GUIDE FOR SURVEY - EVALUATION OF URBAN DWELLING ENVIRONMENTS

by

JOHN MANNING BALDWIN
B. Arch., University of Michigan
1968

SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF
ARCHITECTURE
IN ADVANCED STUDIES
at the
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
January, 1974

Signature of Author ..............................................................
Department of Architecture, January 23, 1974

Certified by .............................................................. Thesis Supervisor

Accepted by .............................................................. Chairman, Departmental Committee on Graduate Students

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GUIDE FOR SURVEY-EVALUATION OF URBAN DWELLING ENVIRONMENTS

This is a guide for making surveys and evaluations of existing urban dwelling environments. The surveys are references for understanding the dwelling environments/situations of urban areas. Since the surveys are of existing situations, they provide data/information which at least incorporates the realities of an area. The surveys are intended as a tool for the formulation of housing policies and programs.
GUIDE FOR SURVEY – EVALUATION OF URBAN DWELLING ENVIRONMENTS
by John Manning Baldwin

Submitted to the Department of Architecture
on January 23, 1974
in partial fulfillment of the requirements for the
degree of Master of Architecture in Advanced Studies.

ABSTRACT

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The guide presents a compact format for surveys, which is being used in the program: Urban Settlement Design in Developing Countries at the School of Architecture and Planning, M.I.T. Use of this format allows dwelling/land situations from one context to be readily compared with those of another context.

The guide provides a procedure for identifying the dwelling/land systems existing in an urban area, which assists in the selection of case studies for survey-evaluation.

Each typical page to be included in a survey is described/explained and illustrated by an example page showing recommended content and layout.

A glossary is included to clarify the terms essential in making a survey-evaluation.

Thesis Supervisor: Horacio Caminos
Title: Professor of Architecture
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OBJECTIVES:

- To organize into a concise reference existing methodologies, procedures, formats, and definitions for making a survey-evaluation of urban dwelling environments;

- To provide simple guidelines/instructions for making surveys and evaluations;

- To describe a simple procedure for identifying the dwelling/land systems existing in and serving an urban area.

APPLICATION:

The guide is intended as a tool for those concerned with the survey-evaluation of any urban dwelling environments.

COPYRIGHT © 1974, Urban Settlement Design in Developing Countries. M.I.T. All rights reserved; no section may be reproduced by any means without written permission.
This guide intends to describe and explain the methodology, procedures, format, and definitions for the survey-evaluation of urban dwelling environments developed in the program: Urban Settlement Design in Developing Countries (USDCC) directed by Professor Horacio Caminos.

The methodology was developed initially to survey 16 dwelling environments in the following urban areas: BOSTON, Massachusetts, U.S.A.; LIMA, AREQUIPA, Peru; CIUDAD GUAYANA, Venezuela; MEDELLIN, Colombia (see URBAN DWELLING ENVIRONMENTS, Caminos, Turner, Steffian. M.I.T. Press, Cambridge, 1969).

Further surveys were made in SAN JUAN, Puerto Rico (Caminos, Goethert, 1971); BOGOTA, Colombia (Popko, Kessler, 1971); NAIROBI, Kenya (Caminos, Goethert, Patel, Gattoni, Chana, 1973); KAMPALA, Uganda (Mulumba, 1973); BANGKOK, Thailand (Ocharoen, Phisuthikul, 1973); MEXICO CITY, Mexico (Davila, Cortes, Espinosa, Bazant, 1973); KABUL, Afghanistan (Samizay, 1973); BEIRUT, Lebanon (Take, 1973).

Other surveys in progress include: CALI, Colombia (Milan, 1973-74); AHMADABAD, India (Patel, 1973-74); RIYADH, Saudi Arabia (Al-Hussayen, Shuaibi, 1973-74); ANKARA, Turkey (Tokman, 1973-74).

The surveys are made to identify and evaluate the different dwelling/land situations of an urban area in relation to social, economic, and physical factors.

The surveys are intended as a tool for the formulation of housing policies and programs. They have been extensively used by the Urban Settlement Design Program for the elaboration of urbanization projects in San Juan, Nairobi, and Beirut.

The purpose of this guide is to provide simple guidelines for the surveys. The guide is structured in the following manner:
- Odd numbered pages contain examples of surveys taken from: DWELLINGS AND LAND, Caminos et. al.; URBAN DWELLING ENVIRONMENTS; and the Urban Settlement Design Program files.
- Even numbered pages contain the explanation of the example on the facing page.

The author gratefully acknowledges the guidance and advice of Professor Horacio Caminos, whose experience was invaluable in the preparation of this work. I am also indebted to Reinhard Goethert for his personal assistance and to my wife, Barbara, for her moral support.

Photographs of the LIMA URBAN CONTEXT have been reproduced from the following sources: Audio-Visual Productions, Emil Willimetz; Foto Doos; and Corporacion Nacional de Turismo, Lima. Photographs of the SOUTH END, BOSTON CASE STUDY are by the author and the Boston Redevelopment Authority (aerial).
INTRODUCTION

DWELLINGS AND LAND

This guide is concerned with two aspects of housing and urban development: DWELLINGS and LAND. Dwellings and land are basic components of the physical framework of human settlements.

Combinations of dwellings and land can take many configurations. For instance, a given dwelling/land situation is inhabited by a specific cultural group, permits a limited range of population densities, is inhabited by a limited range of income groups, and provides a specific efficiency of land utilization.

The overall dwelling environment of any urban area consists of a limited number of recognizable dwelling/land situations which should be identified and evaluated to determine appropriate models for specific purposes.

DWELLING/LAND SYSTEM IDENTIFICATION

DWELLING/LAND SYSTEM - a distinct dwelling environment/housing situation characterized by its users as well as by its physical environment.

These systems/situations may be recognized by the local vocabulary. Mexico City, for example, has low income CIUDADES PERDIDAS (popular temporary shanty towns), housing 2% of the urban population; VECINDADES (tenements), housing 23%; COLONIAS POPULARES (squatter settlements), housing 39%; and UNIDADES (public projects), housing 6%. The remaining 30% are middle/high income environments characterized by other dwelling/land systems.

In other areas these situations may be recognized as distinct physical environments. For example, Nairobi, Kenya has very low income traditional rural village/squatter situations, housing 8% of the urban population; low income industrial row/grouped tenements, housing 41%; low income tenement courts, housing 23%; and middle/high income victorian suburban cottages, garden city row houses and walk-up apartments, housing the remaining 28%.

Some systems are easily recognized because they represent very dominant housing situations in terms of the population housed or the land area occupied. The COLONIAS POPULARES of Mexico City house 39% of the population and cover approximately 30% of the urban area. The suburban/garden city environments of Nairobi house 28% of the population and cover approximately 80% of the urban area.

To be comprehensive, a survey-evaluation of an urban area's dwelling environments should be derived from an understanding of all of its dwelling/land systems. However, surveys do not necessarily represent the complete "spectrum" of housing in a given urban area, but may represent specific situations of particular interest. For example, the surveys made in the Urban Settlement Design Program have emphasized the situations of the lower income sectors and have included middle/high income situations as points of reference.
IDENTIFICATION PROCEDURE

The identification procedure described here is by no means rigid. In each particular case, time available, resources (financing, personnel) and expertise will determine the extent, depth and accuracy of the identification. Since it can be done very simply, scarcity of resources should not prevent its completion. To explain the extent, depth, accuracy achieved, it is important in all cases to qualify the information used.

1) Locate all residential areas by USER INCOME GROUP on an urban map. This information may be found in studies or reports done by government agencies, financing institutions, and/or housing research institutions.

Income level is a basic indicator. Income has a direct relationship to the quality and permanency of the dwelling, the size and construction technology involved. As income increases, the level of housing increases. Physical and financial resources are made available to the user in direct relation to his income. The lower income sectors are directly involved with the provision of shelter while the middle and high sectors are relatively uninvolved.

The following is a stratification of income groups. The middle and high income groups are considered to be capable of providing their own housing opportunities. Therefore, emphasis has been on the housing situations of the lower income groups.

USER INCOME GROUP - based upon the subsistence (minimum wage) income per household per year, five groups are distinguished:

Very Low: (below subsistence level) the group with no household income available for housing, services, or transportation.

Low: (at subsistence level) the group that can afford limited subsidized housing.

Moderate: the group that has access to public/private commercial housing (rental).

Middle: the group that has access to private commercial housing (ownership).

High: the most economically mobile sector of the population.

2) Identify the DWELLING UNIT TYPES within these income areas. Aerial photographs, urban maps showing buildings, real estate brokers/agents, real estate sections of local newspapers, and scanning field surveys may be sources of information.

The dwelling unit is a basic indicator of the physical aspects of a dwelling environment. The following is a classification of dwelling unit types.

DWELLING UNIT TYPE - four types of dwelling units are considered:

Room: A SINGLE SPACE usually bounded by partitions and specifically used for living; for example, a living room, a dining room, a bedroom, but not a bath/toilet, kitchen, laundry, or storage room. SEVERAL ROOM UNITS are contained in a building/shelter and share the use of the parcel of land on which they are built (open spaces) as well as common facilities (circulation, toilets, kitchens).

Apartment: A MULTIPLE SPACE (room/set of rooms with or without bath, kitchen, etc.). SEVERAL APARTMENT UNITS are contained in a building/shelter and share the use of the parcel of land on which they are built (open spaces) as well as some common facilities (circulation).

House: A MULTIPLE SPACE (room/set of rooms with or without bath, kitchen, etc.). ONE HOUSE UNIT is contained in a building/shelter and has the private use of the parcel of land on which it is built (open spaces) as well as the facilities available.

Shanty: A SINGLE OR MULTIPLE SPACE (small, crudely built). ONE SHANTY UNIT is contained in a shelter and shares with other shanties the use of the parcel of land on which they are built (open spaces).

Generally, dwelling units correlate with income groups in the following pattern:

- SHANTY: very low incomes
- ROOM: low, moderate incomes
- APARTMENT: middle, high incomes
- HOUSE: middle, high incomes

3) Describe each area in terms of the following secondary/supplementary indicators:

- DWELLING TYPE: detached/semi-detached/row/grouped/walk-up/high rise.

4) List significant, representative dwelling environments recognized by the local vocabulary.

5) Make initial, tentative selections of case study environments. To adequately survey some systems, several case studies illustrating different aspects may need to be selected. Document these cases through sketch plans, dwelling plans/sections, brief descriptions, etc. for final selection.

6) Make final selections after conducting field surveys. Field work allows positive identification of specific cases and is prerequisite to the survey-evaluation of case studies.

While maps, existing documents, common knowledge, etc. are necessary for a quick, overall view of the range of dwelling/land situations existing in an urban area, field surveys are essential to the selection of case studies. Field surveys are important during initial as well as final selections, providing information which is based upon direct observations of existing conditions. Duplications of cases are eliminated and missing cases are added as needed following field work.
The diagrams shown below represent typical page formats for a survey-evaluation of urban dwelling environments. They are summarized here in the order in which they are subsequently described and explained.

**FRONT MATTER** Introductory material describing the content/scope, purposes, and applications of the survey. Normally, two pages are used as shown.

**URBAN CONTEXT** Section describing the urban area within which case studies are surveyed. Six pages are normally used as shown (four may be used when the urban area is small, allowing the four plans to be shown on two pages).

Scale of plans: 1:250,000

**CASE STUDIES** Sections containing the dwelling/land systems or housing situations surveyed. The following is included for each case study:

- **LOCALITIES:**
  Four pages are normally used as shown (two may be used when a locality is small, allowing the three plans to be shown on one page).

Scale of plans: 1:10,000

The summary shows:
- Sections to be covered;
- Format, composition of typical pages (note page numbering: even pages on the left, odd on the right);
- Information to be included on each pair of facing pages;
- Index of explanations-examples (guide page numbers shown in parenthesis).
**CASE STUDIES**

**LOCALITY SEGMENTS:**
Two pages are always used as shown.
Scale of plans: 1:2,500

**LOCALITY BLOCKS:**
Two pages are always used as shown.
Scale of plans: 1:1,000

**TYPICAL DWELLINGS:**
Two pages are always used as shown.
Scale of plans: 1:200

**EVALUATIONS**
Sections evaluating case studies:

**PHYSICAL DATA MATRIX:**
Multiples of the two pages shown are used when extensive comments are included.

**COMMUNITY FACILITIES, UTILITIES/SERVICES MATRIX:**
Multiples of the two pages shown are used when extensive comments are included.

**LAND UTILIZATION:**
**PATTERNS, PERCENTAGES, DENSITIES:**
Two pages shown can accommodate up to 10 case studies (four can accommodate up to 20, etc.).

**LAND UTILIZATION: OPTIMUM RANGES and LAYOUT EFFICIENCY:**
Two pages can be used as shown.

**BACK MATTER**
Material supplementary to the survey text.
Normally, two pages are used as shown.

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<table>
<thead>
<tr>
<th>LOCALITY SEGMENTS</th>
<th>LOCALITY BLOCKS</th>
<th>TYPICAL DWELLINGS</th>
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<tr>
<td>Material supplementary to the survey text. Normally, two pages are used as shown.</td>
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</tbody>
</table>
FRONT MATTER

FRONT MATTER - information/material which precedes the text of a book.

PURPOSES:
- to outline the scope, limitations, and special features of the work;
- to establish the context, objectives, and applications of the work.

CONTENTS:
Ak ACKNOWLEDGEMENTS
Co CONTENTS
Pr PREFACE

ACKNOWLEDGEMENTS: (not shown in the adjacent example) statements of recognition and expressions of appreciation for assistance in the completion of the work. They should include personal credits for research, field work, photographs, production, and sources of information and/or general support. Any financial support is also generally acknowledged.

CONTENTS: list of the titles and beginning page numbers of each section of a book: front matter, text divisions, and back matter.

PREFACE: author's explanations of the content/scope, purposes, and applications of the work and the data from which the work was derived:

CONTENT: statements of the scope of the work and a concise description of its presentation.

PURPOSE: statements of the objectives/goals of the work.

APPLICATION: statements of the uses of the work.

DATA: basic sources of information, methods of research, and schedule of completion used in producing the work.
CONTENTS, PREFACE (EXAMPLE FROM DWELLINGS AND LAND) NAIROBI, KENYA [ ]

CONTENTS

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INTRODUCTION: Urban Land Utilization (2)
Nairobi Urban Context (4)
Ndyu, A Rural Migrant in Nairobi (6)

PWELLINGS AND LAND EVALUATIONS: Time/Process Perspective (9)
Physical Data Matrix (12)
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PREFACE

CONTENT: This study describes and evaluates different dwelling environments in the context of rapid urbanization in developing countries. The focus of the study is on twenty selected situations existing at the present time in Nairobi, Kenya. The following is included: a brief "Introduction" on urban land utilization, on the Nairobi urban context, and on Nduru—a rural migrant; "Dwelling and Land Evaluations" on the time/process perspective, physical aspects, utilities and services, land utilization and layout efficiency; and "Twenty Case Studies" in Nairobi. The case studies include the full housing spectrum from very low income to high income situations. Each case is summarily described in similar terms: DRAWINGS: dwelling group, dwelling plan, and dwelling section; DESCRIPTIVE DATA: socio-economic and physical; and PHOTOGRAPHS: aerial, environment and dwelling. The cases provide firsthand material with which to identify basic patterns in different aspects of the housing process, particularly in the matter of land utilization.

PURPOSE: This study attempts: a) to identify and describe a representative cross-section of housing in the Nairobi urban area illustrating the physical and socio-economic environment; b) to organize case studies into a comparative framework to facilitate analysis/evaluations; c) to relate the housing process to issues of land utilization.

APPLICATION: This study provides: a) a reference for the understanding of the housing environment/situation of urban areas, particularly Nairobi, Kenya; b) a model for the identification of dwelling subsystems in any urban context; c) a reference for policy decisions relating to housing programs (See: "INTERIM URBANIZATION PROJECT DANDORA, Nairobi, Kenya: a progressive development including a SITE AND SERVICES model," Cambridge, Massachusetts, Spring 1973); d) a reference for the formulation of urban land policies in the context of rapid urbanization and its consequences: provision of more and more public services to a population that has less and less capacity to pay.

DATA: The information for the surveys was derived from various sources: theses and surveys performed by students from the University of Nairobi; surveys, drawings, maps, and aerial photographs from the Nairobi City Council; and field surveys, studies and photographs by participants of the Urban Settlement Design Program, M.I.T. The preliminary work was carried out through the Urban Settlement Design Program at the Massachusetts Institute of Technology during Fall 1971/Spring 1972. Detailed field surveys were carried out in Nairobi, Kenya, during the summer 1972. The work was completed during the spring, summer, and fall, 1973.

H.C., R.G., T.S.C.
URBAN SETTLEMENT DESIGN PROGRAM
Cambridge, Massachusetts Fall 1973
URBAN CONTEXT

URBAN CONTEXT - an urban area/environment within which dwelling/land systems develop.

PURPOSES:
- to give readers not familiar with the context a brief, panoramic view;
- to provide points of reference and comparison with other urban contexts.

CONTENTS:

Ud Descriptions: brief paragraph covers each of the following aspects of the urban area (note the numbering of paragraphs):

1. Primary Information: geographical location, latitude, longitude, climate, etc.
2. History: main events in the development of the area.
3. Economy: annual per capita income, primary industries, economic growth, etc.
4. Government: administrative/political divisions, powers, controls affecting urban development, etc.
5. Demography: population size, growth rate; significant age-sex characteristics; etc.
6. Socio-Cultural: ethnic/cultural divisions, class structure, annual household incomes, etc.
7. Socio-Economic: physical situations/locations of income groups in the urban area.
8. Housing: costs of land, minimum standard dwellings; financing terms; housing availability; etc.

Uc Diagrams/Graphs: WIND, TEMPERATURE, HUMIDITY, RAIN, SNOW, SUN

UTC Urban Topography and Circulation
ULU Urban Land Use Pattern
UI Urban Income Pattern
UG Urban Growth Pattern
Up Photographs
Us Urban Context Sources

EXAMPLE KEY

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EXAMPLE KEY
LIMA, PERU

URBAN CONTEXT

1. Lima is located on an irrigated, alluvial plain between the arid foothills of the Andes and the Pacific Ocean, latitude 12° South, longitude 77° West; although there is no rainfall, humidity is extremely high, and the area is covered by low clouds from April to November; high winds are unknown, and the temperature range is slight, although its effects are increased by the humidity.

2. Founded by Pizarro in 1535 during the conquest of Tahuantinsuyo, the Inca Empire, Lima was Vice-regal capital of the South American Spanish colonies through the sixteenth century and one of four administrative divisions in the eighteenth century. Capital of Peru shortly after Independence in 1821, Lima and its adjacent port of Callao have maintained their pre-eminence as the center of trade and, in the twentieth century, of industrial development.

3. In 1967, the annual per capita income of the metropolitan area was estimated at U.S.$350, three times that of the rest of Peru and representing 42.5 percent of the GNP.

4. Lima is the seat of a highly centralized national government, elected by all literate, adult persons. Local elections were reintroduced in 1965 for municipal governments; the metropolitan area is divided into 25 municipalities whose authority over urban development is limited to the issue of building licenses and inspections. Authorization for subdivisions are made by the national planning agencies.

5. The estimated population of Lima in 1968 is 2,800,000 assuming a 5.5 percent average annual increase since 1961; approximately half the increase is due to immigration from provincial areas; 50 percent of the metropolitan population is under twenty years of age.

6. There are no major ethnic or cultural divisions that are not tied to the income class structure; the great majority of the 0.3 percent of households with incomes more than U.S.$8,000 are European types; the vast majority of those of predominantly Andean Indian origin, together with the Negro minority, are in the lower income sectors. There is a substantial degree of socioeconomic mobility between the lowest income level (around U.S.$300 per annum) and the skilled wage level (around U.S.$1,500 p.a.) which includes approximately 80 percent of the metropolitan population.

7. The lowest income sectors are concentrated in and around the older urban centers and in the barriadas (squatter settlements) on marginal lands; these, accommodating approximately 25 percent of the population, are established by ex-migrants, relocating from central city areas. Upper-income sectors are concentrated in one older suburban area near the seaside resorts and in a new suburban area among the Andean foothills to the East.

8. The cheapest subdivision building land is sold at between U.S.$750 -1,000 per minimum lot (160 m²) with up to 10 years credit; the minimum standard dwelling costs approximately U.S.$1,500. Fifty percent of the metropolitan population cannot afford the commercial costs owing to high interest rates (minimum 9 percent through nonprofit savings and loan associations).

(Example from URBAN DWELLING ENVIRONMENTS)
UTC URBAN TOPOGRAPHY AND CIRCULATION: plan of the urban area showing physical setting, primary approach routes, and major streets.

It is recommended that the plan be drawn at a scale of 1:125,000 and reduced in half to 1:250,000.

Information to be included is listed below with suggested drawing conventions (shown at 1:125,000 scale).

<table>
<thead>
<tr>
<th>INFORMATION</th>
<th>CONVENTION</th>
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<tbody>
<tr>
<td>-Water edge</td>
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<td>-Distance circles (5, 10, 15 km radii)</td>
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<td>-Contour lines (interval varies with relief)</td>
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<td>-Rapid transit routes</td>
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<tr>
<td>-Airports</td>
<td></td>
</tr>
<tr>
<td>-Case study localities</td>
<td></td>
</tr>
</tbody>
</table>

EXAMPLE KEY

2 Ud Ud Ud
3 UG

4 ULU
5 UI

6 UG
7 Up
LIMA, PERU [ ]

URBAN CONTEXT
(EXAMPLE FROM URBAN DWELLING ENVIRONMENTS)

URBAN TOPOGRAPHY AND CIRCULATION

1. LAS CUEVAS
2. EL ERMITANO
3. EL AGUSTINO (hill)
4. EL AGUSTINO (flat)
5. MENDICITA
6. AIRPORT

PACIFIC OCEAN

URBAN TOPOGRAPHY AND CIRCULATION
1:250000
**ULU URBAN LAND USE PATTERN**: plan/diagram of the urban area showing the distribution of its residential, commercial, and industrial areas.

Areas taken by these land uses are illustrated by textures/tones.

It is recommended that the plan/diagram be done at a scale of 1:125,000 and reduced in half to 1:250,000.

Information to be included is listed below with suggested conventions (shown at 1:125,000 scale).

<table>
<thead>
<tr>
<th>INFORMATION</th>
<th>CONVENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential areas</td>
<td></td>
</tr>
<tr>
<td>Commercial/light industrial areas</td>
<td></td>
</tr>
<tr>
<td>Industrial areas</td>
<td></td>
</tr>
<tr>
<td>Distance circles (5, 10, 15 Km radii)</td>
<td></td>
</tr>
<tr>
<td>Water edge</td>
<td></td>
</tr>
<tr>
<td>Water areas</td>
<td></td>
</tr>
<tr>
<td>Airports</td>
<td>A</td>
</tr>
</tbody>
</table>
LIMA, PERU

(EXAMPLE FROM URBAN DWELLING ENVIRONMENTS)

DWELLINGS AND LAND

URBAN LAND USE PATTERN

AREAS
- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
UI URBAN INCOME PATTERN: plan/diagram of the urban area showing the distribution of its income groups. These groups can be identified by the following methods:

QUINTILES: a distribution based on the annual income of each fifth of all families/households.

SUBSISTENCE LEVEL: a distribution based on the subsistence (minimum wage) income required to support life. Five groups are distinguished:

- Very Low: (below subsistence level) the group with no household income available for housing, services, or transportation.
- Low: (at subsistence level) the group that can afford limited subsidized housing.
- Moderate: the group that has access to public/private commercial housing (rental).
- Middle: the group that has access to private commercial housing (ownership).
- High: the most economically mobile sector of the population.

Areas inhabited by low (very low, low), medium (moderate, middle), and high income groups are illustrated by textures/tones.

It is recommended that the plan/diagram be done at a scale of 1:125,000 and reduced in half to 1:250,000.

Information to be included is listed below with suggested conventions (shown at 1:125,000 scale).

INFORMATION
- Low income groups
- Medium income groups
- High income groups
- Distance circles (5, 10, 15 Km radii)
- Water edge
- Water areas
- Airports

CONVENTION
UG URBAN GROWTH PATTERN: plan/diagram of the urban area emphasizing its growth in recent times. For this purpose, its built-up areas are generally shown at three periods: pre-twentieth century, first half of the twentieth century, and the present.

Each period's built-up areas are illustrated by textures/tones.

It is recommended that the plan/diagram be done at a scale of 1:125,000 and reduced in half to 1:250,000.

Information to be included is listed below with suggested conventions (shown at 1:125,000 scale).

<table>
<thead>
<tr>
<th>INFORMATION</th>
<th>CONVENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early period (pre-twentieth century)</td>
<td>![Texture 1]</td>
</tr>
<tr>
<td>Intermediate period (1900 to 1950)</td>
<td>![Texture 2]</td>
</tr>
<tr>
<td>Present period</td>
<td>![Texture 3]</td>
</tr>
<tr>
<td>Distance circles (5, 10, 15 Km radii)</td>
<td>![Distance Circles]</td>
</tr>
<tr>
<td>Water edge</td>
<td>![Water Edge]</td>
</tr>
<tr>
<td>Water areas</td>
<td>![Water Areas]</td>
</tr>
<tr>
<td>Airports</td>
<td>![Airports]</td>
</tr>
</tbody>
</table>
LIMA, PERU

(EXAMPLE FROM URBAN SETTLEMENT DESIGN FILES)

DWELLINGS AND LAND

URBAN GROWTH PATTERN

DATES

1910
1945
1965

PACIFIC OCEAN

10km
15km
20km
50km
150km

1:250000
Photographs: general environment of the urban context can be shown using views of the city center, low and middle/high income housing, and/or urban activities.

Urban context sources: list for each urban plan, climate, photographs, and general information.

Sources are listed by title and publication date only. The complete source (title, author, publisher's name, city of publication, date) is listed alphabetically in the bibliography.

Quality of information given in the plans should be included in one of the following terms:
- Tentative: when based upon rough estimations of limited sources.
- Approximate: when deducted from different and/or not completely reliable sources.
- Accurate: when taken from reliable or actual sources.
LIMA, PERU

(top left) The houses in this middle/high income suburb have central courtyards filled with plants and flowers in the Spanish Colonial tradition. Areas like this are in sharp contrast with Lima's barriadas.

(top right) The presidential palace in the city center is within view of barriadas on the lower slopes of the Andes Mountains.

(bottom) One of the largest barriadas is built along the Rio Rimac. This area is within the city center (note the tall buildings in the background). Half of Lima's two million people are barriada dwellers.

URBAN CONTEXT SOURCES


Urban Land Use Pattern: (approximate) IBID.

Urban Growth Pattern: (approximate) POE.


CASE STUDIES
LOCALITIES

LOCALITY - a relatively self-contained residential area/community/neighborhood/settlement within an urban area which may contain one or more dwelling/land systems.

PURPOSES:
- to illustrate dwelling/land systems in relation to community environment;
- to illustrate their extent, composition, and layout.

CONTENTS:
- Location Key
- Descriptions: LOCATION, ORIGINS, LAYOUT, LAND USE, CIRCULATION
- Photographs
- Locality Plan
- Locality Land Use Pattern
- Locality Circulation Pattern

EXAMPLE KEY

Lk Location Key: simple plan of the urban area showing the location of a locality in relation to the city center.

Key should be drawn at a scale that will allow the urban area to fit within a column of text. It is recommended that it be drawn at twice the desired scale and reduced in half.

Information to be included is listed below with suggested conventions (shown before reduction).

INFORMATION
-Water edge (major bodies of water)
-Urban boundary (if one exists)
-Distance circles (5, 10, 15 km radii)
-Major roadways
-Major railways
-LOCALITY location

Ld Descriptions: brief paragraph covers each of the following aspects of a locality:

LOCATION: relating locality to city center, major routes, etc.

ORIGINS: history of locality's development, present trends of development, etc.

Lp Photographs: general/community environment of a locality can be shown using views of community facilities, typical street character, and/or typical activities.
LOCATION: The area of the city of Boston known as the South End is adjacent to the central business district.

ORIGINS: Originally, Boston was attached to Roxbury only by a very narrow neck of land along which ran Washington Street. During the early nineteenth century this was gradually widened by the filling of Back Bay. The South End was built up in the 1850's and 1860's, mostly with row houses but also with a full complement of churches, schools, hotels, and hospitals. Before the filling of the South Bay, the shore line and bay was a fashionable recreation area, and the locality was dominated by single-family houses. After the bay was filled for industrial use, the occupancy of the locality changed. The single-family dwellings were converted into apartments and rooming houses for low-income people. At the present time, because of the lack of available housing to meet the demand and the proximity of the locality to the central business district, high-income families are forcing the poor to move elsewhere.
LP LOCALITY PLAN: showing a locality in terms of its boundaries, buildings, and streets.

It is recommended that the plan be drawn at a scale of 1:5,000 and reduced in half to 1:10,000.

Information to be included is listed below with suggested drawing conventions (shown at 1:5,000 scale).

INFORMATION
- LOCALITY buildings
- Other buildings
- Street curbs
- Contour lines (interval varies with relief: 5/10/25m)
- Railroads
- Water edge
- Water areas
- Selected LOCALITY SEGMENT

Ld Descriptions: brief paragraph covers the following aspect of a locality:

LAYOUT: boundary conditions, land subdivision, purpose of layout, etc.
The area within the rectangle formed by the main-line railroad and turnpike, the local elevated railway, and Massachusetts Avenue is uniform and systematic. Where main streets and boundaries have permitted, and in the majority of cases, the blocks of originally single-family row houses are long with their short sides facing the main traffic streets. The system ensures a maximum flow along the latter and, therefore, past the sites for commercial activities. The blocks are subdivided by access alleys giving access to the backs of all plots.
Descriptions: brief paragraph covers the following aspect of a locality:

LAND USE: distribution of land uses, community facilities, etc.

LOCALITY LAND USE PATTERN: plan/diagram of a locality showing the distribution of its residential, commercial, and industrial areas as well as the locations of its community facilities.

Areas taken by these land uses are illustrated by textures/tones and community facilities are indicated by letter designations.

It is recommended that the plan/diagram be done at a scale of 1:5,000 and reduced in half to 1:10,000.

Information to be included is listed below with suggested conventions (shown at 1:5,000 scale).

INFORMATION

- Residential areas
- Commercial/light industrial areas
- Industrial areas
- Open spaces/community facilities
- Streets/parking areas
- Rapid transit routes
- Bus routes
- Water areas

CONVENTION

Community facilities commonly found are listed below with suggested designations (shown at 1:5,000 scale).

Health H
Post Office PO
Social Services SS
Parking Pk
Police P
Fire Department F
School S
Church Ch
Recreation R
Library L
University U
LAND USE: A concentration of light industry and a hospital complex border the south side of the locality, but there are also scattered industrial buildings in other sections; commerce is concentrated along the four main through streets. There are a large number of community facilities in the area—the survey shows 26 churches and 12 schools.

[Diagram showing land use pattern with areas marked as residential, commercial, and industrial. Key: Pk Parking, P Police, F Fire Department, S School, Ch Church, R Recreation, L Library, U University, H Health, PO Post Office, SS Social Services, Bus, Rapid Transit.]
**LOCALITY CIRCULATION PATTERN**: plan of a locality showing its vehicular and pedestrian routes or ways.

Circulation ways can be classified according to "modes" of use as follows:
- **Pedestrians only**: paths, walkways, etc.
- **Pedestrians (dominant) and Vehicles**: residential streets, minor streets, etc.
- **Vehicles and Pedestrians**: collector streets, secondary streets, etc.
- **Vehicles (dominant) and Pedestrians**: minor arterials, primary streets, etc.
- **Vehicles only**: major arterials, expressways, etc.

It is recommended that the plan be drawn at a scale of 1:5,000 and reduced in half to 1:10,000.

Information to be included is listed below with suggested conventions (shown at 1:5,000 scale).

**INFORMATION**

**CONVENTION**

- **Vehicular**
  - Major arterials
  - Minor arterials
  - Collector streets
  - Residential streets

- **Pedestrian**
  - Heavy
  - Moderate
  - Light

- **Railroads**

- **Water areas**

**EXAMPLE KEY**

<table>
<thead>
<tr>
<th>Description</th>
<th>Convention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrians</td>
<td>Lk</td>
</tr>
<tr>
<td>Vehicular</td>
<td>LD</td>
</tr>
<tr>
<td>Heavy</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td></td>
</tr>
<tr>
<td>Railroads</td>
<td></td>
</tr>
<tr>
<td>Water areas</td>
<td></td>
</tr>
</tbody>
</table>
CIRCULATION: Major, limited-access highways bound three sides of the locality separating the locality from the city's central business district. The fourth side is bounded by a main local and vicinal circulator that serves as a meshing line with the adjacent community. The important locality circulation is along parallel streets that run the length of the locality. The secondary circulation is along the cross streets.
LOCALITY SEGMENTS

LOCALITY SEGMENT - a 400 meter by 400 meter area taken from and representing the residential character and layout of a locality.

The locality segment also represents the environment/area around a dwelling that is cognizable and used by the dwelling occupants because it contains facilities that are accessible by walking: schools, playgrounds, shops, bus stops, etc.

PURPOSES:
-to illustrate dwelling/land systems in relation to pedestrian environment (400 meters represents a six minute walk);
-to allow comparison of localities in terms of the same size and shape.

SELECTION CRITERIA: segments should be:
-typical or representative layouts;
-representative of residential and community facility areas.

CONTENTS:
Ld Descriptions (locality): POPULATION, INCOME
Lg Graphs: LOCALITY POPULATION DISTRIBUTION, LOCALITY ANNUAL INCOME DISTRIBUTION
SA LOCALITY SEGMENT AIR PHOTOGRAPH
SP LOCALITY SEGMENT PLAN
Le Charts: LOCALITY CONSTRUCTION TYPES, LOCALITY COMMUNITY FACILITIES, LOCALITY UTILITIES AND SERVICES

EXAMPLE KEY

Ld Descriptions: brief paragraph covers each of the following aspects of a locality:
-POPULATION: significant age-sex characteristics, population size, etc.
-INCOME: average household income, locality average relative to urban average, significant observations, etc.

Lg Graphs: the following aspects of a locality's population are illustrated:
LOCALITY POPULATION DISTRIBUTION: two stepping curves show percentages of males and females by age group in the same manner as URBAN POPULATION DISTRIBUTION.
Horizontal scale represents percentages (0 to 25% of the total male population on the left; 0 to 25% of females on the right);
Vertical represents ages (0 to 90 years in five year increments).
Include source, date; and total population.

LOCALITY ANNUAL INCOME DISTRIBUTION: bars show percentages of the population within major income ranges in the same manner as URBAN ANNUAL INCOME DISTRIBUTION.
Horizontal scale represents percentages (0 to 50% of the total population);
Vertical represents annual household income (0 to 25,000 dollars U.S.).
Include source, date; and total number of households.
POPULATION: Sixty percent of the 3,262 persons registered in the 1960 census were males with an average age of forty-five years; the 40 percent female population had an average age of forty-seven years (the largest of the five-year age groups was that of sixty-five to fifty-nine).

INCOME: The average household income in 1960 was U.S.$2,284—30 percent of the average for the Boston metropolitan area. No households with incomes of over $8,000 were registered.
**LOCALITY SEGMENT PLAN:** shows streets, land subdivision, and building masses.

It is recommended that the plan be drawn at a scale of 1:1,250 and reduced in half to 1:2,500. If city maps are not available, the plan could be traced from the **LOCALITY SEGMENT AIR PHOTOGRAPH.**

Information to be included is listed below with suggested drawing conventions (shown at 1:1,250 scale).

<table>
<thead>
<tr>
<th>INFORMATION</th>
<th>CONVENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Buildings</td>
<td></td>
</tr>
<tr>
<td>-Street curbs</td>
<td></td>
</tr>
<tr>
<td>-Lot lines (where possible)</td>
<td></td>
</tr>
<tr>
<td>-Contour lines (interval varies with relief: 1 or 5m)</td>
<td></td>
</tr>
<tr>
<td>-Water edge</td>
<td></td>
</tr>
<tr>
<td>-Water areas</td>
<td></td>
</tr>
<tr>
<td>-Selected LOCALITY BLOCK</td>
<td></td>
</tr>
</tbody>
</table>

**LOCALITY CONSTRUCTION TYPES:** two bar charts show (1) the approximate percentage of each construction type within the total number of dwellings and (2) the building group that generally produces each type.

Vertical scales are the same for both charts representing construction types (SHACK, MUD-WATTLE, WOOD, MASONRY-WOOD, MASONRY-CONCRETE, CONCRETE).

Horizontal scales represent:
- First chart: percentages (0 to 100% of the total number of dwellings);
- Second chart: building groups (SELF-HELP, ARTISAN, SMALL CONTRACTOR, LARGE CONTRACTOR).

Include quality of information:
- Tentative: when based upon rough estimations of limited sources.
- Approximate: when deducted from different and/or not completely reliable sources.
- Accurate: when taken from reliable or actual sources.

**LOCALITY COMMUNITY FACILITIES; LOCALITY UTILITIES AND SERVICES:** bar charts show their approximate availability.

Vertical scale lists community facilities (POLICE; FIRE PROTECTION; HEALTH; SCHOOLS; PLAYGROUNDS; RECREATION, OPEN SPACES) and utilities and services (WATER; SEWERAGE; STORM DRAINAGE; ELECTRICITY; GAS; REFUSE COLLECTION; PUBLIC TRANSPORTATION; PAVED ROADS, WALKWAYS; TELEPHONE; STREET LIGHTING).

Horizontal scale represents availability of community facilities, utilities, and services in the following manner:

- **NONE:** when facilities/utilities/services are unavailable to a locality.
- **LIMITED:** when facilities/utilities/services are available to but inadequate for a locality.
- **ADEQUATE:** when facilities/utilities/services are available to, of sufficient capacity for a locality.

Include quality of information as above.
CASE STUDIES (EXAMPLE FROM URBAN DWELLING ENVIRONMENTS)

LOCALITY CONSTRUCTION TYPES

<table>
<thead>
<tr>
<th>LOCALITY</th>
<th>CONSTRUCTION TYPES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOUTH END, BOSTON</td>
<td></td>
</tr>
</tbody>
</table>

The chart shows (1) the percentage of each construction type within the total number of dwellings and (2) the building group that generally produces each type.

Quality of information: Approximate

LOCALITY COMMUNITY FACILITIES

POLICE
FIRE PROTECTION
HEALTH
SCHOOLS, PLAYGROUNDS
RECREATION, OPEN SPACES

LOCALITY UTILITIES AND SERVICES

WATER SUPPLY
SANITARY SEWERAGE
STORM DRAINAGE
ELECTRICITY
GAS
REFUSE COLLECTION
PUBLIC TRANSPORTATION
PAVED ROADS, WALKWAYS
TELEPHONE
STREET LIGHTING

The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.

Quality of information: Approximate

LOCALITY SEGMENT PLAN

1:2500
LOCALITY BLOCKS

BLOCK - a primarily residential area bounded and served by public streets, walkways.

PURPOSES:
- to illustrate dwelling/land systems in relation to immediate environment;
- to illustrate subdivision of and physical controls on land which indicate its utilization;
- to facilitate comparison of dwelling/land systems in terms of areas, densities, and network efficiency.

SELECTION CRITERIA: blocks should be:
- homogeneous residential sectors where lots are similar in area;
- typical or representative layouts;
- bounded on all sides by public streets, walkways (if possible).

CONTENTS:
BP LOCALITY BLOCK PLAN
Bd LOCALITY BLOCK LAND UTILIZATION DATA:
BLU LOCALITY BLOCK LAND UTILIZATION
LUd LAND UTILIZATION DIAGRAMS: PATTERN, PERCENTAGES, DENSITY

EXAMPLE KEY

BP LOCALITY BLOCK PLAN: records land subdivision information (buildings, circulation, lot lines, physical controls, etc.).

It is recommended that the plan be drawn at a scale of 1:500 and reduced in half to 1:1,000.

Information to be included is listed below with suggested drawing conventions (shown at 1:500 scale).

INFORMATION

- BLOCK buildings
- Other buildings
- Lot lines between attached BLOCK buildings
- Lot lines not physically defined
- Walls, fence lines
- Trees, hedgerows
- Street curbs
- Contour lines (1 meter interval)
- Measurement limits (center line of streets, walkways)

CONVENTION

ARRAS: measured from the LOCALITY BLOCK LAND UTILIZATION indicating maintenance responsibility and user control (see explanation on following page).

The areas are listed in Hectares, Percentages.

NETWORK EFFICIENCY: determined by the ratio (R) of network length to area(s) served and measured in meters per hectare. R varies inversely to layout efficiency; a smaller R indicates a greater efficiency. R and average lot area (eg m) are listed.

PROCEDURES for computation of ratio (R) follows:

A. Where blocks are bounded by streets, walkways:
1) Measure the network length (streets, walkways) counting 1 length when they serve lots on both sides and 1/2 when they serve lots along block boundaries;
2) Measure block area from center line of bounding streets, walkways;
3) Divide: network length = R block area

B. Where blocks cannot be identified, R can be computed from a typical lot (see diagram below):

1) Divide: network length (1/2 lot width) = R1
2) Divide: length of connector per lot
   no. of lots between connectors
3) Divide: length of connector per lot
   length of connector per lot
4) Add: R1 + R2 = R

C. Where neither blocks nor lots can be identified, the R is not measurable.

LOCALITY BLOCK PLAN

LOCALITY BLOCK LAND UTILIZATION DATA

<table>
<thead>
<tr>
<th>DENSITIES</th>
<th>Total Number</th>
<th>Area Hectares</th>
<th>Density N/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOTS</td>
<td>69</td>
<td>1.92</td>
<td>35.94</td>
</tr>
<tr>
<td>DWELLING UNITS</td>
<td>276</td>
<td>1.92</td>
<td>143.75</td>
</tr>
<tr>
<td>PEOPLE</td>
<td>460</td>
<td>1.92</td>
<td>239.58</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AREAS</th>
<th>Hectares</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC (streets, walkways, open spaces)</td>
<td>0.77</td>
<td>40</td>
</tr>
<tr>
<td>SEMI-PUBLIC (open spaces, schools, community centers)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PRIVATE (dwellings, shops, factories, lots)</td>
<td>1.15</td>
<td>60</td>
</tr>
<tr>
<td>SEMI-PRIVATE (cluster courts)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1.92</td>
<td>100</td>
</tr>
</tbody>
</table>

NETWORK EFFICIENCY

\[ R = \frac{\text{network length (circulation)}}{\text{areas served (circulation, lots)}} \]

\[ = \frac{338 \text{ m}^2}{167 \text{ m}^2} \]
LUd LAND UTILIZATION DIAGRAMS: illustrate land utilization relationships within a locality. Each diagram represents one hectare within a 4cm x 4cm square. It is recommended that the following diagrams be drawn within 8cm x 8cm squares and reduced, allowing conventions shown for LOCALITY BLOCK LAND UTILIZATION to be used:

PATTERN: a one hectare sample selected from the LOCALITY SEGMENT PLAN (scale 1:2,500) illustrating land utilization in relation to buildings, subdivision. It should be a typical/representative layout. Use LOCALITY BLOCK LAND UTILIZATION conventions and show buildings, street curbs, and physical controls. Include a key showing all land utilization tones.

PERCENTAGES: a one hectare diagram showing percentages of land utilization measured in LOCALITY BLOCK LAND UTILIZATION DATA: AREAS. Use LOCALITY BLOCK LAND UTILIZATION conventions in the diagram to graphically represent the percentages (buildings are considered private land utilization). Include a key showing all land utilization areas and percentages. Display percentages in the following manner (tones shown before reduction):

PRIVATE: (dwellings, lots)
SEMI-PRIVATE: (cluster courts)
SEMI-PUBLIC: (open spaces, playgrounds)
PUBLIC: (streets, walkways, open spaces)

DENSITY: a one hectare diagram representing density (persons per hectare) measured in LOCALITY BLOCK LAND UTILIZATION: DENSITIES. Dots representing 20 persons are arranged uniformly within the square. Include a key showing the population density.
LOCALITY BLOCK LAND UTILIZATION

LAND UTILIZATION DIAGRAMS

PATTERN
Public: streets/walkways
Semi-Public: playgrounds
Semi-Private: cluster courts
Private: lots
dwellings

PERCENTAGES
Streets/Walkways 40%
Playgrounds -
Cluster Courts -
Dwellings/lots 60%

DENSITY
Persons/Hectare
240

0 10 50m
1:1000
TYPICAL DWELLINGS

DWELLING - the general, global designation of a building/shelter, containing one or more dwelling units in which people live.

PURPOSES:
- to illustrate dwellings in relation to lot/land;
- to describe dwelling/land systems in terms of physical and socio-economic components;
- to facilitate comparison of dwelling/land systems in terms of user income and physical data.

SELECTION CRITERIA: dwellings should be:
- typical of the physical system being described;
- typical in terms of users.

Within a single locality several dwellings may be considered typical. In these cases more than one typical dwelling is included as follows.

CONTENTS:
DP TYPICAL DWELLING
Dp Photographs
Dpd PHYSICAL DATA
Dsd SOCIO-ECONOMIC DATA
Cs CASE STUDY SOURCES

DP TYPICAL DWELLING: plan, section, and elevation showing the uses of spaces by furniture layout.

It is recommended that the plans be drawn at a scale of 1:100 and reduced in half to 1:200.

Information to be included is listed below with suggested drawing conventions (shown at 1:100 scale).

INFORMATION
CONVENTION

PLAN
-Dwelling walls: Shack
Mud-wattle
Rough wood
Masonry/concrete/finished wood

-All other lines
-Furniture
-Street curbs
-Section indicator
-Entrance arrow

SECTION
-Section cuts

ELEVATION
-All other lines

CASE STUDIES
Label all rooms/areas on each plan with the suggested plan symbols listed below (shown at 1:100 scale).

Living Room LR
Dining/Eating Area D
Bedroom BR
Kitchen/Cooking Area K
Laundry L
Toilet/Bathroom T
Closet/Storage C
Room (multi-use) R

EXAMPLE KEY

Living Room LR
Dining/Eating Area D
Bedroom BR
Kitchen/Cooking Area K
Laundry L
Toilet/Bathroom T
Closet/Storage C
Room (multi-use) R

16 17
Dp Dpd Dsd Cs

DP

Dp

Dp

Dpd

Dsd

Cs

(36) CASE STUDIES
SOUTH END, BOSTON

EXAMPLE FROM URBAN DWELLING ENVIRONMENTS

SECTION

DWELLINGS AND LAND

ELEVATION

PLAN

TYPICAL DWELLING

LR Living Room
D Dining/Eating Area
BR Bedroom
K Kitchen/Cooking Area
L Laundry
T Toilet/Bathroom
C Closet/Storage
R Room (multi-use)

0 1 5 10m
1:200
**Photographs:** typical dwelling can be shown using views which describe its location in relation to others, its lot/land, and its relation to streets.

**PHYSICAL DATA:** describes the physical environment of a typical dwelling.

Data to be included is listed below with specified options (shown in capital letters) and/or requested information (shown in parentheses). Options are defined in glossary.

<table>
<thead>
<tr>
<th>DATA</th>
<th>OPTIONS/INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>-Dwelling Unit</strong></td>
<td></td>
</tr>
<tr>
<td>type: ROOM/APARTMENT/HOUSE/SHANTY</td>
<td></td>
</tr>
<tr>
<td>area (sq m): (total floor area)</td>
<td></td>
</tr>
<tr>
<td>tenure: LEGAL RENTAL/LEGAL OWNERSHIP</td>
<td></td>
</tr>
<tr>
<td><strong>-Land/Lot</strong></td>
<td></td>
</tr>
<tr>
<td>utilization: PUBLIC/SEMI-PUBLIC/PRIVATE/SEMI-PRIVATE</td>
<td></td>
</tr>
<tr>
<td>area (sq m): (private, semi-private area)</td>
<td></td>
</tr>
<tr>
<td>tenure: EXTRALEGAL: RENTAL/OWNERSHIP/LEGAL: RENTAL/OWNERSHIP</td>
<td></td>
</tr>
<tr>
<td><strong>-Dwelling location:</strong> CITY CENTER/INNER RING/PERIPHERY</td>
<td></td>
</tr>
<tr>
<td>type: DETACHED/SEMI-DETACHED/(ROW/GROUPED)/WALK-UP/HIGH-RISE</td>
<td></td>
</tr>
<tr>
<td>no. of floors: (number)</td>
<td></td>
</tr>
<tr>
<td>utilization: SINGLE/MULTIPLE, INDIVIDUAL/FAMILY</td>
<td></td>
</tr>
<tr>
<td>physical state: BAD/FAIR/GOOD</td>
<td></td>
</tr>
<tr>
<td><strong>-Dwelling Development mode:</strong> INCREMENTAL/INSTANT</td>
<td></td>
</tr>
<tr>
<td>developer: POPULAR/PUBLIC/PRIVATE</td>
<td></td>
</tr>
<tr>
<td>builder: SELF-HELP/ARTISAN/SMA</td>
<td></td>
</tr>
<tr>
<td>CONTRACTOR/LARGE CONTRACTOR</td>
<td></td>
</tr>
<tr>
<td>constr. type: SNACK/MUD-WATTLE/WOOD/MASONRY-WOOD/MASONRY-CONCRETE/CONCRETE</td>
<td></td>
</tr>
<tr>
<td>year of constr.: (year dwelling was built)</td>
<td></td>
</tr>
<tr>
<td><strong>-Materials foundations:</strong> (structural)</td>
<td></td>
</tr>
<tr>
<td>floors: (flooring, structural)</td>
<td></td>
</tr>
<tr>
<td>walls: (infill, structural)</td>
<td></td>
</tr>
<tr>
<td>roof: (roofing, structural)</td>
<td></td>
</tr>
<tr>
<td><strong>-Dwelling Facilities</strong></td>
<td></td>
</tr>
<tr>
<td>wc: (number per dwelling unit)</td>
<td></td>
</tr>
<tr>
<td>shower: (number per dwelling unit)</td>
<td></td>
</tr>
<tr>
<td>kitchen: (number per dwelling unit)</td>
<td></td>
</tr>
<tr>
<td>rooms: (number per dwelling unit)</td>
<td></td>
</tr>
<tr>
<td>other: (list others as applicable)</td>
<td></td>
</tr>
</tbody>
</table>

**SOCIO-ECONOMIC DATA:** describes the users of a typical dwelling.

Data to be included is listed below with specified options (shown in capital letters) and/or requested information (shown in parentheses). Options are defined in glossary.

<table>
<thead>
<tr>
<th>DATA</th>
<th>OPTIONS/INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General: Social</strong></td>
<td>(for household head)</td>
</tr>
<tr>
<td>ethnic origin: (nationality/race/clan/etc.)</td>
<td></td>
</tr>
<tr>
<td>place of birth: (city, state/country)</td>
<td></td>
</tr>
<tr>
<td>education level: (none/primary school/secondary school/business college/university/etc.)</td>
<td></td>
</tr>
<tr>
<td><strong>-Number of Users</strong></td>
<td></td>
</tr>
<tr>
<td>married: (number in typical unit)</td>
<td></td>
</tr>
<tr>
<td>single: (number adults in unit)</td>
<td></td>
</tr>
<tr>
<td>children: (number in typical unit)</td>
<td></td>
</tr>
<tr>
<td>total: (number in typical unit)</td>
<td></td>
</tr>
<tr>
<td><strong>-Migration Pattern</strong></td>
<td></td>
</tr>
<tr>
<td>no. of moves: (number by household head)</td>
<td></td>
</tr>
<tr>
<td>rural - urban: (date moved to city)</td>
<td></td>
</tr>
<tr>
<td>urban - urban: (dates of intra-urban moves)</td>
<td></td>
</tr>
<tr>
<td>urban - rural: (date moved to rural area)</td>
<td></td>
</tr>
<tr>
<td>why came to city:</td>
<td></td>
</tr>
<tr>
<td><strong>-General: Economic</strong></td>
<td></td>
</tr>
<tr>
<td>income group: VERY LOW/LOW/MODERATE/MIDDLE/HIGH</td>
<td></td>
</tr>
<tr>
<td>employment: (household head's job/trade)</td>
<td></td>
</tr>
<tr>
<td>distance to work: (in kilometers)</td>
<td></td>
</tr>
<tr>
<td>mode of travel: (means of transport to work)</td>
<td></td>
</tr>
<tr>
<td><strong>-Costs</strong></td>
<td></td>
</tr>
<tr>
<td>dwelling unit: (amount in dollars U.S.)</td>
<td></td>
</tr>
<tr>
<td>land value: (dollar amount per Hectare)</td>
<td></td>
</tr>
<tr>
<td><strong>-Dwelling Unit Payments</strong></td>
<td></td>
</tr>
<tr>
<td>financing: SELF-FINANCED/(PRIVATE/PUBLIC FINANCED)/PUBLIC SUBSIDIZED</td>
<td></td>
</tr>
<tr>
<td>rent/mortgage: (dollar amount per month)</td>
<td></td>
</tr>
<tr>
<td>% income spent: (percentage)</td>
<td></td>
</tr>
</tbody>
</table>

**CASE STUDY SOURCES:** list for each locality, locality segment, locality block, and typical dwelling plan; physical data; socio-economic data; photographs; and general information.

Sources are listed by title and publication date as are URBAN CONTEXT SOURCES.

Quality of information given in the plans and data should be included as in URBAN CONTEXT SOURCES.
**Case Study Sources:**

Locality Block Plan: (approximate) Field Survey, Bruce Gavin, 1967.
Locality Block Land Utilization: (approximate) inferred from plan, Harris Associates, 1965.
EVALUATIONS

PHYSICAL DATA MATRIX

PHYSICAL DATA MATRIX - a summary of dwelling and land data described for each case study locality.

PURPOSES:
- to provide a comprehensive view of the urban area's dwelling types;
- for comparison and determination of housing trends/patterns;
- for reference in policy decisions relating to housing programs.

CONTENTS:
PM PHYSICAL DATA MATRIX
PMc Comments/Observations

---

PM PHYSICAL DATA MATRIX: table in which the PHYSICAL DATA (see pp. 38-39) from each case study locality is systematically arranged for ready reference.

Case study localities are listed in order by user income groups from lowest to highest. The cases are then grouped into categories by dwelling/land system. Include the number of people (population) and percentage of total urban population using each category. The ten categories shown in the adjacent example were identified as follows:

CATEGORY/INCOME
A V.LOW-LLOW-M.LOW
B LOW-M.LOW
C LOW
D MIDDLE
E MIDDLE
F MIDDLE
G MIDDLE-HIGH
H HIGH
I MIDDLE-HIGH
J MIDDLE-HIGH

Matrix contains a separate column for each data group/set of options as shown. Data is recorded within these columns by blackening the appropriate box.

Data to be included is listed below with specified options (shown in capital letters) and specified information (shown in parenthesis).

DATA OPTIONS/INFORMATION
-User income: VERY LOW/LOW/MODERATE/MIDDLE/HIGH
-Dwelling Unit type: SHANTY/ROOM/APARTMENT/HOUSE
-area: 50 SQ M OR LESS/51-100 SQ M/101 SQ M OR MORE
-tenure: LEGAL RENTAL/LEGAL OWNERSHIP
-rent/mortgage: 20% OR LESS OF INCOME/21% OR MORE OF INCOME
-Land/Lot utilization: PUBLIC/SEMI-PUBLIC/Private/SEMI-PRIVATE
-area (sq m): (private, semi-private area)
-tenure: EXTRALEGAL/RENTAL/OWNERSHIP/LEGAL/RENTAL/OWNERSHIP

PMc Comments/Observations: provide for each numbered column of the matrix. They should include: explanations of data which cannot be accommodated within the matrix, observations of patterns/trends/exceptions/special cases in the data, reasons/conclusions for the observed patterns, etc. See example comments/observations included below.

(7) DWELLING UNIT AREA: Three divisions of areas are considered: a) less than 50m²; b) 50 to 100m²; and c) 101m² or more. The expected pattern is followed: the larger the area, the larger the income.

In the lower income groups, the dwelling usually consists of one room only, while in the higher income strata a full complement of spaces in the dwelling is provided. The dwelling unit areas range from 12m² (MAHATRE VALLEY - 1 room) to a high of 166m² (MOODLEY-FIBERA - 3 bedrooms, living room, kitchen, bathroom, servants' quarters). The small areas of the low income people are a result of the limited financial resources (Note BAHATI 17m²) or from limited construction resources of the squatters in constructing their dwellings (Note KARURA VILLAGE 41m²). In 1964, 80% of the dwellings were of one room (U.N. Report. 1964).
# Evaluations

## Physical Data Matrix

<table>
<thead>
<tr>
<th>Localities</th>
<th>Population per Category</th>
<th>% of Total Population</th>
<th>User</th>
<th>Dwelling Unit</th>
<th>Land/Lot</th>
<th>Dwelling</th>
<th>Dwelling Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 1. Dagoretti</td>
<td>42,000</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B 1. Kirinyaga Village</td>
<td>181,000</td>
<td>36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C 1. Karura Village</td>
<td>26,000</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D 1. Mathare Valley</td>
<td>118,000</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E 1. Kariobangi</td>
<td>1,800</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F 1. Upper Hill</td>
<td>32,000</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G 1. Kariobangi South</td>
<td>1,500</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H 1. Quayara Road (Det.)</td>
<td>13,000</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I 1. Quayara Road</td>
<td>31,000</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J 1. Woodley - Ribeira</td>
<td>31,000</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K 1. Woodley</td>
<td>31,000</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L 1. Parklands</td>
<td>31,000</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M 1. Parklands (Det.)</td>
<td>31,000</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>509,300</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: (1) = Constructed (2) = Provided (NA = Not Applicable)
COMMUNITY FACILITIES, UTILITIES/SERVICES MATRIX

COMMUNITY FACILITIES, UTILITIES/SERVICES MATRIX - a summary of availability of facilities, utilities/services described for each case study locality.

COMMUNITY FACILITY - something that is built/established to serve some community need (school: education; police: order/protection; etc.).

UTILITY/SERVICE - the organization and/or infrastructure for meeting the general need (as for water supply, wastewater removal, electricity, etc.) in the public interest.

PURPOSES:
- to provide a comprehensive view of the availability of an urban area's facilities and utilities/services;
- to compare availability of these with respect to income level.

CONTENTS:
CM COMMUNITY FACILITIES, UTILITIES/SERVICES MATRIX
CMc Comments/Observations

CM COMMUNITY FACILITIES, UTILITIES/SERVICES MATRIX: table in which the availabilities of LOCALITY COMMUNITY FACILITIES and LOCALITY UTILITIES AND SERVICES (see pp. 30-31) are systematically arranged for ready reference.

Case study localities are listed in the same order by income level, are grouped in the same categories by dwelling/land system, and include the same number of people and percentage of total population using each category as is shown in the PHYSICAL DATA MATRIX.

Availability of each community facility/utility/service to the case studies is illustrated by a bar chart. Each bar represents availability in the following manner:

- NONE: when facilities/utilities/services are unavailable to a locality.
- LIMITED: when facilities/utilities/services are available to but inadequate for a locality.
- ADEQUATE: when facilities/utilities/services are available to, of sufficient capacity for a locality.

WATER: Availability is considered "none" where there is no provision at all; "limited" where the service is limited or occasional; and "adequate" where there is adequate or normal service.

The availability of water is directly related to income sector:

Cases rating "limited" (localities 1 through 5) are from the very low and low income sectors, comprising approximately 132,500 people or 26% of the population of Nairobi. Generally, these cases are served by public standpipes or trucked water with the result that water consumption in very low income areas averages 4 gallons per capita per day (gpcd).

Cases rating "adequate" (localities 6 through 20) are from the middle and high income sectors, comprising approximately 376,800 people or 74% of the population of Nairobi. Generally, these cases are served by water systems that are piped either directly into dwelling units or to semi-private outlets immediately adjacent to dwellings. As a result water consumption in high income areas averages 6 gpcd (NCC Report, 1971).
### Community Facilities, Utilities/Services Matrix

#### Locality

<table>
<thead>
<tr>
<th>Category</th>
<th>Population per Category</th>
<th>% of Total Population</th>
<th>Locality</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>42,000</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>181,000</td>
<td>36</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>26,000</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>D</td>
<td>118,000</td>
<td>23</td>
<td>4</td>
</tr>
<tr>
<td>E</td>
<td>1,800</td>
<td>.4</td>
<td>5</td>
</tr>
<tr>
<td>F</td>
<td>32,000</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>G</td>
<td>1,500</td>
<td>.3</td>
<td>7</td>
</tr>
<tr>
<td>H</td>
<td>13,000</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>I</td>
<td>31,000</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>J</td>
<td>63,000</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>509,000</td>
<td>100</td>
<td>11</td>
</tr>
</tbody>
</table>

#### Community Facilities

- Police
- Fire Protection
- Health
- Schools, Playgrounds
- Recreation
- Water
- Sewerage
- Storm Drainage
- Electricity
- Gas
- Refuse Collection
- Public Transportation
- Paved Roads, Walkways
- Telephone
- Street Lighting

#### Utilities and Services

- [Diagram representation of utilities and services]
LAND UTILIZATION:
PATTERNS,
PERCENTAGES,
DENSITIES

LAND UTILIZATION: PATTERNS, PERCENTAGES, DENSITIES - a summary of residential land utilization in an urban area.

PURPOSES:
-to illustrate land utilization relationships within each case study environment and among different environments;
-to graphically compare the environments in terms of patterns, percentages, and densities.

CONTENTS:
LUc Comments
LUd Diagrams: PATTERNS, PERCENTAGES, DENSITIES

LUc Comments: brief paragraph covers the land utilization percentages and density of each case study environment. Include comments/observations regarding the consequences and/or potentials of each. List cases similar to each in terms of land utilization and layout for comparison.

LUd Diagrams: illustrate the land utilization relationships (PATTERNS, PERCENTAGES, DENSITIES) for all case studies within 4cm x 4cm squares, each of which represents one hectare.

It is recommended that the diagrams be drawn within 8cm x 8cm squares and reduced. Use the same diagrams as described in LAND UTILIZATION DIAGRAMS (see pp. 34-35) and arrange as shown. Up to ten cases can be shown on facing pages in this manner.

EXAMPLE KEY

(44) EVALUATIONS
LAND UTILIZATION:
PATTERNS, PERCENTAGES, DENSITIES

1 DAGORETTI
Rooms: private traditional
Low percentage of land for streets and walkways: high percentage of land for lots. Despite these percentages, DAGORETTI is a burden to the municipality because of low population density. The low income settlers are unable to pay for utilities and services. Similar cases: none.

2 KIRINYAGA VILLAGE
Shanties: popular temporary
Land for public utilization constitutes only open spaces. All the land with private utilization is the sheltered area. In addition, high population density aggravates the very poor living conditions of KIRINYAGA VILLAGE. Similar cases: 3, 4, 6.

3 KARURA VILLAGE
Shanties: popular temporary
Land for public utilization constitutes only open spaces. All the land with private utilization is the sheltered area. In addition, high population density aggravates the very poor living conditions of KARURA VILLAGE. Similar cases: 2, 4, 6.

4 MATHARE VALLEY
Rooms: private tenements
Land for public utilization constitutes only open spaces. All the land with private utilization is the sheltered area. In addition, high population density aggravates the very poor living conditions of MATHARE VALLEY. Similar cases: 2, 3, 6.

5 KAWANGWARE
Rooms: private tenements
Low percentage of land for streets and walkways; no land for public open spaces; high percentage of land for lots; high population density. KAWANGWARE will be an optimum settlement in terms of land utilization if adequate public open spaces are provided nearby. Similar cases: 9, 10.
LAND UTILIZATION: OPTIMUM RANGES

LAND UTILIZATION: OPTIMUM RANGES - a comparison, evaluation of case studies from an urban area in terms of land utilization percentages and residential population density.

PURPOSES:
-to evaluate the effectiveness of existing residential land utilization;
-to facilitate the formulation of urban residential land policies.

CONTENTS:
LUg Graphs: PUBLIC, SEMI-PUBLIC, PRIVATE
LUs Summaries: PUBLIC, SEMI-PUBLIC, PRIVATE

LUg Graphs: case studies are compared and evaluated in relation to three "Optimum Percentages" of land utilization (PUBLIC, SEMI-PUBLIC, PRIVATE) and a "Desired/Acceptable Gross Density Range." Each case study, represented by a numbered dot, is plotted on the three graphs in terms of its land utilization percentages and population density measured in LOCALITY BLOCK LAND UTILIZATION DATA: AREAS, DENSITIES (see pp. 32–33).

Vertical scales represent PUBLIC, SEMI-PUBLIC, PRIVATE land utilization percentages (0 to 100% of the total block area for each); Horizontal scale is the same for all graphs representing residential population density (0 to 2000 persons per hectare on a logarithmic scale); Shaded area is the same for all graphs representing a "Desired/Acceptable Gross Density Range" (300 to 600 persons per hectare based upon case studies and accepted zoning standards in different urban contexts in developing countries).

Curves represent "Optimum Percentages" of land utilization (based upon case studies in Latin America and U.S.A., they can be considered a universal basis for evaluating land utilization percentages). The curves show:

PUBLIC: optimum percentages (20 to 30% of the total block area for streets, walkways, open spaces) which increase slightly with density.

SEMI-PUBLIC: optimum percentages (3 to 31% of the total block area for open spaces, playgrounds, open spaces, etc.) which increase considerably with density.

PRIVATE: optimum percentages (77 to 39% of the total block area for dwellings, lots) which decrease considerably with density. Areas of Semi-Private utilization (cluster courts) may be considered Private utilization for purposes of this evaluation.

Any case study near all three curves and within the shaded density area can be considered optimum in terms of land utilization.

LUs Summaries: (example is continued on the following page) case studies are evaluated in relation to the optimum percentage curves in the following manner:

PUBLIC:
Cases above the curve have higher than optimum percentages of land devoted to streets, walkways, open spaces and are therefore a burden to the municipal government in terms of land, construction, maintenance, and operation; Cases below the curve have less than optimum public percentages and may still be a burden to the municipality when they serve areas of less than desired density.

SEMI-PUBLIC:
Cases above the curve have higher than optimum percentages of land devoted to open spaces, playgrounds, schools, etc. and are therefore a burden to the municipal government as with PUBLIC; Cases below the curve have less than optimum semi-public percentages and therefore have generally inadequate areas for supporting facilities.

PRIVATE:
Cases above the curve have higher than optimum percentages of land devoted to dwellings, lots and therefore yield more taxable land for the support of public areas, facilities; Cases below the curve have less than optimum private percentages and therefore may have less than adequate private areas; Cases above and below the curve having densities lower than the desired range may be a burden to the municipal government in the provision, maintenance, and operation of utilities and services.

EXAMPLE KEY

(46) EVALUATIONS
LAND UTILIZATION: OPTIMUM RANGES

The three graphs shown are used to evaluate and compare the 20 case studies in terms of LAND UTILIZATION PERCENTAGES and RESIDENTIAL POPULATION DENSITY. Land utilization percentages are computed for the following areas:

1. PUBLIC: streets, walkways, open spaces.
2. SEMI-PUBLIC: open spaces.
3. PRIVATE: dwellings, lots.

Residential population density is the total number of persons per unit hectare. The range of desired/acceptable densities is 300 persons per Ha to 600 persons per Ha, based upon case studies and accepted zoning standards in different urban contexts in developing countries. This range can be achieved assuming that the dwelling development is of 1-3 stories, with an average built-up area of 10-20 m² per person and 35-35 percent of land/lot coverage.

**KEY**

- VERTICAL SCALE: Land utilization percentages (0 to 100%).
- HORIZONTAL SCALE: Residential population density (0 to 2,000 persons per Ha shown on logarithmic scale).
- CURVE: Range of optimum land utilization percentages (optimum values vary for different densities based upon case studies and accepted zoning standards in different contexts).
- SHADED AREA: Desired/optimum efficiency of land utilization (the intersection of desired/accepted residential population densities and desired/accepted land utilization percentages).
- NUMBERED DOTS: the Nairobi case studies.

**PUBLIC:** streets, walkways, open spaces. Areas within an urban layout used for pedestrian and vehicular circulation. The land has minimum physical controls and maximum public responsibility in initial purchase, development and maintenance. The CURVE shows optimum area percentages for streets, walkways, and open spaces. (20-30 %, based upon case studies in Latin America and in the U.S.A.) The percentage of street and walkway areas varies slightly with density.

**SEMI-PUBLIC:** open spaces. Areas within an urban layout used for supporting facilities and services. (Open spaces-playgrounds are the only supporting areas considered since the land utilization percentages are only based upon a small sector area) The land has partial or complete physical controls and public/user responsibility in development and maintenance. The CURVE shows optimum area percentages for open spaces. (3-31 %, based upon case studies in Latin America and in U.S.A.) The percentage of open spaces varies considerably with density.

**PRIVATE:** dwellings, lots. Areas within an urban layout used for residential and commercial use. The land has maximum physical controls and owner/tenant/user responsibility in development and maintenance. The CURVE shows optimum area percentages for dwellings and lots. (The range of optimum percentages of land for Public areas is 20-30% with 3-31% for Semi-Public areas; therefore, the remaining 77-39% of land is for private use.)
LAYOUT EFFICIENCY

LAYOUT EFFICIENCY - a comparison, evaluation of case study layouts from an urban area in terms of network efficiency and lot area.

PURPOSES:
- to evaluate the efficiency of existing residential layouts;
- to facilitate the formulation of urban residential land policies (subdivision).

CONTENTS:
LEg LAYOUT EFFICIENCY
LEs R-VALUE SUMMARY

LEg LAYOUT EFFICIENCY: graph shows the degree of efficiency of case study layouts in relation to an "Optimum R-Value Curve." Each case study, represented by a numbered dot, is plotted on the graph in terms of its network efficiency (R or R-Value) and average lot area computed in LOCALITY BLOCK LAND UTILIZATION DATA: NETWORK EFFICIENCY (see pp. 32-33).
Vertical scale represents R-Values (100 to 2000 meters per hectare on a logarithmic scale); Horizontal scale represents lot areas (0 to 4400 square meters, an upper limit for urban layouts); Curve represents "Optimum R-Values" (derived from lots: of different areas having a width to depth ratio of 1:4; served by streets, walkways bounding only the short dimension of the lot; and served by transverse connector streets at intervals of 150 meters).

LEs R-VALUE SUMMARY: table lists the degree of efficiency and comments on the efficiency of each case study. Cases above the curve have less than optimum efficiency; Cases below the curve have greater than optimum efficiency.

EXAMPLE KEY
LAYOUT EFFICIENCY

The urban layout is the physical configuration determined by the combination of networks of circulation and areas served. Networks of circulation (highways, streets, walkways) define the lines of distribution/collection of the utilities and services, and are publicly owned land. Areas served (lots, blocks) are usually privately owned land. The urban layout is a major economic determinant in the provision of utilities and services and their maintenance and operation.

The efficiency/effectiveness of a network is the ratio of the length of the network to the area(s) served:

\[ \text{Efficiency} = \frac{\text{Network length}}{\text{Area(s) served}} \]

The R-Value varies inversely to the network efficiency; a smaller R indicates a higher efficiency and vice versa. The layouts of the case studies have been evaluated in terms of network efficiency and are shown in the graph below. For further information on the R-Value see: "A Method for the Evaluation of Urban Layouts", INDUSTRIAL FORUM, Volume 3, Number 2, Montreal, December, 1971.

**R-VALUE SUMMARY**

<table>
<thead>
<tr>
<th>Cases</th>
<th>Degree of Efficiency</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 3</td>
<td>Very Inefficient</td>
<td>R-Value not measurable</td>
</tr>
<tr>
<td>4</td>
<td>Very Inefficient</td>
<td>Too frequent transverse streets (assumption: 1 room = 1 lot)</td>
</tr>
<tr>
<td>5</td>
<td>Very Inefficient</td>
<td>Lots served on two sides (assumption: 1 room = 1 lot)</td>
</tr>
<tr>
<td>6</td>
<td>Very Inefficient</td>
<td>Large lots, very low population density (not shown on graph)</td>
</tr>
<tr>
<td>7</td>
<td>Inefficient</td>
<td>Lots served on two sides</td>
</tr>
<tr>
<td>8</td>
<td>Inefficient</td>
<td>Lots served on two sides</td>
</tr>
<tr>
<td>9</td>
<td>Inefficient</td>
<td>Large lots, very low population density, inefficient lot proportions</td>
</tr>
<tr>
<td>10</td>
<td>Inefficient</td>
<td>Too frequent transverse streets, lots served on two sides</td>
</tr>
<tr>
<td>11, 12</td>
<td>Inefficient</td>
<td>Large lots, very low population density, inefficient lot proportions</td>
</tr>
<tr>
<td>13</td>
<td>Inefficient</td>
<td>Large lots, very low population density, inefficient lot proportions</td>
</tr>
<tr>
<td>14</td>
<td>Inefficient</td>
<td>Large lots, very low population density, inefficient lot proportions</td>
</tr>
<tr>
<td>15</td>
<td>Inefficient</td>
<td>Large lots, very low population density, inefficient lot proportions</td>
</tr>
<tr>
<td>16</td>
<td>Inefficient</td>
<td>Large lots, very low population density, inefficient lot proportions</td>
</tr>
<tr>
<td>17</td>
<td>Inefficient</td>
<td>Large lots, very low population density, inefficient lot proportions</td>
</tr>
<tr>
<td>18</td>
<td>Inefficient</td>
<td>Large lots, very low population density, inefficient lot proportions</td>
</tr>
<tr>
<td>19</td>
<td>Inefficient</td>
<td>Large lots, very low population density, inefficient lot proportions</td>
</tr>
<tr>
<td>20</td>
<td>Inefficient</td>
<td>Large lots, very low population density, inefficient lot proportions</td>
</tr>
</tbody>
</table>

**KEY**

VERTICAL SCALE: R-Value (efficiency values on logarithmic scale).
HORIZONTAL SCALE: Lot areas (m²).
CURVE: Optimum R-Value (the optimum values are derived from lots of different areas having a width to depth ratio of 1:4, a public street serving only the short dimension of the lot, and transverse streets at intervals of 150 meters).
NUMBER DOTS: the R-Values of the Nairobi case studies.
BACK MATTER

BACK MATTER - supplementary material which follows the text of a book.

Though normally requiring two pages, back matter is illustrated on the adjacent page by an abbreviated sample.

PURPOSES:
- to give the reader useful/additional information not included in the text;
- to provide the author a place to explain the language used;
- to contain the complete list of sources.

CONTENTS:
G1 GLOSSARY
Ab ABBREVIATIONS
Eq EQUIVALENTS
Bi BIBLIOGRAPHY

G1 GLOSSARY: a collection of terms used in the text, which are defined to clarify their use. It is a useful tool for the reader in understanding the exact meaning of these terms as used by the author. The terms are listed in alphabetical order.

Terms defined in the glossary are taken from USDDC files. Definitions of terms are included in the text when they are essential to the presentation/understanding of the subjects. Definitions of terms which are generally understood/accepted and not essential to the presentation/understanding of the subjects are included in the Glossary.

The criteria for the preparation of the definitions have been as follows:
- Third Preference: Definitions given by the authors. Used when existing sources were not appropriate/satisfactory.

Ab ABBREVIATIONS: included to define symbols or shortened forms of words or phrases used for brevity in the text.

Eq EQUIVALENTS: included as an aid for readers not familiar with the systems (measurement/monetary/etc.) used in the text. Include the METRIC SYSTEM EQUIVALENTS as shown. Monetary equivalents are generally expressed in relation to the U.S. dollar.

Bi BIBLIOGRAPHY: complete list of all sources arranged in alphabetical order. The sources should be listed title first to be consistent with the abbreviated URBAN CONTEXT SOURCES and CASE STUDY SOURCES.

EXAMPLE:
Glossary

**Glossary of Dwelling Construction Types:** Primary dwelling construction types and materials are grouped in the following categories:

**Shack**
- Roof: structure - sod, branches.
- Infill: thatch, mats, flattened tin cans, plastic or canvas sheets, cardboard and/or scrap wood.
- Walls: structure - sod, branches, poles, infill - thatch, mats, flattened tin cans, plastic or canvas sheets, cardboard, scrap wood, and/or mud.
- Floor: structure/infill - compacted earth.

**Mud and Straw Roof:** structure - wattle.
- Infill: thatch, flattened tin cans, or corrugated iron sheets.
- Walls: structure - wattle.
- Infill: mud.
- Floor: structure/infill - compacted earth.

**Wood Roof:** structure - wood rafters.
- Infill: thatch, flattened tin cans, or corrugated iron sheets.
- Walls: structure - wood frame.
- Infill: rough saw wood planks.
- Floor: structure/infill - compacted earth, wood joists, flooring.

**Masonry/ Roof:** structure - wood rafters.
- Infill: corrugated iron or asbestos sheets, or corrugated tin sheets.
- Walls: structure/infill - murram, stone, brick, block or tile masonry without columns.
- Floor: structure/infill - poured concrete slab on/off grade, wood joists, flooring.

**Concrete Roof:** structure/infill - poured reinforced concrete with tar and gravel, or terracotta tiles.
- Walls: structure/infill - murram, stone, brick, block or tile masonry without columns, or with columns for multi-story dwellings.
- Floor: structure/infill - poured concrete slab on/off grade.

**Concrete Floor:** structure/infill - poured or precast reinforced concrete with tar and gravel, or terracotta tiles.
- Walls: structure - poured or precast walls or frame.
- Infill - metal, wood, masonry, plastic.
- Floor: structure/infill - poured or precast concrete slab.

**Dwelling Builder:** Four groups are considered:

- Self-Help Built: where the dwelling unit is directly built by the user or occupant.
- Artisan Built: where the dwelling unit is totally or partially built by a skilled craftsman hired by the user or occupant; payments can be monetary or an exchange of services.
- Small Contractor Built: where the dwelling unit is totally built by a small organization hired by the user, occupant, or developer; 'small' contractor is defined by the scale of operations, financially and materially; the scale being limited to the construction of small quantities of similar units, or a singularly large complex.
- Large Contractor Built: where the dwelling unit is totally built by a large organization hired by a developer; 'large' contractor is defined by the scale of operations, financially and materially; the scale reflects a more comprehensive and larger size of operations encompassing the building of large quantities of similar units, or a singularly large complex.

**Equivalents**

**METRIC SYSTEM EQUIVALENTS**

<table>
<thead>
<tr>
<th>Linear Measures</th>
<th>Metric</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 centimeter</td>
<td>0.3937 inches</td>
<td></td>
</tr>
<tr>
<td>1 meter</td>
<td>100 centimeters = 39.37 inches or 3.28 feet</td>
<td></td>
</tr>
<tr>
<td>1 kilometer</td>
<td>1,000 meters = 3,280.83 feet or 0.6214 miles</td>
<td></td>
</tr>
<tr>
<td>1 inch</td>
<td>2.54 centimeters</td>
<td></td>
</tr>
<tr>
<td>1 foot</td>
<td>0.3048 meters</td>
<td></td>
</tr>
<tr>
<td>1 mile</td>
<td>1.6093 kilometers</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Square Measures</th>
<th>Metric</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 square meter</td>
<td>1,550 square inches or 10.764 square feet</td>
<td></td>
</tr>
<tr>
<td>1 hectare</td>
<td>10,000 square meters = 2.4711 acres</td>
<td></td>
</tr>
<tr>
<td>1 square foot</td>
<td>0.0929 square meters</td>
<td></td>
</tr>
<tr>
<td>1 acre</td>
<td>0.4047 hectares</td>
<td></td>
</tr>
</tbody>
</table>

**DOLLAR EQUIVALENTS**

All income, cost, and rent/mortgage data have been expressed in terms of the U.S. equivalent:
1 U.S. dollar = 1 Kenya shilling.

**Reference Abbreviations**

- LAMBEY, J., A CASE STUDY OF UNCONTROLLED SETTLEMENT IN NAIROBI. Etherton, D. Housing Research Unit, University of Nairobi, 1972.
- MEMORANDUM ON HOUSING SUBSYSTEMS OF MATHARE VALLEY Stock, G. Institute for Development Studies, University of Nairobi, 1970.
- MATHARE VALLEY - A CASE STUDY OF UNCONTROLLED SETTLEMENT IN NAIROBI, Daggett, H. University of Nairobi, 1972.
- SITE AND SERVICE ANALYSIS, Housing Research and Development Unit, University of Nairobi, 1971.
- SOME THOUGHTS ON HOUSING POLICY FOR NAIROBI, Harris, J. Institute for Development Studies, University of Nairobi, 1969.
GLOSSARY

BLOCK: a primarily residential area bounded and served by public streets, walkways.

COMMUNITY FACILITY: something that is built/established to serve some community need (school: education; police: order/protection; etc.).

DWELLING: the general, global designation of a building/shelter, containing one or more dwelling units in which people live.

DWELLING CONSTRUCTION TYPES: primary dwelling construction types and materials are grouped in the following categories:

- Shack
  - Roof: structure - rods, branches. infill - thatch, mats, flattened tin cans, plastic or canvas sheets, cardboard and/or scrap wood.
  - Walls: structure - rods, branches, poles. infill - thatch, mats, flattened tin cans, plastic or canvas sheets, cardboard, scrap wood, and/or mud.
  - Floor: structure/infill - compacted earth.

- Mud and Wattle
  - Roof: structure - wattle. infill - thatch, flattened tin cans, or corrugated iron sheets.
  - Walls: structure - wattle. infill - mud.
  - Floor: structure/infill - compacted earth.

- Wood
  - Roof: structure - wood rafters. infill - thatch, flattened tin cans, or corrugated iron sheets.
  - Walls: structure - wood frame.
  - Floor: structure/infill - rough hewn wood planks.

- Masonry/Wood
  - Roof: structure - wood rafters. infill - corrugated iron or asbestos sheets, or terracotta tiles.
  - Walls: structure/infill - murram, stone, brick, block or tile masonry without columns.
  - Floor: structure/infill - poured concrete slab on/off grade, wood joists, flooring.

- Masonry/Concrete
  - Roof: structure/infill - poured reinforced concrete with tar and gravel, or terracotta tiles.
  - Walls: structure/infill - murram, stone, brick, block or tile masonry without columns, or with columns for multi-story dwellings.
  - Floor: structure/infill - poured concrete slab on/off grade.

- Concrete
  - Roof: structure/infill - poured or precast reinforced concrete with tar and gravel, or terracotta tiles.
  - Walls: structure - poured or precast walls or frame.
  - Floor: structure/infill - poured or precast concrete slab.

DWELLING DENSITY: the number of dwellings, dwelling units, people or families per unit hectare.

DWELLING DEVELOPER: three sectors are considered in the supply of dwellings:

- Popular Sector: the marginal sector with limited or no access to the formal financial, administrative, legal, technical institutions involved in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the popular sector generally for 'self-use' and sometimes for profit.

- Public Sector: the government or non-profit organizations involved in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the public sector for service (non-profit or subsidized housing).

- Private Sector: the individuals, groups or societies who have access to the formal financial, administrative, legal, technical institutions in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the private sector generally for profit.

DWELLING DEVELOPMENT MODE: two modes are considered:

- Incremental: the construction of the dwelling and the development of the local infrastructure to modern standards by stages often starting with provisional structures and underdeveloped land. This essentially traditional procedure is generally practiced by squatters with de facto security of tenure and an adequate building site.

- Instant: the formal development procedure in which all structures and services are completed before occupation.
DWELLING FINANCING: the process of raising or providing funds.
Self Financed: provided by own funds
Private/Public Financed: provided by loan
Public Subsidized: provided by grant/aid

DWELLING TYPE: the physical arrangement of the dwelling unit:
Detached: individual dwelling unit, separated from others.
Semi-Detached: two dwelling units sharing a common wall (duplex).
Row/Grouped: dwelling units grouped together linearly or in clusters.
Walk-Up: dwelling units grouped in two to five stories with stairs for vertical circulation.
High Rise: dwelling units grouped in five or more stories with stairs and lifts for vertical circulation.

DWELLING UNIT: a self-contained unit in a dwelling for an individual, a family, or a group.

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

DWELLING UNIT AREA: the dwelling unit area (m²) is the built-up, covered area of a dwelling unit.

DWELLING UNIT COST: the initial amount of money paid for the dwelling unit or the present monetary equivalent for replacing the dwelling unit.

DWELLING UTILIZATION: the utilization indicates the type of use with respect to the number of inhabitants/families.
Single: an individual or a family inhabiting a dwelling.
Multiple: a group of individuals or families inhabiting a dwelling.

LAND UTILIZATION: a qualification of the land around a dwelling in relation to user, physical controls, and responsibility.
Private: (dwellings, lots)
User: owner/tenant/squatter
Physical Controls: complete
Responsibility: user
Semi-Private: (cluster courts)
User: a group of owners and/or tenants
Physical Controls: partial/complete
Responsibility: users
Semi-Public: (open spaces, playgrounds, schools)
User: a limited group of people
Physical Controls: partial/complete
Responsibility: public sector, users
Public: (streets, walkways, open spaces)
User: anyone/unlimited
Physical Controls: minimum
Responsibility: public sector

LAND UTILIZATION: PHYSICAL CONTROLS: the physical/legal means or methods of directing, regulating and co-ordinating the use and maintenance of land by the owners/users.

LAND UTILIZATION: RESPONSIBILITY: the quality/state of being morally/legally responsible for the use and maintenance of land by the owners/users.
LAND VALUE: refers to: 1) the present monetary equivalent to replace the land; 2) the present tax based value of the land; or 3) the present commercial market value of the land.

URBAN CONTEXT: an urban area/environment within which dwelling/land systems develop.

LOCALITY: a relatively self-contained residential area/community/neighborhood/settlement within an urban area which may contain one or more dwelling/land systems.

LOCALITY SEGMENT: a 400 meter by 400 meter area taken from and representing the residential character and layout of a locality.

PERCENT RENT/MORTGAGE: the fraction of income allocated for dwelling rental or dwelling mortgage payments; expressed as a percentage of total family income.

USER INCOME GROUP: based upon the subsistence (minimum wage) income per year, five income groups are distinguished:
Very Low: (below subsistence level) the group with no household income available for housing, services, or transportation.
Low: (at subsistence level) the group that can afford limited subsidized housing.
Moderate: the group that has access to public/private commercial housing (rental).
Middle: the group that has access to private commercial housing (ownership).
High: the most economically mobile sector of the population.

SUBSISTENCE INCOME: average amount of money required for the purchase of food and fuel for an average family of 5 people to survive.

UTILITY/SERVICE: the organization and/or infrastructure for meeting the general need (as for water supply, wastewater removal, electricity, etc.) in the public interest.

TENURE: two situations of tenure of the dwelling units and/or the lot/land are considered:
Legal: having formal status derived from law.
Extralegal: not regulated or sanctioned by law.

Three types of tenure are generally considered:
Rental: where the users pay a fee (daily, weekly, monthly) for the use of the dwelling unit and/or the lot/land.
Lease: where the users pay a fee for long term use (generally for a year) for a dwelling unit and/or the lot/land from the owner (an individual, a public agency, or a private organization).
Ownership: where the users hold in freehold the dwelling unit and/or the lot/land which the unit occupies.
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NOTES FOR A HOUSING POLICY WITH SPECIAL REFERENCE TO LOW INCOME HOUSING SYSTEMS IN METROPOLITAN MEXICO, Turner, J.F.C. M.I.T., Cambridge, 1971.


USDDC Dwelling Environment Surveys, M.I.T.: BANGKOK, Thailand (Ocharoen, Phisuthikul, 1973); BEIRUT, Lebanon (Take, 1973); KABUL, Afganistan (Samizay, 1973); KAMPALA, Uganda (Mulumba, 1973); MEXICO CITY, Mexico (Davila, Cortes, Espinosa, Bazant, 1973).