mode of operation. Downstream from the reservoir the water temperature regime, the riparian habitat, the assimilative capacity are all likely to change, sometimes drastically. This in turn affects the productivity of the stream and hence the resource base of the population dependent upon it. Retaining silt in the reservoir may deprive downstream flood plain areas of nutrient replenishment, as well as resulting in degradation downstream from the dam as a result of the increased carrying capacity of releases after having "dropped load" in the reservoir.

From Downstream Areas

Urban areas also impose demands for inputs on downstream areas, particularly from coastal waters, i.e., bays, estuaries, near-shore coastal areas. The types of demands are similar to those imposed on upstream areas, e.g.: finfish and shellfish for food; sand, gravel, coral for building materials; wood from mangroves for charcoal production; offshore petroleum and natural gas for varied uses. Through its demand for food the urban area may exert a demand for shallow water areas, such as mangroves, for conversion to aquaculture, thereby eliminating habitat for certain native species.

Within the Urban Area

Water and land are the two common inputs imposed by an urban area upon itself. Water for self-supplied users and for public water supply systems is often obtained from ground water in urban areas, such as Mexico City, Bangkok, Jakarta. Given the typical no, or inadequate, regulation of withdrawals and no charge for withdrawals, sustained yield of aquifers is exceeded. This in turn results in a larger and larger cone of influence, which induces flow from more distant portions of the aquifer. Very often this in turn results in salinity intrusion in urban areas on or adjacent to coastal waters and/or to inducing inflow of waters contaminated by discharges within the urban area. In addition, withdrawals exceeding recharge have often resulted in land subsidence, as in Mexico City and Bangkok.

The demand for land for various uses, e.g., residential, commercial, institutional, industrial, as an urban area expands, and the often typical urban sprawl which results, lead to the drastic decrease or elimination of agricultural use of lands in areas peripheral to urban areas, such as for truck crops and dairy products. For example, between 1955 and 1980, the urban area of Santiago de Chile increased from about 19 thousand hectares to about 44 thousand hectares, while the irrigated area within the city decreased from about 63 thousand hectares to about 37 thousand hectares (Gross and Rodriquez, p. 16). It was estimated that, by about 2000, the urban area would increase by about another 30,000 hectares and the irrigated area decline by about the same amount (Ibid). Most of the land in the urban area which shifted from agricultural to urban use consisted of Class I and Class II agricultural lands. The same phenomenon has occurred in Mexico City (Ibarra, et al., 1987), Sao Paulo (Kowarick and Jacobi, 1985), and Quito (Carrion, 1986). One significant result of this process of urbanization of peripheral urban land is a substantial increase in the prices the urban area residents have to pay for the agricultural products formerly produced in these areas.

The process, as described succinctly by White (1984, pp. 30-

32), is one in which the urban area "reaches" farther and farther into rural areas for the basic goods of water, food, and wood to meet its demands.

Summary of Environmental Effects of Demands of Urban Areas

Figure 8 shows the nature of, and a framework for analyzing, the environmental effects of the demands of an urban area on rural areas for disposal of residuals and for inputs for activities in the urban area. Table 3 lists some of the effects of these increasing demands as a result of continuing concentration of population and activities within urban areas.

Distribution of Environmental Effects

It is important to emphasize that the environmental effects of urbanization are not imposed equally on all segments of the population in urban areas. The prevalent lack of financial and institutional capability in urban areas for providing services results in inadequate provision of water supply, sewerage, solid wastes managment. Typically lower income groups are subject to the worst conditions. For example, in Sao Paulo about 65% of the population in downtown, higher income areas is served by sewers, whereas only about 20% of the population in the peripheral, low income areas, in served by sewers. The failure to provide public water supply throughout urban areas often results in low income groups paying five to ten times the unit rate for water from private vendors as they would pay for water from the public system in the same area. (See Whittington, et al., 1989.) Depending on the housing pattern in an urban area, lower income groups may be exposed to substantially higher concentrations of gaseous residuals for more of the time than higher income groups.

Aside from limited data on the access of lower income groups to public water supply and public sewerage, and even fewer data on access to private water supply, detailed, quantitative data on the incidence of environmental effects on, and the exposure to ambient environmental conditions of, lower income groups is meager. (For discussion see Campbell, 1989.)

Factors Affecting Environmental Problems in Urban Areas

The nature, extent, and severity of environmental problems in urban areas are a function of: geographic location; topographic setting; meteorological conditions; mix of activities; and spatial pattern. An inland location in a valley surrounded by hills or mountains, e.g., Quito, Ljubljana, with meteorological conditions yielding inversions for significant portions of the year, is likely to result in substantial air

quality problems, particularly as personal income increases and private vehicle use increases. If activities in the urban area are primarily residential, commercial, institutional, and light industrial, and the temperature regime is moderate, thereby requiring little space heating and cooling, then air quality problems will be directly related to vehicle emissions and hence will relate to CO, HC, NOx, particulates. If there is substantial heavy industry in the urban area, the mix of gaseous discharges will be substantially different, with more possibilities of discharges of so-called toxic or hazardous air pollutants. If the urban area is located on a coast, with off-shore breezes transporting the gaseous discharges away from the urban area, water quality problems in the bay or sound are likely to be more critical than air quality problems, even with a large magnitude of vehicle movements. Thus, in some urban areas the incidence of diseases relating to air quality, such as bronchial problems, will be greater than the incidence of diseases relating to poor water quality, such as gastroenteric diseases. In other urban areas the reverse will be true.

The effects of AEQ conditions on humans are a function of the stresses imposed via different pathways, the nutritional levels of the receptors, age composition of the population in relation to distribution of more susceptible components of the population. Thus, there is no hierarchy of environmental problems which exists for all urban areas. The relative importance of different types of AEQ problems must be assessed in each area and will vary from area to area. This assessment is one of the most important purposes of analysis of AEQ problems in an urban area.

City Size

For any given topographic setting, meteorological conditions, mix of activities, and spatial pattern, lower concentrations of air quality indicators would be expected, related to vehicle emissions, in smaller cities than in larger cities, simply because the number of vehicle miles is less, and congestion may be less. The "heat island" for a medium-sized city is smaller than that for a large urban area. If a medium-sized city has a concentration of industrial activities, particularly heavy industrial activities, certain air quality and water quality problems can be substantially worse than in a large city with predominantly governmental, commercial, and residential activities. For the same size watershed in which an urban area exists, a smaller urban area would presumably have less impermeable area within the urban watershed than a large urban area, and hence would have lower storm runoff for the same meteorological conditions.

The spatial pattern of an urban area is an important variable affecting environmental problems. Higher densities

decrease the costs of providing water supply, sewerage, and solid wastes disposal services, provided that these infrastructure investments are made as the urban area grows and do not have to be put in place by retrofitting. Per capita consumption of energy can be less (Regional Plan Association, 1974), thereby decreasing the adverse environmental effects of energy generation. On the other hand, increased density can lead to increased traffic congestion, especially where jobs and economic activities are concentratred in the center of the urban area. This result can occur even though denser urban areas have more of total movements via public transit. Increased congestion can result in substantially reduced speed of travel and much increased emissions of air pollutants from vehicles.

Some of the adverse environmental effects of growing urban areas can be mitigated by imposing multi-nodal (poly-nucleated) patterns of urban development(Ingram, 1987). Such patterns would reduce the unidirectional flow of goods and people within the urban area. Those patterns could make possible utilization of less capital intensive methods for handling wastewater, such as neighborhood septic tank systems, multi-lagoon systems, spray irrigation.

One might argue that the factors contributing to deterioration in environmental quality are less in medium-sized cities than in large cities. However, it is likely that the capacity for environmental quality management is even less in medium-sized cities than in large cities. Both professional capacity and financial capacity are likely to be smaller.

Very little rigorous analysis has been done on the relationship between city size and environmental problems in DCs, if there is a relationship. An analysis by Izeogu (1989) is a beginning.

GOVERNMENTAL RESPONSES TO ENVIRONMENTAL DEGRADATION IN URBAN AREAS

Many DCs have recognized the past and continuing deterioration of environmental quality in urban areas. (There appears to be substantially less recognition of the relationship between deterioration of terrestrial and aquatic ecosystems in rural areas and urbanization.) Governments at the national level have responded in various ways. A few urban governments have also attempted to develop programs to cope with the multi-faceted problem. This section contains a characterization of the types of responses and a succinct appraisal of their effectiveness.

National/Macro Responses

Various approaches have been adopted at the national level

in different countries, with the focus not limited solely to urban areas. "Labels" of some examples are indicated in Table 4. Typically the problem is implementation of those policies. As the table indicates, little is known about the degree of effectiveness actually achieved, if any.

Current "environmental" policies and effects are typified by the following.

o Many countries have established ministries or departments of the environment, e.g., Senegal, Malaysia, Indonesia. Some countries have assigned responsibility for environmental effects to existing agencies, each with respect to its "domain", e.g., marine pollution (Jamaica), agriculture, energy (Korea, Thailand), industry, health. Some have attempted to make existing legislation work more effectively by establishing a coordinating committee at an high level of authority, such as the Office of the President (Malawi). Coordinating mechanisms among indiviual agencies can also be established at the local level, as in the case of Jabotabek in Indonesia. (For a comparative study of the reponses in Malaysia, Senegal and Jamaica, see Gombay, 1989.)

Typically the separate environmental ministries, the environmental sections within existing line ministries, and coordinating entities have little or no staff to carry out the responsibilities assigned. For example, the Ministry of the Environment of Indonesia has virtually no staff competent with respect to industrial technology, so that it has no capacity to discuss environmental implications of potential industrial projects with the Ministry of Industry. Within line agencies, the environmental section is typically staffed with lower level individuals and shunted to the side in terms of decision-making procedures. Staffs of coordinating committee mechanisms usually function primarily as administrators.

o Some countries have passed comprehensive legislation relating to the environment, and have promulgated detailed ordinances based thereon. These ordinances often include ambient air quality and ambient water quality standards and liquid and gaseous discharge standards developed by the World Health Organization or the U.S Environmental Protection Agency. There is little or no recognition of the problems of implementing such ordinances. Consequently, these laws and ordinances are generally not enforced, because the responsible agencies have: very few trained staff; insufficient authority for inspecting activities; little or no equipment for measurement and analysis; inadequate transportation facilities; the "on-duty" period is weekdays between 0800 and 1700, which means that activities which operate throughout the day and throughout the year do not have to worry about inspections for over three-fourths of the year. (This results in the classic problem of what is termed "midnight

dumping", a phenomenon recognized even in the PRC.) In addition, typically no sanctions exist for noncompliance, or the sanctions which exist on paper are not applied.

Recognizing the shortcomings of formal, institutional mechanisms, e.g., inertia in bureaucracies, a few attempts have been made to encourage voluntary compliance with regulations by meeting with industrial leaders, as in Dakar, Senegal (Kante, 1986; Republic du Senegal, 1985; Republic du Senegal, 1986). However, even if this approach were to be successful, it will not be very effective if industrial activities represent only a small portion of the problem of discharges to the environment, which is the case in some urban areas.

o Some countries have attempted to decentralize responsibility for environmental quality management to urban governments of at least the largest cities, and to capitals of provinces. However, devolution has typically not been accompanied by a real transfer of power and by the allocation of funds to the lower levels of government for implementation or by the granting of financing authority to local and provincial levels to enable them to raise funds for environmental quality management. (See Ngom, 1989, and Attahi, 1989, with respect to Dakar and Abidjan, respectively.)

o Recognizing the adverse impacts occurring on forested lands, significantly because of demands in urban areas, many governments have embarked on afforestation programs. In virtually all cases the rate of afforestation is much less than the rate of logging. New plans for afforestation are continually being developed, but the net growth of forest resources is still negative. In some cases reliance is being placed on locally managed woodlots, involving the local populace rather than arbitrary directives from the central government. This may achieve positive results at least in circumscribed areas.

o A few governments have relocated the capital of the country to another, sparsely populated or unpopulated section of the country. This strategy has had no discernable impact on the rate of growth of the former capital, and hence on the environmental problems associated therewith (Strem and White, 1989).

o Many governments have passed legislation requiring the preparation of environmental impact statements (EIS), at least for government projects. Even where the capacity to prepare such statements exists, which is rare, the procedure typically is to prepare the statement after the project has been formulated. This virtually guarantees that the EIS will have no effect, particularly in the absence of any reasonably powerful, indpendent environmental group. (In a few case, influential non-governmental organizations have emerged, e.g., ENDA in Senegal,

Friends of the Earth in Malaysia.) The fundamental problem is to incorporate environmental considerations directly into economic development projects and programs. (See Hufschmidt, et al., 1983.)

A related problem is that the typical EIS procedure considers single projects instead of analyzing a set of projects which affects an urban area. For example, one development in a single watershed in an urban area may have insignificant effects on the urban area as a whole, but a set of installations on several watersheds can have very significant environmental impacts in the urban area.

o Some governments have developed and attempted to implement "integrated rural development programs", in the hope of reducing the rate of urbanization. Even where locally effective programs have been implemented, they have affected such a small portion of the rural population that they have had essentially no effect in terms of reducing the rate of migration from rural areas to urban areas. The scope of such programs has simply been too small.

Local Responses

Two responses at the local level merit mention.

o In some large urban areas, such as Quito and Jakarta, the local government has established so-called independent enterprises to provide certain services, such as water supply and sewerage. These entities are supposed to be self-supporting, and hence self-financed. Often such agencies: (1) are not completely self-supporting, so that the governments of general jurisdiction must subsidize them to some extent; and (2) "cream off" the customers able to pay, leaving the lower income segments of the population with little or no service.

The separation of these agencies from the basic structure of local government results in two difficult problems. One, it is difficult to integrate their activities with each other, e.g., water provided by a water supply enterprise results in wastewater which must be handled somehow for disposal. Two, it is difficult to integrate their activities with the urban planning agency of the local government, because they are no longer an integral component under the authority of the executive or council.

o An all too frequent response to water quality problems in urban areas is to consider construction and operation of a capital intensive sewage treatment plant, and the associated sewerage collection system if one does not exist. This is often done: prior to analysis of the sources of discharges, which is necessary in order to know that the plant will actually improve

the situation; with little or no recognition of the problems of operating the plant once constructed; and without consideration of alternatives which would reduce generation of liquid residuals at the sources, very likely at much lower costs. This response is aided and abetted by consulting firms---local and expat---whose profits are directly proportional to the capital intensity of a project. In contrast, what is needed is consideration of the whole range of options available, many of which involve relatively small capital investments.

"Privatization" of the provision of services, e.g., water supply, sewerage, solid wastes disposal, and "pricing" of services provided, have been tried in various places. Results have been mixed, the former depending on the management capabibility of the private firm, the latter depending on the level of charge and the equity with which it was collected.

Characterizing Shortcomings of Responses in DCs

The present shortcomings in the typical developing country responses to environmental problems associated with rapid, large-scale urbanization may be summarized as:

- lack of planning;
- lack of resources; and
- lack of commitment to possible solutions.

Lack of Planning

Even in those cases where comprehensive new laws have been enacted, there is little evidence of an integrated view of the economic, technologic, social/institutional, and environmental systems involved. For example, Malaysia's federal structure permits each state of the federation to accept or reject most federal legislation pertaining to the environment (Gombay, 1989, p. 5). For any type of environmental quality improvement program, a country must first: (1) develop a set of resource plans, e.g., water plan, energy plan, forestry plan; and (2) make explicit the linkages and interdependences among those plans. A national water plan cannot be developed by having a set of river basin plans each developed by different consultants under separate bilateral programs.

In addition to the above-indicated natural resources plans, a comprehensive risk management strategy needs to be developed, which strategy links the problems of residuals management, occupational health, community safety, and low-waste technology. For examples, see Campbell and Glenn (1983); Kante, (1986); Perez-Trejo and White (forthcoming); UNEP/WHO (1989); and

White (1988). The preparation for such a strategy should begin with the delineation of the "industrial profile of a city" (White and Anderson, 1988). However, regardless of the desirability of those goals, it must be recognized that the capacity to develop such plans and strategy rarely exists. Most DCs have difficulty in developing a reasonably comprehensive plan for a single sector.

Lack of Resources

By the time environmental quality became a recognized important, lasting issue, a great many developing countries were hopelessly in debt. Consequently, the new ministries and departments are largely still-born, consisting of a small office with sparse furniture, out of the way, with an old typewriter, and being way down the pecking order to use increasingly scarce government vehicles. Overseas training for environmental specialists is still discussed as a novelty; few local universities offer adequate training. Salaries are insufficient, in competition with the private sector and government agencies "higher on the totem pole", to attract and retain competent individuals.

Lack of Commitment

There have been countless initiatives to clean up the streets, conserve water, and plant trees in cities, but generally the commitment peters out once the photo-opportunity has passed. The relation with international agencies is one element of this spasmodic mode of operation. Most agencies still favor "project" support rather than long-term support. Unfortunately, "environmental issues" cannot be solved by a few projects. Environmental quality management is a continuous task, 24 hours a day, 365 days a year. Many donor agencies still cherish the belief that, if the "government is serious", the government will continue to support the environmental project(s) once the funds have been disbursed. Given the financial state of at least the poorest half of the developing countries and the many needs in addition to environmental improvement, this attitude is completely unrealistic.

Other problems of commitment surface when an environmental initiative runs up against an entrenched policy, e.g., in Africa when a property tax is proposed in an urban area to raise revenues to support environmental quality programs. The official answer often is that the land is nationalized. (The same problem existed in Eastern Europe.) The real reason is that no government wants to risk taxing urban dwellers who actually have property rights, i.e., the wealthiest members of the community.

Analogous problems with respect to "entrenched

policies" occur in rural areas. For example, in southern Senegal villagers formerly planted trees to be assured of wood for fuel and construction. Since the land was nationalized, they are not allowed to cut what used to be their own trees. Instead, the central government allocates licenses to produce charcoal to people from other regions who cut but do not replant. The villagers do not replant either. In fact, during a recent visit by the President they set fire to whole sections of the forest in protest of the policy. It seems clear that one could find many examples of decline in environmental quality which began with the denial of land and water security to local people who had the most to gain by ensuring that their practices were sustainable.

FACTORS AFFECTING CAPACITY OF URBAN AREAS TO MANAGE ENVIRONEMNTAL QUALITY

In addition to the problems described in the preceding section, other factors affect the capacity of local and national governments to cope with environmental problems in urban areas. These factors can usefully be divided into: (1) those related to the structural characteristics and financial capacity of urban area governments; and (2) inadequate understanding and perception of environmental quality management and of efficient strategies for carrying out such management.

Structural Characteristics/Financial Capacity

o Fragmented local and regional governmental structure

Typically several or many agencies are involved with, have responsibility for one or more tasks of environmental quailty management in urban areas. Lines of authority and responsibity are not clear. Very often there has been no identification of the existing institutional milieu, and of the linkages---or lack thereof---among the various agencies and entities.

Table 5 illustrates the type of analysis which would be helpful and would form the basis for restructuring agency activities. Although the example is for water resources management in Thailand, the approach exemplified is equally relevant for envionmental quality management in urban areas. Of course, restructuring requires time and "political will", the latter often in short supply. But it should be emphasized that it is not necessarily essential to "wipe out" agencies. The critical condition is to achieve integration of activities, which means providing some <u>integrating authority</u> but does not mean that a single agency must perform all of the tasks.

o Inadequate staffing

Local, regional, and usually national governmental agencies do not have staff trained either in integrated environmental quality management or in individual disciplines of which such management is comprised, e.g., economics, technology, ecology, and institutional analysis. A critical problem is obtaining staff which has the competence to integrate these facets of management, in analysis, in presentation to decision makers, and in implementation.

The local government agency, or the provincial agency, will have at best one or two individuals with adequate training and some experience. These individuals are spread so thin that it is impossible for them to supervise adequately the wide range of tasks involved.

One result of this type of situation is that decisions are made even before rough analyses are done. Another not unusual result is the succumbing to the blandishments of consulting firms advocating capital intensive "solutions", which solutions provide at least a building on which to place a plaque with the minister's name. The capital intensive option is often stimulated by bilateral and multilateral lending programs where the objective is to "push out" the money or to provide work possibilities for country firms. In general it is also much simpler to design and construct a major capital project, even if it cannot be operated adequately, than it is to develop long-run institutional capability for implementing low capital intensive alternatives.

- Centralized authority

Weak, poorly functioning local governments are often associated with an high degree of centralization in the national government of authority and of control of "the purse". Based on an IMF survey in 1982, on the order of 85% of government jobs in DCs were "central government" jobs, compared with 55%-60% in industrial countries (Stren and White, 1989, p. 22). In addition, the power to raise substantial revenues is not given to local government units in most cases and disbursements to local governments from central governments are insufficient and often irregular. Thus, even where there is decentralization of authority on paper, it becomes meaningless without the "power of the purse".

- Inadequate revenue raising capacity

Even where local governments have been given authority to levy property taxes, inadequate reconds of land and building ownership in urban areas and inadequate procedures for appraising values result in much less revenue being raised from property taxes than should be possible. In addition, inadequate consideration has been given to other possible sources of

revenue, such as a "documentary tax" on property transfers and broader use of user charges, including effluent charges, directed at particular goups of users of services.

o Inadequate funding from central governments

The economies of many DCs had stagnated or were actually declining in absolute terms by the early 1980s. This resulted from: the large increase in oil prices in the mid-1970s; the recovery and subsequent increase in value of the U.S. dollar; falling world prices for primary goods, the main exports of the DCs; and the increased level of debt requiring diversion of most of the net returns to the central government---if any---to debt repayment. Thus, funds available from central governments to local governments for environmental quality management have declined, with no change likely in the near future.

o Inadequate maintenance of existing facilities

Lack of financial resources has resulted in situations such that even where infrastructure facilities exist, often they cannot be operated or are inoperable because of lack of foreign exchange to buy spare parts and chemicals, e.g., for water supply and water treatment systems, or because electric energy is lacking to operate pumps. Charges for provision of urban transport on public systems are typically insufficient to provide resources for maintenance and replacement. Lack of maintenance results in higher emissions per kilometer than would occur with adequate maintenance.

o Inability to control land uses

Governments of urban areas are often unable to control land uses. At least two important results stem from the lack of control. One, development is not prevented on environmentally "fragile" or erosion prone areas, such as the steep hillsides surrounding Quito, Caracas, Rio. Elimination of native vegetation and decreasing permeability results in more erosion for the same intensity of precipitation. In addition, typically these areas have no facilities for handling wastewater and solid wastes, so that storm water runoff transports more contaminants to adjacent water courses.

Two, speculators often purchase land in an urban area and hold it undeveloped for some years, so that a patchwork evolution of the urban area occurs. This in turn results in inefficient provision, or an inefficient basis for provision, of urban services, e.g., water supply, sewerage, transportation.

o Emphasis on sectoral projects/programs

Much, if not most, of the multilateal and bilateral aid

programs have focussed on sectoral projects, e.g., for water supply, urban transport, housing, sewerage. The physical, technological, and economic interrelationships between and among environmental quality management sectors are essentially ignored, e.g., a project to improve air quality by imposing constraints on certain gaseous discharges from power plants neglects the liquid and solid secondary and tertiary residuals generated by the physical measures to reduce the gaseous discharges. In addition, the single sector, single medium approach often misses alternatives which would result in reducing discharges into more than one medium, e.g.,by changing procduction process rather than by installing a physical measure on the "end of the pipe".

Two additional common results of the sectoral focus are: (1) failure to achieve integration between urban planning and the sectoral projects and programs; and (2) failure to achieve integration of sector projects and programs in regional economic development programs. Formal or informal linkages between and among relevant agencies rarely exist.

Inadequate Understanding of Environmental Quality Management

Basic to improving the capacity for enviromental quality management in urban areas in DCs is removal of very common lack of understanding of, and incorrect perceptions about, environmental quality management. This pertains to decision-makers, technical staffs, environmental groups, and users of the environment, e.g., industrial activities, institutional activities, governmental operations, residences, commercial operations. The situation is endemic in DCs, and is not uncommon in so-called developed countries.

- Benefits from expenditures for environmental protection or measures to improve environmental quality

Given the principal objective in DCs of economic development in order to improve the standard of living/quality of life/welfare of the inhabitants, allocation of resources to protect the environment or improve environmental quality have rarely received much support. A basic reason for this lack of support is a lack of understanding how such expenditures are essential for economic development. This reflects the fact that gross national product (GNP) or GNP per capita has been used as a measure of the status of an economy, without incorporating environmental aspects. For at least two decades attempts have been made to devise systems of national accounts which modify GNP to account for expenditures and damages relating to environmental effects.

As noted previously, the contribution to GNP attributed to urban areas excludes damages from the adverse environmental

effects of urbanization and includes so-called "defensive expenditures" which are made to try to counter the adverse effects on activities. That is, these defensive expenditures are those which would not have been necessary if there had been no deterioration in environmental quality. The funds could have been used for productive investments. Thus, instead of an objective function for an economy being to maximize GNP, a more appropriate objective function would be:

Maximize [GNP - PC - PE - DRC - damages],

where GNP = gross national product;
PC = production costs;
PE = protection (defensive) expenditures for, e.g., treatment at intakes, filters for intake air
DRC = discharge reduction costs; and
damages = the damages to humans and nonhuman species and to materials as a result of concentrations in the environment.

Without going into the details of the problems of calculation, of an urban area with minimal regard for PE and DRC will result in ever increasing damages such that net welfare to the urban area is likely to decrease.

- Costs of reducing discharges

There is a common perception that "pollution control" or improving ambient environmental quality is very expensive. One important result of this misperception is a failure to impose constraints on discharges from new activities, even those of multinational firms for whom meeting virtually any standards would be no problem, i.e., incremental costs would be negligible. Even in the few cases where short-run costs would be somewhat higher for a "cleaner" installation, the longer-run savings from reduced damages are likely to be substantially higher than the short-run incremental costs, even on a present value basis.

Numerous studies have shown that there are multiple measures for reducing discharges, with respect to both existing facilities and grassroots facilities. With respect to the former, evidence is available from responses to sewer charges (Kneese and Bower, 1968; Hudson, et al., 19811. With respect to grassroots facilities, see Kneese and Bower (1979). This is particularly true for the industrial sector, because production typically involves a set of unit processes and unit operations. Changing a single unit process or operation can reduce discharges significantly. Some of these methods have resulted in net savings rather than in net costs. The basic thrust of the various "pollution prevention pays" programs, such as that of 3M, is to find internal ways to minimize costs of reducing discharges.

A basic reason for the myth of inevitability of high costs to improve ambient environmental quality is that the typical approach has been, and usually still is, to consider that the only option is to install some measure at the "end-of-the-pipe", e.g., a scrubber, a wastewater treatment plant. Such measures not only are typically expensive, but they add to the total material and energy residuals discharged to the environment, because they require inputs to modify the waste streams discharged into them. Their function is simply to shift the mix of residuals discharged to a mix that is presumably less harmful than the unmodified original mix. Therefore the emphasis should be first, on reducing or preventing generation of residuals, and second on materials and energy recovery.

An even larger gap in understanding relates to how changing product characteristics can reduce both material and energy inputs required and wastes generated and discharged. An example is the production of unbleached consumer paper products rather than the white paper products of the developed world. All too often the managers of the tourist sector in DCs think that the nature of the products in developed countries must be adopted in order to attract their clientele. There is no recognition of the environmental implications of that view.

Thus, the myth of high costs for environmental quality improvement impedes action.

- Environmental interrelationships

One of the basic "facts of life" often overlooked in relation to environmental quality management is the interrelationship among liquid, gaseous, solid, and energy residuals and the three environmental media, atmosphere, water bodies (surface and ground), and land. There are technologic and economic tradeoffs among the forms of residuals in the generating activity, i.e., very different mixes of residuals are generated and discharged depending on the mix of raw materials, production processes, and product characteristics chosen, and environmental constraints imposed on the activity. In addition, subsequent to discharge from an activity there are likely to be movements from one medium to another, or a sequence of movements. These interrelationships are depicted in Figure 9.

These interrelationships mean that, for example, in developing a program to reduce liquid discharges, one must be cognizant of the solid residuals, e.g., sludge, which will likely be generated in that program and which will have to be disposed of somewhere. Or, one must be cognizant of the possible leaching from landfills used for the disposal of solid residuals. Or, one must be cognizant of the problem of disposing of scrubber sludge generated in reducing SOx discharges from power plants. (See The Conservation Foundation, 1984.)

In addition to the above interrelationships, there are relationships between measures designed to improve conditions inside work plants, i.e., in relation to occupational health, and resulting effects on ambient environmental quality. For example, reducing exposure to fumes inside a plant could be done by collecting the fumes with fans and discharging them into the outside air, thus degrading ambient air quality. Or the gases could be scrubbed out of the internal atmosphere with a water blanket and discharged into the sewer or an adjacent stream. Thus, measures to improve occupational health may exacerbate environmental quality problems. Institutional mechanisms must be developed in urban areas to take these relationships into account.

o Information requirements

There is a common perception that nothing can be done in terms of improving ambient environmental quality because informtion is lacking, and that obtaining the relevant information requires extensive, detailed, and sophisticated analysis. In reality, in many---if not most---cases, rough calculations can provide sufficient data for initial efforts. Hence, a beginning can be made in terms of applying simple measures to improve ambient environmental quality while building the capacity to obtain additional data and to make the next level of analyses.

One can think of a continuum of urban areas based on the level of detail needed to initiate efforts, from essentially no analysis to increasingly extensive analysis, e.g.:

Katowice, where it is obvious what needs to be done if air quality is to be improved;

Quito, where only minimum analysis needs to be done to make a start;

Ljubljana, where somewhat more extensive analysis than in Quito was needed in order to determine whether industrial activities or multi-unit residential activities were the major sources of SOx discharges;

Cities where there are no predominant sources, so that more extensive analysis must be done in order to develop a cost-effective strategy for improving environmental quality.

Just as there tends to be infatuation with capital intensive, high-technology measures presumed to improve ambient environmental quality, so there is infatuation with computers, software, and sophisticated analyses. That the data are often lacking or are grossly inaccurate and that the results

are often not relevant, does not seem to deter the desire to proceed in that manner.

o Implementation

Improvements in ambient environmental quality are only achieved by inducing activities to modify their behavior in relation to their use of the environment. Various incentives, what can be termed "implementation incentives"---positive and negative---can be imposed at various points to induce action. Figure 10 shows various loci for the imposition of implementation incentives and examples of types of incentives.

Typically there is virtually a complete lack of understanding of: (a) the problems of implementation; and (b) the range of implementation incentives available.

Problems of Implementation

For example, with respect to the first, a governmental agency will adopt a set of discharge standards without considering how such standards will be implemented, i.e., imposed and enforced. What is actually needed is an <u>implementation incentive system</u>. Such a system consists of:

(1) a set of implementation incentives, e.g., rules or procedures that an activity must follow, a set of discharge limitations which must not be exceeded by a specified amount a specified portion of the time, a set of charges related to inputs to or outputs from the activity, specification of the quality of inputs which can be used, specification of types of equipment which must be used;

(2) a system for measuring and monitoring performance of the activity, e.g., monitoring the quantities of materials discharged, the qualitities and/or quantities of material and/or energy inputs, the quantities of residuals removed from the discharge streams and their disposal, the qualities of product outputs;

(3) a system of on-site inspection to determine if, for example, specified equipment is in place and operating, the system for measuring performance is in place and is operating, the analysis of the samples taken is accurate, the results of the performance monitoring are as reported; and

(4) a set of sanctions, e.g., fines, fees, withdrawal of operating permit, exclusion from government contracts, imprisonment, for failure to comply with the rules/procedures/standards, or failing to pay charges.

Implementation incentive systems must be developed with

respect to: specific residuals of concern, generated and discharged by a particular activity or class of activity, and the entity or set of entities (agencies) which will apply the incentives. Combinations to illustrate this point are shown in Table 6.

To develop and maintain an effective implementation program requires that the responsible agency or agencies have the following capabilities:

technical capability to review permit applications, to aid activities in selecting measures to reduce discharges, to define noncompliance explicitly;

technical capability to inspect activities and to measure performance; and

capability to apply sanctions.

The last primarily involves political "capability", or---more accurately---political will on the part of politicians to impose sanctions for noncompliance. This is particularly difficult in DCs where many productive activities are government owned, i.e., are nationalized industries. Typically it is very difficult for one government agency to regulate another government agency or entity, particularly when both agencies are on the same level, at least on paper, e.g., the Ministry of Environment and the national oil company. If sanctions can not be imposed, behavior will not be modified. [Note: This problem is not exclusive to DCs, as witness the recent statements by both the Department of Energy and the Department of Defense in the U.S. that the U.S. Environmental Protection Agency does not have jurisdiction over them.]

Range of Implementation Incentives

A typical decision in a DC in initiating a program to improve ambient environmental quality is to take over a set of discharge standards from elsewhere, as noted previously. What should be done, however, is to set forth the range of implementation incentives (IIs) which, conceptually at least, are possible. IIs can be divided into <u>economic</u> and <u>noneconomic</u> incentives. The former category can be roughly divided into <u>subsidies</u> and <u>nonsubsidies</u>. A subsidy is defined as any provision which results in an activity's paying <u>less</u> than the full resource costs of the measures adopted, e.g., management incentives are shown in Table 7.

Noneconomic IIs can be characterized as:

specification of action;

specification of performance;

specification of procedure;

provision of technical information and of technical evaluation of performance;

presentation of performance to the public, i.e., public image; and

judicial.

Experience in various countries, particularly in Western Europe, has shown that a mix of incentives is likely to be most effective and efficient in achieving the desired improvement in environmental quality. (See Bower, et al., 1981.) A detailed discussion of implementation, including implementation incentives, is contained in Bower, et al. (1987 Chapter 10).

DONOR PROGRAMS: ENVIRONMENT AND URBANIZATION

This section contains: description and appraisal of World Bank programs relating to urbanization; and an appraisal of donor programs, multilateral and bilateral, relating to urbanization. The programs of the U.S. Agency for International Development are described in Annex A. Additional details on Bank programs are provided in Annex B.

World Bank

Until recently, environmental considerations received little attention in the World Bank's work plans and policy statements concerning urban development. Most of the internal attention to environment was devoted to industrial pollution. Much of the external pressure on the Bank from environmental orgnizations surrounded rural development activities that cleared forests for roads and commercial agriculture or resulted in inundation of large areas of land by reservoirs.

Buckley, et al. (1988) included the following paragraph on environmental issues in the World Bank's urban development operations:

> "Environmental concerns are also fundamental to the Bank's urban lending. Helping to provide the infrastructure and services necessary to promote urban employment opportunities may also contribute to a less congested, degraded environment. Therefore, the necessary infrastructure and services for waste management, pollution control, and improved shelter

require parallel improvement. In the longer run, improvement of the financial conditions of urban areas is almost a prerequisite for making significant improvements in the environmental conditions of developing countries."

This report also states that, "Sixteen of the nineteen FY 88 urban projects have direct, positive impacts. None of the projects is anticipated to worsen envionmental problems." However, no empirical justification was provided for this assertion of favorable environmental impacts of the urban development portfolio. It is not clear whether ex ante or ex post environmental impact assessments were conducted of the projects to serve as a basis for the statement. Nor were any studies of the relationship between urban development and environmental quality cited.

A later report (World Bank and UNCHS, 1989), mentioned the possibility of adverse environmental impacts in this sector, mostly through pollution and encroachment on land and other natural resources. It noted, "These negative impacts have not always been easy to identify and are invariably hard to quantify since the damages are mostly sustained by third parties, outside the market, and often with a time lag." However, with respect to land encroachment, e.g., increasing impermeability in urban areas, it is relatively simple to estimate the impact on urban storm runoff.

The FY 89 Annual Review of Urban Development and Water Supply Operations (Infrastructure and Urban Development Department, 1989) was the first of this series to list "upgrading the urban environment" as one of the six aims of work in these two sectors. It also cited specific project components that promoted environmental quality, e.g.:

- on-site sanitation, sewerage, and solid waste collection (Mozambique, Zimbabwe, Brazil);
- pollution control through operation of sewage treatment plants and solid wastes landfills (Zimbabwe, Brazil);
- hazardous wastes management (Brazil);
- air pollution control through traffic management (Chile);
- erosion control and coastal protection (Mozambique);
- hillside stabilization (Brazil);
- an early warning system for floods (Sudan);

o promotion of low-cost toilets, smokeless cookstoves, and non-timber building materials (Nepal); and

o salinity control works and low-flow augmentation for water quality protection (Nigeria).

This report did acknowledge the "need for a more pro-active stance in protecting the urban environment".

Appraisal

Based on the foregoing and the detailed review of World Bank sector programs shown in the Annex, the following conclusions with respect to Bank operations with respect to urbanization and environmental quaity seem warranted.

o The Bank appears not to have developed an overall framework either for analysis of environmental quality management in urban areas or as a basis for integrating sector programs.

o The Bank appears not to have given explicit attention to the problems of developing and applying implementation incentives in relation to inducing activities to modify behavior in terms of reducing discharges to the environment and/or in terms of making more efficient use of the natural environment.

o Although recent Bank reports and statements have noted the need for institution building, as yet there is little indication of how the Bank will aid that process, especially given the length of time required to develop institutional capability.

Common Problems in Urban Donor Programs

The urban development programs of donors have generally paid little direct attention to environmental impacts. Common problems in this area include an over-emphasis on a sectoral approach; donor financing restrictions; failure to do timely environmental analysis, monitoring, and mitigation; and inadequate attention to implementation. Another issue seldom raised, but of equal importance, is the relationship between neglect of rural development and environmental deterioration in other areas.

Donor efforts have over-emphasized a sectoral approach. Separate projects are usually developed for housing, energy facilities, roads, water supply and sanitation, and industrial development. There is little or no coordination across these separate investment decisions for a more rational sequencing or scaling of these activities. For example, without consideration of how road construction or new industrial employment induces

changes in housing patterns or how planned and squatter housing affects the effective demand for water supply and sanitation, it is dificult to do good urban planning. In the absence of integrated planning, service quality and the environment both are likely to suffer. Further, there is little coordination among donors. (See Whittington and Calhoun 1988.)

Donor financing restrictions also have unintended effects on environmental quality. The choice of technology is often skewed toward expensive, complicated solutions that are inappropriate for the skills and resources available in DCs. There are several reasons for this problem. One, donors--including the multilateral development banks---often insist that consultants from industrial countries be hired, which consultants are likely to be most familiar with high-tech processes and equipment. Bilateral donors sometimes tie aid to the purchase of goods and services from their own countries, even when these are not the ones most suitable to the needs of the recipient countries. Two, many donors only finance initial capital costs or foreign exchange components of project costs and expect that governments or users will bear the O,M & R costs. This provides DCs with an incentive to choose technologies that are more capital intensive, less labor intensive, and more dependent on imported components (James, 1987), even though the DCs will have a difficulty time affording the OMR costs.

Few donors conduct timely assessments of the environmental impacts of development projects in general. In fact, the environmental impacts of urban projects have received even less attention than projects in some other sectors. Although techniques exist for combining factual information on projected impacts and values (Hyman, et al, 1988), donors are not using these techniques in their decision-makinmg.

Most donors have not even systematically gathered information on the likely physical, chemical, biological, and ecological effects of urban development. Nor have they developed frameworks for doing so. Where environmental assessments have been made, they are usually prepared too late to be of any real usefulness in project design. Once the projects have been approved, there is rarely any monitoring or mitigation of the actual impacts that occur.

Failure to match the amount and type of aid to the absorptive capacity of institutions in DCs is another common weakness of donor funding,. Increasingly the World Bank has expressed an interest in providing assistance for institution building---as noted above---to help improve the efficiency and effectiveness of its projects. However, this is made difficult by the usual litany of administrative problems in DCs, e.g.: political favoritism; poor financial management; lack of poliical will; lack of employee commitment to the goals; and a shortage of

skilled personnel and the inputs they require to do the job.

Even the best-laid plans of bankers and bureaucrats can go astray in implementation, resulting in unfavorable environmental impacts. Often this mistracking is due to inadequate consideration of social, cultural, and economic factors that affect the responses of people to a changing situation. Market incentives and disincentives, as well as the regulatory and policy environment, provide the context for behavioral responses, while local skills and reources are the constraints. Often there is a lack of understanding of the multiple factors which affect the decisions of a given activity.

From the post-World War II period through the mid-1970s, conventional development theories emphasized rapid national economic growth over regional development and income distribution objectives. The prevailing view was that underdeveloped areas and disadvantaged groups would eventually gain as the benefits spread geographically from the center to the periphery and "trickled down" from the more affluent to the poor.

The neglect of regional balance had negative effects on both rural and urban areas by accelerating rural-urban migration. Rural migrants often are more productive, better educated, and have better skills and motivation than the ones who stay behind. This drain of human resources also pulled capital out of rural areas. In turn, the growth of the labor force in the urban areas outstripped the absorptive capacity of the formal economy and governments found it difficult to meet the rapidly increasing demand for social services and physical facilities.

The resulting urban problems, such as increase in slums, lack of safe drinking water and sanitation, and crime, were considered in donor policy documents beginning in the early 1970s (Miner and Chetwynd, 1972; World Bank, 1972). Some of their responses have been counterproductive. Governments of DCs were encouraged to expand the centralization of administration and to incur expenditures on large-scale urban infrastructures. Yet, the roots of the urban problems in the underdevelopment of rural areas have not been addressed.

IMPLICATIONS FOR AID URBAN PROGRAMS

Governments are the clients of AID. As the foregoing litany of environmental problems in urban areas and the inadequate governmental responses show, governments have to be convinced to change their approaches to management of the urban environment, and that such a change will have positive net results. This must be done in relation to their dealing with the omnipresent issue of allocation of resources to competing demands, and particularly the pressure for economic growth. One important function AID can perform is to aid in improving the capacity of governments to

make those allocation decisions with explicit inclusion of environmental quality considerations. That capacity is a function of, at least: (1) understanding of urbanization-AEQ relationships, including the elimination of the misperceptions described above; and (2) developing the capacity to generate information relevant to those deciions. The latter includes information with respect to: (1) the costs and consequences of not implementing measures to improve and protect AEQ; (2) the costs of achieving different levels of AEQ; (3) the distribution of costs and gains, i.e., who benefits from and who pays for improved AEQ; and (4) the institutional implications, including administrative costs and necessary bureaucratic modifications of alternative strategies.

To aid the development of understanding and capacity, AID could undertake the following activities.

o Integration of EQM with urban planning

Develop a guide for analysis of environmental quality management in the context of urban planning: multi-media; multi-source; multi-pollutants; alternative spatial patterns; alternative scenarios; alternative management strategies. Include specific examples of application. Develop and hold courses for top staff individuals responsible for the analyses in individual countries, not in the U.S. Develop the example to be used as the case studty in each course for the course in terms of the local context.

o As a necessary corollary to the above, develop a simplified method of analysis to identify the nature and level of environmental quality problems, and the sources thereof, in an urban area. Illustrate when "back of the envelope" calculations are sufficient; when increasing levels of complexity of the analysis are necessary.

o Develop a simplified guide for analysis for regional economic development with explicit incorporation of AEQ and measures to change AEQ in the analytical method. This is important in order to be able to demonstrate the positive aspects of measures to improve and/or protect AEQ, i.e., net regional product can increase rather than decrease, the point made in a previous section.

o Develop and apply, for illustration, a simplified method for analysis of the distribution of environmental effects in urban areas, e.g., exposure to various levels of air quality in relation to levels of income.

o Develop a guide for analysis of individual activities, e.g., industrial, commercial, institutional. Illustrate application of the guide, including compilation of examples for

specific activities, as in Kneese and Bower (1979, Chapter 4).

o Develop, and illustrate the application of, a guide for formulating and analyzing alternative systems for management of environmental quality in urban areas. It is particularly important to illustrate the entire range of measures for improving AEQ, e.g.: changing product characteristics, i.e., not adopting the cosmetic specifications and proliferation of items of same type as in "developed countries"; using simple technologies. Simple technologies yielding desired performance levels can be utilized even in very densely populated areas. For example, about 40% of the 20 million people who lived in Tokyo Metropolis in 1980 utilized septic tanks or on-site storage tanks for wastewater disposal (Hanayama, et al., 1983).

o Develop a guide which describes in detail the different types of incentives which can be imposed on activities to induce desired behavior, e.g., location in particular areas, reduction in discharges. Incentives include subsidies, standards, charges, technical assistance. All existing systems for air quality management and water quality management in the U.S. and Europe, East and West, include a mix of incentives, e.g., standards + charges + subsidies. What needs to be made clear is how different combinations are logical for different types of activities. Particularly difficult is developing mixes of incentives which will be effective in inducing changes in behavior by public agencies and activities.

Improving the understanding of urbanization-environmental quality problems and improving the capacity to generate relevant information for decisions relating thereto, is not going to occur as a "Great Leap Forward". Nor will it come by a large infusion of money. Rather, what is required is consistent, rigorous, relevant technical inputs over time, where technical includes the combination of economic, technologic, ecologic, and institutional aspects. Technical assistance "on the ground" for at least 5 years at a time is required, preferably by a full-time team of 2 or 3 professionals, with short-term specialists as required. The team works jointly with host country professionals. (An example is that of the Dutch aid mission working to develop the capacity of staff in the Institute of Hydraulic Engineering in Bandung to do water resources planning.) Continuity of inputs from individuals working within a common framework is essential. What must be avoided is a succession of short-term consultants, even under the same umbrella, who provide different views of how to tackle the management problem.

In the process of developing the capacity to analyze urban environmental quality, and in generating information from those analyses, will come specific investment projects suitable for AID financing.

AID is well-structured to operate in the above mode, i.e., to support long-term technical assistance, unlike IBRD, IDB, and ADB. This puts AID in a special position of oppotunity.

Caveats

As background for implementing such program activities, at least two caveats should be mentioned. One, White (1989) suggests that, to be effective, any U.S. aid agency has a "credibility" gap to overcome. That is, it is not difficult for those in DCs, when listening to suggested steps to improve environmental quality in their countries, to point out that the U.S. "record" is not all that great. Several thousand Superfund sites yet to be cleaned up, thousands of leaking underground storage tanks, various bays and estuaries with substantially reduced productivity as a result of pollutant discharges, about 100 urban areas which do not meet ambient air quality standards. Thousands of acres of forest vegetation apparently adversely affected by acid precipitation. One is more believable if one's own record is good, if not exemplary.

Two, a significant amount of the resources necessary to improve AEQ in urban areas will have to be raised from "users" in the area, by one means or another. But 100% cost recovery, or anything close to it, is an illusory goal, at least if sophisticated technology is involved. Where willingness to pay exists, which is widespread, that willingness can easily be dissipated by erratic or failing service, and by the fact---readily observable by individual users---that governmental entities do not pay their bills and/or do not abide by the various environmental regulations which the government---which "owns" them---has established. The "war" is likely to be lost if this battle cannot be won. (It should be emphasized that this is not just a problem in DCs, witness the flat statements by U.S. DOE and DOD that EPA has no jurisdiction over them.)

CONCLUDING COMMENT

This section is a summary by White (1989) of the context of the urbanization-environmental quality relationship.

Environmental quality management in urban areas is but part, of course an integral part, of overall urban management. It is widely realized that sectoral efforts to improve urban management will not be effective unless they are planned within a comprehensive framework. The driving forces behind change in developing countries are population growth and urbanization. Population growth in rural areas is not sustainble under most current rural policies; the surplus people simply move to the cities. More appropriate rural policies and programs might slow down the rate of urban growth. However, cities would still grow very rapidly because of natural growth, i.e., averaging 3%

per annum, of their populations.

What is involved is a race to complete the demographic transition, to level off, if possible, at about 10 billion people worldwide by about the year 2035. The quality of rural and urban life must be improved to give the natural transition the best possible chance to go through to completion. Family planning will help the process in a few favorable cultural and economic circumstances. But it will have no impact so long as economies remain poor and the infant mortality rate stays above 150 per thousand. Even if the 10 billion figure is achieved, environmental quality conditions in urban areas will only be livable if there is an high level of environmental quality management.

Cities of the DCs are now very different from the nineteenth century cities of the industrialized world. Cities of the DCs are growing faster; many are going to be very much bigger; and they contain a much greater mass of the very poor. These cities are not amenable to traditional urban planning of the "Town and Country" variety. The cities are physically growing faster than the macroeconomic systems of which they are parts. Indeed, many developing country economies are stagnating under crushing foreign debts.

At a global scale, the management context includes the global warming of the atmosphere and the expected attendant rise in sea level. Whatever the rate of change turns out to be, a period of increasing climatic uncertainty exists. This uncertainty will further constrain urban management efforts in DCs. Whatever is proposed as part of an intervention program by an international agency has to take these very difficult factors into account.

REFERENCES

Attahi, K., 1989, Cote d'Ivoire: an evaluation of urban management reforms, in Stren and White, Editors, African Cities in Transition, Westview Press, Boulder

Bower, B.T., 1984, A conceptual framework for analysis of water resources management in Asia, Natural Resources Forum, 8, 4, 343-356

Bower, B.T., Barre, R., Kuhner, J., and Russell, C.S., 1981, Incentives in water quality management, RfF Research Paper R-24, Resources for the Future, Washington, D.C.

Bower, B.T., Spofford, W.O., Jr., and Waddell, T.E., 1987, Guide for analysis for integrated residuals management, Resources for the Future, Washington, D.C.

Buckley, R., et al., 1988, The emerging role of housing finance: FY 88 annual review of urban development operations, World Bank, Washington, D.C.

Campbell, M. and Glenn, W., 1982, Profit from pollution prevention, a guide to industrial waste reduction and recycling, Pollution Probe, Toronto

Campbell, T., 1989, Urban development in the Third World: environmental dilemmas and the urban poor, in Leonard, H.J. and Contributors, Environment and the Poor: Development Strategies for a Common Agenda, U.S.-Third World Policy Perspectives No. 11, Overseas Development Council, Transactions Books, New Brunswick

Carrion, F., 1986, Urban ecology in Quito during the decade of the 1970's, Project Ecoville Working Paper No. 32, Institute for Environmental Studies, University of Toronto, Toronto

The Conservation Foundation, 1984, Controlling cross-media pollutants, The Conservation Foundation, Washington, D.C.

Coppock, J.T. and Sewell, W.R.D., 1976, Spatial dimensions of public policy, Pergamon Press, Oxford

Foster, D., 1989, Urban environmental concept paper, viewing environmental protection as investment in urban infrastructure, Paper Prepared for U.S. AID Office of Housing and Urban Affairs, Research Triangle Institute, Research Triangle Park, N.C.

Garcia, R.V., 1988, Biospheric change and food systems, International Federation of Institutes for Advanced Study and United Nations Research Institute for Social Development, Toronto

Gomboy, N., 1989, Environmental regulation in developing countries, Unpublished Paper, Institute for Environmental Studies, University of Toronto, Toronto

Gross, P. and Rodriquez, A., 1987, Urban environmental quality: the case of Santiago de Chile, Project Ecoville Working Paper No. 38, Institute for Environmental Studies, University of Toronto, Toronto

Hanayama, K., et al., 1983, Industrial development and its repercussions on environmental quality of Tokyo Bay, International Federation of Institutes for Advanced Study, Solna

Hills, P. and Whitney, J., Editors, 1988, Environmental quality issues in Asian cities, Project Ecoville Working Paper 43, Univesity of Hong Kong, Institute for Environmental Studies, University of Toronto, Toronto

Hudson, J.F., Lake, E.S., and Grossman, D.S., 1981,

Pollution pricing, D.C. Heath & Co., Lexington

Hufschmidt, M.M., James, D.E., Meister, A., Bower, B.T., and Dixon, J.A., 1983, Environment, Natural Systems, and Development, Johns Hopkins Press, Baltimore

Hyman, E., Stiftel, B., Moreau, D., and Nichols, R., 1988, Combining facts and values in environmental impact assessment: theories and techniques, Westview Press, Boulder

Ibarra, V., Puerte, S., Saavedra, F., and Schteingart, M., 1987, Urban environmental quality: the case of Mexico City, Project Ecoville Working Paper No. 39, University of Toronto, Toronto

Infrastructure and Urban Development Department, 1989, FY 89 annual review of urban development and water supply operations, World Bank, Washington, D.C.

Ingram, G.K., 1987, Priorities for urban development and shelter policies and programs, Paper Prepared for Presentation at International Conference on Urban Shelter in Developing Countries, London

Isard, W., 1956, Location and space-economy, MIT Press and John Wiley & Sons, New York

Izeogu, C.V., 1989, Urban development and the environment in Port Harcourt, Environment and Urbanization, 1, 1,, pp. 59-69

Jeffrey, J., 1987, The choice of technology in public enterprise: a comparative study of manufacturing in Kenya and Tanzania, in Stewart, R., Editor, Macro Policies for Appropriate Technology in Developing Countries, Westview Press, Boulder

Jordan, R.S., 1986, Population and the planning of large cities in Latin America, Paper prepared for Presentation at International Conference on Population and the Urban Future, Barcelona, Spain, 19-22 May

Kante, B., 1986, Policies, constraints and opportunities for low- and non-waste technolgies in developing countries, Industry and Environment, 9, 4, pp. 15-18

Kneese, A.V., and Bower, B.T., 1968, Managing water quality, Johns Hopkins Press, Baltimore

Kneese, A.V., and Bower, B.T., 1979, Environmental quality and residuals management, Johns Hopkins Press, Baltimore

Kowarick, L., and Jacobi, P., 1985, Economic development, urbanization and environment: the case of Sao Paulo, Project

Ecoville Working Peper No. 20, University of Toronto, Toronto

Lurie, C. and Laredo, D., 1989, Environmental impact of rapid urbanization and industrial development: water resources in the urban context, Report prepared for the Bureau for Asia and the Near East, U.S. Agency for International Development, Washington, D.C.

Miles, S., 1979, Ecodevelopmenmt and Third World urban regions: a prospective for international development cooperation policy, Supply and Services, Ottawa

Miner, W. and Chetwynd, Jr., 1972, Focus on urban development: perceptions, problems, approaches, and needs: a potential role for U.S. technical assistance, U.S. Agency for International Development, Washinton, D.C.

Ngom, T., 1989, Appropriate standards for infrastructure in Dakar, in Stren and White, Editors, African Cities in Transition, Westview Press, Boulder

Perez-Trejo, F. and White, R.R., forthcoming, A simulation model of the response to an industdrial emergency in a Third World city

Pill, C., 1989, Congressional inquiry on urbanization, summary of cable responses, Report prepared for Office of Housing and Urban Programs, U.S. Agency for International Development, Washington, D.C.

Policy, Planning and Research Staff, 1989, FY 89 annual review of urban development and water supply operations, Infrastructure and Urban Development Department, World Bank, Washington, D.C.

Regional Plan Association, 1974, Regional energy consumption, RPA Bulletin 121, Regional Plan Association, New York

Rep. du Senegal, 1985, Seminaire national sur une politique concretee de protection de l'environnement avec le secteur industriel, Dakar, 18-19 Janvier,1985, Ministere de la Protection de la Nature, Dakar

Rep. du Senegal, 1986, Conference ateller sur l'importance des technologies propres pour un developpement economique durable, Dakar 12-25 Fevrier, 1986, Ministere de la Protection de la Nature, Dakar

Rondinelli, D. and Ruddle, 1978, Urbanization and rural development: a spatial policy for equitable growth, Praeger, New York

Sachs, C., 1989, Urban challenges for the 90's, Strategic Planning Division, World Bank, Washington, D.C.

Stren, R.E., 1986, The ruralization of African cities; learning to live with poverty, Project Ecoville Working Paper No. 34, Institute for Environmental Studies, University of Toronto, Toronto

Stren, R.E. and White, R.R., Editors, 1989, African cities in crisis, Westview Press, Boulder

UNEP/WHO, 1989, Access to life-saving services in urban areas, World Health Organization, Geneva

U.S. Agency for International Development, 1988, Urbanization in the developing countries, Interim Report to Congress, U. S. Agency for International Development, Washington, D.C.

U.N. Department of International Economic and Social Activities, 1987, The prospects of world urbanization, 1984 assessment revised as of 1984-85, Pub. FT/ESA/SER.A/101, United Nations, N.Y.

Water and Sanitation Division, 1989, UNDP-World Bank water and sanitation program: country work plan, 1989-90, World Bank, Washington, D.C.

White, R.R., 1984, The case for integrating urban and environmental planning in Senegal, Project Ecoville Working Paper No. 14, Institute for Environmental Studies, Univesity of Toronto, Toronto

White, R.R., 1988, Outline for a short course in risk management and rapid urban growth, IFIAS Series on Urban Risk, Paper Number Two, IFIAS, Toronto

White, R.R., 1989, Institute for Environmental Studies, University of Toronto, personal communication

White, R.R. and Anderson, A., 1988, Guidelines for urban risk assessment in developing countries, Paper prepared for UNESCO's Man and the Biosphere Program, IFIAS Series on Urban Risk, Paper Number One, IFIAS, Toronto

White, R.R. and Burton, I., 1983, Approaches to the study of the environmental implications of contemporary urbanization, Man and the Biosphere (MAB) Technical Notes 14, UNESCO, Paris

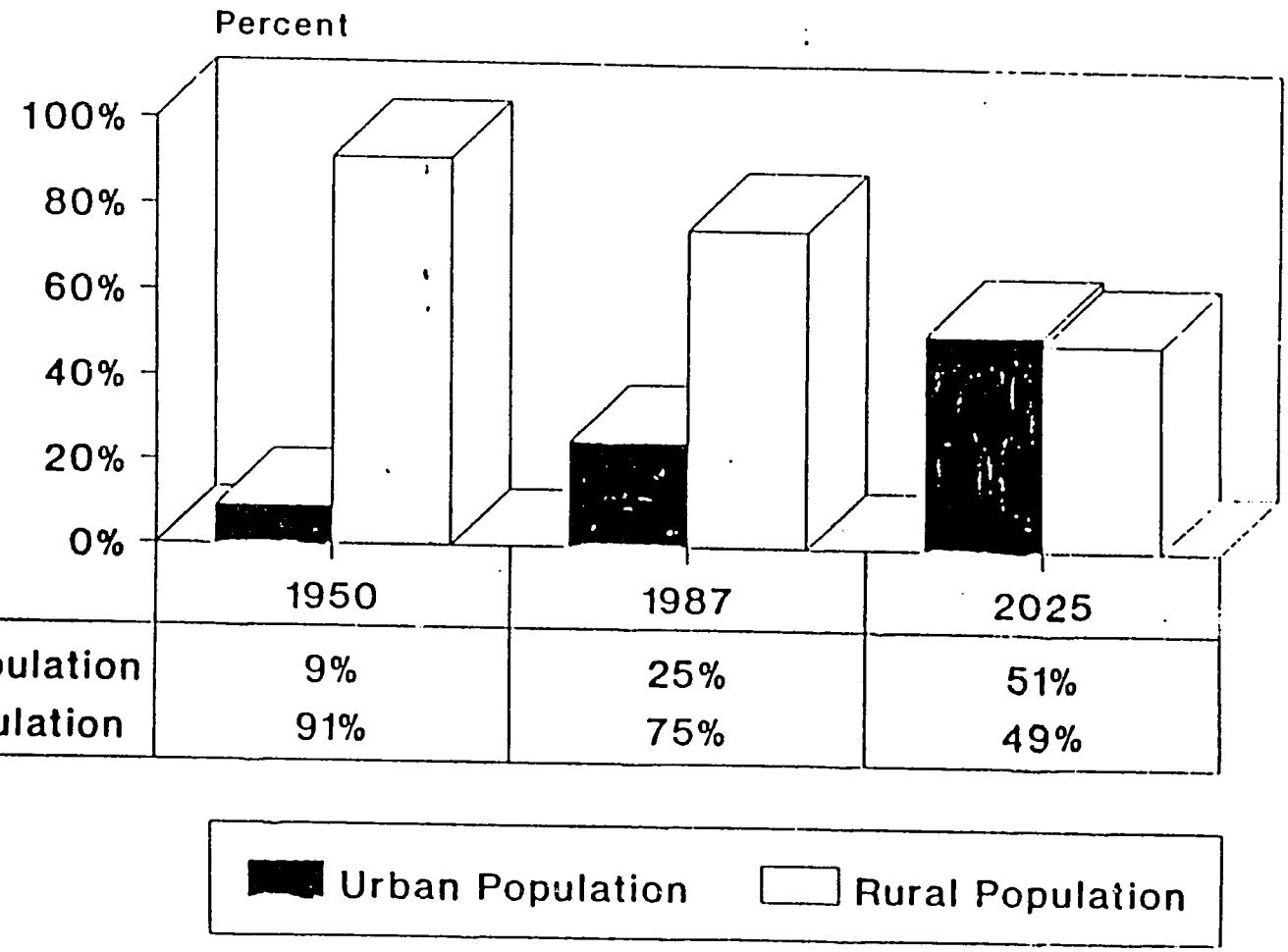
Whitney, J and Dufournaud, C., 1982, The simulation of the urban-rural ecological system: the SIMURCOL model, Project

Ecoville Working Paper No 1, Institute for Environmental studies, University of Toronto, Toronto

Whittington, D. and Calhoun, C., 1988, Who really wants donor co-ordination, Development Policy Review, 6, pp. 295-309

Whittington, D., Lauria, D.T., and Mu, Xinming, 1989, Pay for urban services, a study of water vending and willingness to pay for water in Onitsha, Nigeria, Infrastructure and Urban Development Department, World Bank, Washinton, D.C.

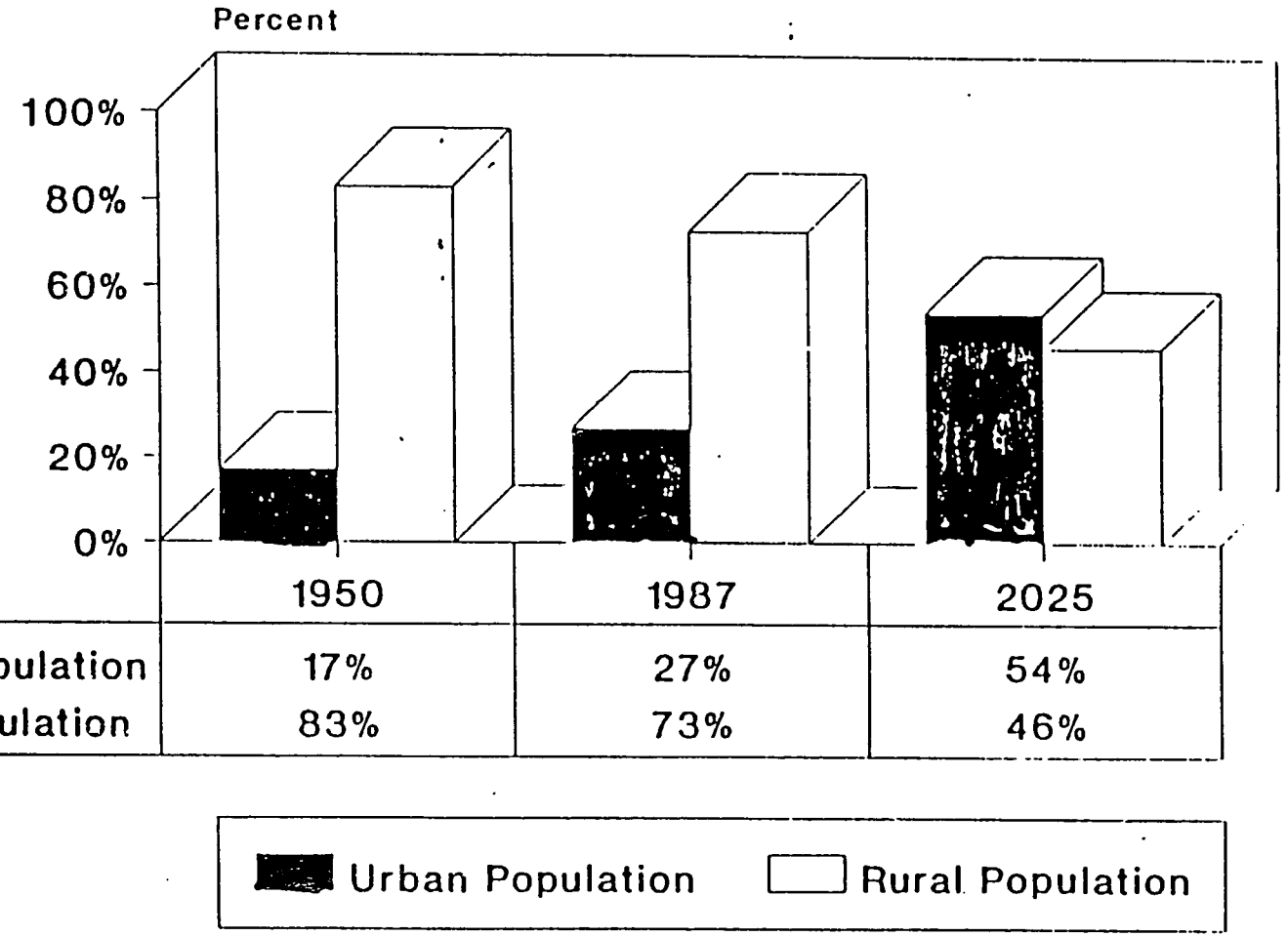
Fifure 1A. Estimated and Projected Level of Urbanization in Africa Region Countries



	1950	1987	2025
Urban Population	9%	25%	51%
Rural Population	91%	75%	49%

UN Estimates and Projections, 1987

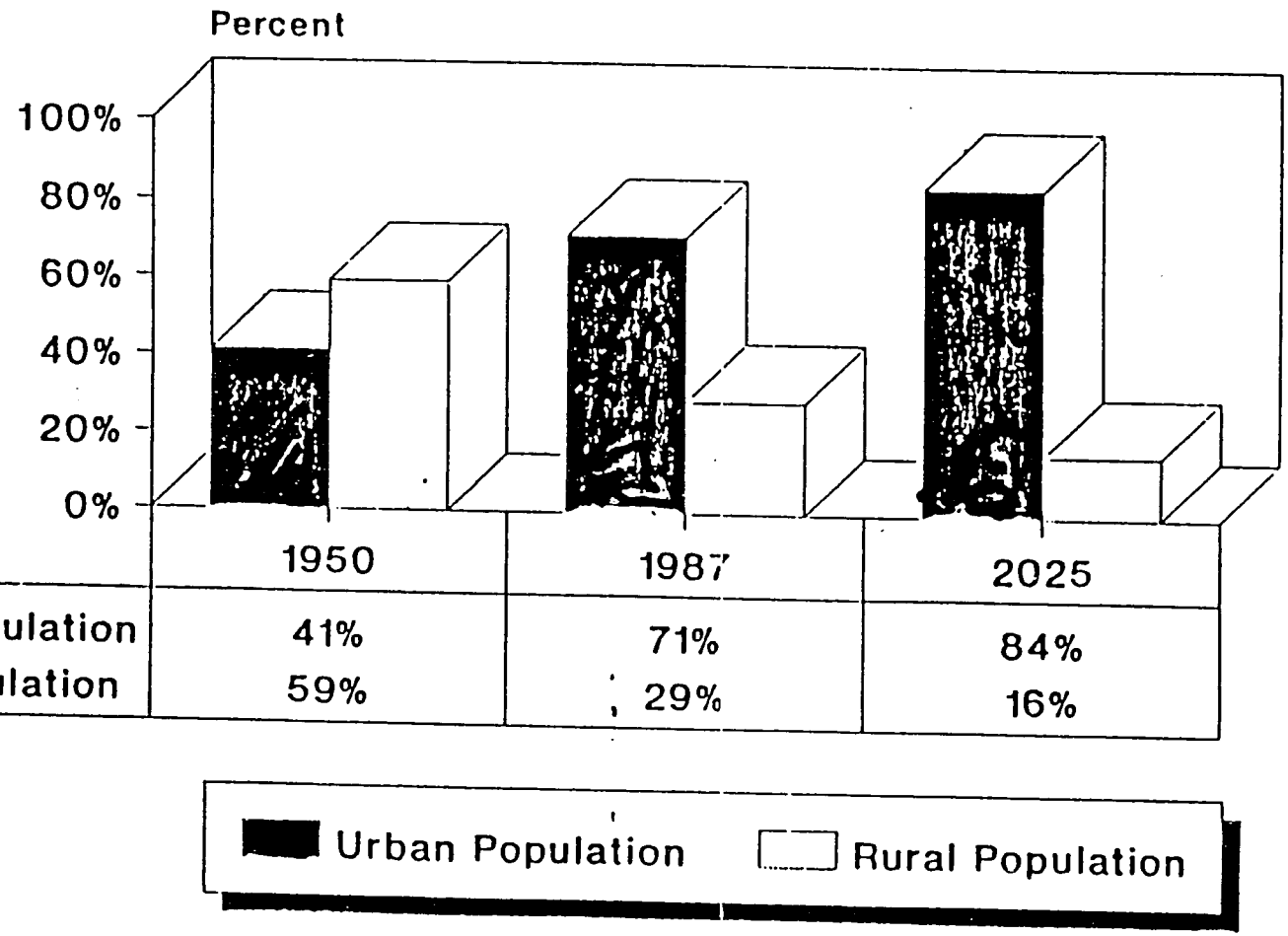
Figure 1B. Estimated and Projected Level of Urbanization in ANE Region Countries



	1950	1987	2025
Urban Population	17%	27%	54%
Rural Population	83%	73%	46%

UN Estimates and Projections, 1987

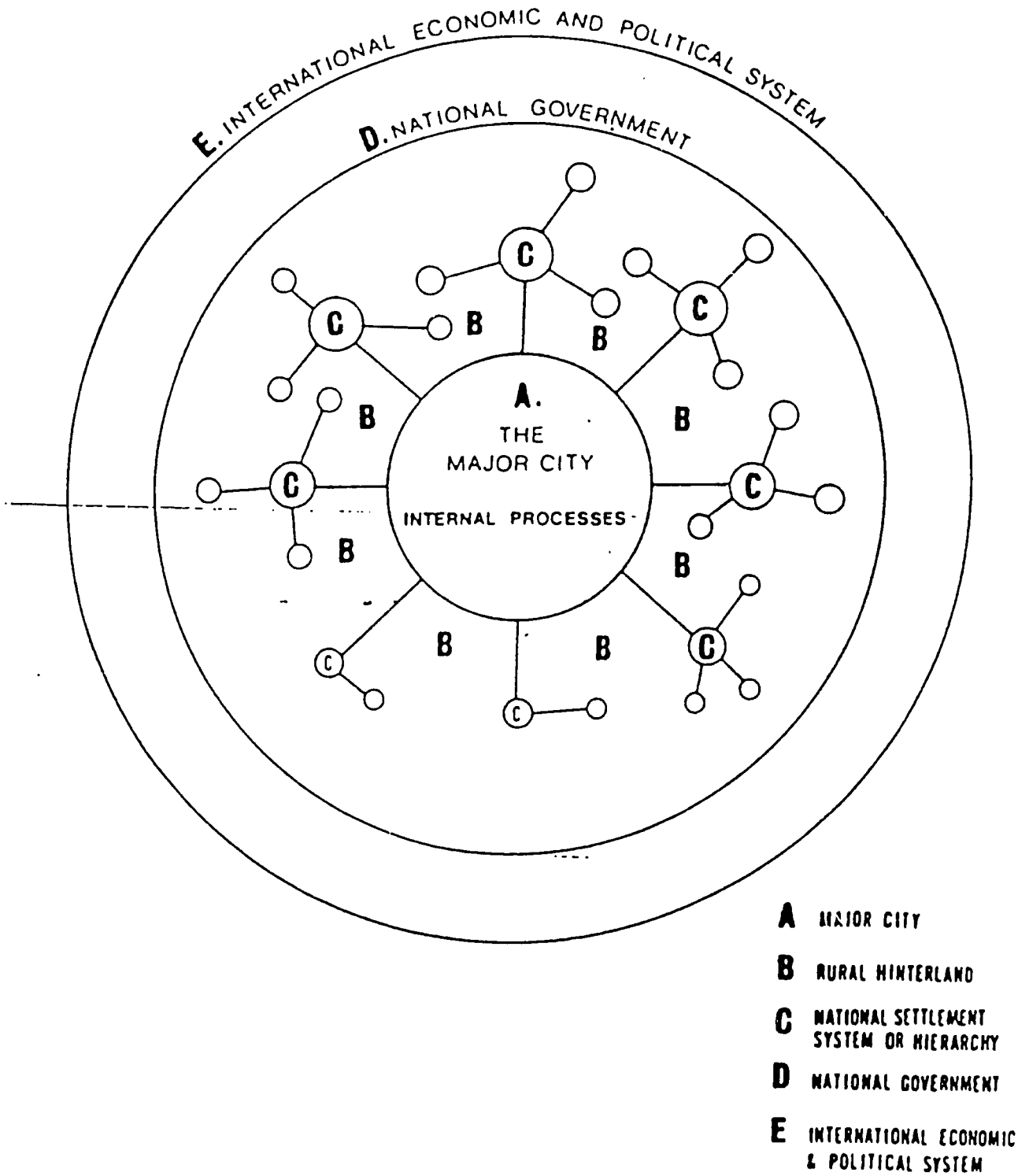
Figure 1C. Estimated and Projected Level of Urbanization in LAC Region Countries



	1950	1987	2025
Urban Population	41%	71%	84%
Rural Population	59%	29%	16%

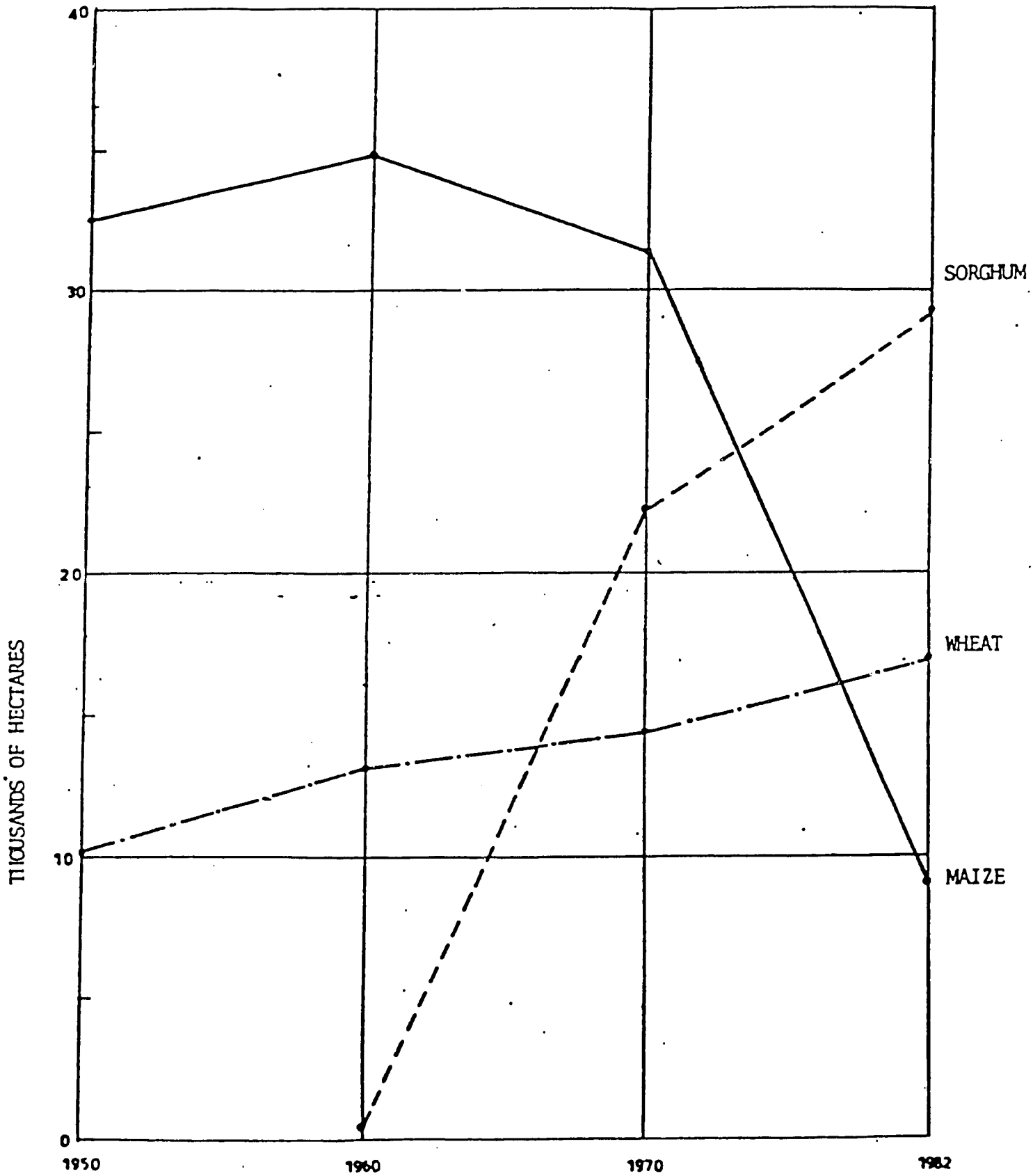
UN Estimates and Projections, 1987

Figure 2. The Context of Urbanization



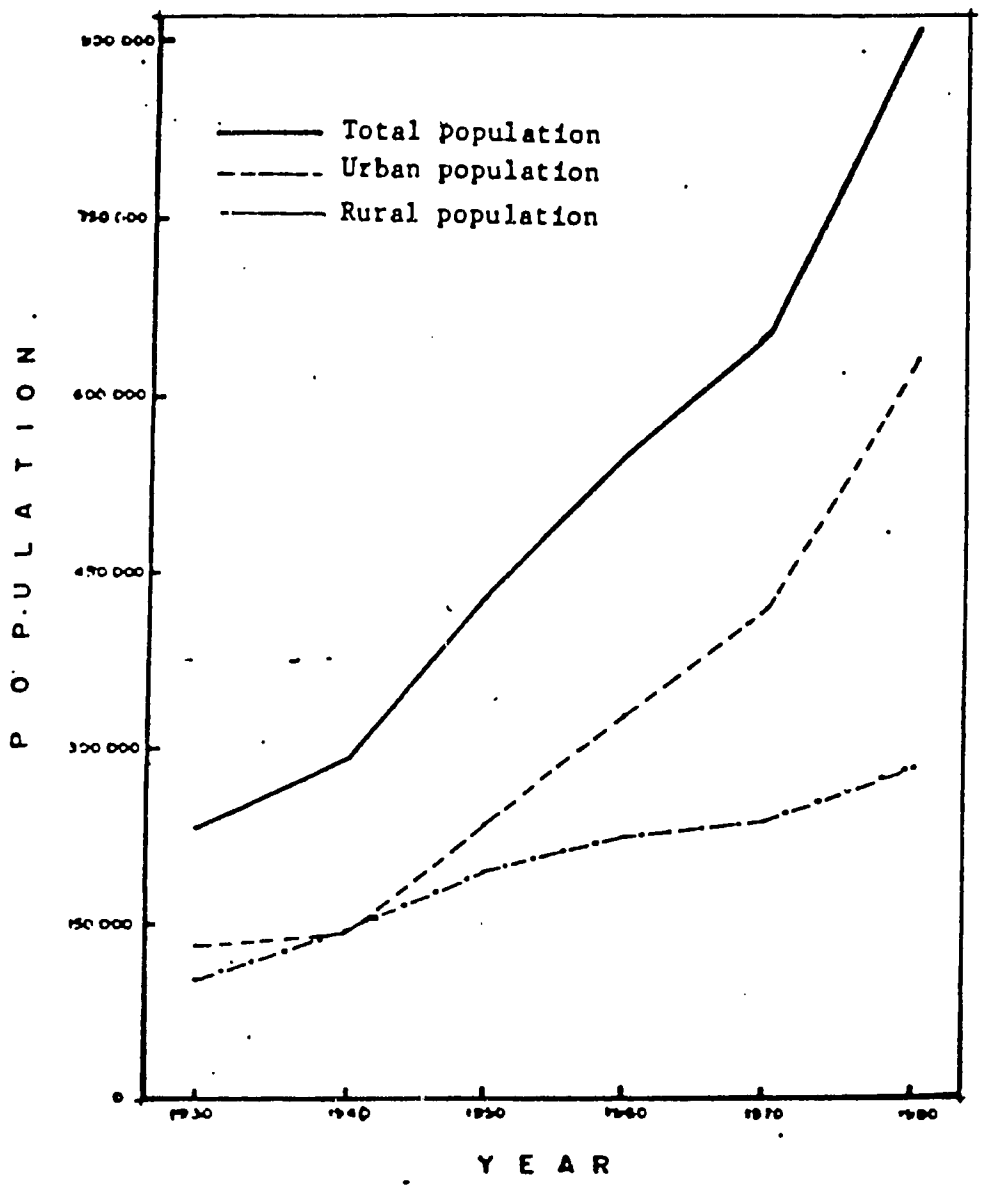
White and Burton (1983, p. 15)

Figure 3. Evolution of Cropping Pattern in La Lguna, Mexico Region



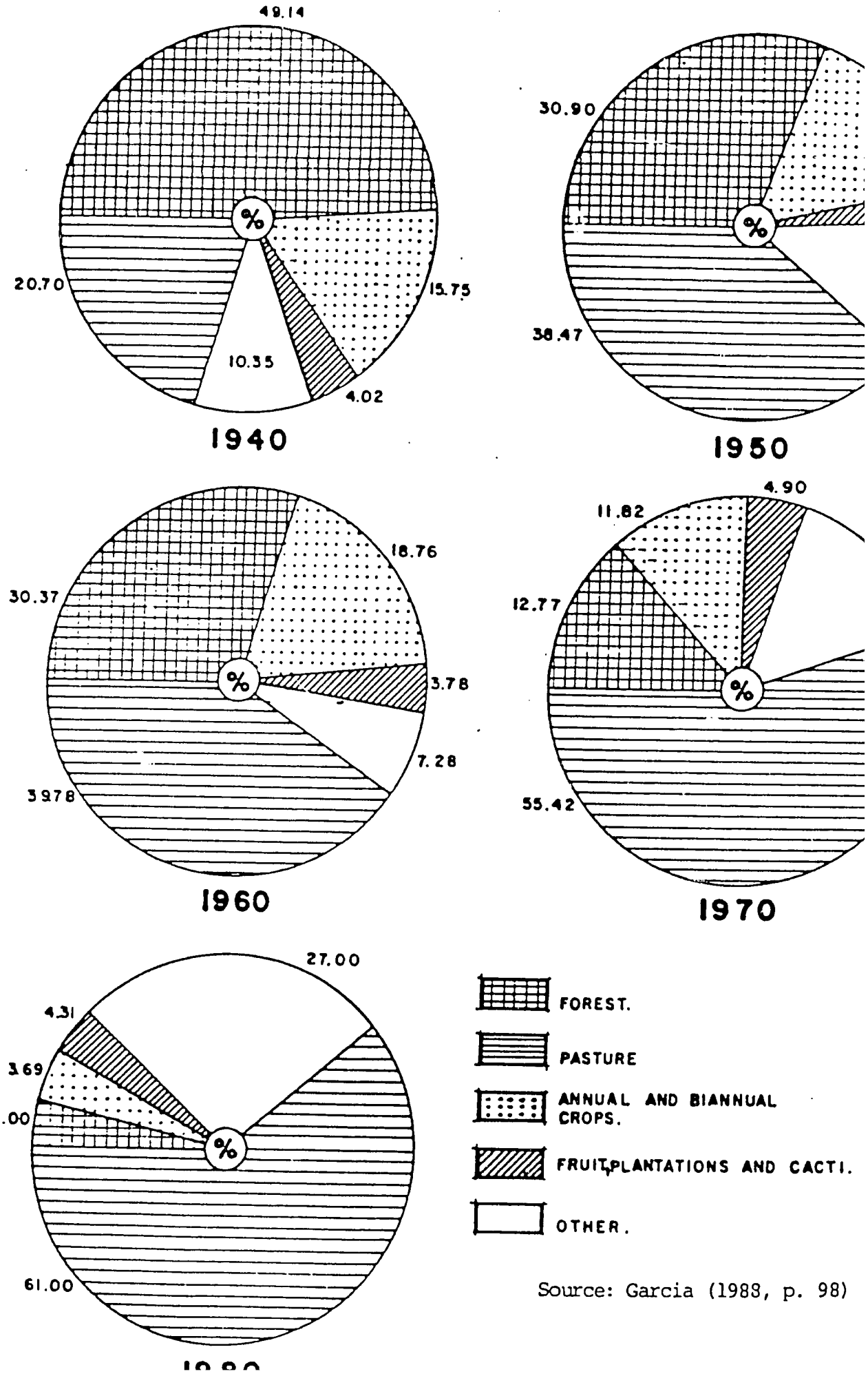
Garcia (1988, p. 48)

Figure 4. Trends in Urban and Rural Populations in La Laguna Region, Mexico



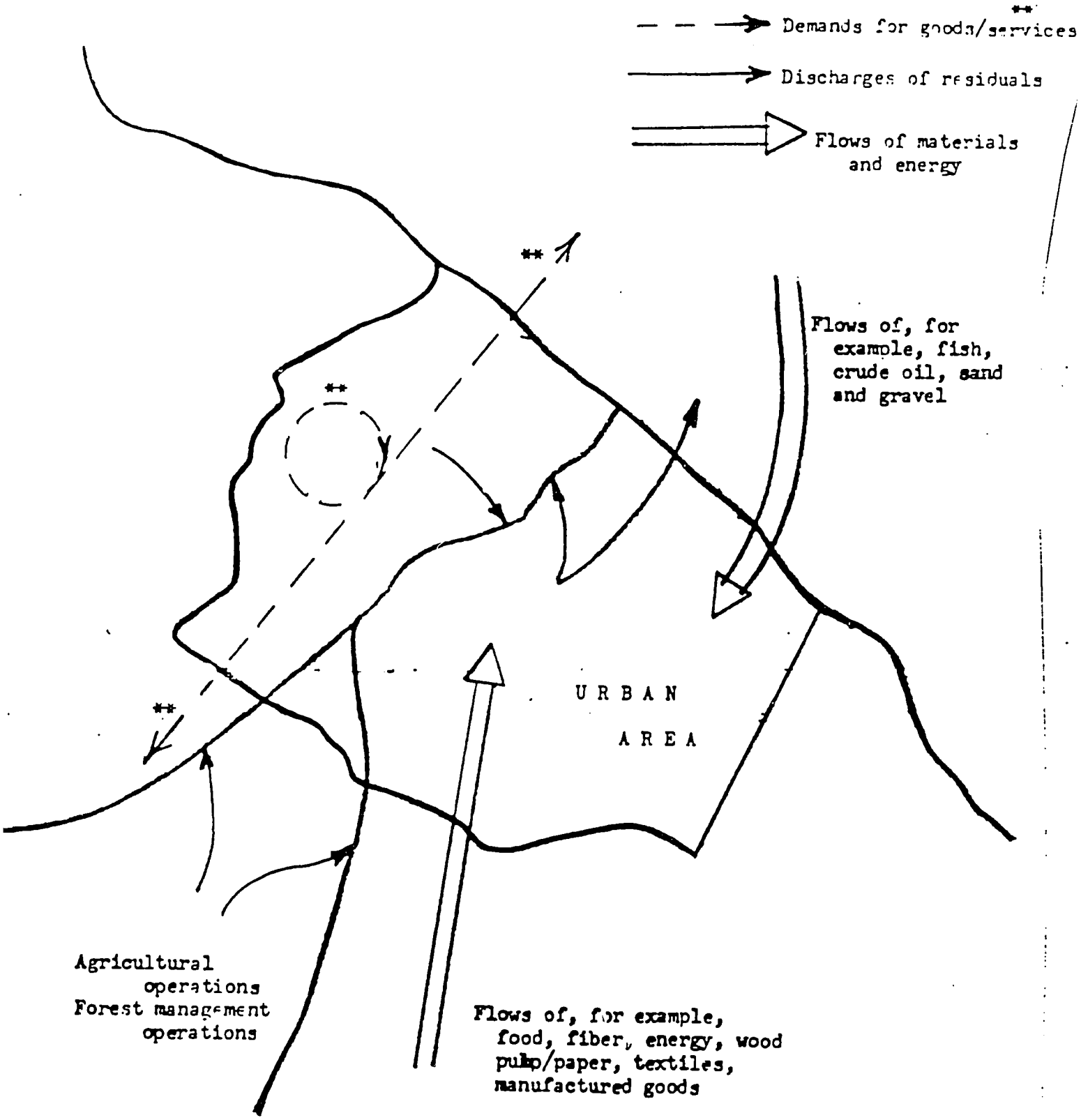
Source: Garcia (1988, p.57)

Figure 5, Evolution of Land Use in Tabasco Region, Mexico



Source: Garcia (1988, p. 98)

Figure 6. Simplified Schema of Demands of Urban Lands on Upstream and Downstream Resources



**Includes demands for disposal of residuals, e.g., liquid to streams, coastal waters; solid to land; gaseous to atmosphere, some of which move inland via on-shore winds for deposition on land

MAGNITUDE OF MATERIAL AND ENERGY FLOWS INTO URBAN AREA = f["life style", e.g., type of transport system, product characteristics]

Figure 7. Economic Activities, Residuals Generation and Discharge, and Occupational Health

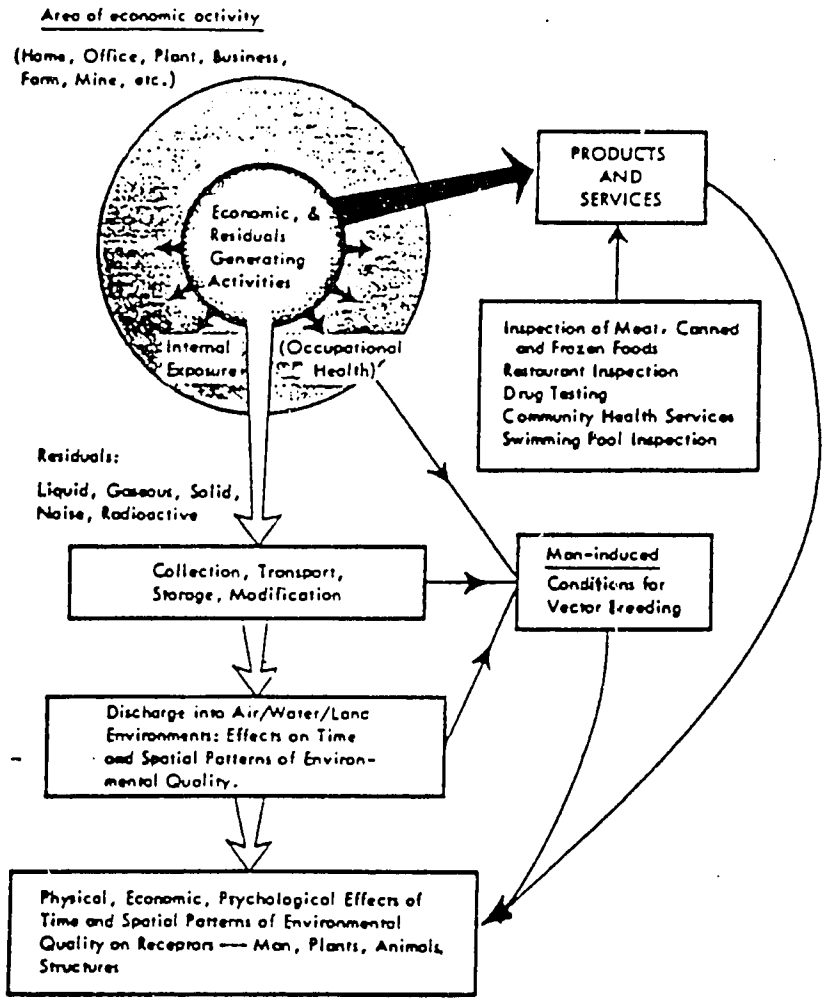
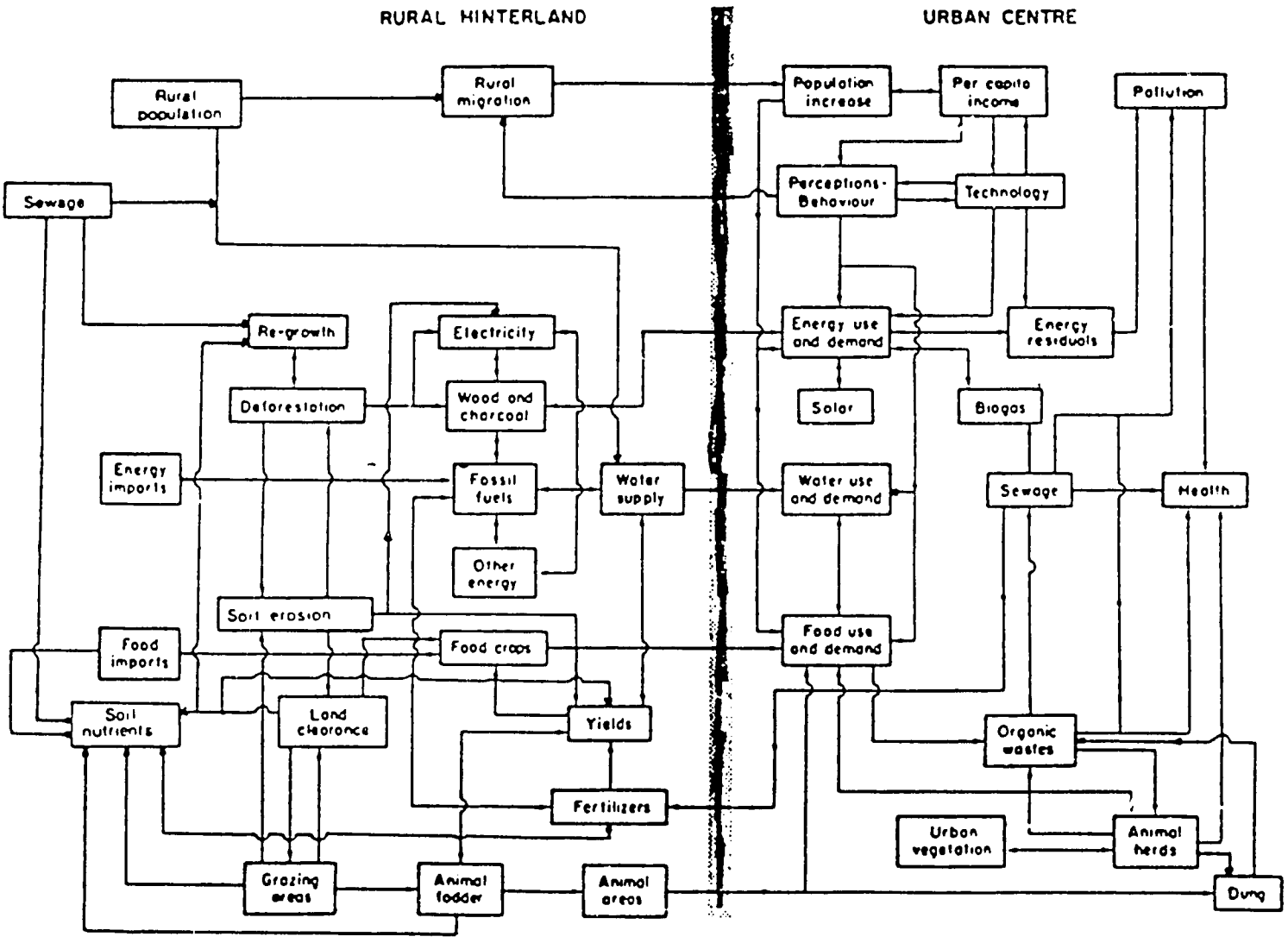


Figure 8. A Framework for Analysis of Interactions between Urban Areas and Rural Areas



Soure: White and Burton (1983, p. 86)

Figure 9. Illustration of Interrelationships among Forms of Residuals and Pathways in the Environment

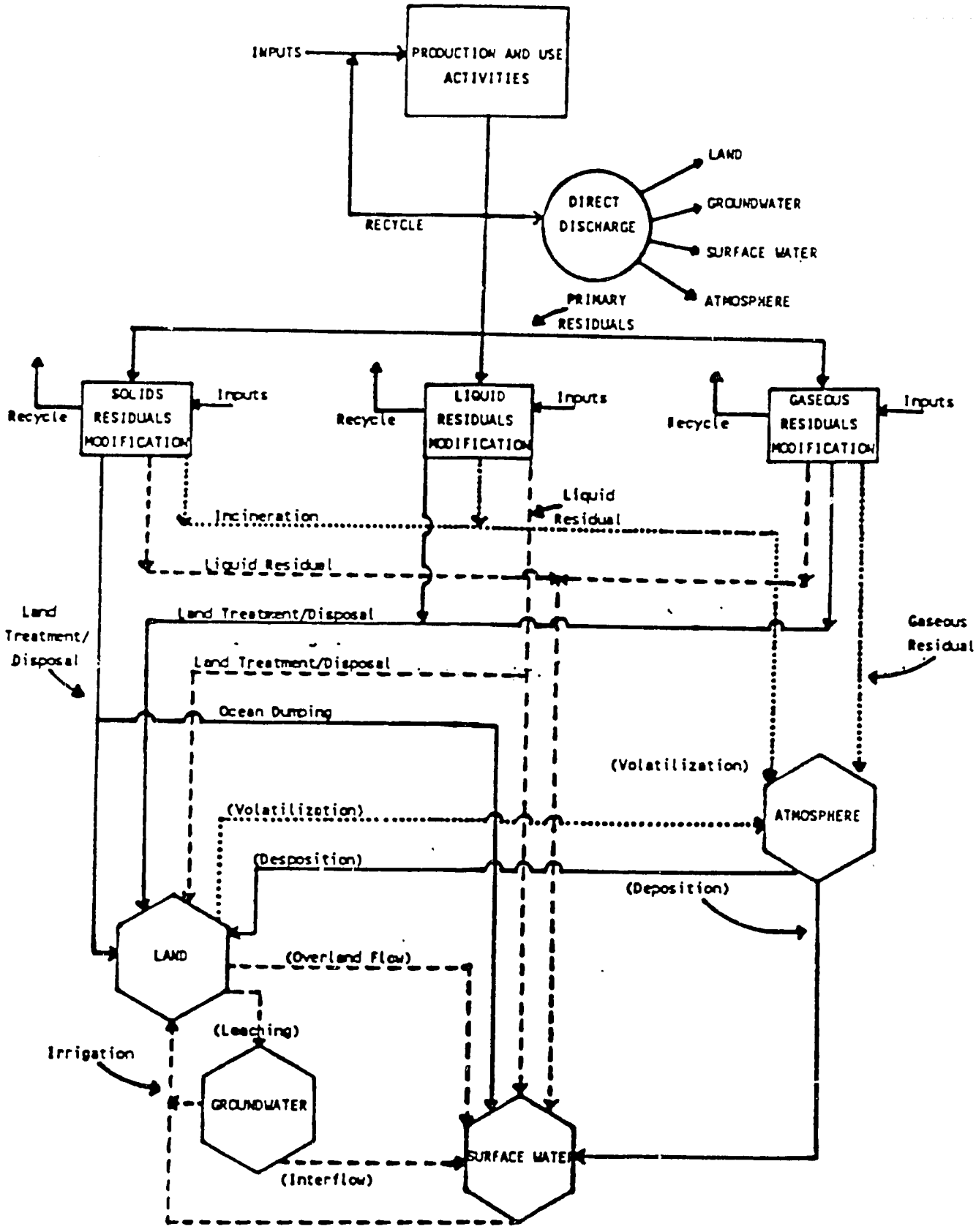


Figure 10. Possible Loci of Implementation Incentives

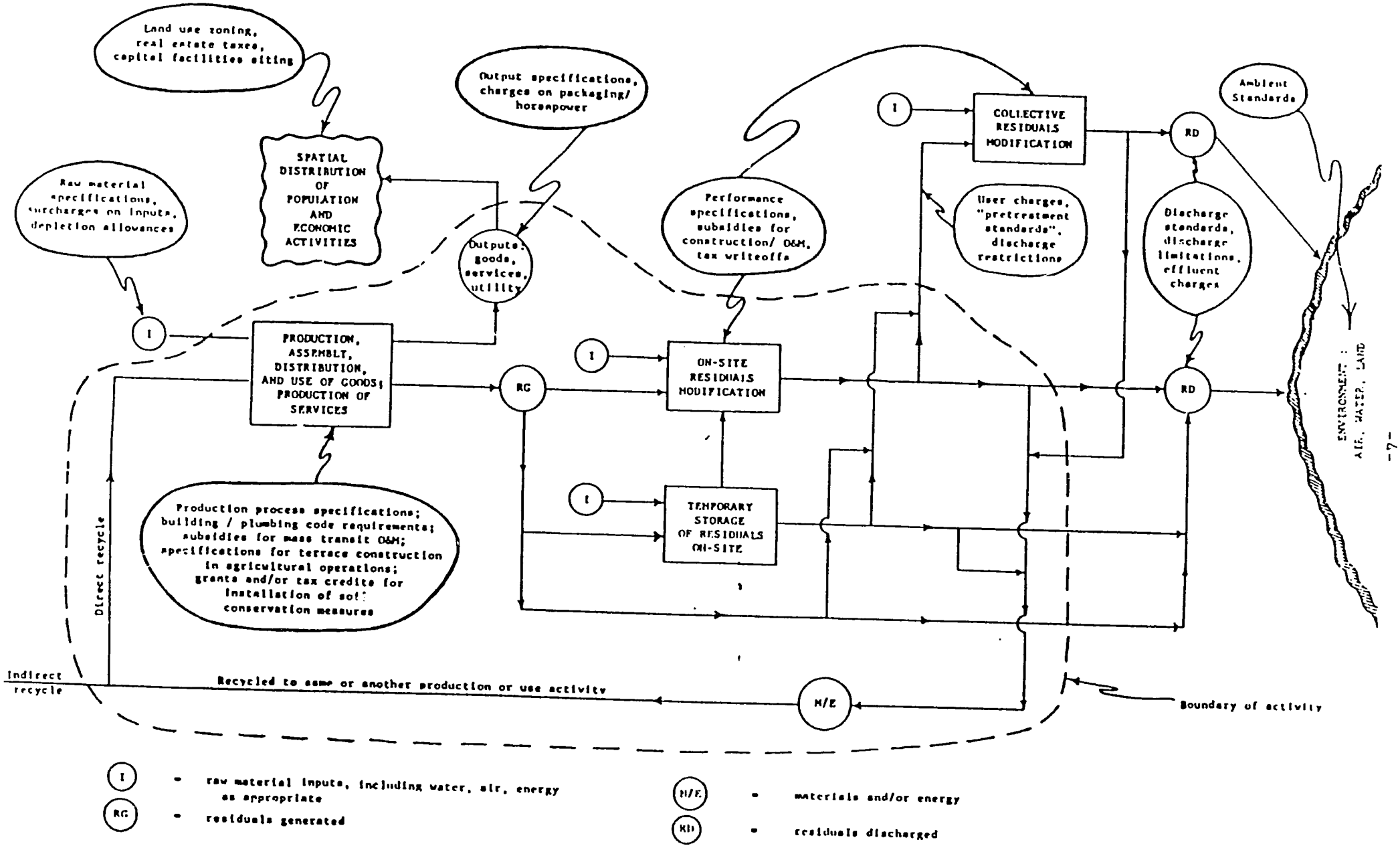


Table 2. Estimated and Projected Urban Growth, in the Asia and Near East Region

Country	Total Population (millions)			Urban Population (millions)			Urban Population as % of Total			Average Annual Growth Rate (%) of Urban Population	
	1950	1985	2000	1950	1985	2000	1950	1985	2000	1965-80	1980-85
Morocco	9	22	30	2	10	16	26	44	56	4.2	4.2
Tunisia	4	7	9	1	4	6	31	56	68	4.2	3.7
Egypt	20	47	64	9	22	35	42	46	56	2.9	3.4
Jordan	1	4	6	0	2	5	35	69	74	5.3	4.0
Yemen A.R	3	7	11		1	4	2	19	33	10.7	7.3
Oman	0.4	1	2	0.01	0.34	0.30	2	9	15	8.1	7.3
Pakistan	40	100	141	7	27	53	18	29	38	4.3	4.8
India	358	759	964	62	197	330	17	25	34	3.6	3.9
Bangladesh	42	101	146	2	18	27	4	13	18	8.0	7.9
Sri Lanka	8	16	20	1	3	5	14	21	24	2.3	8.4
Nepal	8	16	25	0	1	3	2	7	14	5.1	5.6
Burma	18	37	48	3	9	17	16	24	28	2.8	2.8
Thailand	20	51	66	2	13	19	10	18	29	4.6	3.2
Philippines	21	54	74	6	22	36	27	39	49	4.0	3.2
Indonesia	80	166	211	10	59	77	12	25	37	4.7	2.3
Total	632	1,390	1,815	105	389	634	17	30	38		

Sources: *Prospects of World Urbanization 1984-1985*
World Development Report 1988
World Resources 1988-1989
U.S. AID ANE Bureau - Draft Natural Resources Strategy 1988
International Drinking Water and Sanitation Decade, Review of Mid-decade Progress

Lurie and Laredo (1989)

Table 3. Some Effects of Concentrating Population in Urban Regions

National development is based on interaction of socio-economic functions leading to concentration of activities & people in given geographic areas of the country (interregional distribution) which if unbalanced and continued on an unplanned basis results in-		
Regional development requires interaction of socio-economic functions which in turn leads to (intraregional) concentration in metropolitan areas which if continued unplanned results in-		
Phenomenon	Manifest Consequences	Breakdown in Developmental Environments
Overloading of capacities of natural environment in urban region with resulting	Increasing pollution Decreasing environmental qualities Poorer "neighbourhood" linkages Environmental degradation	Breakdown of ecological balance and access to nature in urban region
Overloading of land in certain locations and areas with resulting	Higher densities Higher land prices Outward movement of less competitive uses Underuse and abandonment of land	Excessive separation of land uses and breakdown of interaction among functions
Overloading of technologies of urban infrastructure with resulting	Growing congestion Diminishing quality Decreasing accessibility Decreasing use	Lower quality, poorer access and breakdown of linkages among functions
Overloading of institutional structures in urban region with resulting	Unresponsiveness "Alienation" Poor participation Fragmented sectoral, bureaucratic action	Breakdown of communication with and among institutions, sectors & citizens
Overconcentration of economic activity with resulting	Depletion of resources Increase in prices Allocation of resource according to ability to pay Increase in disparities	Breakdown in productive processes
Rural area and small town abandonment with resulting	Depletion of human resources Inability to maintain infrastructure Collapse of social structure Further abandonment	Breakdown in service provision in rural areas

Source: White and Burton (1983, p. 30)

Table 4. Some Examples of Country Approaches to Environmental Quality and Urbanization

Country	National Spatial Policy	Industrial Location Policy	National Urbanization Policy	Environmental Regulations/ Policy	Water and Sanitation	Hazardous Waste	Health	Housing	Comments
Morocco				E	E		E	E	
Jordan				E	E		E		Presence of water determines spatial policy
Sri Lanka				E					Uncoordinated urban development
Bangladesh				E	E	E	E		Environmental policy not well implemented
Pakistan				L	E				Environmental policy in place but not integrated
Egypt			E	E	E			E	Spatial policy focused on decentralization
India		E		L	E		E	E	Industrial development not permitted in 5 largest cities
Nepal				E					National conservation strategy - not linked to urban areas
Yemen A.R.									Law based on Islamic principles
Thailand	L			L	E	E	E		Decentralization policy ineffective
Philippines	E	E		E	E		E	E	Spatial policies focus on growth centers
Indonesia	E		E	E	E	E			Extensive environmental regulations

E - Exists (success unknown)
L - Limited Success in Implementation
Blank - Denotes no policy or inavailability of data

Source: Lurie and Laredo (1989, p.63)

Table 5. Example of Fragmentation in Natural Resources Management

Water Resources Management Activities Related to Irrigated Agricultural Production in Thailand with the Public or Private Agencies Responsible for those Activities, 1982

RESPONSIBLE AGENCY / ACTIVITY AND TASK	MINISTRY OF AGRICULTURE AND COOPERATIVES								MINISTRY OF INTERIOR								MINISTRY OF COMMUNICATIONS			MINISTRY OF INDUSTRY			MIN. OF PUB. HLTH		MIN. OF SCI./TECH.		STATE ENTERPRISES																		
PLANNING																																													
Basic Survey	●	●				●																																							
Analysis	●																		●	●																									
Formulation	●																												●			●													
Env. Impact	●																															●													
Assessment	●																									●						●													
Evaluation	●																															●													
Review/Appr.	●																									●						●													
DESIGN																																●													
Det. Plans	●																																												
Specific.	●																																												
Budgeting	●																															●													
Scheduling	●																															●													
CONSTRUCTION																●																●													
Bids	●																															●													
Work Supervision	●											●																																	
Disbursement	●											●																	●			●													
Approval	●															●													●			●													
OPERATION																																													
Watershed Mgt.			●																																										
Reservoir Mgt.	●																																												
Control Gate	●																																												
Water Release	●																															●													
MAINTENANCE																																													
Cleaning/Mown	●																															●													
Cleaning/Levels	●																																												
Repair/Mown	●																																												
Repair/Levels	●																																												
Dredging	●																																												
IRRIGATION												●																																	
Hydroelectric																																													
Fishing																																													
Recreation																																●													
Disease Control																																													
FARM PRODUCTION																																													
Inputs				●		●	●	●															●	●																					
Credit					●																																								
Extension				●					●																						●													
Weather Forecast																																													
MARKETING																			●																										
Processing				●					●																																				
Transportation				●																																									
Pricing																																													
Storage				●																																									

Source: Bower and Hufschmidt (1984)

Table 6. Illustration of Relationship among Activity, Residual, Physical Measure, Implementation Incentive, an Institutional Arrangement

Residual(s) Affected	Physical Measure	Applicable Activity	Implementation Incentive	Institutional Arrangement (locus/bci of authority)
Windblown particulates	Plant/maintain windbreak trees	Agricultural operation	Provision of free tree stock and planting/care instructions	State Department of Environmental Protection, State Department of Agriculture
All from municipal sewage treatment plant	Better operation of conventional primary and secondary sewage treatment plant	Municipal sewage treatment plant	Training of operators by state agency (cost borne by state)	Sate Department of Environmental Protection
"	"	"	Salary increment for licensed operators	Municipality
"	"	"	Require operators to have state license (after training and certification exam)	State Department of Environmental Protection
Chromium	Recovery system	Manufacturing operation	Provide detailed information on design/cost of alternative recovery systems	Environmental Protection Agency (fedoral)
Phosphates	Limit phosphate content in detergents	Detergent production	Ordinance	Municipal, state, federal government
Suspended solids fertilizers	Terraces	Agricultural operation	Regulation requiring terraces on all crop land with slopes > X %, with state bearing 50% of construction cost	State Department of Environmental Protection
Glass containers	Standardize shapes and sizes, i.e. wide mouth, straight sides	Container producers	National legislation	Federal (national), based on national standards or design specifications
Particulates	Various, e.g. precipitators, baghouses, changed quality of raw material input	Activities generating particulates, e.g., manufacturing, energy generation, incinerator	Effluent charges: 2 cents per kg discharge; 2 cents per kg discharged above discharge standard	State Department of Environmental Protection

Table 7. Examples of Economic Implementation Incentives

Implementative Incentive	Comment
Daily fine for not installing double seals on floating roof storage tanks for crude petroleum	
Annual charge for operation of spray booths that use solvent-based, rather than water-based paints	
Fine for use of prohibited cleaning solvents	
Per-pound charge on production of solvent-based paints	
Charge formula with higher charges for higher concentrations in discharge	
Charge for any discharge in excess of specified quantity per unit of output	Charge will be varied by season or by flow conditions.
Fine for failure to operate degreasers properly	
Charge on each gallon of gas sold	Charge could be varied by season.
Charge on each ton of solvent used in printing operations	Charge could be varied by season.
Charge per unit of residuals discharged, e.g., X cents per kg of BOD, Y cents per kilocalorie, Z cents per million population equivalent (PE)	
Charge per unit of related input, e.g., S cents per kg of sulfur in fuel, D dollars per kg of pesticide employed, F cents per lb. of active ingredient(s) in N fertilizer applied	
Charge per unit of related output, e.g., P cents per kg of packaging weight, H dollars per year per auto horsepower	
Charge on related activities, such as surcharge on downtown parking fees	
Subsidy for each additional percent removal achieved	
Subsidy per unit of reduction on related input use	
Subsidy per unit of reduction on related output	
Subsidy for related activities, such as treatment plant construction, agricultural practice upgrading	
Annual permit fee based on annual discharge, dollars per ton	

Table 7 (continued)

Implementative Incentive	Comment
Initial permit fee and annual permit fees to operate, based on size of activity	
Require posting of performance band at beginning of year	A performance bond is an amount of money paid to a regulatory agency each year, in relation to operation of RDR facilities, before an activity is undertaken. The amount returned at the end of the year is related to level of performance achieved.
Payment per hectare for removing highly erodible lands from crop production	
Withholding crop support payments unless soil erosion reduction measures are installed and maintained annually	
Performance bond to induce adherence to land reclamation specifications after mining operations	
Deposit fees on beverage containers	
"Ultimate" disposal charge for durable goods, e.g., vehicles, large appliances (stoves, refrigerator, sofas), tires	
Less than market interest rate loans to public and private activities for installation of discharge reduction measures	
Grants for some portion of the capital cost of discharge reduction measures	
Grants for some portion of the operation and maintenance costs of discharge reduction measures	
Grants for some portion of the capital cost of installing less "polluting" production technology	
Tax credits for installation of discharge reduction measures	
Rapid depreciation allowance for capital costs of discharge reduction measures	
Reduction in real estate tax for commercial/industrial activities for locating in specified area	
Bonuses for WWTP operators in relation to plant performance	Analogous to profit sharing.
Charge on aircraft in relation to noise generated in takeoffs and landings	Use increasing block rate schedule based on decibels.
Reduction of landing charge for less noisy aircraft	

Annex A

AN ASSESSMENT OF A.I.D. ACTIVITIES AND PROCEDURES AFFECTING URBAN ENVIRONMENTAL QUALITY

Eric L. Hyman

INTRODUCTION

This annex briefly assesses A.I.D. activities and procedures affecting urban environmental quality. It begins with a history of A.I.D.'s evolving interest in environmental quality and agency guidelines for environmental reviews. Specific urban sectoral issues such as housing, water supply and sanitation, industrial pollution control, and energy supply are covered. This is followed by a discussion of of the inclusion of environmental factors in the urban development sector.

At present, A.I.D. defers most of the major infrastructure development projects in developing countries in transportation, road construction, power supply, and urban water supply and sewerage to the multilateral development banks (Pill 1989). For the most part, A.I.D. equates urban environmental issues with solid and liquid waste disposal and industrial pollution. The inter-sectoral linkages between urbanization and energy use, road construction and residential development, or urban land-expansion and off-side land productivity have not generally been addressed.

History of Environmental Concern Within A.I.D.

A.I.D. has been in the forefront among the bilateral donors and multilateral development banks in its concern for environmental quality. However, most of this attention has been directed to rural environmental issues such as deforestation, loss of biological diversity, agricultural chemicals, and sustainable land use. In 1976, A.I.D. adopted environmental assessment procedure and also began to devote special attention

to pesticide use.

In 1977, Foreign Assistance Act Amendments gave A.I.D. a mandate to strengthen the capacity of LDCs to manage their natural resource base and take environmental consequences of development into account. Further amendments in 1978 identified environment and resource issues as critical targets for sustained growth and noted that deforestation posed a threat to improving agricultural productivity. A.I.D. revised its pesticide use guidelines in 1980 and initiated an Office of Forestry, Environment, and Natural Resources. The first formal agency policy on forestry was adopted the following year.

In 1983, Section 118 of the Foreign Assistance Act was amended to encourage conservation of endangered plant and animal species and habitat management. Two policy determinations were issued (PD-6 and PD-7); the former is on "Environment and Natural Resource Aspects and Development Assistance", and the latter is on "Forestry Policy and Programs". A sector strategy, "Statement on Environment and Sustainable Development", was also released that year.

A sector strategy on forestry was issued in 1984. In 1985, the overseas Private Investment Corporation (OPIC) was given a Congressional mandate to comply with sections 118 and 119 of the Foreign Assistance Act. The following year, the Foreign Assistance Act was amended to place a high priority on conservation and sustained management of tropical forests. The missions were required to analyze actions to conserve natural forests and biological diversity in their CDSS reports. An annual report on the implementation of measures to conserve

natural forests was also required.

A.I.D. issued a Natural Resources management Plan for Sub-Saharan Africa in 1987, emphasizing forestry, agroforestry, and biological diversity. A Biological Diversity Consultative group composed of private foundations and A.I.D. was also formed in 1987. The Foreign Assistance Appropriations Act of 1988 directed A.I.D. to monitor the economic and environmental soundness of the programs of the multilateral development banks. That same year, A.I.D. released a "Manual for Project Economic Analysis" that includes a discussion of issues in valuing environmental effects (A.I.D. 1988a; A.I.D. 1989a; A.I.D. in press).

Despite all of this attention to the rural environment, the urban environment has not been given much attention in the Congressional authorizing legislation or agency policy statements.

Environmental Guidelines and Procedures

In 1976, A.I.D. adapted Regulation 16 (22 CFR Part 216) to incorporate environmental quality considerations in decision making. This regulation was revised in 1980 and made part of the Foreign Assistance Act in 1981. Each bureau was required to assign an Environmental Officer to oversee implementation of these procedures. There are also Environmental Officers in the regional offices and country missions as well as an Agency Environmental Coordinator. The General Counsel also monitors the process.

An initial screening of the potential for significant

environmental impacts is done by the project designers. Twelve types of projects on the "black list" are presumed to require an environmental review.

1. Riverbasin dams
2. Irrigation or water management
3. Agricultural land leveling
4. Drainage projects
5. Large-scale agricultural mechanization
6. New land development
7. Resettlement
8. Road building or improvement
9. Powerplants
10. Industrial plants
11. Large-scale potable water and sewerage
12. Procurement or use of EPA-registered pesticides

A second category, known as the "white list" contains projects that generally do not require environmental reviews. These projects support (1) research, (2) training, (3) extension, or (4) institution building. Also exempted are projects funded by multiple donors or implemented by PVOs in cases where the A.I.D. contribution is less than $1 million or 25% of the total project cost (Chew 1988). This amounts to a rather large loophole since A.I.D. has increasingly emphasized the role of PVOs and donor cooperation, development assistance. By this rule, a $10 million project with $2 million in A.I.D. funding and potentially large environmental impacts would escape agency environmental review. Regulation 16 also does not apply to activity supported through local currency funding (A.I.D. 1988).

A third category of projects, the "grey list", has been added to include items on the "white list" that might have negative environmental impacts. For these projects, a written statement that the impacts will be insignificant is required. If

information is not sufficient to demonstrate this, an initial environmental examination is necessary. Many projects on the "grey list" support intermediate credit institutions that may finance environmentally damaging activities. A.I.D. is able to impose environmental condition on the subprojects. In one example, a tannery in Kenya had to install an effluent treatment plant before receiving financing.

The agency follows three types of environmental reviews for different circumstances: (1) initial environmental examinations, (2) environmental assessments, and (3) environmental impact statements. The initial environmental examination (IEE) is a preliminary study by the A.I.D. mission or project designers to identify foreseeable impacts. The study preparers submit a recommendation for a negative or positive "threshold decision". A negative threshold decision means that no further environmental review is necessary, while a positive one will lead to preparation of an environmental assessment or an environmental impact statement. This decision is made by the Bureau Environmental Officer.

An environmental assessment (EA) is a detailed study to identify impacts of proposed actions, possible mitigation measures, and alternatives with fewer negative impacts. A detailed study plan for an EA is produced through a "scoping process" that involves agency personnel and contractors and host country officials. Two factors that must be considered in enviromental reviews are the impacts of proposed pesticide use and the likely effects of the project on endangered species. The Bureau Environmental Officer may request written comments on the

EA from other U.S. federal agencies. The recommendations of the EA are reviewed as part of the project paper after clearance by the Bureaus Environmental Officers.

An environmental impact statement (EIS) examines broader impacts than an EA on the U.S. or global environment or areas outside the jurisdiction of a particular country. The procedure for an EIS is similar to that for an EA except that the A.I.D. Administrator may also hold public hearings in the U.S. and the document must be cleared by both the Agency Environmental Coordinator and the General Counsel (Chew 1988).

When environmental questions have been raised about a particular component of a project, funds may be withheld for that component while the rest of the project proceeds. Any project that requires an EA or EIS must contain provisions for data collection and analysis of significant environmental changes that occur during project implementation. If significant adverse effects occur, an EA or EIS must then be prepared. This rule allows unexpected impacts to occur without monitoring in the case of projects that only undergo an IEE.

Typically, environmental assessments cost less than 1% of the A.I.D. investment in a project, visually $100,000-400,000 for large-scale development projects and $10,000-$30,000 for small projects. The environmental review process has resulted in changes in project design. For example, the EA for the Cairo wastewater project determined that construction should be phased and certain alternatives adopted. The Palazu Valley Project in Peru proposed road building and settlement for large-scale, agro-

industries that would have cleared a sizable area of tropical rainforest. As a result of the EA's recommendation, measures for natural forest management and small-scale agriculture in the area were implemented in the Central Selva Resources Management Project (Chew 1988).

For housing projects, some sector-specific environmental guidelines were prepared by PRE/H in 1977. These are not reviewed here because a copy could not be obtained from A.I.D./W. However, they are supposed to be used in the field together with the agency's general environmental guidelines. A report that applied these guidelines in a case in Liberia is analyzed later in this annex.

Housing

The Private Enterprise Bureau of A.I.D. has an Office of Housing and Urban Programs. Regional Housing and Urban Development Offices (RHUDOs) in the field also provide assistance to country missions. A.I.D. has supported projects for sites and services and urban upgrading for health and quality of life in over 50 countries (A.I.D. n.d.).

Some of the earlier projects in this sector have suffered from inattention to environmental concerns. For example a Dakar housing project (Senegal HG-001) built housing on unstable sand and some houses were damaged as the sand shifted. The Umoja housing project (Kenya HG-005) experienced cost over-runs because of unstable black cotton soils that had not been surveyed early enough in the siting process.

In recent years, A.I.D. has been changing its focus from

housing construction grants to mobilizing initiative and financial resources from the private sector as well as reforming policy constraints that affect this sector. One common policy constraint in many countries is that housing construction standards and materials requirements are inappropriate for the urban poor and lower middle class. Also government restrictions on land availability for housing frequently increase costs.

The Kenya Small Towns Project (HG-007) is an example of the new approach. Instead of funding site-specific construction, this project focuses on strengthening government planning and the ability to deliver urban infrastructure and services. The Tetuan Project (Morocco HG-009) involved delivery of residential infrastructure to an area with steep slopes.

In the mid-1980s, several new tools were used by A.I.D. in analyzing the housing sector. These tools include sheltor sector assessments, site selection criteria, land development and subdivision standards, and environmental checklists.

Broader urban issues also began to be addressed through studies to support urban policy dialogues, housing need assessments, urban development assessments, municipal management audits, and private sector capacity studies. This new emphasis appears in the Jordan (HG-003) grant for urban development policy and in a recent urban project in Nepal.

Water Supply and Sanitation

Although A.I.D. has supported large-scale infrastructure construction for water supply and sanitation, the agency's current emphasis in this sector is on smaller systems for urban

households and villages. Since 1973, more than 700 water supply and sanitation projects have been funded, including major urban ones in Egypt, Jordan, and Oman. Large wastewater treatment projects are underway in Cairo and Alexandria. At the other end of the scale, there is a self-help, gravity-fed water supply project in Malawi and a project for construction of wells leading to public taps in Togo (A.I.D. in press). Other activities in this sector include a project for sewer infrastructure for small towns in Tunisia (HG-005), a study of alternative technologies for areas where sewer systems are not suitable in Tunisia (HG-006), and adoption of measures for controlling storm water run-off and on-site domestic sewage contamination in San Miguelito (Panama HG-009).

In 1980, the centrally funded Water and Sanitation for Health (WASH) project began. Since then, it has provided short-run technical, assistance in 60 countries through a consortium of the University Research Corporation, International Science and Technology Institute, Research Triangle Institute, and the Training Resources Group. Originally, the primary focus was technical, but now there is an increasing emphasis on social, institutional, and financial aspects. Examples of WASH project work in the urban areas include a study of vendors in squatter settlements in Nigeria and development of a comprehensive institutional development program for the water and sanitation sector in Sri Lanka (A.I.D. in press).

Industrial Pollution Control

Other than water supply and sanitation, industrial pollution control is the other urban-related sector in which A.I.D. pays closest attention to environmental impacts. Environmental reviews usually have to be conducted for large-scale industrial development projects.

In 1982, A.I.D. and some U.S. corporations formed the International Environment and Development Service, administered by the World Environmental Center. The purpose of this service is to strengthen managerial and technical capabilities for industrial health and safety. More than 35 U.S. firms and federal/state agencies have cooperated in this activity. Assistance has been provided in such examples as control of the environmental and health effects of small-scale gold mining in the Philippines and pollution abatement at an iron and steel mill in Jordan (A.I.D. in press).

Other A.I.D. activities in this sector include (1) an Industrial Safety and Health Development project in India for training and establishment of a computerized database system; (2) a workshop on hazardous and toxic waste management carried out by the World Environment Center; (3) a seminar on risk assessment held at the East-West Center; and (4) creation of the Indonesia Environmental Management and Information Center (Ibid.). A.I.D. has recently submitted a report to Congress on how to reduce industrial pollution in LDCs.

A.I.D. has also devoted increasing attention to pesticide use and disposal. Although most of the direct impacts of

pesticide use are in rural areas, other impacts on urban land and water resources and consumers can occur. In 1970, world sales of pesticides amounted to $2.7 billion; they increased to $11.6 billion in 1980 and are projected to be $18.5 billion in 1990. The largest growth in pesticide sales has been in LDCs (Ibid.)

In 1978, A.I.D. established a policy on pesticides. It is now being reviewed to emphasize integrated pest management (IPM). In 1984, A.I.D. funded a six-year $6 million IPM research project at CATIE, an international agricultural research facility in Costa Rica. The agency has also supported work in this area at the American School for Agriculture at Zamorao, Honduras. In 1989, The Conservation Foundation prepared a report under contract to A.I.D. on Opportunities to Assist Developing Countries in Proper Use of Agricultural and Industrial Chemicals.

Energy

Commercial energy demand is largely an urban problem and often has major impacts on air quality. The availability and cost of fuel for transportation and industry has a major effect on urban development patterns. In rural areas, biomass is the predominant form of energy used. The relationship between biomass energy sources and environmental quality has received much attention. However, A.I.D., like many donors, tends to treat energy projects as a separate sector, without fully considering the linkages to environmental quality and urbanization.

In 1970, LDCs used 10% of the world's consumption of fossil fuels and electricity. By the year 2000, this is expected to

increase to 25%. In 1984, energy imports consumed more than 50% of total export earnings in India, Kenya, and the Dominican Republic. In many LDCs, electricity supply takes up a quarter of the development budget (A.I.D. 1989a). Yet, shortages of electricity are a major constraint to economic growth in most LDCs.

Although LDCs comprise 75% of the world's population, they only consume 18% of the electricity generated. Per capita consumption is only 250 kWh in A.I.D.-assisted countries, compared to 10,500 kWh in the United States. Electricity consumption is much lower outside the largest urban areas than the national averages. The unmet demand for electricity in an LDC typically ranges from 10-15% of total generation capacity, and this can reduce industrial production significantly.

This situation is expected to worsen. An estimated 1,500 GW of electric power capacity is needed in LDCs between 1988 and the year 2008, assuming an economic growth rate of 4.5% per year. Using conventional systems, this would require a capital investment of $125 billion per year. Even with massive end-use conservation, improvements in powerplant efficiency, and reductions in transmission and distribution losses, 700 GW would be needed. The conservation improvements and production investments for that would cost $75-110 billion per year. In comparison, only $50-60 billion per year is now being spent, including donor and development bank funds (U.S. A.I.D. 1988b).

Although most of the investment in electricity infrastructure has been for urban areas and large-scale industry,

electrification is also important for small-scale rural industries. For lack of an affordable and reliable supply of electricity, firms often do not locate in smaller towns or areas on the urban periphery even though they would be closer to raw material sources and would face labor costs.

A.I.D. is continuing its centrally funded Energy Policy Development and Conservation Program, which began in 1982. This program has assisted more than 25 countries in conservation of energy in industry, transportation, buildings, and electricity generation facilities. Since only 10-20% of the population in A.I.D.-assisted countries has access to electricity, the agency is continuing to invest in this sector for both urban and rural areas. In the area of renewable energy, there is an ongoing Business Energy Systems and technology project.

There are also various country-specific projects in this sector. For example, there is an Energy Management Consultation and Training Project in India to transfer U.S. combustion and conservation technologies. There are large energy projects such as the Energy Demand Management Project in Morocco, the Science and Technology for Development Project in Egypt, and a major program of electrification in Pakistan (A.I.D. 1989a).

Survey of Mission Activities in the Urban Sector

In 1989, a survey of selected A.I.D. missions was conducted to determine current activities in the urban sector and future priorities (Pill 1989). Some missions that specifically mentioned concerns about urban environmental quality are discussed below.

Urban environmental quality is a particular problem in Brazil. The Brazil program, not a full-scale mission, directs its small level of resources in this sector to large and medium sized cities where urban services have been declining. It emphasizes training officials in urban planning techniques and transfer of public and private resources to municipalities.

The Costa Rica mission identified housing as a priority program and also mentioned urban infrastructure development services, and urban land use planning.

The Sri Lanka mission listed environmental impacts of development as one of its main concerns along with land tenure and titling; urban infrastructure, transport, and communications; housing; and urban unemployment.

Previously, rural poverty was the main focus of the A.I.D. program in Thailand. With increasing incoming and urbanization, the priority is shifting to urban issues. The Thai mission noted particular problems from the environmental impacts of industry especially in and around Bangkok. It also cited the need for off-farm employment, development of agro-industries, and municipal management of taxation. In the next decade, it sees funding of operation and replacement of municipal infrastructure and services, private provision of urban services, employment generation, and environmental degradation as priority areas. The government's next five-year plan will include an assessment of urbanization.

Egypt is the only country where A.I.D. is involved in large-scale infrastructure development. It has four large urban

infrastructure development. The mission is preparing an urban strategy for its action plan. This strategy will emphasize population growth, employment generation, urban encroachment on arable land, environmental concerns, urban infrastructure, housing, social services, and urban administration and financing.

Jordan is unusual for an LDC in that it is 70% urban. The A.I.D. mission lists managing infrastructure and services, environmental quality, and land use conflicts between agriculture and urban growth as the most important urban issues in the country over the next decade. The Morocco mission mentioned the urban environment, specifically disposal of solid and liquid waste and the management of wastewater facilities.

The Tunisian mission cited degradation of the urban environment. Its CDSS in 1990 will contain a full urban assessment.

Gambia has experienced a particularly high rate of urbanization, 15% per year over the period 1979 to 1983. Policies favoring urban areas (e.g., price subsidies, expansion of government jobs, and urban parastatals) are largely responsible for this urban growth. The new focus of the A.I.D. program there will be on agricultural productivity and rural development.

The Liberian mission listed macro-economic stabilization and food security as the most critical issues and noted their implications for preservation of infrastructure and social services. Solid and human waste disposal in the capital city was also identified as a problem.

The rate of urbanization is high in Kenya, 8% per year,

while employment, infrastructure, housing, health, and community services in urban areas are already strained. Urban investment has been declining. A.I.D. Kenya currently has four housing grant programs, one enterprise development project, and one agricultural marketing project directly targeted to urban areas. The next CDSS will examine urban issues in detail. Important needs include policy reforms, self-financing of infrastructure, and development of the urban informal sector.

A separate survey of A.I.D. mission has been conducted to examine the relationship between agriculture, industrialization, and urban pollution. Issues addressed include pesticide use and disposal, industrial effluent treatment, and solid waste management. Responses have been received from 39 missions, including 18 in Africa, 9 in Asia/Near East, and 12 in Latin America/Caribbean.

Environmental Project Funding

Table 1 lists A.I.D. funding of environmental activities from FY 1989 to FY 1991. In nominal dollars, funding increased in FY90 over the previous year. It decreased in FY91, but remained higher than in FY89. Adjusted for inflation, the real increase over the period is small.

The largest category of support in this area is for environmental management, planning, and policy. The funding for forestry is one third or less of that amount. The financial assistance provided for agricultural land development and soils together is less than the amount devoted to forestry. About half

TABLE 1. A.I.D.'s ENVIRONMENT ACTIVITIES BY BUREAU, FY 1989-91 (thousands of dollars)

	Africa			Asia/Near East			Latin America/ Caribbean			FVA			PPC			PRE			S&T			Science Advisor			All Bureaus		
	FY89	FY90	FY91	FY89	FY90	FY91	FY89	FY90	FY91	FY89	FY90	FY91	FY89	FY90	FY91	FY89	FY90	FY91	FY89	FY90	FY91	FY89	FY90	FY91	FY89	FY90	FY91
Forestry	5,462	2,112	2,431	8,695	7,384	6,140	9,291	10,869	10,676	1,455	1,309	1,594	1,200	1,560	1,560	0	0	0	2,480	1,922	3,195	587	585	585	29,170	25,741	26,181
Hazardous Waste	65	28	25	270	1,595	575	0	0	0	0	0	0	0	0	0	0	0	0	125	136	186	0	0	0	460	1,795	786
Env. Mgmt. Planning & Policy	5,540	19,846	14,090	50,383	56,417	57,201	10,229	12,365	7,886	0	0	0	1,375	1,047	938	475	500	450	4,356	5,533	6,360	2,680	2,673	2,173	75,036	98,381	89,098
Soils	2,770	2,744	1,638	0	0	0	1,101	2,201	1,580	0	0	0	2,000	2,000	2,000	0	0	0	4,390	4,063	4,244	0	0	0	10,261	11,008	9,462
Ag. Land Develop.	4,169	3,470	2,914	5,746	7,370	8,100	1,201	1,939	1,623	0	0	0	0	0	70	0	0	0	240	308	256	0	0	0	11,356	11,148	12,963
Water Quality Improvement	250	150	250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	250	150	250
Water Quality Health	0	0	0	0	0	0	0	0	0	0	0	0	4,975	5,067	5,028	0	0	0	374	224	415	750	750	250	6,099	6,041	5,693
Water Resources Mgmt.	1,821	1,294	1,950	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,821	1,294	1,950

[1] Excludes the large Cairo Wastewater Projects; Data as of October 19, 1990

as much is spent for water quality and health as for agricultural development. A relatively small sum has been allocated for hazardous waste control.

A portion of the allocations for institution building and training, water quality and health, and hazardous waste assist activities in urban areas. However, almost all of the environmental funding has been directed toward rural areas. In particular, deforestation, desertification, waterlogging and salination, watershed management, soil conservation and land management, and water supply and sanitation have been the priority areas within the environmental sector. There is a large centrally funded Natural Resources Policy Analysis project with a total budget of $12 million through FY94, although funding was only $650,000 in FY90.

Most of the environmental funding is under the Private Sector Energy and Environment Account ((PSEE), but some relating to public health and safety, hazardous waste, and environmental problems associated with urbanization is also classified under the Agricultural, Rural Development and Nutrition Account (ARDN). The actual total amount spent from the PSEE Account was $15.322 million in FY88, $129.319 million in FY89, and $137.646 million in FY90 (A.I.D. 1989a).

The Latin America/Caribbean Bureau has developed a strategy statement for its environmental programs. Five priority areas were identified for this region:

1. Sustainable agriculture including agroforestry, soil and water conservation, land use, and integrated pest management
2. Production from natural forests
3. Management of wildlands and protection of biological

diversity

4. Management of critical watershed for maintenance of hydropower, municipal water supplies, and irrigation, as well as coastal resources protection
5. Policy formulation, institutional strengthening, and environmental education

Examples From Specific Projects

This section discusses two examples from specific projects: the environmental review for a low-income housing project in Liberia and the scope of a study on urban implications of development in Tunisia.

Liberia Housing Project IEE

The environmental review for the Liberia project is an initial environmental examination used to support a negative determination that the project would not have significant effects on the human environment (Boyer 1978). First, it described the general existing environmental conditions and estimated the area within a 5-km radius of Monrovia that was unsuitable for development without a major investment in land reclamation and drainage. It noted that a large number of low-income families live in areas with health risks from flooding. Census data indicated that many people lived in substantial housing having one or more deficiencies in basic utilities (such as tap water or electricity) or that had been constructed of only temporary or semi-permanent materials.

Environmental considerations were important in providing information on potential sites for the shelter sector analysis and in preparation of an impact identification matrix. This matrix identified of the critical environmental concerns in the

project area, the components of the project with potential impacts, and the types and extent of probable impacts by project component. The following environmental concerns were included:

I. Existing Water Resources
   A. Surface
   B. Underground
   C. Estuary
   D. Ocean

II. Environmentally Sensitive Areas
   A. Unique or unstable geological formations
   B. Wetlands, marshes, floodplains, and estuaries
   C. Aquifer recharge areas
   D. Rare or endangered plant and animal species and their habitats
   E. Historical, archaeological, and cultural resources

III. Impacts of Existing and/or Future Land Use Activities and Development Patterns
   A. Wildlife refuges
   B. Prime agricultural land
   C. Valuable natural resources -- e.g. forests, wetlands, and mineral
   D. Open space and recreational land
   E. Ecological balance of the area
   F. Stability and preservation of human settlements

IV. Human Environment

   A. Traditional customs and socio-cultural conditions
      1. Community characteristics and cohesion
      2. Social organization
      3. Institutional structures
      4. Lifestyles and cultural trends
      5. Family patterns and values
      6. Demographic or social profile
      7. Personal safety and convenience

   B. Established housing practices
      1. Building materials
      2. Construction techniques
      3. Housing form and styles
      4. Interior design or structure
      5. Spatial relationships of the structure to other shelter components
      6. Population size
      7. Housing location

C. Effect on public health and general well being

1. Communicable disease control
2. Displacement and relocation of population
3. Employment and income generation
4. Land tenure and stability of human settlement areas
5. Expenditure patterns

D. Locational factors potentially affecting the project

1. Significant natural hazards
   a. Seismic disturbances
   b. Flooding/high water table
   c. Droughts
   d. Tornadoes and hurricanes
   e. Landslides, rock slides, or unstable slope conditions
   f. Fires
   g. Soil stability

2. Existence of major environmental health concerns
   a. Water quality/supply
   b. Climate and ambient air quality
   c. Communicable disease
   d. Man-made nuisances--noise, odors, toxic materials

3. Availability and capacity of basic community infrastructure
   a. Transportation -- accessibility to jobs and services
   b. Water supply and distribution
   c. Sewage collection, treatment, and disposal
   d. Man-made nuisances -- noise, odors, toxic materials

4. Urban/regional growth and land use considerations
   a. Strains on the capacity of existing natural systems or man-made system
   b. Identifiable important environmental resources threatened by urbanization
   c. Rare and endangered plant and wildlife habitats
   d. Wetlands
   e. Agricultural lands
   f. Floodplains

89

g. Forest
h. Historic, archeologic, and culturally significant sites
i. Unique natural areas
j. Scarce or critical raw material

For each of the project components, the level of concern on the above environmental factors was tabulated using the following key:

NA - Not applicable
U - Unlikely to be important
P - Potentially important
C - Critical
S - Significant environmental impacts will occur unless alternative actions or mitigating measures

These impacts were then identified as positive or negative. Project components considered likely to cause environmental impacts included storm drainage and construction of sewerage systems, housing, and infrastructure. An accompanying text described the potentially important or critical impacts in short paragraphs.

The project design had previously identified mitigating measures to reduce the potential for adverse impacts. Yet, the IEE noted that additional actions would be necessary to protect environmental quality, such as:

1. Preparation of site development guidelines and construction plans
2. Creation of a buffer zone along environmentally sensitive areas
3. Use of cut and fill or grading to avoid encroaching on water courses and floodplains
4. Carrying out land development in increments over a single season
5. Coordinating erosion and sedimentation control with grading and construction
6. Following stormwater retention methods
7. Designing on-site drainage facilities that need minimal

maintenance

8. Building outlet control structures to minimize the velocity of stormwater runoff
9. Conducting a soil suitability analysis
10. Requiring sewerage effluent from on-site disposal to meet environmental quality standards

The methodology used in this IEE is a matrix approach that cross-tabulates the potential impacts corresponding to specific project activities, thus creating a simple model of casual relationships. A matrix approach does not recognize the probabilistic nature of impacts directly, although risk evaluations may be buried within the ratings. As a result, the analyst cannot systematically distinguish between a low-impact event of high probability. It does not allow for quantification of the magnitude of direct effects and does not help much in placing monetary values on the effects. A matrix takes a static view that does not consider dynamic aspects or charges in relationships over time. It offers no means of capturing indirect or feedback effects and does not address the timing of impacts.

Conceptually, a matrix could be expanded to suit multiple-objective decision making, but a matrix becomes cumbersome as the number of variables increases. The method relies heavily on the subjective views of an expert or team of experts. Since the listed environmental variables are too general for measurement unless broken down further, much is left to judgment. Since no criteria are provided for making the ratings, the assumptions embedded in them are not open to scrutiny. The method does not facilitate public involvement.

Because a matrix is easy to construct, it can serve as a

focal point for discussion and information gathering during the initial phase of an environmental assessment. Beyond this, a matrix does not facilitate comparisons of alternative plans. The approach does have low resource requirements for time and money, but is not well suited for a complete analysis of a large-scale project (Hyman, Stiftel, Moreau, and Nichols 1988).

Tunisia Urban Study

The Tunisia mission (1989) developed terms of reference for an urban implications study. The objectives of this study were to (1) shed light on the urban implications of a private sector development strategy, (2) determine capital requirements for urban investments and policy changes needed, and (3) identify government and mission resources to support these recommendations.

The quality of the urban environment was one of the four key issues identified for investigation, besides urban employment, infrastructure and urban services delivery, and municipal administration. The terms of reference directed attention to the effects of unplanned urban growth on flooding of urban and adjacent agricultural land, salinization of soils, leaching due to improper disposal and treatment of liquid and solid waste, and development of natural areas for tourism.

Given the scarcity of water in Tunisia, the opportunity costs of the expansion of urban residential and industrial demand for water were identified in the TOR as an important topic to be addressed. The National Sewer Authority is already over-

stretched and reluctant to expand services to more cities. Thus, an important consideration in the study consists of the policy implications of shifts in sewerage responsibility to smaller municipalities. The study will also determine whether additional electric power infrastructure has to be built, given the existing widespread availability of electricity in Tunisia. Other issues to be examined in this study include solid waste collection and management, and the regulation of air and water pollution by urban industry.

REFERENCES

A.I.D. 1988a. A.I.D. Policy Paper on Environment and Natural Resources Washington, D.C.: A.I.D.

A.I.D. 1988b. Power Shortages in Developing Countries: Magnitudes, Impacts, Solutions, and the Role of the Private Sector. Washington, D.C.: A.I.D.

A.I.D. 1989a. Congressional Presentation FY 1990. Washington, D.C.: A.I.D.

A.I.D. 1989b. "List of Environmental Subprojects by Bureau." Washington, D.C.: A.I.D.

A.I.D. n.d. "Relevant PRE/H Experience." Washington, D.C.: A.I.D.

A.I.D. in press. "U.S. A.I.D. and the Environment: A Historical Perspective." Frontlines

Boyer, J. 1978. Initial Environmental Examination: Liberia Low-Income Housing Development Grant. Washington, D.C.: A.I.D.

Bureau for Latin America and the Caribbean. n.d. Environmental and Natural Resource Management in Central America: A Strategy for A.I.D. Assistance. Washington, D.C.: A.I.D.

Chew, Siew. 1988. Environmental Assessments of Development Projects: A Preliminary Review of A.I.D.'s Experience. Washington, D.C.: A.I.D.

Hyman, Eric; Bruce Stiftel; David Moreau; and Robert Nichols. 1988. Combining Facts and Values in Environmental Impact Assessment: Theories and Techniques: Boulder, Colorado: Westview Press.

Panehal, Alexi (A.I.D. PRE/H). 1989. Personal communication.

Pill, Charles. 1989 Congressional Inquiry on Urbanization: Summary of Cable Responses. Washington, D.C.: A.I.D.

Tunisia Mission. 1989. Urban Implications Study: Terms of Reference. Tunis: A.I.D.

WORLD BANK URBAN SECTOR ACTIVITIES

Urban Development Activities

Areas of World Bank involvement that affect the relationship between cities and environmental quality include urban development, transportation, water supply, sanitation, municipal waste disposal, and industrial development. The urban development category comprises urban infrastructure, urban administration and policy, land management, and housing.

Over the period from FY 1983 to FY 1988, the Bank increased the proportion of its portfolio in urban development from 4 percent to 10.5 percent in 19 loans (Buckley et al., 1988). These figures do not include urban-based activities that fall into other categories, such as: development finance companies; education; energy; non-project lending; industry; population; health and nutrition; small-scale enterprises; technical assistance; telecommunications; transportation; water supply and sewerage. Also excluded are disaster relief and reconstruction, because the inclusion of emergencies would skew analysis of trends.

In FY 1988, the total urban lending by the IRBD and IDA was $2 billion in 19 new loans, for an average loan size of $106 million. The amount of urban lending per new urban dweller, an indicator of the increase in the demand for new urban services, is relatively small. It varies considerably across regions, e.g.: $1.14 in East Africa; $44.38 in West Africa; $26.34 in Europe/Middle East/North Africa; $40.25 in Asia; $11.94 in South Asia; and $40.45 in the Latin American/Caribbean region in FY 1986-87 (Ljung and Farvacque, 1988). The amount provided to Africa is low relative to the large needs. The urban sector's share of total regional lending in FY 86-87 was 0.5 percent in East Africa, 11.5 percent in West Africa, 14 percent in East Asia, 3.5 percent in South Asia, 4 percent in Europe/Middle East/North Africa, and 7.3 percent in Latin America. The last excludes the loan for earthquake reconstruction in Mexico (Ibid.).

The composition of the urban sector lending has shifted. Housing finance lending comprised 34 percent of the total urban lending in FY 1988, but it only began six years ago. The annual investment in shelter and basic infrastructure has been $100-$150 million in recent years. Lending has also increased for municipal infrastructure and urban management as the ability of governments to support these activities has increased. About $450 million was loaned for municipal infrastructure (non-emergency purposes) and $250 million through municipal

development funds in FY 1988 (Buckley et al., 1988). In FY 1989, total lending in the urban sector, $1.2 billion, was much lower than the level in FY 1988, and slightly below the levels of FY 1986 and FY 1987. Only 12 urban projects were approved in FY 1989. About 80 percent of the loans were through the IBRD and 20 percent through the IDA, the latter mostly for low-income African countries.

The FY 1989 Annual Review listed the following aims for urban projects: (1) developing the economic base of cities by providing infrastructure services; (2) improving urban administration; (3) increasing domestic resource mobilization and cost recovery; (4) improving access to housing through financial policies; (5) improving the functioning of urban land markets; and (6) upgrading the urban environment (Infrastructure and Urban Development Department, 1989).

The World Bank/UNCHS (Habitat) program is involved in applied research and information dissemination on urban development and shelter issues. It has provided technical support assistance in coordination of donor aid and held seminars and supported publications. Its future agenda is to conduct more case studies, and prepare more analytical and synthesis reports, and guidelines. These activities and expenditures have an increased emphasis on operational applications such as the testing of guidelines and preparation of models of urban management for dissemination (World Bank/UNCHS, 1989).

The Bank sees the urban agenda shifting from "sporadic interventions" to "broader financial and institutional issues," including "linking these investments to the national economy." Increased emphasis will be on "urban productivity" rather than "urban poverty" alleviation on the grounds that the basic cause of urban poverty is the low productivity of jobs and that the urban poor suffer most from distortions in the markets for land, housing, and finance (Buckley et al., 1988). There is also a move from a single-city orientation to a regional focus that reaches more medium-sized cities. It also reports placing a greater emphasis on efficient land use to decrease the direct costs of land in projects and the costs of building and maintaining infrastructure (Bertaud, Bertaud, and Wright, 1988).

Land management has been a part of housing sites and services and upgrading projects since 1973 (Ljung and Farvacque, 1988). The main land management activities include settling land tenure, registering land ownership, reforming land use regulation and zoning approvals to improve the operation of the market, urban spatial planning, the development of flexible performance standards, and land information management (World Bank/UNCHS, 1989).

The Bank has four priority areas for policy changes in the urban sector: (1) rationalization of public expenditures to increase local resource mobilization and cost recovery; (2) reform of municipal, regional, and central government administrations; (3) stimulating private investment; and (4) enabling secondary cities and towns to support better agriculture and rural development (Ljung and Farvacque, 1988).

On the topic of urban infrastructure policies, it has been recommended that: regulations restricting the ability of manufacturers to trade infrastructure services be relaxed; private sector participation in infrastructure supply be increased through subcontracting, franchising, and districting; and pricing be restructured to reflect capacity limits and congestion (Lee and Anas, 1989).

The Bank has identified the following areas for further research on urban services and infrastructure: (1) the response of firms to deficiencies in the service; (2) alternatives available and their costs; (3) causes of the failure to meet demand; (4) the appropriateness of pricing policies; (5) private versus public provision of infrastructure; and (6) options for more efficient production and delivery of services such as investment, technology, regulations, and financing (Lee and Anas, 1989).

Housing Activities

In DCs, the investment in housing comprises 2 to 8 percent of GNP, 15 to 30 percent of gross capital formation, and between one-quarter and one-half of the capital stock. Housing is usually the single largest form of household wealth, consuming 25 to 30 percent of household incomes. Housing uses more urban land than any other land use (Buckley and Mayo, 1988). The number of inhabitants of squatter settlements in urban areas is increasing much faster than the general rate of population growth (Bertaud, Bertaud, and Wright, 1988).

The World Bank has been involved in the shelter sector for over 16 years, with 99 projects in 50 countries (Buckley et al., 1988). Direct production of housing through the public sector has proven to be expensive and too slow relative to the large unmet demand. Consequently, the current areas of emphasis of World Bank Shelter projects are the upgrading of existing squatter settlements and provision of only sites and services rather than complete housing units. Moreover, housing finance has become a much larger priority than housing production.

Sites and services projects may include:

1. securing the land tenure;

2. providing trunk connections to existing utilities and roads;

3. building core houses, usually a simple wall with utility hookups;

4. establishment of on-site infrastructure for water supply and sanitation, roads, drainage, and electricity;

5. construction of social facilities such as schools, health clinics, and community centers; and

6. provision of financing for purchase of land, core houses, and building materials.

Sites and services projects were first tried in the 1940s and 1950s in Chile, Peru, Kenya, and South Africa without external assistance. The first World Bank project of this type was in Senegal in 1972. Since then, the Bank has financed around 100 of these projects. Between 1972 and 1989, 11.7 percent of the total shelter lending went for sites and services. The average obscures the high rate of 42 percent in the early 1970s and the decline to 8 percent in the late 1980s. In some cases, governments have opposed the lower design standards of this approach (Infrastructure and Urban Development Department, 1989).

In FY 1988, the World Bank provided $1 billion for housing. Conventional shelter projects fell to 15 percent of the total urban lending, but the amount, $300 million, exceeded the annual lending for sites and services and squatter settlement upgrading of the late 1970s and early 1980s when that dominated urban lending. Over half of the shelter projects experienced delays due to problems in land acquisition (Buckley et al., 1988).

Housing finance lending increased from one project at $60 million in FY 1983 to six projects totalling $680 million in FY 1988. This represented an increase from 11 to 34 percent of total urban lending. The average housing finance loan size in FY 1988 was $112 million. Some loans categorized under development finance also have housing components.

The bulk of the housing finance loans are in Asia and Latin America/Caribbean; relatively little is in Africa (Buckley et al., 1988). Since 1972, the World Bank has financed 80 shelter projects and 55 integrated projects with shelter components at a total cost of $15.6 billion, which represents about 60 percent of urban operations. In FY 1989, loans for urban shelter projects, including the land, totaled $2.24 billion, with $341 million in Africa, $31.5 million in Asia, $187 million in Europe/Middle East/North Africa, and $1.68 billion in Latin America/Caribbean. However, the Bank estimates that sheltering all of the poor by the year 2000 would require $150-$200 billion in 1988 dollars, excluding the cost of any public subsidies provided (Infrastructure and Urban Development Department, 1989).

Currently, most of the borrowers for housing finance loans are financial intermediaries rather than public housing agencies. Many of these intermediaries obtain most of their loan funds domestically. The average arrears rate is 12 percent in the housing finance projects and 16 percent in the development finance institutions. An arrears rate less than 6 percent would be considered commercial quality (Buckley et al., 1988).

An internal review of the 17 housing finance projects since FY 1983 included the following:

1. Fiscal and financial policy dialogues are important.
2. Projects have increasingly relied on financial intermediaries to channel funds because of their ability to raise domestic revenues, administer loans more effectively, and reduce contingent liability on the part of governments.
3. Improvements are needed in charging for foreign exchange risk, i.e., wealthier borrowers are more likely to purchase imported housing materials.
4. More emphasis is needed with respect to financial expertise by the World Bank staff (Buckley et al., 1988).

Because direct government expenditures on housing are relatively small, they have less effect on the sector than the regulatory framework, macroeconomic policies, and financial sector policies. Thus, the World Bank is placing increased emphasis on policy dialogues with governments as a way to increase the housing stock.

The impact of housing policies on the macroeconomy may be significant. For example, over one-fifth of the inflation in Columbia has been attributed to credit policies to support housing (Buckley and Mayo, 1988). The income distribution effects may also be unfavorable; in many countries, subsidized programs for housing development or finance have mostly benefited middle and upper income households (World bank, 1975).

Transportation Activities

World Bank lending in the transportation sector has fluctuated considerably. It amounted to $2.1 billion in FY 1987, and $2.6 billion in FY 1988 (Buckley et al., 1988). A large part of these expenditures is for road construction outside of urban areas. The urban share is much smaller, amounting to about $0.3 billion in FY 1989 (Infrastructure and Urban Development Department, 1989).

The World Bank has identified five key issues in the urban transport sector:

1. strengthening public institutions involved in urban transport;
2. development of low-cost solutions including demand management, traffic control, road improvements, and better maintenance;
3. providing access and priority for public transport;
4. improving public transport systems; and
5. increasing private sector participation in the provision of services and facilities (Ljung and Farvacque, 1988).

Water Supply and Sanitation Activities

Estimates of the coverage of water and sanitation services vary. The Water and Sanitation Division (1988) stated that 40 percent of the world's population does not have safe and convenient drinking water and that just 25 percent has adequate sanitation facilities. The proportion is even lower in rural areas. The unserved population was 2 billion in 1980. Providing these services through conventional, large-scale alternatives would cost $600 billion, $300 per person. That sum is a large portion of per capita GNP in many countries. Churchill et al. (1987) report that 65 percent of the rural population in DCs does not have a safe and convenient water source and 75 percent lack a satisfactory means of disposal for human waste.

Briscoe and de Ferranti (1988) estimated that 30 percent of the world's population, 1.5 billion people, lacked safe drinking water. Currently, governments are spending $1.5 billion per year on rural water supply. Some progress has been made; the proportion of rural people without access to safe water has fallen from 80 percent in the 1960s to less than 60 percent at the end of the 1980s.

The number of urban households without sewerage connections is increasing rapidly, and less than one-quarter of the sewage collected is treated before discharge (Ljung and Farvacque, 1988). Sewer services in cities reached only 12 percent of the urban population in Africa and 41 percent of the urban population in Latin America.

However, the reported figures on coverage overstate what constitutes reasonable access and choice of use. For example, in Africa, only one-third of the reported population covered actually had access, and in India, half of the villagers nominally served by hand pumps were not using them. In Latin America and the Caribbean, a higher proportion of both the urban and rural population is served, but further gains will be slow in coming. Rapid progress has been made in Asia and the Pacific, but in Africa, two-thirds of the rural population lacks an improved water supply (Briscoe and de Ferranti, 1988). In fact, coverage levels in Sub-Saharan Africa are declining. The low

level of World Bank support in East Africa reflects the limited success of earlier interventions (Ljung and Farvacque, 1988).

Most of the World Bank's lending in this sector goes to urban projects, for example in FY 1985, $772 million was loaned for urban projects and only $108 million for rural water supply. Through 1984, the Bank loaned a total of $530 million for rural water supply (Churchill et al., 1987). Over the period 1974-80, 92 percent of the Bank's lending in this sector was urban-related, and the proportion only decreased to 86 percent in 1981-85 (Briscoe and de Ferranti, 1988). In FY 1986-87, the urban share of water and sewerage lending was 76 percent (Ljung and Farvacque, 1988).

Total IBRD and IDA lending for water supply and sewerage has fluctuated from $781 million in FY 1985, $605 million in FY 1986, $1.114 billion in FY 1987, to $535 million in FY 1988 (Buckley et al., 1988). These figures do not include water supply and sanitation components of agriculture or infrastructure projects (Water and Sanitation Division, 1989a). Urban and rural lending for water and sewerage as a proportion of total regional lending varies considerably. In FY 1986-87, the proportion was 3.2 percent in East Africa, 0.6 percent in West Africa, 5.2 percent in East Asia, 4.8 percent in South Asia, and 12.6 percent in Europe/Middle East/North Africa, and 2.2 percent in Latin America. Over the same time period, per new urban dweller, the World Bank loaned for water and sewerage $9.14 in East Africa, $2.50 in West Africa, $14.92 in East Asia, $14.60 in South Asia, $82.93 in Europe/Middle East/North Africa, and $12.02 in Latin America. Thirteen of the 17 new projects in this sector in FY 1987 were for large-scale conventional alternatives (Ljung and Farvacque, 1988).

In FY 1989, water supply and sanitation lending increased to $791 million in 10 projects. About 72 percent of the loans were through the IBRD and 28 percent through the IDA. These figures exclude two urban projects that have water supply and sanitation components. State characteristics of some of the FY 1989 loans include:

1. rehabilitation and management of existing facilities;
2. provision of services to low-income groups;
3. promotion of water conservation through pricing;
4. direct investment by private companies in urban water supply; and
5. calculation of a demand curve for water (Infrastructure and Urban Development Department, 1989).

Smaller environmental health components are also included in some projects under other categories (Listorti, 1989).

In addition to the IBRD and IDA loans, the World Bank is involved in some other activities in the water supply and sanitation sector. Since 1978, a UNDP/World Bank program has developed and tested appropriate technologies and innovative implementation strategies to extend coverage to low-income groups. This program has spent $45.3 million over 18 years and has a balance available of $28.7 million for 1989-92 (Water and Sanitation Division, 1989b). It also carries out pilot and demonstration projects, and currently operates in 12-15 priority countries. The UNDP/World Bank program has focused on poverty alleviation and participation by local people, including women. It has operated in over 40 LDCs. The program involves: applied research; promotion, dissemination, and information exchange; and management and donor coordination.

Its achievements include lab and field testing of 2,700 pumps of 70 types in 17 DCs; promotion of the concept of village-level operation and management of maintenance of handpumps (Arlosoroff, 1988); low-cost pilot and demonstration projects for sanitation in 17 DCs; promotion of policies for low-cost alternatives to conventional sewerage; assistance in project appraisal and leveraging of funds from other U.N. sources; and preparation of publications and training materials on integrating women in community water supply and sanitation projects.

Some of the experience gained in this program is incorporated as a small component of the large loans. For example, low-cost urban water supply and wastewater disposal for Jakarta was included in a loan to Indonesia. In Nigeria, a $5.5 million community-level program was part of a $400 million large-scale project. Low-cost sanitation in four cities was part of a Bolivian project. Two large demonstration projects for Mark II handpumps are underway in China (Water and Sanitation Division, 1989b).

The World Bank has also established Regional Water and Sanitation Groups (RWSGs) in Africa and South Asia. Others are planned for East Asia and Latin America/Caribbean. An RWSG is a technical cooperation group based in a World Bank resident mission that assists governments in planning and implementation of projects in this sector.

An International Training Network for water and waste management (ITN) with 3 centers has been created; 15 centers are planned in total. The Network provides audio-visual and printed materials for dissemination of information in English, French, and Spanish.

The World Bank has also produced various technical reports on technical topics such as: latrine construction (Mara, n.d.); design and siting of ocean outfalls for wastewater from coastal cities (Gunnerson, 1982); and water supply and sanitation project

preparation (Golladay, 1983; Grover, Burnett, and McGarry, 1983). Some of the activities underway now include: (1) preparation of a handbook on urban sanitation; (2) a study of alternatives to conventional sewerage; (3) a study of the relationship between technology choice in sanitation and socioeconomic characteristics of the target population; and (4) experiments with social marketing to stimulate the demand for sanitation (Water and Sanitation Division, 1989b).

Some important lessons have been learned in the World Bank's activities in water and sanitation. Both urban and rural populations are often willing to pay for convenient sources of safe drinking water; however, heavily chlorinated water is not popular in some areas. The time savings in water collection can be substantial. Yard taps are preferred over more distant community standpipes or wells that still require substantial amounts of water carrying. Water consumption usually increases when the convenience of supply is better, but the increased consumption may have a lower marginal value than the basic level of consumption (Churchill et al., 1987).

The perceived need of local people for sanitation systems is much lower, especially outside of urban areas (Briscoe and de Ferranti, 1988). Many water supply and sanitation systems have not charged user fees commensurate with the costs. As a result, maintenance services have often suffered. Also, users have not had a sufficient incentive to conserve use. The connection between health improvements and water supply is more complicated than originally thought.

The Water and Sanitation Division (1989b) identified the following key issues in this sector:

1. how the make water resources available at an acceptable cost for domestic, industrial, and agricultural uses;
2. establishment of incentives for effective institutions and sustainable management and maintenance of facilities;
3. ensuring environmentally safe collection and disposal of municipal waste and wastewater; and
4. providing the increasing financial resources needed.

The stated new directions for the program for the period 1988-90 emphasize: (1) community-based water supply systems for rural areas instead of centralized systems; (2) the importance of considering social and cultural standards for water and sanitation; (3) inclusion of health professionals and social scientists with engineers in project decision making; and (4) participatory financing of low-cost systems by communities (Water and Sanitation Division, 1988). Churchill et al. (1987) recommend financing piped water systems for higher-income DCs in Southeast Asia and Latin America and handpumps in Sub-Saharan Africa.

Biscoe and de Ferranti (1988) suggest that the primary role of governments and donors must change from direct providers of water and sanitation services to being facilitators through: training; information dissemination; technical and managerial assistance; and decreasing the barriers to private suppliers of equipment, drilling, and maintenance services.

Ljung and Farvacque (1988) note that grants and soft loans to parastatal utilities have often been ineffectually used and projects were too complex. Demand or capacity use projections were often inaccurate. A review of 60 completed water-supply projects found that over four-fifths of the projects did not meet their targets for number of clients served or amount of water sold. This shortfall caused financial problems for water authorities. The same study urged greater attention to the water and sanitation needs of small and medium cities since most attention has been devoted to large urban centers.

In project design, Briscoe and de Ferranti (1988) recommend a greater role for users in deciding on the type of improvements needed, bearing most of the costs, and taking responsibility for maintenance. The government and donor role would be to establish an environment conducive to community construction and management of improved facilities. The Water and Sanitation Division 1989b) also recommends increased collaboration with nongovernmental organizations, especially those with strong grassroots connections to women.

Municipal Solid Waste Management Systems

Large cities in DCs often spend as much as 30 to 50 percent of their operating budgets on solid waste management. Yet, in most cases, municipal solid waste collection services are only available to less than half of the population in those cities (Urban and Infrastructure Department, 1989). Generally, the poor are excluded, especially those living in squatter settlements. Even the portion of solid wastes collected is not always handled properly due to institutional difficulties.

There are few economies of scale in residential solid wastes collection for collection districts serving populations of more than 50,000 people. When the hauling distance from collection to the point of final disposal exceeds 15-20 km, intermediate transfer sites are sometimes used (Bartone, n.d.). Trash collection services could be handled by the private sector. In addition, there is much scope for resource recovery and re-use in DCs, of which significant amounts already exist. In some countries, trash scavengers are well organized.

The quantity and composition of municipal solid wastes vary in countries with different income levels. The municipal wastes generated per capita per day average 0.4 to 0.6 kg in low-income DCs, 0.5 to 0.9 kg in middle-income DCs, and 0.7 to 1.8 kg in industrialized countries. The density of the wastes is usually 2 to 3 times higher in low-income DCs than in industrialized countries and the moisture content is usually 3 times higher. Other common characteristics of municipal solid waste in LDCs is a high composition of organic matter and a smaller particle size (Cointreau, 1982).

These differences in waste characteristics have implications for technology choice. Compaction trucks and landfill compactors cannot achieve as high a compaction ration in DCs. Incineration usually requires supplemental energy in DCs due to the higher moisture content and lower proportion of high heat-value combustibles. Mechanical sorting of glass, metal, and plastics is not generally encouraged since less of this waste is present and much of it has already been scavenged (Cointreau, 1982).

Waste storage and disposal can be a larger problem in DCs because: households have less living and yard space; access areas between shanty dwellings are small; the climate is warm, seasonal rainfall may be high; and traffic often moves slowly due to road congestion or slow-moving bicycles and animal carts (Ibid.).

Thus, refuse managers may need to consider: (1) a higher collection frequency for municipal wastes; (2) manual or animal-powered pushcarts for access in shanty areas; (3) tractor or animal-powered transport vehicles; and (4) intermediate sites for transferring wastes to large vehicles for final shipment.

The World Bank has only been involved in a small number of municipal solid wastes management projects. An example of one such loan is a pilot project in Monterrey, Mexico, which provided 43 percent of the investment capital needed to set up a decentralized state-level company covering 8 municipalities. The rest of the capital cost was borne by the central government and the state and municipal governments. The operating costs are to be covered by tipping fees and property taxes (Bartone, n.d.).

Solid wastes projects are categorized under the World Bank's tabulations for water and sanitation. Between FY 1983 and FY 1989, only $106 million was loaned under the classification (Urban and Infrastructure Development Division, 1989). However, some projects in other categories have had solid wastes components.

A World Bank review of 71 of its projects with solid wastes components showed that the impacts were limited. Most of the support was for vehicle procurement and this was not combined

with adequate planning, management, or operating performance. Typically, one-third to one-half of the collection fleet is out of service at any one time and the collected wastes are not disposed of properly.

The Bank acknowledges that it needs to prepare more comprehensive projects in this area, which would include: (1) more technical assistance and training; (2) strategic planning; (3) investment in primary collection as well as secondary collection, transfer stations, and ultimate disposal; (4) greater private sector participation; and (5) improved financial management and cost recovery (Urban and Infrastructure Development Department, 1989).

In July of 1988, the President of the World Bank, Barber Conable, issued a policy statement on toxic and hazardous wastes. The new policy completely prohibited support for ocean dumping of toxic or hazardous wastes and inter-country shipment or disposal of these wastes. He also stated that support would be provided for country efforts to improve their own domestic facilities for waste management through resource recovery, reprocessing, and safe disposal.

The World Bank has prepared a number of technical reports on waste management. Examples include: a three-volume manual on safe disposal of hazardous wastes (Batstone, Smith, and Wilson, eds., n.d.); guidelines for planning and implementation of municipal solid waste management (Cointreau, 1982); a review of techniques for the recycling of municipal waste in LDCs (Cointreau et al., 1982); and methods for co-composting of human waste with domestic organic solid waste (Obeng and Wright, n.d.).

The UNDP/World Bank joint program in water and sanitation has done state-of-the-art reviews of waste management technologies, case studies and evaluations of solid wastes management activities in major cities of 18 DCs, studied health and environmental issues, and carried out some small demonstration projects for new approaches such as waste-fed aquaculture. Nevertheless, it acknowledges that "more attention is needed to solid waste management and resource recovery for urban and peri-urban areas" (UNDP/World Bank Water and Sanitation Program, 1988).

Industrial Pollution Control

Although industrial pollution control is not strictly an urban issue, most of the large-scale industrial firms that use technologies that generate a lot of residuals are located in urban areas. The World Bank has funded very few projects that are specifically identified as industrial pollution control. From FY 1983 to FY 1989, a scant $30 million was loaned under the

"pollution control" subcategory of water supply and sanitation projects. However, this does not include pollution abatement components of industrial development programs.

In 1985, the Office of Environmental and Scientific Affairs issued environment, health, and safety guidelines for hazardous materials use in industry. These guidelines address environmental considerations, work planning, transportation, emergencies, first aid, training, safety and security, and worker morale.

The World Bank has prepared a series of technical reports and guidelines on environmental impacts of industrial projects. The Environmental Department (1988a) guidelines cover 55 industrial categories ranging from aluminum production to wool scouring. The guidelines describe the process, address downstream standards and controls, and list permissible pollution levels based on reasonable costs of existing treatment and control technologies. Where these levels cannot be achieved, project appraisal and supervisory missions must document this and explain why.

Technica Ltd. (n.d.) prepared a manual for the World Bank on the planning of projects in the chemicals and energy industries. It contains guidelines on identifying, analyzing, and controlling major hazards including assessment procedures, emergency plans, and development restrictions around the site. It also provides a simplified approach to planning projects.

The Bank has also issued various reports on technical and managerial aspects of pollution control. One example, Palange and Zavala (1987), provides guidelines for project planning and financing of water pollution control. It reviews: sources and effects of major pollutants; water quality standards; control measures for residuals from domestic, industrial, and non-point sources; water re-use; operation and maintenance of treatment works; legal issues and institutional arrangements; estimation of economic and financial benefits and costs; the use of direct regulation versus economic incentives; privatization; and pricing of services.

The Environment Department (1988b) has also issued guidelines for occupational health and safety, both generally and for 48 industrial categories ranging from the aluminum industry to textiles. The guidelines list equipment and procedures to be used and threshold limit values for exposures to hazards. The discussion covers air contaminants, burns, heat stress, noise, sanitation, medical examinations, training and education requirements, and record keeping.

REFERENCES

Arlosoroff, Saul, et al. 1987. Community Water Supply: The Handpumps Option. Washington, D.C.: World Bank.

Bartone, Carl. n.d. Institutional and Management Approaches to Solid Waste Disposal in Large Metropolitan Areas. Washington, D.C.: World Bank.

Batstone, Roger, James Smith Jr., and David Wilson, eds. The Safe Disposal of Hazardous Wastes: Special Needs and Problems of Developing Countries. Washington, D.C.: World Bank/World Health Organization/United Nations Environmental Program.

Bertaud, Alain, Marier Agnes Bertaud, and James Wright Jr. 1988. Efficiency in Land Use and Infrastructure Design: An Appreciation of the Bertaud Model. Washington, D.C.: World Bank.

Briscoe, John and David de Ferranti. 1988. Water for Rural Communities: Helping People Help Themselves. Washington, D.C.: World Bank.

Buckley, Robert, et al. 1988. The Emerging Role of Housing Finance: FY 88 Annual Review of Urban Development Operations. Washington, D.C.: World Bank.

Churchill, Anthony, et al. 1987. Rural Water Supply and Sanitation: Time for a Change. Washington, D.C.: World Bank.

Cointreau, Sandra. 1982. Environmental Management of Urban Solid Wastes in Developing Countries: A Project Guide. Washington, D.C.: World Bank.

Cointreau, Sandra, et al., 1982. Recycling From Municipal Refuse: A State of the Art Review and Annotated Bibliography. Washington, D.C.: World Bank Technical Paper 30.

Environmental Department. 1988a. Environmental Guidelines. Washington, D.C.: World Bank.

Environmental Department. 1988b. Occupational Health and Safety Guidelines. Washington, D.C.: World Bank.

Golladay, Frederick. 1983. Meeting the Needs of the Poor for Water Supply and Waste Disposal. Washington, D.C.: World Bank Technical Paper 9.

Grover, Brian, Nicholas Burnett, and Michael McGarry. 1983.

Water Supply and Sanitation Project Preparation Handbook, Vols. 1-3. Washington, D.C.: World Bank.

Gunnerson, Charles, et al. 1988. Wastewater Management for Coastal Cities: The Ocean Disposal Option. Washington, D.C.: World Bank Technical Paper 77.

Infrastructure and Urban Development Department. 1989. FY 89 Annual Review of Urban Development and Water Supply Operations. Washington, D.C.: World Bank.

Lee, Kyu and Alex Anas. 1989. Manufacturer's Responses to Infrastructure Deficiencies in Nigeria: Private Alternatives and Policy Options. Washington, D.C.: World Bank.

Listorti, James. 1989. Environmental Health Component: An Approach to Project Enhancement. Washington, D.C.: World Bank.

Ljung, Per and Catherine Farvacque. 1988. Addressing the Urban Challenge: A Review of the World Bank FY 87 Water Supply and Urban Development Operations. Washington, D.C.: World Bank.

Mara, D. Duncan. n.d. The Design of Ventilated Improved Pit Latrines. Washington, D.C.: World Bank.

Obeng, Letitia and Frederick Wright. n.d. The Co-composting of Domestic Solid and Human Wastes. Washington, D.C.: World Bank, Technical Paper 57.

Palange, Ralph and Alfonso Zavala. 1987. Water Pollution Control: Guidelines for Project Planning and Financing. Washington, D.C.: World Bank, Technical Paper 73.

Technica, Ltd. n.d. Techniques for Assessing Industrial Hazards. Washington, D.C.: World Bank.

UNDP/World Bank Water and Sanitation Program. 1988. Country and Global Work Plan, 1988-90. Washington, D.C.: World Bank.

Water and Sanitation Division. 1988. Water and Sanitation: A Strategy for the 1990s Decade and Beyond. Washington, D.C.: World Bank.

Water and Sanitation Division. 1989a. UNDP-World Bank Water and Sanitation Program: Annual Report, 1988. Washington, D.C.: World Bank.

Water and Sanitation Division. 1989b. UNDP-World Bank Water and Sanitation Program: Country Work Plan, 1989-90. Washington, D.C.: World Bank.

World Bank. 1972. Urbanization: Sector Working Paper. Washington, D.C.: World Bank.

World Bank. 1975. Housing Sector Policy Paper. Washington, D.C.: World Bank.

World Bank. 1989. World Development Report. Washington, D.C.: World Bank.

World Bank and UNCHS. 1989. Urban Management Program: An Overview of Program Areas. Washington, D.C.: World Bank.