931[illegible]3
PD-AAQ-477

MEMORANDUM

June 29, 1979

TO : DAA/DS/DT, Dr. John I. Bruce

THRU : DS/PO, Robert Simpson
THRU : DS/UD, William R. Miner

FROM : DS/UD, Eric Chetwynd, Jr.

SUBJECT: Lawrence Berkeley Laboratory Proposal on Resource Conservation in Third World Cities

It is requested that you approve use of $100,000 from the small activity account to fund the subject project. The project, based on an unsolicited proposal from Lawrence Berkeley Laboratory, has been reviewed by DS/PO and by an informal steering committee made up of representatives from the regional bureaus and PPC. A revised proposal was prepared by Lawrence Berkeley Laboratory on June 18, 1979 in response to the concerns and issues raised in these reviews. The latest proposal, as reflected in the project PIO/T, is fully responsive to the issues and questions raised.

The PIO/T is attached for processing by DS/PO.

ACTION RECOMMENDED: That you approve this request.

APPROVED: John I. Bruce

DISAPPROVED:

DATE: July [illegible] 1979

Clearance: DS/EY, Eric Melby Date: 1 July 79

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Folder

Worksheet

AID 1350-1X (1-78)

PIO/T

DEPARTMENT OF STATE
AGENCY FOR
INTERNATIONAL DEVELOPMENT

PROJECT IMPLEMENTATION ORDER/TECHNICAL SERVICES

1. Cooperating Country: World wide

Page 1 of 9 Pages

2. PIO/T No. 3698325

3. XX Original or Amendment No. _____

4. Project/Activity No. and Title: Resource Conserving Urbanism in Third World Cities (931-0003--Small Activities)

DISTRIBUTION

5. Appropriation Symbol: 72-1191021.6

6. Allotment Symbol and Charge: 946-36-099-00-20-91

7. Obligation Status: [X] Administrative Reservation [ ] Implementing Document

8. Project Assistance Completion Date (Mo., Day, Yr.): October 31, 1980

9. Authorized Agent: SER/CM

10. This PIO/T is in full conformance with PRO/AG: N/A _____ Date _____

11a. Type of Action and Governing AID Handbook: XX AID Contract (HB 14) [ ] PASA/RSSA (HB 12) [ ] AID Grant (HB 13) [ ] Other

11b. Contract/Grant/PASA/RSSA Reference Number (If this is an Amendment): N/A

12. Estimated Financing (A detailed budget in support of column (2) is attached as attachment no. 2)

		(1) Previous Total	(2) Increase	(3) Decrease	(4) Total to Date
Maximum AID Financing	A. Dollars		99,968		99,968
	B. U.S.-Owned Local Currency				

13. Mission References

14a. Instructions to Authorized Agent

Negotiate only with Lawrence Berkeley Laboratory. This PIO/T is based upon an unsolicited proposal submitted to DS/UD by that organization.

14b. Address of Voucher Paying Office

SER/FM/PAD, William Pinkney

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15. Clearances—Include typed name, office symbol, telephone number and date for all clearances.

A. The project officer certifies that the specifications in the statement of work are technically adequate: DS/UD, Eric Chetwynd [signature] Phone No. 235-9092 Date 6-29-79

B. The statement of work lies within the purview of the initiating and approved agency programs: William R. Miner, DS/UD [signature] Date 29 June 1979

C. DS/PO Thomas O'Keefe [signature] Date 7/9/79

D. Funds for the services requested are available: FUNDS RESERVED BY Michael Egan, DS/PO [signature] POSTED July 19, 1979 SER/FM/CSD

E. Date

16. For the cooperating country: The terms and conditions set forth herein are hereby agreed to

Signature N/A Date _____

Title

17. For the Agency for International Development

Signature Ken Milow, DS/PO [signature] Date 7/19/79

Title Chief, Program Division

Worksheet

AID 1350-1X (1-78) PIO/T	1. Cooperating Country Worldwide	2. PIO/T No.	Page 2 of 9 Pages
	4. Project/Activity No. and Title Resource Conserving Urbanism in Third World Cities (931-0003 - Small Activities		

SCOPE OF WORK

18. THE SCOPE OF TECHNICAL SERVICES REQUIRED FOR THIS PROJECT ARE DESCRIBED IN ATTACHMENT NUMBER _____ HERETO ENTITLED "STATEMENT OF WORK".

19. SPECIAL PROVISIONS

A. ☐ LANGUAGE REQUIREMENTS (SPECIFY) N/A
(IF MARKED, TESTING MUST BE ACCOMPLISHED BY AID TO ASSURE DESIRED LEVEL OF PROFICIENCY)

B. ☐ ACCESS TO CLASSIFIED INFORMATION ☐ WILL XX ☐ WILL NOT BE REQUIRED BY TECHNICIAN(S).

C. ☐ DUTY POST(S) AND DURATION OF TECHNICIANS' SERVICES AT POST(S) (MONTHS) N/A

D. ☐ DEPENDENTS ☐ WILL NOT BE PERMITTED TO ACCOMPANY TECHNICIAN. N/A

E. ☐ WAIVER(S) APPROVED TO ALLOW THE PURCHASE OF THE FOLLOWING ITEM(S) (COPY OF APPROVED WAIVER IS A N/A

F. ☐ COOPERATING COUNTRY ACCEPTANCE OF THIS PROJECT (APPLICABLE TO AID/W PROJECTS ONLY)
☐ HAS BEEN OBTAINED ☐ HAS NOT BEEN OBTAINED
XX ☐ IS NOT APPLICABLE TO SERVICES REQUIRED BY PIO/T

G. ☐ OTHER (SPECIFY)

The contractor will send a two-person team to Hong Kong for approximately 20 days and during the course of the study and with DS/UD collaboration, will select two other cities for brief comparative visits to be undertaken on return from Hong Kong. Country clearances will be obtained by DS/UD as required.

20. BACKGROUND INFORMATION (ADDITIONAL INFORMATION USEFUL TO AUTHORIZED AGENT)

Lawrence Berkeley Laboratory original proposal dated April 1, 1979 and supplemental summary of the proposal dated June 18, 1979, will be furnished by DS/UD.

21. SUMMARY OF ATTACHMENTS ACCOMPANY THE PIO/T (INDICATE ATTACHMENT NUMBER IN BLANK)

☐ 2 DETAILED BUDGET IN SUPPORT OF INCREASED FUNDING (BLOCK 12)

☐ _____ EVALUATION CRITERIA FOR COMPETITIVE PROCUREMENT (BLOCK 14)

☐ 3 JUSTIFICATION FOR NON-COMPETITIVE PROCUREMENT (BLOCK 14)

☐ 1 STATEMENT OF WORK (BLOCK 18)

☐ _____ WAIVER(S) (BLOCK 19) (SPECIFY NUMBER)

AID 1350-1X (1-78)	1. Cooperating Country Worldwide	2. PIO/T No.	Page 3 of 9 Pages
PIO/T	4. Project/Activity No. and Title Resource Conserving Urbanism in Third World Cities (931-0003 - Small Activities)		

22. Relationship of Contractor or Participating Agency to Cooperating Country and to AID

A. Relationships and Responsibilities

In conducting the work described herein, the contractor will be responsible to DS/UD. Contacts with and visits to AID host countries will be cleared with DS/UD. The contractor may pursue contacts in Hong Kong as appropriate after an initial clearance with DS/UD.

B. Cooperating Country Liaison Official

N/A

C. AID Liaison Officials

William R. Miner, Director, DS/UD
Eric Chetwynd, Jr., Deputy Director, DS/UD (Project Manager)

LOGISTIC SUPPORT

23. Provisions for Logistic Support	IN KIND SUPPLIED BY		FROM LOCAL CURRENCY SUPPLIED BY		TO BE PROVIDED OR ARRANGED BY SUPPLIER
A. Specific Items *(Insert "X" in applicable column at right. If entry needs qualification, insert asterisk and explain below in C. "Comments")*	AID	COOPERATING COUNTRY	AID	COOPERATING COUNTRY	
(1) Office Space					X
(2) Office Equipment					X
(3) Housing and Utilities					X
(4) Furniture					X
(5) Household Equipment *(Stoves, Refrig., etc.)*					X
(6) Transportation in Cooperating Country					X
(7) Transportation To and From Country					X
(8) Interpreter Services/Secretarial					X
(9) Medical Facilities					X
(10) Vehicles (official)					X
(11) Travel Arrangements/Tickets					X
(OTHER SPECIFY) (12)					
(13)					
(14)					
(15)					

B. Additional Facilities Available From Other Sources

N/A

☐ APO/FPO ☐ PX ☐* COMMISSARY

☐ OTHER (Specify, e.g., duty free entry, tax exemption)

STATEMENT OF WORK

General

The goal of the tasks set out in this statement is to help the Agency and developing countries to identify methods for reducing consumption of scarce resources in rapidly growing cities of developing countries. Specifically, the purpose of the project is to refine, develop and adapt a methodology for assessing and diagnosing resource use in cities in developing countries. The methodology should have the capacity to:

(1) Quantify and explain resource consumption to decision makers and planners;

(2) Develop, identify and promote opportunities to induce resource conserving measures; and

(3) Assess the feasibility of energy and other resource accounts in the relatively data scarce environments of developing country cities.

In carrying out this work, the contractor will draw upon the "Ecosystem Framework" methodology outlined in appendix 1 to the contracotr's Summary Proposal to DS/UD of June 18, 1979, placing particular emphasis on adapting and simplifying this framework for use in the context of cities in developing countries. The contractor will begin with the ecosystem data and methodology developed by Newcombe based on Hong Kong data and will refine and develop this approach for more general application and policy making. The work will be carried out over a twelve-month period in specific steps as described in the sections to follow.

Specific Steps

1. Review and Analysis of Literature. The contractor will analyze past experience in applying the "ecosystem" and similar approaches for informing policy, for planning and for guiding technical inovation in the area of urban resource conservation. In conducting this analysis, the contractor will: (a) examine the relationship between resource conserving measures and planning for resource management in cities; (b) identify issues encountered when promoting resource conserving measures in urban growth situations; (c) describe ways in which

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resource conservation can contribute to efficient urban growth, with special reference to Hong Kong; and (d) prepare an annotated bibliography of the most important items covered in the literature review The contractor will provide DS/UD with a rough draft of the literature review (in five copies) at the conclusion of the fourth month of project work.

2. Application of "Ecosystem Framework" Methodology to Hong Kong. The contractor will examine the data gathered and conclusions drawn by Newcombe in light of the changes that have occurred since Newcombe's 1973 study. The contractor will assess: (a) how significantly the ecosystem methodology has contributed to policy decisions on resource flows in Hong Kong; (b) whether it will continue to do so; (c) which features of resource use are described best; (d) the weaknesses of the ecosystem framework as compared with conventional methods; and (e) whether the ecosystem framework leads to special insights concerning resource conservation in urban growth.

   In carrying out the task above, the contractor will send a two-person team to Hong Kong for approximately 20 days for on-site analysis.

3. Extension and Adaptiation of Ecosystem Methodology. The contractor will adapt the ecosystem framework for more general application in developing countries, concentrating on the need to simplify the approach to the maximum possible extent. In performing this task the contractor will be guided by the following requirements and criteria:

   a. The requirement to identify urban boundaries which are practical from an analytical and operational standpoint;

   b. The requirement to develop an approach that is adaptable to the quality and quantity of data available (e.g., through development of rules-of-thumb, proxies or simple indicatiors that will help evaluate urban resource flows);

   c. The need to take into account: (1) efficiencies of fuel use; (2) the direct relationship of conservation to consumption; and (3) the application of pricing to control scarcity or surplus;

   d. The need to develop quick, cheap and routine methods for determining flow and consumption of key resources;

   e. The need to develop easy access to information on urban resource conservation techniques on the part of planners, developers, and decision makers.

In carring out this adaptation task, the contractor will visit two developing country cities to be selected in consultation with DS/UD. The visits, of approximately 5 days each, will be for the purpose of assessing the potential applicability of the ecological framework methodology to cities less developed and smaller than Hong Kong. The cities will be visited on return trip from Hong Kong.

4. Policy Implications and Guidelines for Resource Conserving Interventions. Upon completing task 1 - 3, the contractor will set out policy conclusions and implementation guidelines addressing resource analysis and conservation in cities of developing countries. In carrying out this task, the contractor will consider: (a) approaches AID might take with respect to resource conservation in cities; (b) useful strategies for intervention in the resource consumption process; and (c) the most advantageous points for intervention.

5. Final Report. The contractor will prepare a final report setting out succinctly in layman's language the findings of steps 1 - 4, including suggestions for programs and projects with the greatest promise for resource conserving approaches in cities. The final report also will include suggestions for future field work, selection criteria for site selection and problems requiring further research and development. The contractor will submit the report in draft form to DS/UD in the eleventh month of contract work.

Pending clearance from AID, the contractor will hold a three day workshop in Mexico or in Berkeley, California, with Mexican resource conservation experts to get a developing country reaction to the findings and conclusions presented in the draft final report. The final report, to be submitted at the conclusion of the twelfth month of contract activity, will reflect comments from DS/UD and the Mexican workshop. The final report will be submitted to AID in one photo ready original and 30 copies.

Reports

1. Quarterly Reports. The contractor will submit quarterly reports discussing briefly progress to date, significant findings, and problems requiring DS/UD attention. Quarterly reports will be submitted to DS/UD in five copies.

2. Draft Literature Review. Upon completion of the fourth month of project activity, the contractor will submit a rough draft of the literature review in five copies to DS/UD.

3. Final Report. The contractor will submit to DS/UD five copies of the draft final report for comment on completion of the eleventh month of project work. The final report will be submitted at the end of the twelfth month of project work. It will be submitted to DS/UD in one photo ready original and thirty copies. See section 5. above for contents and coverage.

Attachment 2

BUDGET: August 1979-September 1979

A.	Salaries Senior Scientist - S. Berman: 65 days @ $180 per day = $11,700	$11,700
B.	Fringe Benefits 22.5% of A = $2,632	2,632
C.	Travel, Transportation and Allowances Two round trips to Hong Kong with stoppovers in two other cities to be determined = $4,000 Three round trips to Mexico City at 200 each = $600 Per diem in Mexico City - 4 days x 3 people at $75 per day = $900	10,000
D.	Subcontracts (Purchase Orders with U. C. Berkeley) Senior Scientist - R. Meier: 55 days at $180 per day = $9,900 Scientist - T. Campbell: 240 days at $100 per day = $24,000 Graduate Assistant: 125 days at $50 per day = $6,260	40,150
E.	Other direct costs Scientific Burden $6,470 Conference facilities in Mexico $200	6,670
F.	Overhead 40.5% of A-E = .405 x $71,152 = $28,817	28,817
	TOTAL	$99,968

Note: Salaries and wages are based on payroll groups averages in accordance with costing practice for all DOE programs.

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

Attachment 3

UNITED STATES GOVERNMENT

Memorandum

TO : SER/CM/COD, Mr. L. E. Stanfield **DATE:** July 9, 1979

FROM : AA/DS, Sander Levin

SUBJECT: Justification for Non-Competitive Procurement of Unsolicited Proposal, "Resource Conserving Urbanism in Third World Cities," from Lawrence Berkeley Laboratory (LBL)

The subject proposal is unsolicited. DSB has reviewed the proposal according to the following criteria:

(1) The overall scientific, technical and socioeconomic merits;

(2) potential contribution to AID's specific mission regarding urban development, resources conservation and energy management; and

(3) the capabilities, experience and facilities possessed by LBL.

The substance of the proposal is not available to the Government without restriction from another source, nor does it resemble any pending competitive solicitation. The substance is sufficiently unique to justify acceptance as an unsolicited proposal.

The Project Officer certification with reference to AID PR Notice 78-4 follows:

> I certify that neither I nor, to the best of my knowledge and belief, any other AID employee solicited the proposal or had any prior contact with the proposing institution, other than to convey interest in the field of resource conservation in developing countries relative to the efforts described in the unsolicited research proposal.

Eric Chetwynd, Jr., Project Officer, DS/UD

I request that you award this contract on a non-competitive basis to the Berkeley Laboratory without considering other sources.

5010-108

Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan

SUMMARY OF PROPOSAL

RESOURCE CONSERVING URBANISM IN THIRD WORLD CITIES

Principle Investigators: Dr. Sam Berman
Senior Scientist
Lawrence Berkeley Laboratory

Dr. Richard Meier
Professor of Landscape Architecture
UC Berkeley

18 June 1979

SUMMARY OF PROPOSAL TO A.I.D. CONCERNING RESOURCE CONSERVING URBANISM

I. GOAL:

To identify methods for reducing heavy consumption of scarce resources in rapidly growing cities of developing countries through adoption of resource conserving approaches to urban growth and development.

II. PURPOSE:

To refine, develop and adapt a methodology for assessing and diagnosing resource use in cities in developing countries in order to:

1. Quantify and explain resource consumption to decision makers and planners.
2. Develop, identify, and promote opportunities to introduce resource conserving measures.
3. Discover the feasibility and utility of energy accounts in those environments.

Planners, policy makers, city managers, and other authorities need up-to-date, comprehensive, and integrated information on performance of cities if they are to be able to meet the challenges posed by rapid growth in the coming decades. Most cities in developing countries will henceforth face increasingly scarce resources, interrupted supplies, increasing demands for services, and constantly rising prices. Organizing data along ecosystems lines, as described in Appendix I, is well suited to provide the kind of balanced informa-information that planners need to make decisions under these circumstances. The ecosystem framework applied to urban settings is not new as a conceptual framework. The rationale for the ecosystems framework has been to visualize the the city as an integrated whole, it's essential components and unique endow-

ments of energy, information, and materials leading to particular patterns of consumption and outputs. Drawing on this holistic view, it may be possible to manage rapid growth in order to reduce risks of major upsets, prevent imbalances, and promote well-being.

At the same time, as a method for gathering and organizing data, the ecosystems framework is relatively untested. Newcombe's study of Hong Kong is the most complete quantitative experiment with this framework to date. The work that we propose will refine and develop the method for more general application and policy-making purposes. This requires that the method be scrutinized both in its own terms, using the Hong Kong data, as well as in terms of different urban setting, for instance in smaller, less well-organized cities.

III. OUTPUTS:

This work will produce the following products or outputs.

A. Review and Analysis

The review will analyze past experience of applying this or similar methodologies for informing policy, for planning, and for guiding technical innovation. The review will also assess what potential exists for similar approaches in the future. As well, it will examine the relationship between resource conserving measures and planning of resource management in cities. Hundreds of technologies have been invented, but most remain unused and undiffused. Issues encountered when promoting resource conserving technologies in a context of urban growth need to be identified. Focusing on the city of Hong Kong, this review will discuss how resource conserving urbanism can make a contribution toward achieving stable growth. An annotated bibliography of the most important items found in the search will be prepared.

B. Ecosystem Methodology Provided by the Hong Kong Study

A chief product of this study is the analysis of ecosystem method carried out in Hong Kong. Data gathered and conclusions drawn by Newcombe and his colleagues beginning in 1973 will be examined in light of the changes in Hong Kong since then. Hong Kong has begun to import Chinese oil and has built a rapid transit system since 1975. How has the ecosystem methodology contributed significantly to policy decisions on resource flows in Hong Kong and will it continue to do so? What features of resource use are described best, and what are the weaknesses of the ecosystem framework, as compared to conventional methods. Finally, we will seek to discover whether the ecosystems framework leads to unique insights concerning resource conserving urbanism.

C. Extension and Adaptation of Ecosystem Methodology

To adapt the ecosystems approach for more general application, a number of problems are anticipated. First is the problem of identifying geographic urban boundaries which make operational and analytical sense. A suggested approach to solving this problem appears in Appendix I. A second is that of the quality and availability of data. In most cities the data will be poorer than is the case for Hong Kong. Estimation procedures must be invented to circumvent these types of problems. In all cases, data should be organized so that the resource conserving practices may be organized for convenient local use. Typically, for example, no records are kept on the energy used in food distribution and storage systems. This information is important, even critical, for contingency planning in cases of energy supply failures. Also, this information is important for identifying high energy consumption pathways in these systems. We propose to ascertain what rules of thumb, proxies, or indicators might be used to estimate such flows.

The refinements we propose to carry out on the ecosystem methodology will guided by the following criteria:

- The efficiencies of fuel use, for principal activities in the urban region should be estimatible, according to both the First and Second Laws of Thermodynamics.
- The information should relate directly to consumption (from the point of view of citizens and administrators) and therefore suggest reasonable approaches to improve efficiency in supplying food, fuel, and water, reflecting a hierarchy of locally held values that distinguish a given metropolis from other.
- The information should contribute to variable pricing at peaks, according to daily, weekly, and seasonal cycles. The data should be geared to make adjustments in pricing according to variations in scarcity or surplus.
- Appropriate instruments are needed which produce instantaneous feedback information indicating the use of power and high energy content fuels which allow machine operators and managers to economize as they work. For example, how could drops in line voltage trigger reductions in load?
- Quick, cheap, and routine methods need to be devised for collecting snapshot data on energy use, such as earth satellite infrared photos and total volume of moving transport, which simultaneously, not only reveal conversion to waste heat (signalling entropy increase), but also the reverse, by identifying areas devoted to solar energy collection (e.g., intensive gardening).
- Methods of installing up-to-date information about new techniques for conserving energy that are devised elsewhere in the world into the planning information systems of the respective cities.

D. Guidelines for Resource Conserving Interventions

An important aim of the field work is to draw policy conclusions regarding resource analysis and resource conserving measures. What approaches should A.I.D. take with regard to resource conserving urbanism? What strategies of intervention seem appropriate and useful? What advantageous points of intervention stand out?

Approaches to, and strategies of, implementing resource conserving urbanism depend on knowing problems and stress points in the urban system. The field work enables us to not only understand the evolution of the Hong Kong system in some detail, but also to draw upon material in several contexts so that idiosyncracies in one city may be distinguished from patterns found elsewhere. We will have some idea of what does and does not work, as far as control measures are concerned, and we can identify which problems require more study.

As for program possibilities, a range of positive and negative fiscal incentives, administrative measures, training and educational programs and materials, in addition to physical technologies, will be considered for feasibility in discussions with local contacts.

E. Final Report

The final report will summarize the findings in sections A through D and, in addition, will include suggestions for programs and projects with the greatest promise for resource conserving resources. Further actions will include suggestions for future field work, including selection criteria for sites to be studied in detail using the refined ecosystem methodology.

It is anticipated that strategies for innovations leading to resource conservation will be realizable, and identification of conditions and mechanisms of successful diffusion will be made. Finally, it is anticipated that further in-depth work will be desirable in Latin America and Africa

to study metropolises and smaller cities in order to widen our representative samples of cultural, social, political, geographic, and climatic conditions.

IV. Inputs

The work to be carried out in this proposed project depends on the following four components:

A. Literature

The review will draw upon a computerized data base available at LBL plus available materials at the Environmental Design Library and the Energy and Resource Group Library as well as other libraries in the UC system. The major categories of literature will include theoretical works such as R.L. Meier (1974) Planning for an Urban World (Cambridge: MIT Press); and applied research such as Newcombe's (1975) "Energy Use in Hong Kong" (Journal of Urban Ecology, Vol.1 p.p. 83-103). A third major category will cover studies of particular technologies or groups of technologies such as N. Jequier (1975) Alternative Technologies Problens and Promises, (Paris: OECD).

B. Hong Kong Data

The work we propose to carry out would be based on a multidisciplinary study of the urban ecosystem of Hong Kong. The best data currently available on resource flows in a developing metropolis were produced in the period 1973-78 by Newcombe (1975) and his colleagues (Aston, 1977) in Hong Kong. The Hong Kong study focuses on the flows of energy, food, and water, and is unusual among published studies in that it considers the period since the energy crisis began, eventhough it was designed earlier. Each of these resources is traced from a source point (import, primary production, or catchment, respectively) through various stages of distribution, storage, transformation, and finally to end users. The Hong Kong study is useful in three respects. First, it lays the groundwork by which methods for gathering and organizing data may be applied to other cities.

Second, the empirical findings make it possible to explore various ways to implement resource conserving urbanism. Third, it aligns itself to ecological theory which will continue to suggest shortcuts and simplifications, warn of risks of disaster, and product insights making possible improved well-being of urban residents.

C. Ecosystems Methodology

The ecosystems approach to the study of cities forms a general theoretical framework within the Newcombe study of Kong Kong is a particular application. Both are basic ingredients in this proposed project. The foundations for an Urban Ecosystems approach are discussed in Holling and Orians (1971), Holling and Goldberg (1971), Meier (1974), and here in Appendix I. Analytically, the ecosystems framework has been is use for nearly a decade. It has been employed in cities only recently. Before Newcombe, Meier applied this method in Hong Kong (Meier 1974) and later in Seoul (Meier, 1979) and elsewhere. The framework is ideally suited for integrating manmade and natural environmental factors in a single, coherent, picture. In recent applications the framework also has policy value. However, it is recognized that the use of ecosystem idea is at an experimentation stage.

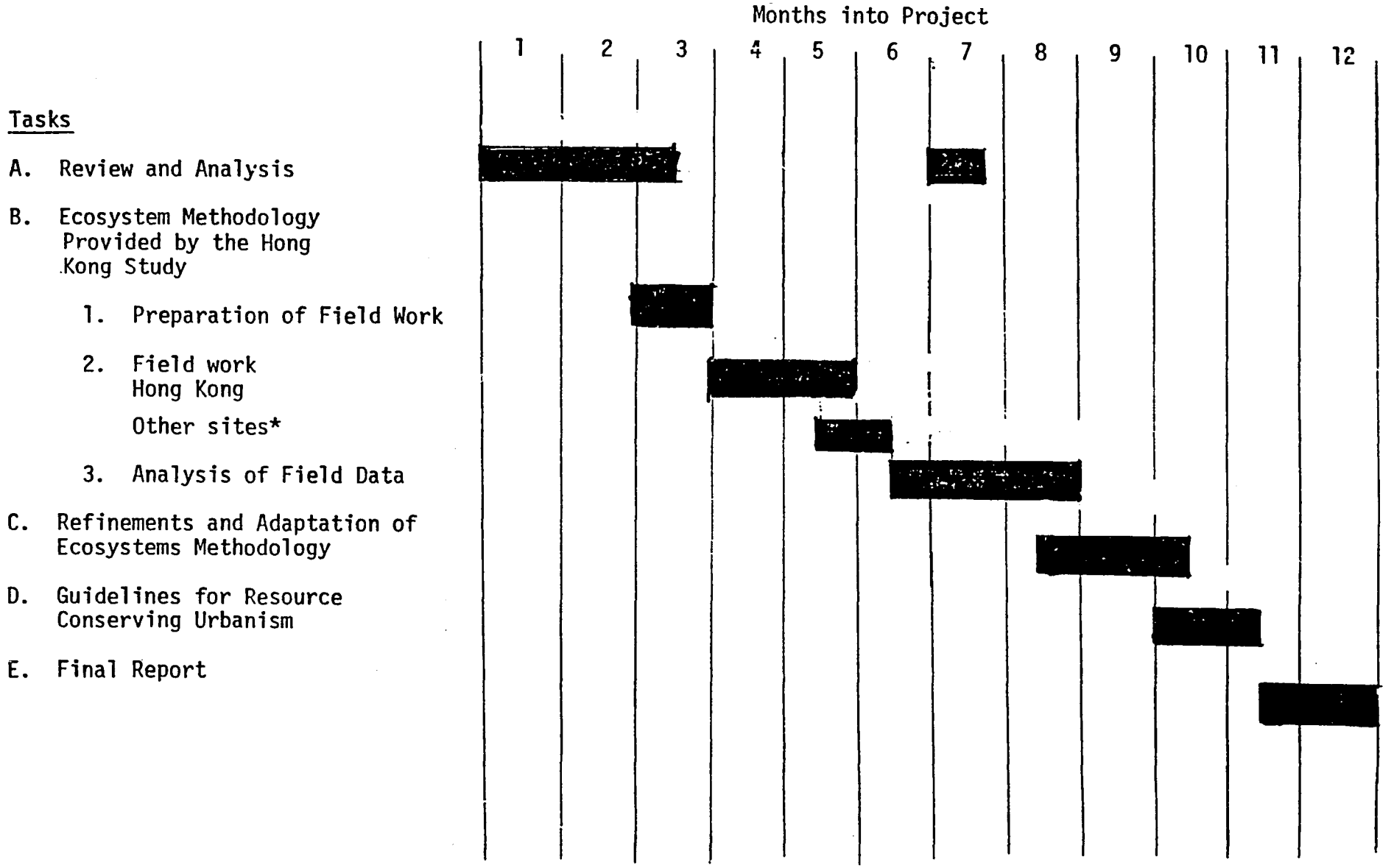
D. A.I.D. Contract

The institutional arrangements between A.I.D. and the Lawrence Berkeley Laboratory and UC Berkeley will run for at least one year in the first phase. The work for the first year will be carried at the level of funding of approximately two person years.

Major Assumptions in this Project

As remarked earlier, the ecosystems framework is still to be considered at an experimentation stage. The present project aims to test whether this framework is suitable in general for organizing data on resource flows and for forming policies concerning resource conserving measures especially in cities of the developing world. In this regard , it must be assumed that the literature on the ecosystems concept and its various applications concerning resource conserving measures is necessary but not sufficient for the purposes set forth in this summary. There is no substitute for field data to test recent applications. It is also assumed that the method and data of the Newcombe study of Hong Kong may be suitably related to the goals and purposes of this project and to other situations. This is not to say that the data and conclusions will necessarily be suitable for policy conclusions concerning other cities. However, it is assumed that the Hong Kong experiment will be instructive and provide insight for both identifying points of interventions and elements of policy in a wide variety of urban settings.

VI. Schedule of Work



*Criteria will be developed early in the project, in collaboration with A.I.D. Urban Development and with Regional Bureaus, for selection of additional field sites to be studied.

Appendix I

ENERGETICS AND THE URBAN ECOSYSTEM
Field Methods for Assessing Structure and Development in Third World Cities

One of the great difficulties with existing studies of energy demand in cities is that the data base has been drawn too narrowly, so that the potentials for adaptation and substitution have been obscured. The urban ecosystem concept attempts to be holistic and comprehensive, therefore offering opportunities for improvement. It allows an investigator to decide when a measure is adequate, as compared with the statistics available in other domains of life in the city. By saving effort expended upon achieving unnecessary precision, a balanced picture, suitable for many kinds of policy formation and planning, can be achieved in a limited amount of time. Such an economical approach is outlined here.

Definition

The ecosystem framework is one in which the city, or metropolis, is seen as an integrated whole with interacting parts. All cities have essential, or fundamental components (left hemisphere in Figure 1) necessary for the maintenance of life. In addition, cities have unique endowments of resources, capital, and labor (right hemisphere in Figure 1). These hemispheres interact with each other and with other imputs resulting in characteristic patterns of consumption and outputs.

Every system needs a boundary. In principle the boundary should

be along a circumferential line of localized minimal interaction, so as to simplify the measurement of inputs and outputs moving across the boundary. The best boundary for a city is the edge of the built-up area, which means that it would be line of maximum rate of change of the density of activity (Figure 2). In practice, we find that the census tracts do not fit such a hypothetical circumstance; therefore the normal rule is that if 10% of the employed labor force commutes into the metropolis, or 20% work on products whose origin and destination are the city, the tract is assigned to the urban community. The urban ecologist will then proceed by combining a composite of local boundaries (counties, townships, small communities, etc.) so that the population inside the boundary is more than 95% urban, as judged by the criteria employed in the local subculture.

The choice of an appropriate boundary allows the ready identification of "gatekeepers," valve tenders, and meter readers who are posted on the border. They obtain the first estimates of the influx of fuel and food into a metropolis. If electric power is imported, then there will be a transformer to step down the voltage. The imports will be registered as numbers of rail car loads, truckloads, standard containers, and bulk cargo. In less organized societies there may be a significant amount of informal movement of imports; then one must undertake observations along the main roads on typical days. An example would be the fuelwood carried into Khatmandu on heads and shoulders of porters and housewives during the early morning hours.

Each urban community is made up of populations of species engaged in purposeful action with respect to each other as individuals or groups and with the environment. These species can be arrayed in a hierarchy depicting levels of organizatior (Figure 1). The number of individuals in each of these populations needs to be estimated, and the present rate of change needs to gauged (preferably as births, deaths, migration, and net growth or decline) Abnormal age distributions should be noted, explained briefly by referring back to historical incidents or stresses, and related to future shifts in consumption. In a well-organized administration like that of Seoul, most of the official statistics will have been compiled into a yearbook, but the reliability must always be questioned. Often, parts of a population will be omitted (people without identity cards, illegal dwelling units, humble vehicles, etc.) Populations of trees and estimates of the annual production of plant biomass may have to be undertaken by closely observing representative small samples. In some metropolises the populations of pigs, chickens, or dogs will be important, but if so there will be local experts who can provide estimates.

The top level in the community hierarchy of populations is too often overlooked, despite its importance. It is made up of organizations of all kinds that extend outside the household primary group. These organizations have an address, officers, a charter, an "interest ," membership or clientele, an activity, a territory, and most of them have "claims" upon urban services. They are specifically described as teams, associations, firms,

offices, syndicates, etc. These organizations are really sub-communities of varying size which function intermittently; there can be many kinds of associations of organizations, thus creating super-organizations, as with subsidiaries in a corporation or teams in a league. The success of a city is influenced to a large degree by the number of voluntary organizations it propagates. We wish, in particular, to identify those organizations which undertake to distribute energy and its immediate substitutes. Because public communication is a prerequisite to human organization, the telephone book offers an important entering wedge in a count of organizations. It will contain a list of the most influential members of this population. Again, however, reliability needs to be questioned, since there may be not only unlisted numbers but also secret societies. The investigator should collect typical histories of the recent formation of viable organizations in order to be alerted to local phenomena. For example, Hong Kong requires the licensing of all social, cultural, and commercial organizations in order to take police action against the secret societies of the underworld. Most metropolises compile directories of organizations, but each of these possess systematic biases which need to be discovered.

Inputs and Outputs

In its broadest perspective, the ecosystem approach would follow all resource inputs, outputs, and internal consumptions. Flows out of a metropolis appear to be less bulky by far than the totality of inputs. Yet we know from chemistry and physics that over the long run (1) mass must be conserved, (2) the chemical elements retain their identity, and (3) energy cannot be lost. In the short run

(for cities, this is less than a century),
all three of these may be embodied as growth in the dimensions of the community, so outputs can be somewhat smaller in dimension than inputs for a given interval of time. When considering transfers of mass, this exercise in energetics requires an understanding of heat capacity. Does the solid waste contain important amounts of energy? The sewage? How much disappears with the cooling water? How much carbon dioxide is produced? Water vapor? How much more (or less) energy is embodied in the manufactured products?
How much energy is radiated to outer space as infrared radiation? This implies knowing something about the "heat island" created by the action and life in the community. Usually the temperature and humidity patterns in time and space will have been crudely worked out by the local meteorologists.
Finally, there is much information in the channels of intermetropolitan information exchange networks concerning substitutes for energy consumption about which some questions are found in the exported newspapers, magazines, and TV/radio media. Are there any questions going out that concern direct substitutes for energy consumption, such as queries about the design of programs for energy conservation? Little can be accomplished with respect to energy policy before urban residents are conscious of a problem, and the need to search for solutions. For example, in 1977-8 many tropical metropolises in the Third World simultaneously encountered the rapidly rising cost of kerosene, the primary fuel employed for cooking in low-income households. Is there a more economical way to cook a pot of rice and vegetables? It is important to note that

the questions concerning energy consumption were posed with many different underlying assumptions; they had already been translated into English because international trade in liquid hydrocarbons is transacted with U.S. dollars and in English.

Energy Distribution Structure

Starting from the respective gateways to the metropolis, the fuels may be traced to warehouses, godowns, tank farms, and other internal storage areas. They may then go through a last stage of refining and blending before being directly delivered to the user or packaged for the marketplace. Most of the perishable food and feed will go directly to the markets, while the staples are temporarily stored.

At this point every metropolis becomes unique. Fortunes are made and lost speculating in the supply of energy-containing commodities; therefore, much of the crucial information is privately held. The initial strategy is to follow the publicly visible flow of food, fuel, and water, using the input and output figures as indicators of what the total may be.

Thus, the distribution system for kerosene may start with a petro station that sells directly to commercial customers, but also to peddlerswith a barrel on a cart (or two cans balanced on a carrying pole) who sell fuel to householders a liter (even as little as a beer bottle full) at a time. Fuel oil may go to the bakery, laundry, and small factory, where gas is not available. In Korea the ubiquitous anthracite briquette has a distribution system all its own, but it is being displaced by propane cyclinders in middle-class homes.

A large share, typically from a quarter to a half, of the energy imported into a Third World metropolis will be consumed by larger scale industry, a major proportion in the form of electric power That component is the easiest category for an outsider to understand, because the technologies are shared worldwide.
The real detective work needs to be focused upon the unique channels for distributing energy-intensive inputs and energy related information that have evolved in that metropolis. An arterial stream of energy-rich input is either transformed into another form of energy (i.e., fuel into electricity and then energy-rich material, as in chromeplating) or subdivided into small packages. These internal ecosystem processes can be diagrammed semiquantatively as crucial subsystems, often only as capacities. The subsystems operate normally in the range of 50-80% of capacity.

Although the focus here is upon energy structures, population estimates, and subsystems, the methods to be employed are basically applied social analysis and policy science--the prerequisite to planning for the middle to long run.

Rationale

There are two overall justifications for using this comprehensive urban ecosystem approach: (1) Third World Cities have a growing "normal" demand for imported energy. It is important to obtain an estimate of what each of the major metropolises feels it needs to sustain balanced growth. (Actual consumption of energy is reported to be rising 5-10% per year despite charges for fuel and

credit greater than the world averages; information about stresses due to imbalance is even more fragmentary.) (2) The likelihood of global supply crises over the next decade is very high. This model enables a metropolitan policy planning staff and managers in the private sector to discover the range of responses available to the metropolis if a third to a half of the energy input is lost. How can this metropolitan community survive energy starvation? (Such an event occurred to Calcutta in the spring of 1979, when virtually all the electric power was taken away for more than a week to produce irrigation water in the countryside so that the metropolis could later be fed. All the power-dependent manufacturing was shut down.)

A third reason for undertaking this study in this fashion will be understood by only a small minority. Projects for energy conservation need to be launched with increasing scope and scale. It is much easier to identify the best set of projects if each can be fitted into the whole. The urban ecosystem framework appears to be one that encompasses all the relevant special disciplines related to energy, and promises to be increasing well understood due to the changing emphasis in the universities. That is the most important reason for testing and elaborating these methods at the present time.

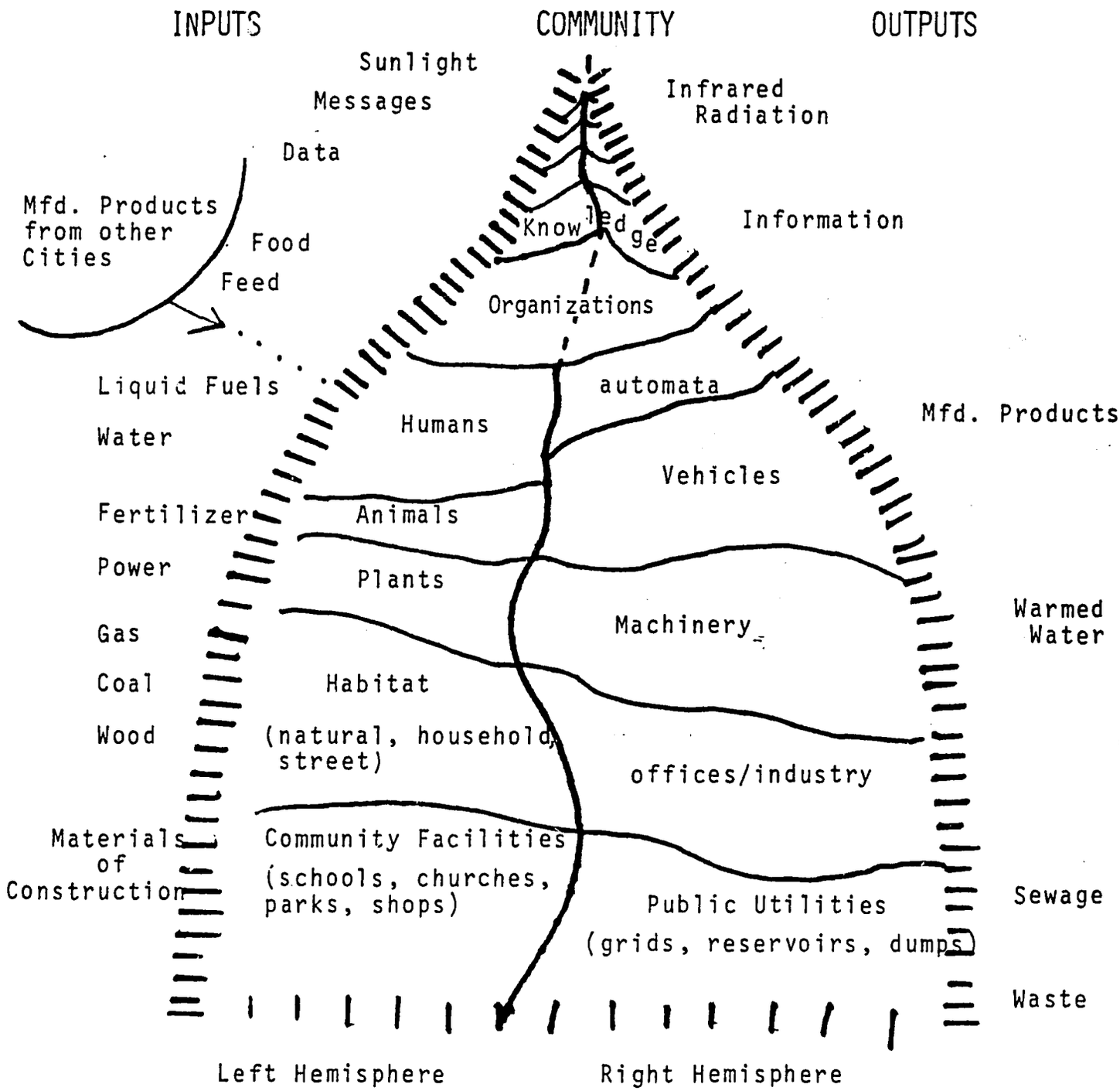


Figure 1

The Urban Ecosystem as Energy Consumer

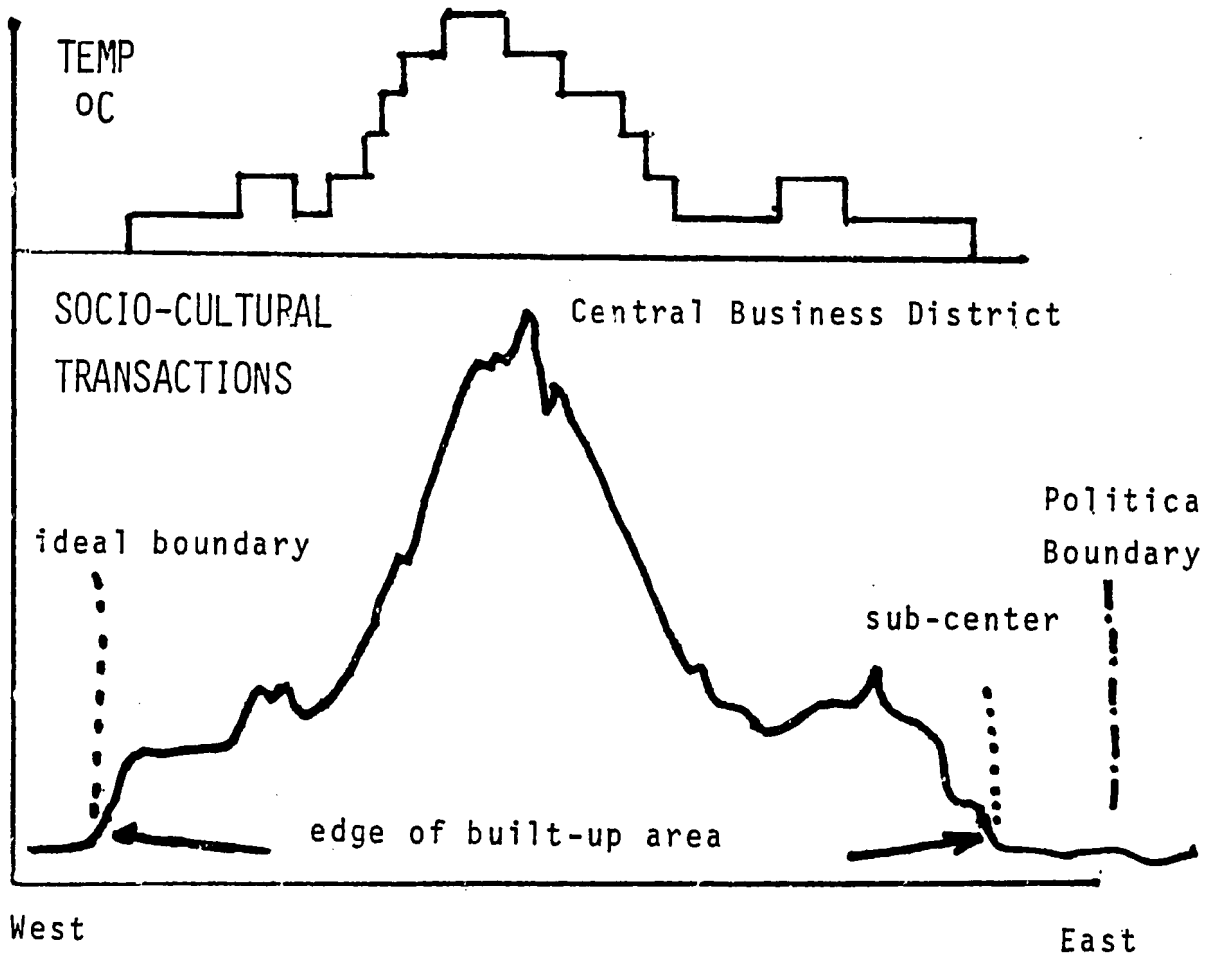


Figure 2

Transect of an Idealized Metropolis

(Top) Heat Island

(Bottom) Distribution of Activity Density

Appendix II

Tasks Skill Matrix

SKILLS

(In total person weeks)

TASKS	Berman	Meier	Campbell	GSRA*
A. Review and Analysis			10	10
B. Ecosystem Methodology Provided by Hong Kong Study				
1. Preparation for Field Work	2	1	2	2
2. Field Work Hong Kong	2	3	4	4
Other Sites	2	1	2	2
3. Analysis of Field Data	2	1	8	8
C. Refinement and Adaptation of Ecosystem Methodology	4	2	10	10
D. Guidelines for Resource Conserving Interventions	1½	1	6	6
E. Final Report	1½	1	6	6
Subtotal	13	11	48	48

Total Approx. 120

*to be named later.