URBAN SETTLEMENT ISSUES: Observations from 181 Surveys of Urban Dwelling Environments in Developing Countries

by
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Submitted to the Department of Architecture on May 7, 1982, in partial fulfillment of the requirements for the degree of Master of Science in Architecture Studies.

ABSTRACT

Observations and summaries were made on 181 surveys of urban dwelling environments in developing countries, carried out by members of the Urban Settlement Design Program (U.S.D.P.), at MIT.

The focus of this study is in three parts - dwelling development, land subdivision and environmental transformation. In short, surveys indicate the significance of the popular sector and progressive development; grid layout is preferred to gridiron layout; and higher density. Multifamily dwellings are a proliferate trend, but should be promoted with caution.

Thesis Supervisor: Horacio Caminos
Title: Professor of Architecture

contents

preface

Growing up in Taipei during the 50's and the 60's, I have witnessed the rapid urbanization process of a large city in a developing area.

When I first started my formal education in 1960, my elementary school was a giant structure that stood at the middle of a rice field. We used to read about the farmers' life from the text books and observed them at work through the classroom windows. When I left the school, the rice field has been paved with asphalt streets and there were western suburban single family houses and walk-up apartments; my family moved to one of these apartment units, along with hundreds of others, whose old traditional residences in the inner city were soon to be levelled and replaced by offices, commercial buildings, or other walk-up apartments. Before I had graduated from high school, high-rise luxury apartments and wide avenues had surrounded the little elementary school structure - with twice as many classrooms by then and virtually no playground left.

Sweet potatoes used to be free for kids. We dug them up from neighborhood vegetable fields, cooked them on a fire in a small earth mound made with the dirt from the same hole. As the neighborhood farms started disappearing, we started buying sweet potatoes from the street vendors - one penny for 2 pieces, it was the best snack on the way home after school. Finally, street vendors became more and more difficult to find, and sweet potatoes were cooked in syrup and served as a western style desert after a gourmet meal.

My family was one of the lucky ones, we prospered with the island's growth of economy. There were many whose quality of life has improved little, or even deteriorated. They either moved from the Mainland to Taiwan with the government or came from rural areas to the cities with hopes of finding prosperity. They

squatted in the inner city, or stayed in tenement halls; until they lost the hopeless fights with the city council who wanted the land for the city's new master plan. Then they either moved to the outskirts for cheaper rent or squatted somewhere else until another clearance came about. Finally, some of the more fortunate ones were able to move into public subsidized walk-up apartment units. Built as economized versions of Western designs and standards, many of these subsidized walk-ups soon turned into verticle slums largely due to the inadequate design for the users; but the low-income users frequently are the ones to take the blame.

Yet, Taiwan is among the most successful examples of economical development in the industrializing areas. Her growth with equality was highly praised. *

Rapid urbanization is taking place everywhere in the developing world. The urban areas, now contain one-third of the world's population, are absorbing three-fourths of the world's population growth. Many major cities are growing at a rate of doubling every 15 years. In 1970, 5 cities in the developing countries had over 5 million people. Over 40 cities will reach this size by the end of this century, with 18 of them having more than 10 million inhabitants. *

Under the pressures of rapid urbanization, the physical environment of most urban areas in the developing world is deteriorating; the gap between effective demand and supply for shelter is widening; the infrastructure is outdated before implementation has been completed.

The conventional method of dealing with this rapid urbanization has proved to be inappropriate at best. However, mass media, advertizement and master salesmanship have made the urban image of the industrialized world irresistable to the developing world. Despite the completely different nature of urban

environmental issues, modern architecture and urban design theory was brought in unguarded to the developing countries, resulting in a mental dependence on the industrialized world. Not infrequently, this mental dependence became the root of wasteful or even disastrous development schemes during the process of urbanization:

In Cairo, the government has adopted costly new towns as the solution for its problems of overcrowding. However, the new towns will at best accomodate 2 million people by the year 2000, while Cairo currently has 76% - 6 million people living in the illegally converted agricultural land. By the year 2000, an additional 6 million people will have to be sheltered. The solution clearly indicates a widening gap of supply and demand, and whether the quality of life in the new towns is suitable to the people of Cairo is still questionable. *

* M.M. El Sioufi, AGRICULTURAL LAND. '81.

In Taiwan, the set-back by-law was adopted from Japan - a country located in a much higher latitude, thus requiring sufficient building set-back to insure sunlight for all lots and streets. Direct sunlight should be one of the last concerns in by-law considerations in Taiwan. If anything, most areas there have the problem of too much solar heat for the majority of the year. This set-back requirement has caused Taipei's scarce open spaces to be broken down to thin stripes, little bits and pieces - hardly usable. *

* H.P. Lin, OPEN SPACES IN URBAN DWELLING ENVIRONMENTS. '82.

In Algeria, modern architectural theory has brought top-heavy poured concrete structures resting on pillars to this country in a seismic zone. Consequentially many cities experienced disasters during a 1980 earthquake. While the degree of the quake was among the highest, the damage was unprecedented before the introduction of Corbusier's five principles of architecture. *

* M.L. Wang, AIA Journal, Nov.'81.

The intend of this work is to reveal the urban settlement issues, by documenting observations from 181 surveys of urban dwelling environments in

developing countries.* It attempts to utilize a collection of surveys of existing dwelling environments, with techniques of statistical analysis, to illustrate the process of urbanization, and issues related to human settlements in this process. The objectives of this work are:

- to identify the common characteristics of urban dwelling developments in developing countries;
- to study the key elements of urban physical environments;
- to provoke further researches in the related issues.

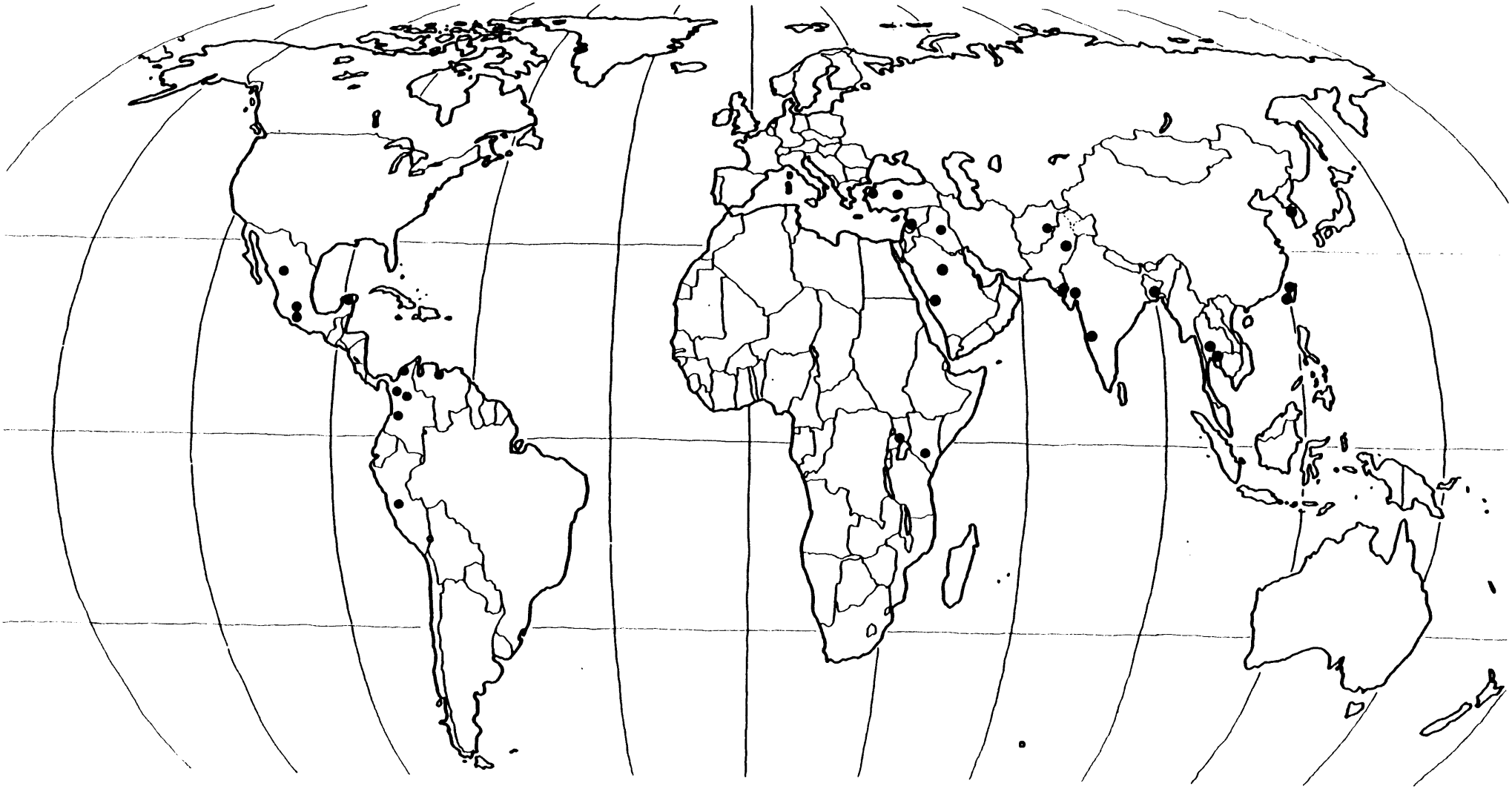
The content of this work is divided into four parts:

1. URBAN DWELLING DEVELOPMENT discusses common characteristics of socio-economic background in developing countries. The discussion is related to dwelling developer, mode of development, user income level, dwelling type, construction type, dwelling builder and location. The intend is to illustrate an overall picture which may provide useful references for planning and policy making.

2. LAND SUBDIVISION studies physical design elements. It relates to layout, circulation, infrasturcture, block size, lot size, population density and private and semi-private land. The intend is to provide rule-of-thumbs for programs and designs related to land subdivision.

3. ENVIRONMENTAL TRANSFORMATION documents the changing character of dwelling environments. The discussion is focused on the initial, present and future use of dwellings and dwelling units, which in term suggests the essence of urban dwelling utilization.

4. APPENDIX provides supporting and complementary references. It includes: data set of the 181 surveys, means and correlation tables, a sample survey and a site and services design proposal with some positive physical elements. The appendix also includes abbreviations, glossary and bibliography.



map showing locations of urban areas surveyed.

introduction

This work is concerned with the policy making and design issues of the urban dwelling environments in developing countries. The information source of this study is primarily from the case study file of Urban Settlement Design Program (U.S.D.P.) in MIT, Cambridge. Other complimentary sources include publications of the U.N. and the World Bank, etc. The case studies of U.S.D.P. are completed by its members as part of their research work in MIT. They are in general surveys of the urban areas of which the members are fimiliarized by personal living experiences. The surveys are made to identify and evaluate the different dwelling/land situations of an urban area in terms of social, economic and physical factors. Since they are of existing situations, the surveys provide information which at least incorporates the reality of an area. They are intended as a tool for the formulation of housing policies and programs, as well as a set of background information for early design decisions.

The methodology of the survey was initially developed to investigate 16 dwelling environments of North and Latin American cities by H. Caminos, J. Turner and J. Steffian. The aims at this initial stage were:

1) To dramatize the correlation between settlements and the geographic and cultural context in the rapidly urbanizing world of today;
2) To illustrate various levels and aspects of the physical environment;
3) To compare and contrast different products and their relationship to effective demands;
4) To find a framework for a more comprehensive approach to settlement development and design.*

Later work by the participants of U.S.D.P. of 1971 and 1973 has contributed to the further development of the survey methodology. In 1974

* H. Caminos, J.C. Turner, J.A. Steffian URBAN DWELLING ENVIRONMENTS. '69.

J. Baldwin made the effort to organize a Guild for Survey-Evaluation of Urban Dwelling Environments which provided a format and standardized the definition of identities used in the survey.

J. Baldwin's Guild was not meant to be a rigid form to cover all the characteristics of dwelling/land systems; rather it was intended as a concise reference for making the survey and evaluation, so the collection of the surveys would maintain a comparative quality. As individual surveys, each case would contain information of sequential levels and aspects - urban area, locality, locality segments, dwelling group, dwelling and dwelling unit. As a collection of cases, they can be compared at the various levels of study, from the urban area to the dwelling unit.

A statistical data set containing 200 entries is built from these surveys in order to use the computer-aided statistical analysis systems All the variables and values of this data set were derived from the identities and terminologies developed for the surveys.

During the development of the methodology for the survey, significant efforts were devoted to the definitions of the terminology. Questions had arisen from time to time, and this set of terminology is by no means final. However, it is important to initiate the effort to clarify the language used in this field of study.

For any science, hard or soft, to progress, it is essential to develop a clear language of communication.

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

FIRST PREFERENCE - definitions from the Webster's Third New International dictionary (Merriam-Webster,1971)

SECOND PREFERENCE - definitons from technical dictionaries, text books or reference manual.

THIRD PREFERENCE - definitions from the U.S.D.P. files. They are used when the existing sources were not appropriate or not complied with architectural conventions/practice.

A glossary is included in the appendix. Though the entries are limited to the terms related to the dwelling/land systems, it could be used as a base for the further development of related efforts.

It is important to note that the information collected in these surveys varies in quality. The quality of information varies in two ways: from case to case, for data is harder to obtain in some areas than others; and from variable to variable, for the value of some variables are harder to define then others. The information of the surveys are classified in 3 levels:

ACCURATE - that can be measured and examined, or obtained from reliable or actural sources. In general, data of developer, builder, mode of d evelopment, layout, block dimensions and unit transit length belong to this level.

APPROXIMATE - when deduced from different and/or not completely reliable sources, or derived from average or approximations of a set of data in order to obtain a representative value, and when the definition is subject to slightly different interpretations. Locations, income levels, builders, dwelling types, dwelling unit types, lot dimensions, lot densities, dwelling densities, gross densities, percentage of private land, etc., belong to this group.

TENTATIVE - when based upon rough estimation or limited samples to represent the whole. Generally, data of this level is not intended to be used for accounting purposes, but as a reference of ranges or deviations. Variables in this

category include: percentage of urban population of a particular dwelling/land system, payment for mortgage or rent as parcentage of income, dwelling and land cost, year of construction, etc.

This report deals primarily with the accurate and approximate data from the surveys. Caution is taken when drawing conclusions from the combination of those data. However, for the purpose of this work: to illustrate a rough picture, to identify some key elements and to provoke areas of further studies; the quality of information is considered to be sufficient in general.

In short, the conclusion of this work can be summerized as follows:

- Many common characteristics of urban dwelling development exist regardless of the differences in urban population, national income or region. They are frequently the determinantes of urban settlement issues. - Popular sector has been providing the most significant portion of dwellings for low and very low income groups. This trend would continue to grow and should be properly assisted and channeled, rather than surpassed by formal financial, administrative, legal and technical institutions.

- The progressive mode of development is the main part of urban development tradition. It allows the maximum participation of users and small information sectors of builders - an overlooked potential from instantaneous development. This mode should be considered the most important alternative to current trends of instantaneous development by public sectors in the development of both infrastructure and dwelling construction.

- The most significant part of the infrastructure cost is determined by layout, which is a design decision during the early stage. The importance of layout in relation to infrastructure cannot be overemphasized.

- The Grid Layout proved to be more flexible and economical than the gridiron layout. The use of lines of access in grid layouts provides potential semi-private open spaces and can contribute to social interactions without the cost of high ratio of public land.
- Dwelling environments transform through time. The most commonplace transformation for dwellings is from detached/semi-detached houses to row/group houses, to walk-up apartments or tenements. This transformation implies the tendency of the diminishing of single family lots, the growth of condominium ownership and smaller dwelling units, with a higher portion of shared facilities and circulation spaces. The environmental transformation should be considered an integral part of dwelling environments and a major element in policy making/design decisions.

1. urban dwelling development

This chapter is concerned with the socio-economic factors of the urban dwelling development. Based upon the available data, seven elements(variables) and their inter-relationships are studied; which include dwelling developer, mode of development, user income level, dwelling type, builder and constuction type. From the study of the characteristics and the inter-relationships of those variables, the following two types of development is revealed:

MODE	-progressive development	-instant development
DEVELOPER	-popular, private	-public, privateate
USER INCOME	-very low to moderate	-low to high
DWELLING TYPE	-shanty,rowgroup,detached /semi-detached,tenement	-detached/semi-detached, row/group, walk-up
BUILDER	-self-help, artisan, small contractor	-small contractor, large contractor
CONSTRUCTION	-shack,adobe,masonry,wood	-masonry, concrete
LOCATION	-all locations	-all locations

Of these two types, the progressive development tend to better mobilize the human resources of the users, the popular scetor, the small builders; and utilize the locally available material and technoledge. It is an importment alternative for developing areas with limited resources.

1-1 COMMONALITY AND VARIATION

(graph 1-1 to 1-14) Countries in the developing world share many common characteristics in its process of urbanization. Those characteristics are common regardless of differences in urban sizes, gross national product or regions among countries. They provide essential background informations about the ingredients (variables) of urban dwelling environments. In the following 7 pages, each variable is illustrated in two parts: for the developing world as a whole (all surveys) and for cases grouped by urban population, GNP and regions (subsets). On the upper half of each page, two graphs are shown for all surveys. These two graphs show the frequency of all values within each variable and the persentage of population each occurrence(case) is related to. On the lower half of each page, the subsets are devided according to urban population, GNP level and regions. In general, the frequency distribution of each variables for all surveys are closely simulated by all subgroups. Whenever a subgroup is showing a significient difference with the whole, the cause is normally explicitily clear. ie. In the high GNP subgroup, the frequency of very low income users and popular sector's developments are lower, as expected.(p.17 and p.19) The means of all numerical variales- such as block dimension, lot dimention, population density, etc.- Of all subgroups is included in appendix 4-1.

FREQUENCY BAR CHART

MODE		FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
INSTANT	**********	88	88	51.76	51.76
PROGRESIVE	*********	82	170	48.24	100.00

20 40 60 80

FREQUENCY

FREQUENCY BAR CHART

PPCT	% OF POPULATION.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
0-10%	IIIIIIIIIIIIIIPPPPPPP	44	44	31.88	31.88
10-20%	IIIIIIIIIIPPPPPPP	34	78	24.64	56.52
20-30%	IIIIIPPPPPP	22	100	15.94	72.46
30-40%	IIIIPPPPP	18	118	13.04	85.51
40-50%	IPPPP	8	126	5.80	91.30
ABOVE 50%	IIPPPPP	12	138	8.70	100.00

10 20 30 40

FREQUENCY

P=SMALL CITY (P<=0.5M).

MODE OF DEVELOPMENT.

MODE	FREQUENCY	CUM FREQ	PERCENT
INSTANT	37	37	48.052
PROGRESIVE	40	77	51.948

P=MEDIUM CITY (0.5M<P<2M).

MODE OF DEVELOPMENT.

MODE	FREQUENCY	CUM FREQ	PERCENT
INSTANT	11	11	45.833
PROGRESIVE	13	24	54.167

P=LARGE CITY (P>=2M).

MODE OF DEVELOPMENT.

MODE	FREQUENCY	CUM FREQ	PERCENT
INSTANT	40	40	57.971
PROGRESIVE	29	69	42.029

MODE=MODE OF DEVELOPMENT.
I=instant development
P=progressive development

GNP=GNP UNDER $300.

MODE OF DEVELOPMENT.

MODE	FREQUENCY	CUM FREQ	PERCENT
INSTANT	33	33	52.381
PROGRESIVE	30	63	47.619

GNP=GNP $300-1500.

MODE OF DEVELOPMENT.

MODE	FREQUENCY	CUM FREQ	PERCENT
INSTANT	46	46	54.762
PROGRESIVE	38	84	45.238

GNP=GNP ABOVE $1500.

MODE OF DEVELOPMENT.

MODE	FREQUENCY	CUM FREQ	PERCENT
INSTANT	9	9	39.130
PROGRESIVE	14	23	60.870

REGION=AFRICA

MODE OF DEVELOPMENT.

MODE	FREQUENCY	CUM FREQ	PERCENT
INSTANT	10	10	43.478
PROGRESIVE	13	23	56.522

REGION=EAST ASIA

MODE OF DEVELOPMENT.

MODE	FREQUENCY	CUM FREQ	PERCENT
INSTANT	41	41	66.129
PROGRESIVE	21	62	33.871

REGION=LATIN AMERICA

MODE OF DEVELOPMENT.

MODE	FREQUENCY	CUM FREQ	PERCENT
INSTANT	23	23	47.917
PROGRESIVE	25	48	52.083

REGION= MIDDLE EAST

MODE OF DEVELOPMENT.

MODE	FREQUENCY	CUM FREQ	PERCENT
INSTANT	14	14	37.838
PROGRESIVE	23	37	62.162

FREQUENCY BAR CHART

DPR	DEVELOPER.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
POPULAR	*********	43	43	25.29	25.29
PRIVATE	**********	67	110	39.41	64.71
PUBLIC	**********	60	170	35.29	100.00

20 40 60

FREQUENCY

FREQUENCY BAR CHART

PPCT	% OF POPULATION.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
0-10%	IIIIOOOOOUUUUUUUUUUUU	44	44	31.88	31.88
10-20%	IIIIIIIOOOOOUUUUUU	34	78	24.64	56.52
20-30%	IIIIIIIOOOUU	22	100	15.94	72.46
30-40%	IIIIIOOUU	18	118	13.04	85.51
40-50%	IOOOU	8	126	5.80	91.30
ABOVE 50%	IIOOOO	12	138	8.70	100.00

10 20 30 40

FREQUENCY

P=SMALL CITY (P<=0.5M).

DPR	FREQUENCY	CUM FREQ	PERCENT
PRIVATE	31	31	40.260
POPULAR	23	54	29.870
PUBLIC	23	77	29.870

P=MEDIUM CITY (0.5M<P<2M).

DPR	FREQUENCY	CUM FREQ	PERCENT
PRIVATE	13	13	54.167
POPULAR	5	18	20.833
PUBLIC	6	24	25.000

P=LARGE CITY (P>=2M).

DPR	FREQUENCY	CUM FREQ	PERCENT
PRIVATE	23	23	33.333
POPULAR	15	38	21.739
PUBLIC	31	69	44.928

DPR=DEVELOPER.
I=private sector
O=popular sector
U=public sector

GNP=GNP UNDER $300.

DPR	FREQUENCY	CUM FREQ	PERCENT
PRIVATE	22	22	34.921
POPULAR	16	38	25.397
PUBLIC	25	63	39.683

GNP=GNP $300-1500.

DPR	FREQUENCY	CUM FREQ	PERCENT
PRIVATE	32	32	38.095
POPULAR	24	56	28.571
PUBLIC	28	84	33.333

GNP=GNP ABOVE $1500.

DPR	FREQUENCY	CUM FREQ	PERCENT
PRIVATE	13	13	56.522
POPULAR	3	16	13.043
PUBLIC	7	23	30.435

REGION=AFRICA

DPR	FREQUENCY	CUM FREQ	PERCENT
PRIVATE	5	5	21.739
POPULAR	7	12	30.435
PUBLIC	11	23	47.826

REGION=EAST ASIA

DPR	FREQUENCY	CUM FREQ	PERCENT
PRIVATE	24	24	38.710
POPULAR	10	34	16.129
PUBLIC	28	62	45.161

REGION=LATIN AMERICA

DPR	FREQUENCY	CUM FREQ	PERCENT
PRIVATE	19	19	39.583
POPULAR	16	35	33.333
PUBLIC	13	48	27.083

REGION=MIDDLE EAST

DPR	FREQUENCY	CUM FREQ	PERCENT
PRIVATE	19	19	51.351
POPULAR	10	29	27.027
PUBLIC	8	37	21.622

FREQUENCY BAR CHART

INC	INCOME LEVEL.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
VERY LOW	**********	30	30	18.18	18.18
LOW	**********	55	85	33.33	51.52
MODERATE	**********	46	131	27.88	79.39
MIDDLE	**********	28	159	16.97	96.36
HIGH	**	6	165	3.64	100.00

10 20 30 40 50

FREQUENCY

FREQUENCY BAR CHART

PPCT	% OF POPULATION.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
0-10%	11111122222233333444444	44	44	31.88	31.88
10-20%	111122233333334445	34	78	24.64	56.52
20-30%	112222333445	22	100	15.94	72.46
30-40%	2222233344	18	118	13.04	85.51
40-50%	12223	8	126	5.80	91.30
ABOVE 50%	1122234	12	138	8.70	100.00

10 20 30 40

FREQUENCY

P=SMALL CITY (P<=0.5M).

INC	FREQUENCY	CUM FREQ	PERCENT
.	5	.	.
VERY LOW	15	15	19.481
LOW	21	36	27.273
MODERATE	21	57	27.273
MIDDLE	15	72	19.481
HIGH	5	77	6.494

P=MEDIUM CITY (0.5M<P<2M).

INC	FREQUENCY	CUM FREQ	PERCENT
.	5	.	.
VERY LOW	3	3	15.789
LOW	6	9	31.579
MODERATE	3	12	15.789
MIDDLE	7	19	36.842

P=LARGE CITY (P>=2M).

INC	FREQUENCY	CUM FREQ	PERCENT
VERY LOW	12	12	17.391
LOW	28	40	40.580
MODERATE	22	62	31.884
MIDDLE	6	68	8.696
HIGH	1	69	1.449

INC=INCOME LEVEL.
1=very low
2=low
3=moderate
4=middle
5=high

GNP=GNP UNDER $300.

INC	FREQUENCY	CUM FREQ	PERCENT
.	5	.	.
VERY LOW	15	15	25.862
LOW	16	31	27.586
MODERATE	12	43	20.690
MIDDLE	12	55	20.690
HIGH	3	58	5.172

GNP=GNP $300-1500.

INC	FREQUENCY	CUM FREQ	PERCENT
VERY LOW	14	14	16.667
LOW	34	48	40.476
MODERATE	27	75	32.143
MIDDLE	7	82	8.333
HIGH	2	84	2.381

GNP=GNP ABOVE $1500.

INC	FREQUENCY	CUM FREQ	PERCENT
VERY LOW	1	1	4.348
LOW	5	6	21.739
MODERATE	7	13	30.435
MIDDLE	9	22	39.130
HIGH	1	23	4.348

REGION=AFRICA

INC	FREQUENCY	CUM FREQ	PERCENT
VERY LOW	7	7	30.435
LOW	4	11	17.391
MODERATE	5	16	21.739
MIDDLE	5	21	21.739
HIGH	2	23	8.696

REGION=EAST ASIA

INC	FREQUENCY	CUM FREQ	PERCENT
VERY LOW	12	12	19.355
LOW	22	34	35.484
MODERATE	18	52	29.032
MIDDLE	8	60	12.903
HIGH	2	62	3.226

REGION=LATIN AMERICA

INC	FREQUENCY	CUM FREQ	PERCENT
.	5	.	.
VERY LOW	10	10	23.256
LOW	12	22	27.907
MODERATE	14	36	32.558
MIDDLE	7	43	16.279

REGION=MIDDLE EAST

INC	FREQUENCY	CUM FREQ	PERCENT
VERY LOW	1	1	2.703
LOW	17	18	45.946
MODERATE	9	27	24.324
MIDDLE	8	35	21.622
HIGH	2	37	5.405

FREQUENCY BAR CHART

BDR	BUILDER.	FREQ	CUM. FREQ	PERCENT
ARTISAN	**********	42	42	25.15
LARGE CONTRACTOR	**********	53	95	31.74
SELF HELP	**********	35	130	20.96
SMALL CONTRACTOR	**********	37	167	22.16

10 20 30 40 50

FREQUENCY

FREQUENCY BAR CHART

PPCT	% OF POPULATION.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
0-10%	AAAHHHHHSSSSTTTTTTTTTT	44	44	31.88	31.88
10-20%	.AAAHHHHSSSSTTTTT	34	78	24.64	56.52
20-30%	.AAHHSSSSSTT	22	100	15.94	72.46
30-40%	AAAAHHSSTT	18	118	13.04	85.51
40-50%	AAAHT	8	126	5.80	91.30
ABOVE 50%	AAAHHSS	12	138	8.70	100.00

10 20 30 40

FREQUENCY

P=SMALL CITY (P<=0.5M).

BDR	FREQUENCY	CUM FREQ	PERCENT
	3	3	3.896
ARTISAN	20	23	25.974
SELF HELP	20	43	25.974
SMALL CONTRACTOR	15	58	19.481
LARGE CONTRACTOR	19	77	24.675

P=MEDIUM CITY (0.5M<P<2M).

BDR	FREQUENCY	CUM FREQ	PERCENT
ARTISAN	8	8	33.333
SELF HELP	3	11	12.500
SMALL CONTRACTOR	7	18	29.167
LARGE CONTRACTOR	6	24	25.000

P=LARGE CITY (P>=2M).

BDR	FREQUENCY	CUM FREQ	PERCENT
ARTISAN	14	14	20.290
SELF HELP	12	26	17.391
SMALL CONTRACTOR	15	41	21.739
LARGE CONTRACTOR	28	69	40.580

BDR=BUILDER.
A=artisan
H=self-help
S=small contractor
T=large contractor

GNP=GNP UNDER $300.

BDR	FREQUENCY	CUM FREQ	PERCENT
	3	3	4.762
ARTISAN	13	16	20.635
SELF HELP	12	28	19.048
SMALL CONTRACTOR	14	42	22.222
LARGE CONTRACTOR	21	63	33.333

GNP=GNP $300-1500.

BDR	FREQUENCY	CUM FREQ	PERCENT
ARTICIAN	19	19	22.619
SELF HELP	22	41	26.190
SMALL CONTRACTOR	18	59	21.429
LARGE CONTRACTOR	25	84	29.762

GNP=GNP ABOVE $1500.

BDR	FREQUENCY	CUM FREQ	PERCENT
ARTISAN	10	10	43.478
SELF HELP	1	11	4.348
SMALL CONTRACTOR	5	16	21.739
LARGE CONTRACTOR	7	23	30.435

REGION=AFRICA

BDR	FREQUENCY	CUM FREQ	PERCENT
	3	3	13.043
ARTISAN	3	6	13.043
SELF HELP	5	11	21.739
SMALL CONTRACTOR	2	13	8.696
LARGE CONTRACTOR	10	23	43.478

REGION=EAST ASIA

BDR	FREQUENCY	CUM FREQ	PERCENT
ARTISAN	10	10	16.129
SELF HELP	12	22	19.355
SMALL CONTRACTOR	18	40	29.032
LARGE CONTRACTOR	22	62	35.484

REGION=LATIN AMERICA

BDR	FREQUENCY	CUM FREQ	PERCENT
ARTISAN	12	12	25.000
SELF HELP	13	25	27.083
SMALL CONTRACTOR	9	34	18.750
LARGE CONTRACTOR	14	48	29.167

REGION=MIDDLE EAST

BDR	FREQUENCY	CUM FREQ	PERCENT
ARTISAN	17	17	45.946
SELF HELP	5	22	13.514
SMALL CONTRACTOR	8	30	21.622
LARGE CONTRACTOR	7	37	18.919

FREQUENCY BAR CHART

PDWTY	PRESENT DWELLING TYPE.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
DETACHED	**********	40	40	23.53	23.53
ROW	**********	57	97	33.53	57.06
SHANTY	******	16	113	9.41	66.47
TENEMENT	********	20	133	11.76	78.24
WALK-UP	**********	37	170	21.76	100.00

10 20 30 40 50

FREQUENCY

FREQUENCY BAR CHART

PPCT	% OF POPULATION.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
0-10%	DDDDDDRRRRRRRRSSSSTTWW	44	44	31.88	31.88
10-20%	DDDDDDRRRSSTTTWWWWW	34	78	24.64	56.52
20-30%	DRRRSSTTTWWW	22	100	15.94	72.46
30-40%	DDRRRRTTTW	18	118	13.04	85.51
40-50%	DRRRW	8	126	5.80	91.30
ABOVE 50%	DDRRRTW	12	138	8.70	100.00

10 20 30 40

FREQUENCY

P=SMALL CITY (P<=0.5M).

PDWTY	FREQUENCY	CUM FREQ	PERCENT
DETACHED	25	25	32.468
ROW	25	50	32.468
SHANTY	8	58	10.390
TENEMENT	9	67	11.688
WALK-UP	10	77	12.987

P=MEDIUM CITY (0.5M<P<2M).

PDWTY	FREQUENCY	CUM FREQ	PERCENT
DETACHED	4	4	16.667
ROW	9	13	37.500
SHANTY	3	16	12.500
TENEMENT	2	18	8.333
WALK-UP	6	24	25.000

P=LARGE CITY (P>=2M).

PDWTY	FREQUENCY	CUM FREQ	PERCENT
DETACHED	11	11	15.942
ROW	23	34	33.333
SHANTY	5	39	7.246
TENEMENT	9	48	13.043
WALK-UP	21	69	30.435

DWTY=DWELLING TYPE
- D=detached/semi-detached
- H=high-rise
- R=row/group
- S=shanty
- T=tenement
- W=walk-up

GNP=GNP UNDER $300.

PDWTY	FREQUENCY	CUM FREQ	PERCENT
DETACHED	15	15	23.810
ROW	17	32	26.984
SHANTY	8	40	12.698
TENEMENT	14	54	22.222
WALK-UP	9	63	14.286

GNP=GNP $300-1500.

PDWTY	FREQUENCY	CUM FREQ	PERCENT
DETACHED	21	21	25.000
ROW	27	48	32.143
SHANTY	7	55	8.333
TENEMENT	6	61	7.143
WALK-UP	23	84	27.381

GNP=GNP ABOVE $1500.

PDWTY	FREQUENCY	CUM FREQ	PERCENT
DETACHED	4	4	17.391
ROW	13	17	56.522
SHANTY	1	18	4.348
WALK-UP	5	23	21.739

REGION=AFRICA

PDWTY	FREQUENCY	CUM FREQ	PERCENT
DETACHED	10	10	43.478
ROW	3	13	13.043
SHANTY	2	15	8.696
TENEMENT	6	21	26.087
WALK-UP	2	23	8.696

REGION=EAST ASIA

PDWTY	FREQUENCY	CUM FREQ	PERCENT
DETACHED	8	8	12.903
ROW	18	26	29.032
SHANTY	10	36	16.129
TENEMENT	7	43	11.290
WALK-UP	19	62	30.645

REGION=LATIN AMERICA

PDWTY	FREQUENCY	CUM FREQ	PERCENT
DETACHED	13	13	27.083
ROW	20	33	41.667
SHANTY	3	36	6.250
TENEMENT	6	42	12.500
WALK-UP	6	48	12.500

REGION=MIDDLE EAST

PDWTY	FREQUENCY	CUM FREQ	PERCENT
DETACHED	9	9	24.324
ROW	16	25	43.243
SHANTY	1	26	2.703
TENEMENT	1	27	2.703
WALK-UP	10	37	27.027

FREQUENCY BAR CHART

CON		FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
ADOBE	****	21	21	12.50	12.50
CONCRETE	**********	56	77	33.33	45.83
MASONRY	**********	65	142	38.69	84.52
SHACK	**	10	152	5.95	90.48
WOOD	***	16	168	9.52	100.00

20 40 60

FREQUENCY

FREQUENCY BAR CHART

PPCT	% OF POPULATION.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
0-10%	AAACCCCCCCMMMMMMMMMSSS	44	44	31.88	31.88
10-20%	.AAACCCCCCCMMMMMMSWW	34	78	24.64	56.52
20-30%	ACCCCMMMMSW	22	100	15.94	72.46
30-40%	ACCCMMMMMW	18	118	13.04	85.51
40-50%	ACMMM	8	126	5.80	91.30
ABOVE 50%	AAAMMMS	12	138	8.70	100.00

10 20 30 40

FREQUENCY

P=SMALL CITY (P<=0.5M).

CON	FREQUENCY	CUM FREQ	PERCENT
	1	1	1.299
ADOBE	17	18	22.078
CONCRETE	21	39	27.273
MASONRY	27	66	35.065
SHACK	4	70	5.195
WOOD	7	77	9.091

P=MEDIUM CITY (0.5M<P<2M).

CON	FREQUENCY	CUM FREQ	PERCENT
ADOBE	2	3	8.333
CONCRETE	11	14	45.833
MASONRY	6	20	25.000
SHACK	2	22	8.333
WOOD	2	24	8.333

P=LARGE CITY (P>=2M).

CON	FREQUENCY	CUM FREQ	PERCENT
ADOBE	2	2	2.899
CONCRETE	24	26	34.783
MASONRY	32	58	46.377
SHACK	4	62	5.797
WOOD	7	69	10.145

CON=CONSTRUCTION TYPE.
A=adobe
C=reinforced concrete
M=masonry
W=wood

GNP=GNP UNDER $300.

CON	FREQUENCY	CUM FREQ	PERCENT
	2	2	3.175
ADOBE	10	12	15.873
CONCRETE	16	28	25.397
MASONRY	25	53	39.683
SHACK	5	58	7.937
WOOD	5	63	7.937

GNP=GNP $300-1500.

CON	FREQUENCY	CUM FREQ	PERCENT
ADOBE	7	7	8.333
CONCRETE	28	35	33.333
MASONRY	35	70	41.667
SHACK	5	75	5.952
WOOD	9	84	10.714

GNP=GNP ABOVE $1500.

CON	FREQUENCY	CUM FREQ	PERCENT
ADOBE	4	4	17.391
CONCRETE	12	16	52.174
MASONRY	5	21	21.739
WOOD	2	23	8.696

REGION=AFRICA

CON	FREQUENCY	CUM FREQ	PERCENT
	1	1	4.348
ADOBE	2	3	8.696
CONCRETE	5	8	21.739
MASONRY	10	18	43.478
SHACK	2	20	8.696
WOOD	3	23	13.043

REGION=EAST ASIA

CON	FREQUENCY	CUM FREQ	PERCENT
ADOBE	4	4	6.452
CONCRETE	18	22	29.032
MASONRY	26	48	41.935
SHACK	6	54	9.677
WOOD	8	62	12.903

REGION=LATIN AMERICA

CON	FREQUENCY	CUM FREQ	PERCENT
	1	1	2.083
ADOBE	8	9	16.667
CONCRETE	18	27	37.500
MASONRY	17	44	35.417
SHACK	2	46	4.167
WOOD	2	48	4.167

REGION=MIDDLE EAST

CON	FREQUENCY	CUM FREQ	PERCENT
ADOBE	7	7	18.919
CONCRETE	15	22	40.541
MASONRY	12	34	32.432
WOOD	3	37	8.108

FREQUENCY BAR CHART

LCTN	LOCATION.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
CITY CENTER	**********	52	52	31.33	31.33
INNER RING	**********	56	108	33.73	65.06
PERIPHERY	**********	58	166	34.94	100.00

20 40 60

FREQUENCY

FREQUENCY BAR CHART

PPCT	% OF POPULATION.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
0-10%	.11122222222333333333	44	44	31.88	31.88
10-20%	.11111222223333333	34	78	24.64	56.52
20-30%	11111112233	22	100	15.94	72.46
30-40%	.112223333	18	118	13.04	85.51
40-50%	12233	8	126	5.80	91.30
ABOVE 50%	1112223	12	138	8.70	100.00

10 20 30 40

FREQUENCY

P=SMALL CITY (P<=0.5M).

LCTN	FREQUENCY	CUM FREQ	PERCENT
CITY CENTER	23	23	29.870
INNER RING	31	54	40.260
PERIPHERY	23	77	29.870

P=MEDIUM CITY (0.5M<P<2M).

LCTN	FREQUENCY	CUM FREQ	PERCENT
CITY CENTER	9	9	37.500
INNER RING	7	16	29.167
PERIPHERY	8	24	33.333

P=LARGE CITY (P>=2M).

LCTN	FREQUENCY	CUM FREQ	PERCENT
.	4	.	.
CITY CENTER	20	20	30.769
INNER RING	18	38	27.692
PERIPHERY	27	65	41.538

LCTN=LOCATION.
1=city center
2=inner ring
3=periphery

GNP=GNP UNDER $300.

LCTN	FREQUENCY	CUM FREQ	PERCENT
CITY CENTER	16	16	25.397
INNER RING	28	44	44.444
PERIPHERY	19	63	30.159

GNP=GNP $300-1500.

LCTN	FREQUENCY	CUM FREQ	PERCENT
.	4	.	.
CITY CENTER	25	25	31.250
INNER RING	20	45	25.000
PERIPHERY	35	80	43.750

GNP=GNP ABOVE $1500.

LCTN	FREQUENCY	CUM FREQ	PERCENT
CITY CENTER	11	11	47.826
INNER RING	8	19	34.783
PERIPHERY	4	23	17.391

REGION=AFRICA

LCTN	FREQUENCY	CUM FREQ	PERCENT
CITY CENTER	3	3	13.043
INNER RING	13	16	56.522
PERIPHERY	7	23	30.435

REGION=EAST ASIA

LCTN	FREQUENCY	CUM FREQ	PERCENT
CITY CENTER	23	23	37.097
INNER RING	18	41	29.032
PERIPHERY	21	62	33.871

REGION=LATIN AMERICA

LCTN	FREQUENCY	CUM FREQ	PERCENT
.	4	.	.
CITY CENTER	12	12	27.273
INNER RING	14	26	31.818
PERIPHERY	18	44	40.909

REGION=MIDDLE EAST

LCTN	FREQUENCY	CUM FREQ	PERCENT
CITY CENTER	14	14	37.838
INNER RING	11	25	29.730
PERIPHERY	12	37	32.432

1-2 DWELLING DEVELOPER

(graph 1-15 to 1-32) Developers from the popular sector, the private sector and the public sector are compared in this section. The relationship of developer and other variables are represented in bar charts and placed in rows, so that all three sectors of developer can be viewed simutaneously. The intend is to illustrate and compare the characters of each sector of developer and their product.

POPULAR SECTOR

FREQUENCY BAR CHART

INC	INCOME LEVEL.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
VERY LOW	**********	22	22	52.38	52.38
LOW	**********	13	35	30.95	83.33
MODERATE	*******	7	42	16.67	100.00

5 10 15 20

FREQUENCY

FREQUENCY BAR CHART

MODE		FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
INSTANT	***	6	6	13.95	13.95
PROGRESIVE	**********	37	43	86.05	100.00

10 20 30

FREQUENCY

FREQUENCY BAR CHART

PDWTY		FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
DETACHED	**********	13	13	30.23	30.23
ROW	**********	12	25	27.91	58.14
SHANTY	**********	13	38	30.23	88.37
TENEMENT	***	3	41	6.98	95.35
WALK-UP	**	2	43	4.65	100.00

5 10

FREQUENCY

PRIVATE SECTOR

FREQUENCY BAR CHART

INC	INCOME LEVEL.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
VERY LOW	****	4	4	5.97	5.97
LOW	**********	22	26	32.84	38.81
MODERATE	*********	18	44	26.87	65.67
MIDDLE	*********	18	62	26.87	92.54
HIGH	*****	5	67	7.46	100.00

5 10 15 20

FREQUENCY

FREQUENCY BAR CHART

MODE		FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
INSTANT	**********	29	29	41.43	41.43
MIX	**	3	32	4.29	45.71
PROGRESIVE	**********	38	70	54.29	100.00

10 20 30

FREQUENCY

FREQUENCY BAR CHART

PDWTY		FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
DETACHED	********	18	18	25.71	25.71
ROW	**********	30	48	42.86	68.57
SHANTY	*	2	50	2.86	71.43
TENEMENT	******	11	61	15.71	87.14
WALK-UP	*****	9	70	12.86	100.00

10 20 30

FREQUENCY

PUBLIC SECTOR

FREQUENCY BAR CHART

INC	INCOME LEVEL.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
VERY LOW	****	4	4	6.35	6.35
LOW	**********	20	24	31.75	38.10
MODERATE	**********	24	48	38.10	76.19
MIDDLE	*********	13	61	20.63	96.83
HIGH	**	2	63	3.17	100.00

5 10 15 20

FREQUENCY

FREQUENCY BAR CHART

MODE	MODE OF DEVELOPMENT.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
INSTANT	**********	55	55	85.94	85.94
MIX	*	2	57	3.13	89.06
PROGRESIVE	***	7	64	10.94	100.00

10 20 30 40 50

FREQUENCY

PDWTY		FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
DETACHED	******	12	12	18.75	18.75
HIGH RISE	*	2	14	3.13	21.88
ROW	*********	17	31	26.56	48.44
SHANTY	*	1	32	1.56	50.00
TENEMENT	***	6	38	9.38	59.38
WALK-UP	**********	26	64	40.63	100.00

10 20

FREQUENCY

POPULAR SECTOR

FREQUENCY BAR CHART

BDR	BUILDER.	FREQ	CUM. FREQ	PERCENT
ARTICIAN	**********	16	16	37.21
SELF HELP	**********	24	40	55.81
SMALL CONTRACTOR	***	3	43	6.98

5 10 15 20

FREQUENCY

FREQUENCY BAR CHART

CON	CONSTRUCTION TYPE.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
ADOBE	**********	11	11	25.58	25.58
CONCRETE	********	4	15	9.30	34.88
MASONRY	**********	12	27	27.91	62.79
SHACK	**********	8	35	18.60	81.40
WOOD	**********	8	43	18.60	100.00

2 4 6 8 10 12

FREQUENCY

FREQUENCY BAR CHART

LCTN	LOCATION.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
CITY CENTER	********	8	8	19.51	19.51
INNER RING	**********	19	27	46.34	65.85
PERIPHERY	**********	14	41	34.15	100.00

5 10 15

FREQUENCY

PRIVATE SECTOR

FREQUENCY BAR CHART

BDR	BUILDER.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
ARTICIAN	**********	26	26	39.39	39.39
LARGE CONTRACTOR	*	2	28	3.03	42.42
SELF HELP	****	7	35	10.61	53.03
SMALL CONTRACTOR	**********	31	66	46.97	100.00

10 20 30

FREQUENCY

FREQUENCY BAR CHART

CON		FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
ADOBE	****	8	8	11.76	11.76
CONCRETE	**********	19	27	27.94	39.71
MASONRY	**********	33	60	48.53	88.24
SHACK	*	2	62	2.94	91.18
WOOD	***	6	68	8.82	100.00

10 20 30

FREQUENCY

FREQUENCY BAR CHART

LCTN	LOCATION.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
CITY CENTER	**********	35	35	50.72	50.72
INNER RING	********	15	50	21.74	72.46
PERIPHERY	**********	19	69	27.54	100.00

10 20 30

FREQUENCY

PUBLIC SECTOR

FREQUENCY BAR CHART

BDR	BUILDER.	FREQ	CUM. FREQ	PERCENT
LARGE CONTRACTOR	**********	55	55	85.94
SELF HELP	**	4	59	6.25
SMALL CONTRACTOR	**	5	64	7.81

10 20 30 40 50

FREQUENCY

FREQUENCY BAR CHART

CON	CONSTRUCTION TYPE.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
ADOBE	**	3	3	4.69	4.69
CONCRETE	**********	37	40	57.81	62.50
MASONRY	**********	22	62	34.38	96.88
WOOD	*	2	64	3.13	100.00

10 20 30

FREQUENCY

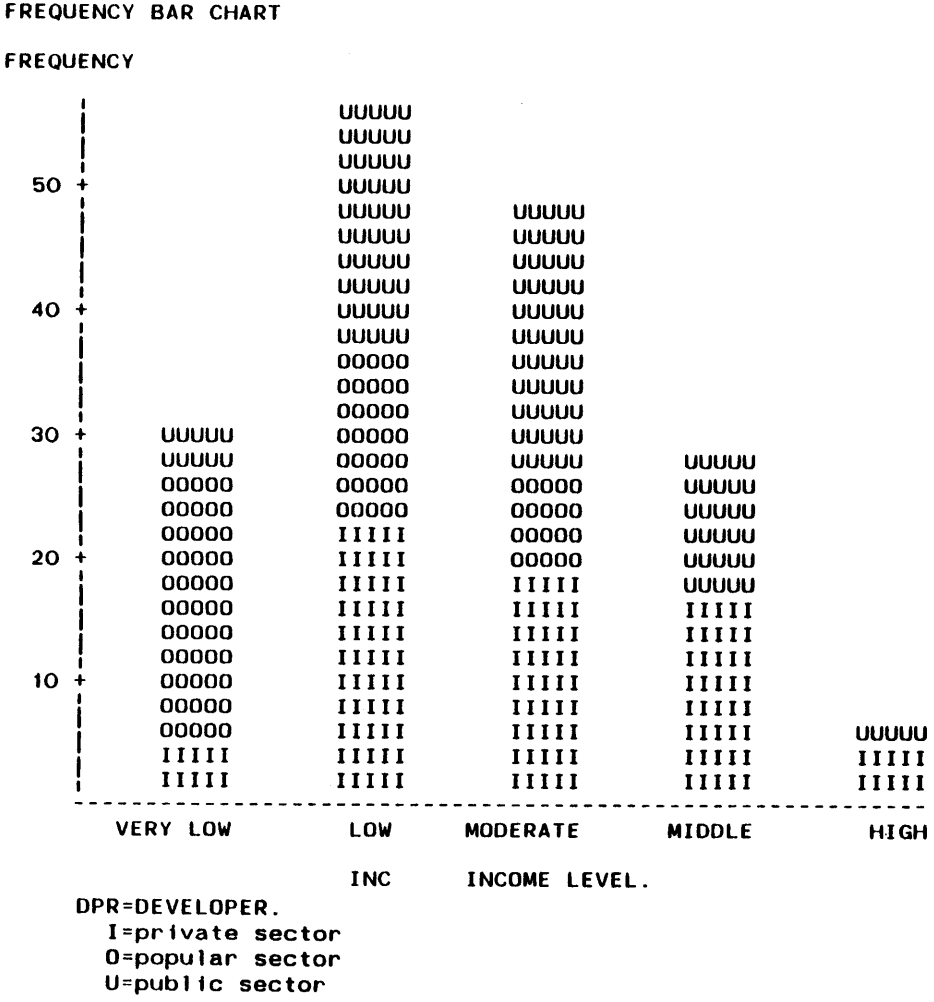
FREQUENCY BAR CHART

LCTN	LOCATION.	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
CITY CENTER	*****	10	10	15.87	15.87
INNER RING	**********	25	35	39.68	55.56
PERIPHERY	**********	28	63	44.44	100.00

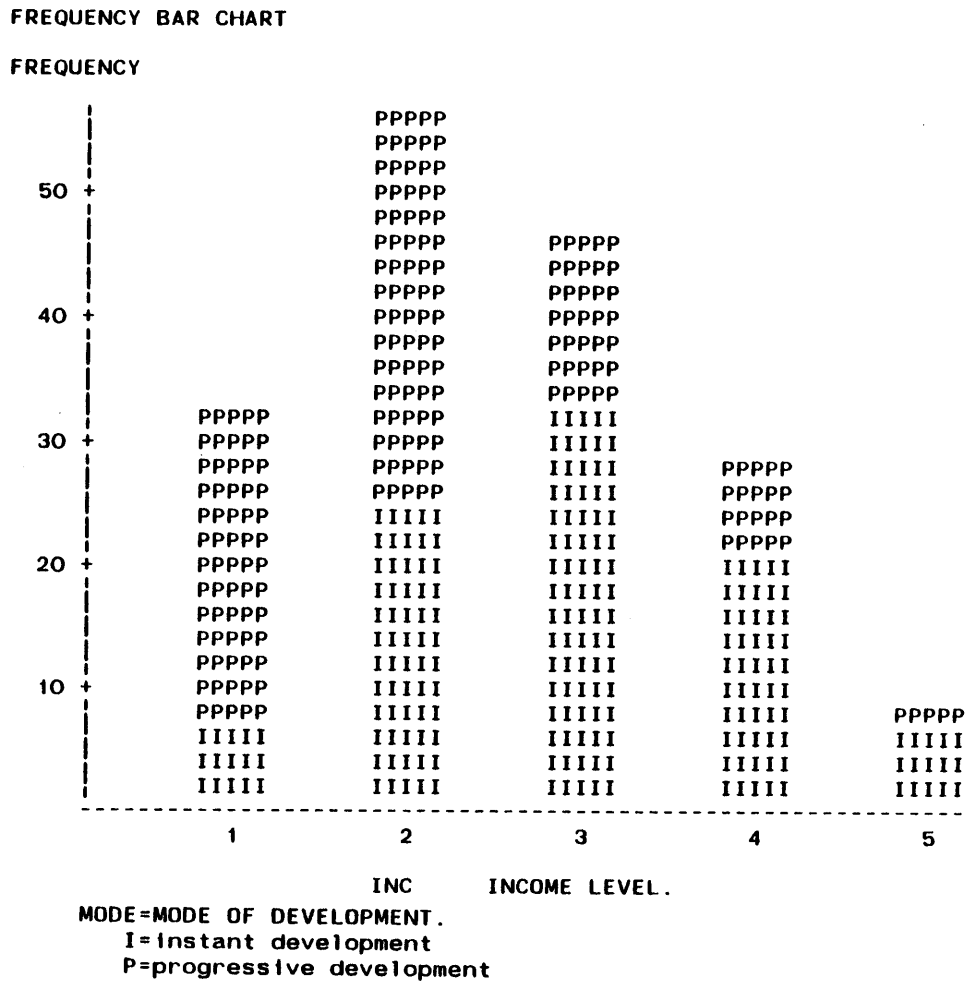
10 20

FREQUENCY

1-3 USER INCOME GROUP



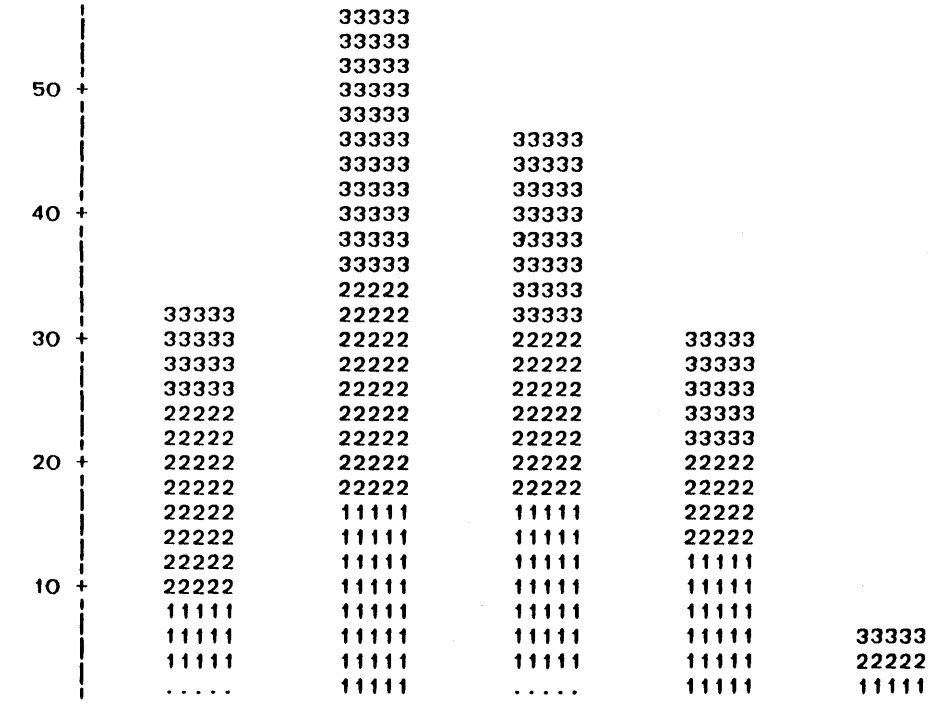
(graph 1-33) The private and public sectors are involved primarily with the low to high income groups; while the popular sector is the predominent developer for the very low income group.



(graph 1-34) The relationship between users' income level and mode of development is reflected in this graph. It indicates that the instant mode is afforded by higher income groups, while progessive mode become more important as the income level drops.

FREQUENCY BAR CHART

FREQUENCY

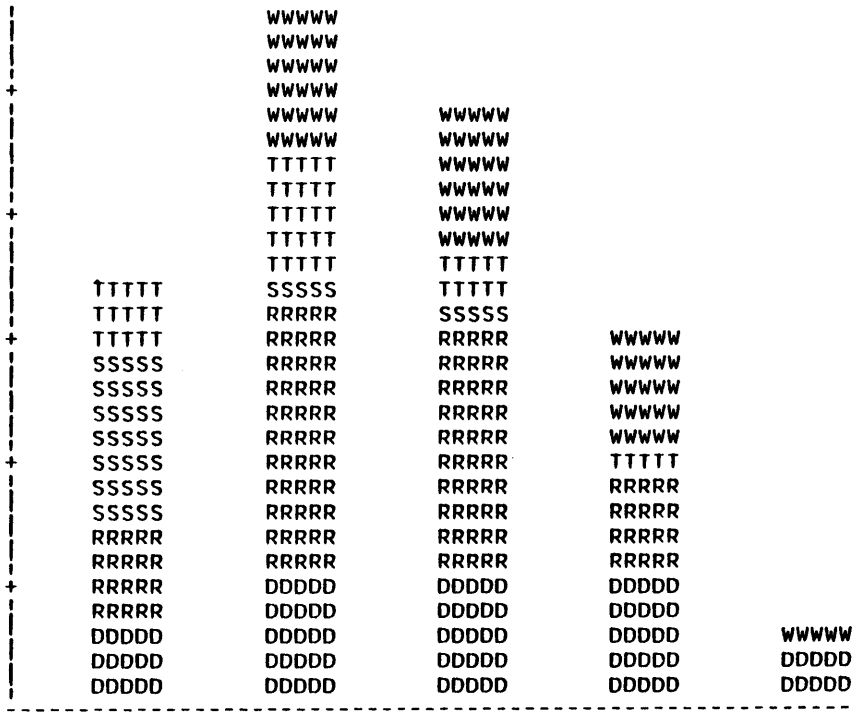


LCTN=LOCATION.
1=city center
2=inner ring
3=periphery

(graph 1-35) The user income group and location are compared in this graph. It shows all income groups are evenly distributed throughout all locations, which at least implies that A) various income groups are mixed in close vacenity, B) the strong desire of the poor to live in the city center or inner ring regardless of probable higher rental cost or smaller living space.

FREQUENCY BAR CHART

FREQUENCY

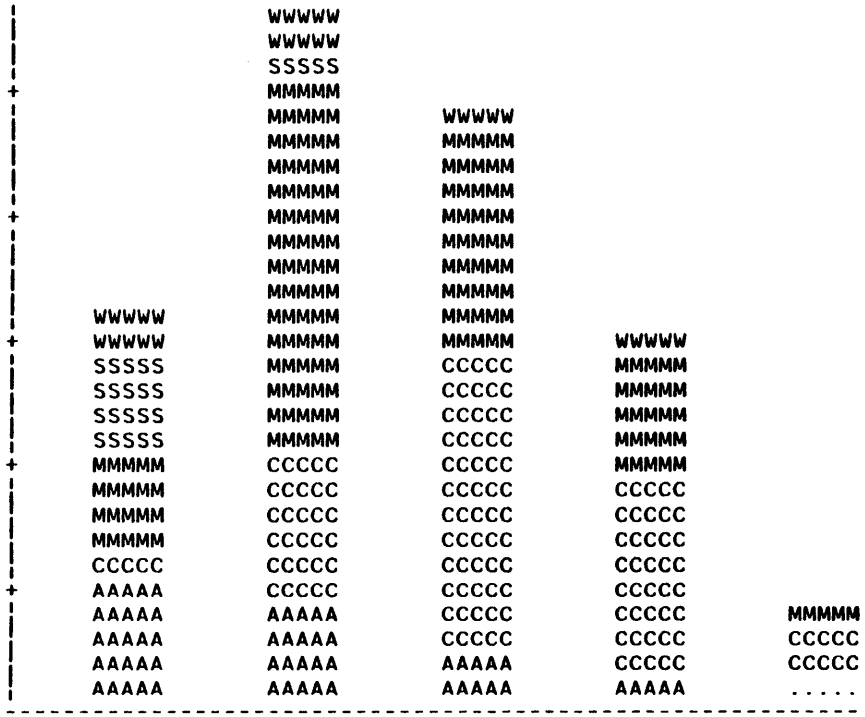


DWTY=DWELLING TYPE
D=detached/semi-detached
H=high-rise
R=row/group
S=shanty
T=tenement
W=walk-up

(graph 1-36) This graph shows that row/group is the most predominant present dwelling type, which is shared by all income groups. It also shows that walk-up is afforded evenly by the low to high income groups.

FREQUENCY BAR CHART

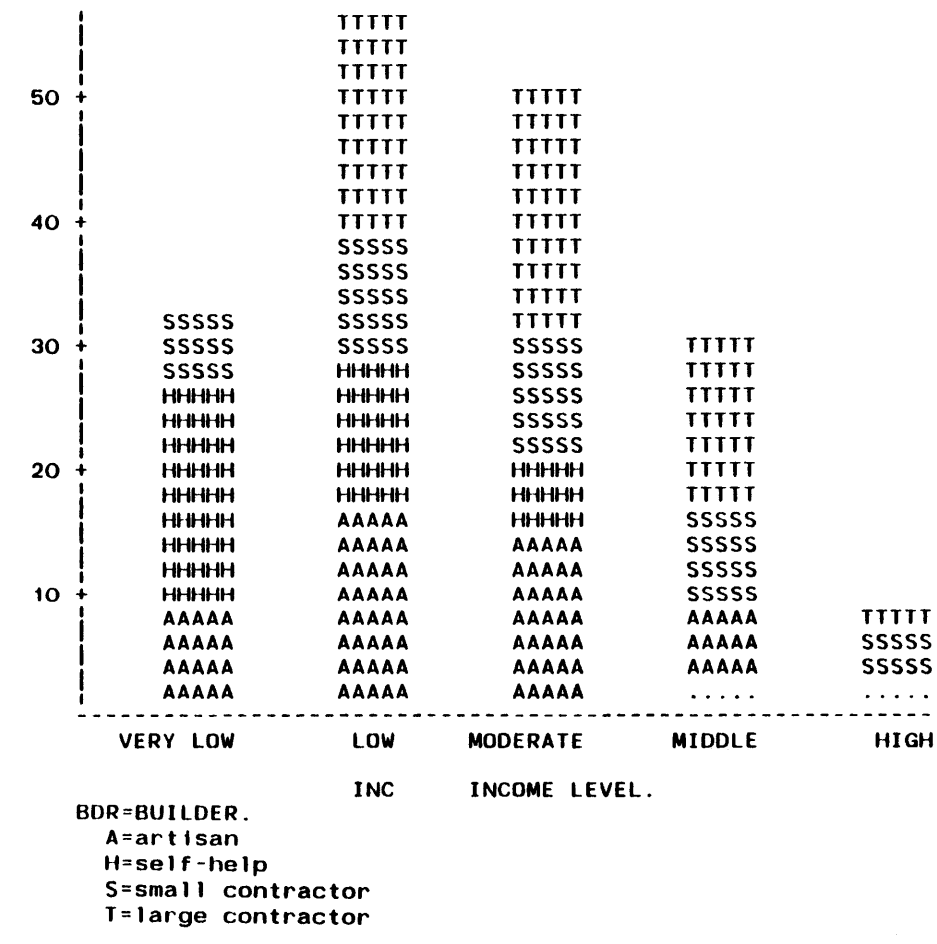
FREQUENCY



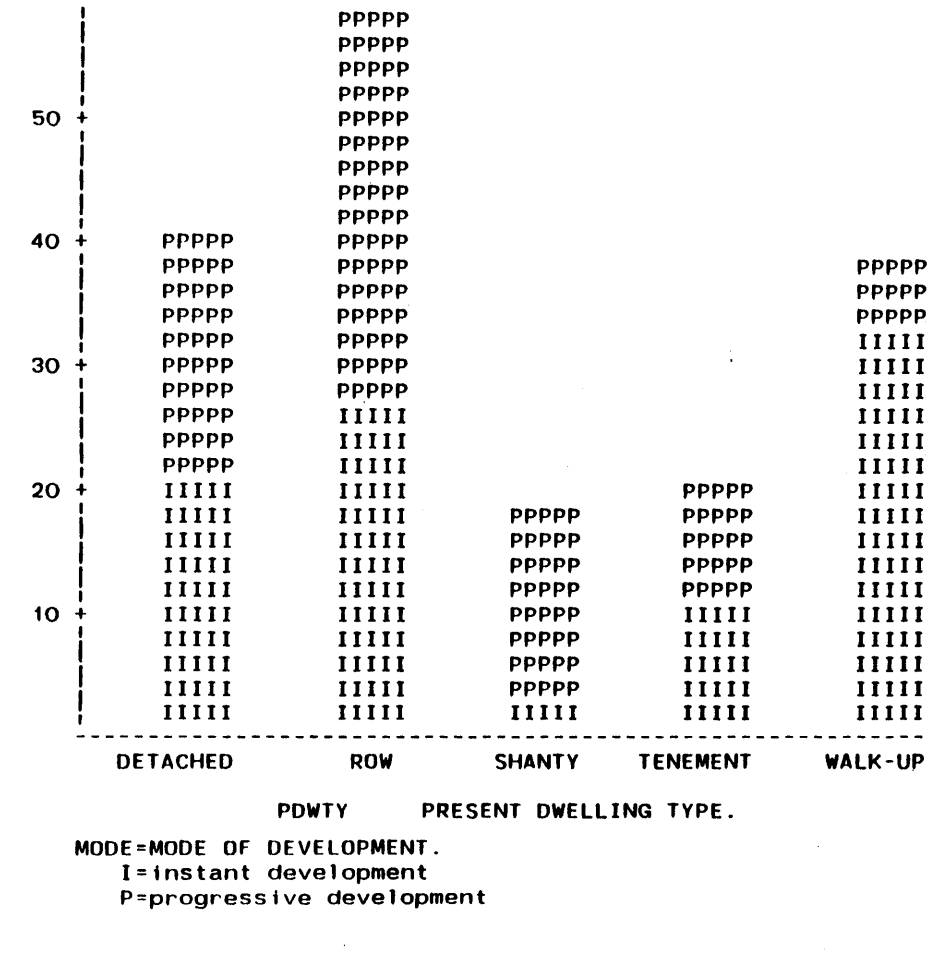
(graph 1-37) Construction types are related to income groups in this graph. It shows A) the use of adobe decreases as income level rises. B) the use of concrete increases as income level rises. C) masonry is the most popular construction type. D) wood is scarce.

FREQUENCY BAR CHART

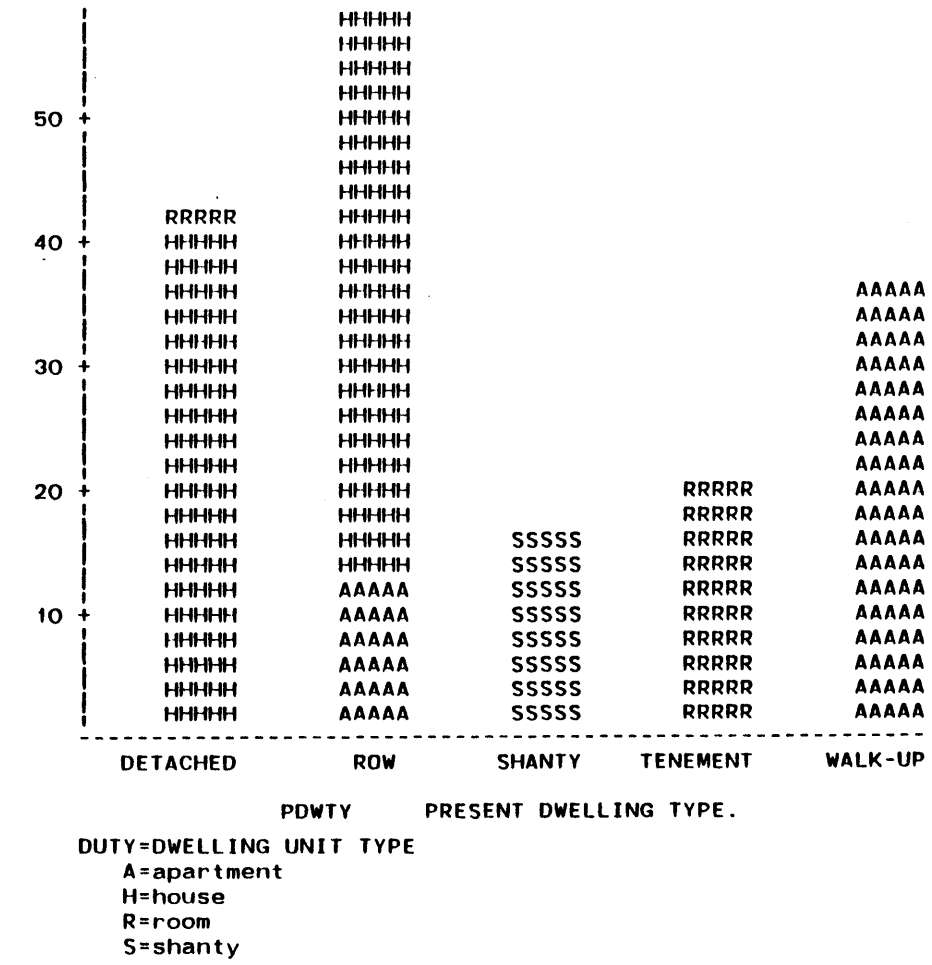
FREQUENCY



(graph 1-38) This graph indicates that majority of the dwelling environments from the moderate to very low income group are self-help or artisan built. It also shows that small contractor is flexible enough to work with all income groups.



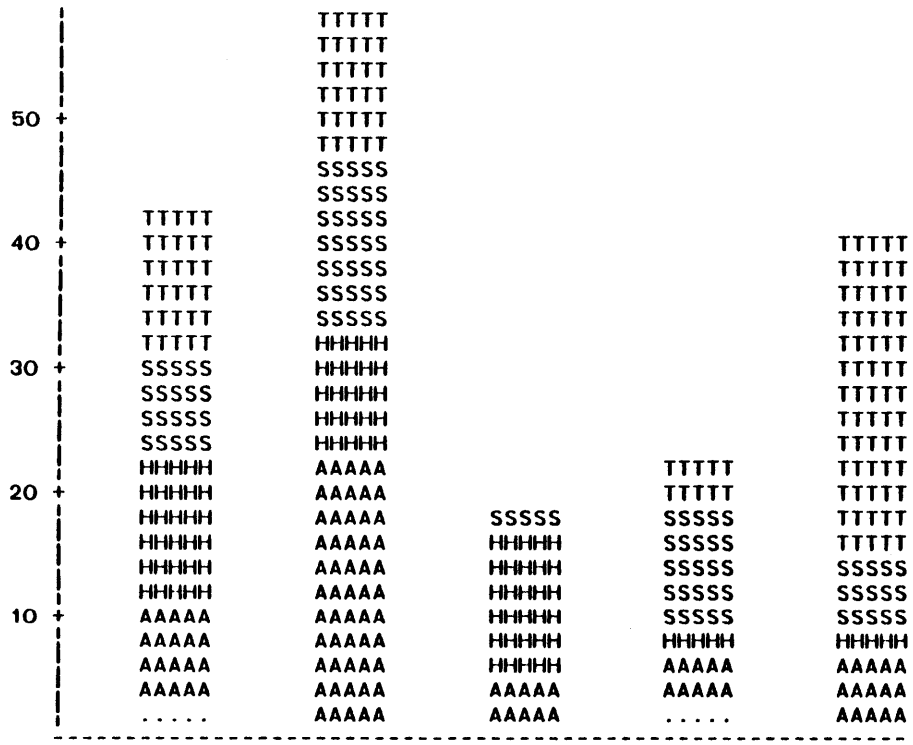
(graph 1-39) Dwelling type and mode of development is related in this graph. With the exceptions of a few that were transformed from row/group, all walk-ups are instantly developed. Which implies high initial cost and high subsity from the public agency if walk-up is developed for the low and very low income users.



(graph 1-40) This graph relates dwelling type with dwelling type. By definition, each dwelling is related to a partcular dwelling unit type except for row/group, which is used as both houses and apartments. Origionally built for extended families in the moderate density urban areas, many row/group dwellings have transformed to multifamily use, while remained single family ownership of the lot and the dwelling.

1-4 BUILDER AND CONSTRUCTION

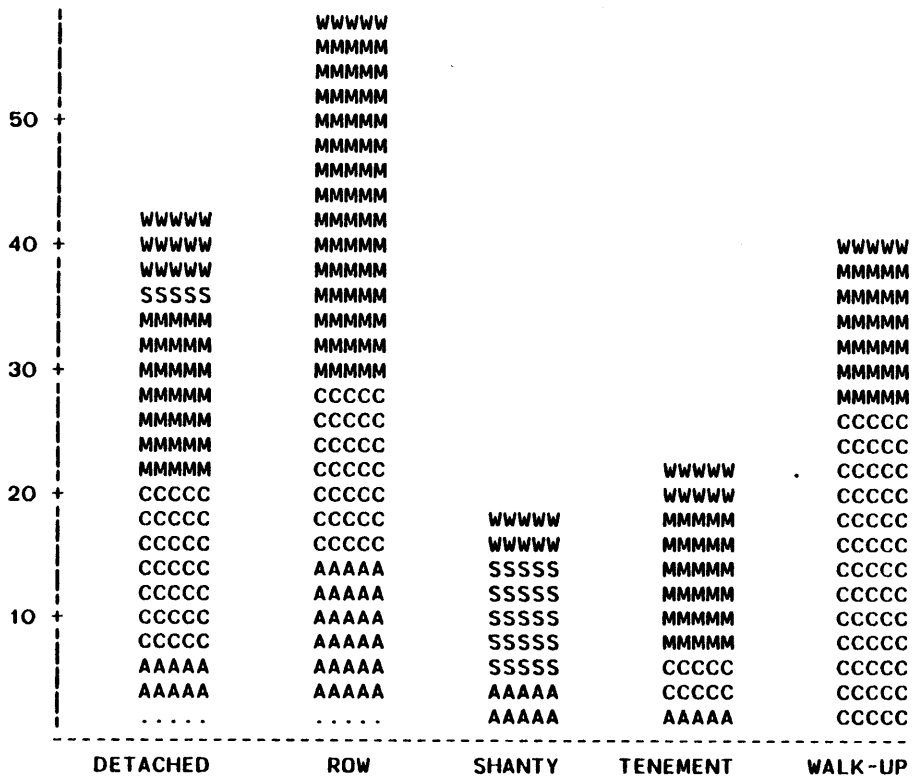
FREQUENCY



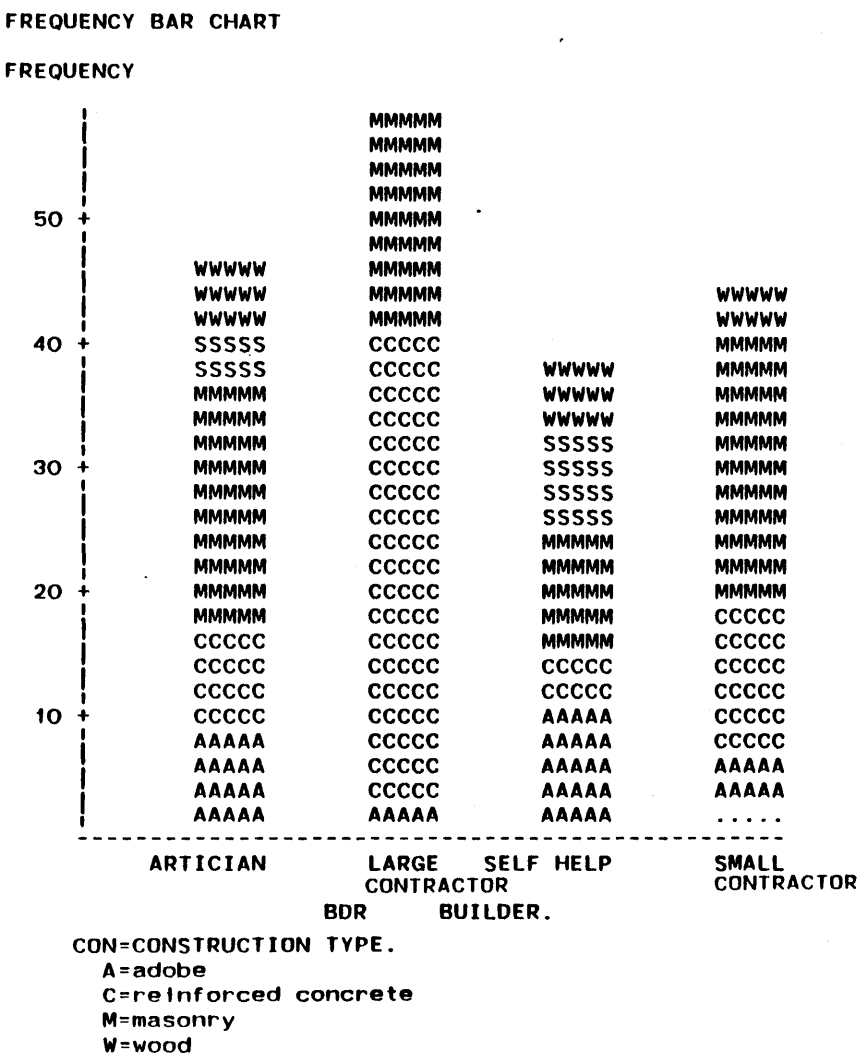
(graph 1-41) This graph shows A) Wood is a flexible building material for all dwelling types, but now has a scarce supply. B) adobe was used for many dwelling types, but is not suitable for walk-up which is frequently four floors or higher. C) once again, masonry shows its flexibility and popularity.

FREQUENCY BAR CHART

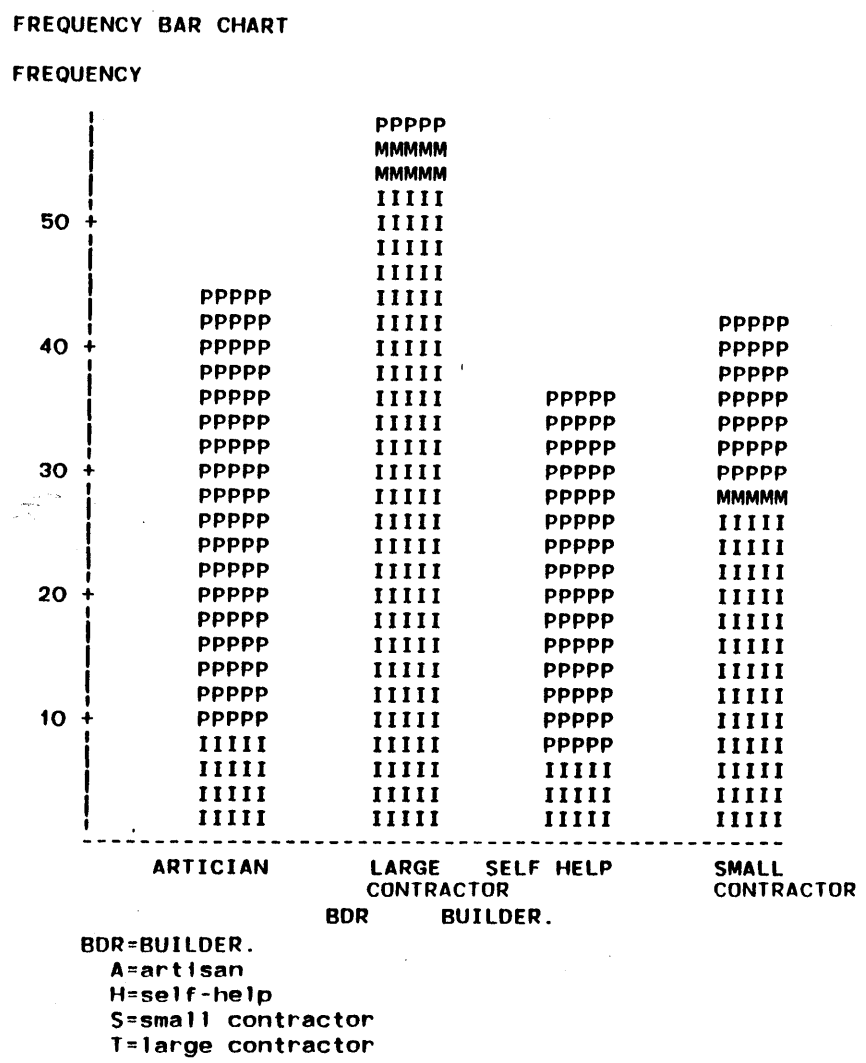
FREQUENCY



(graph 1-42) The capacity of artisan and small contractor to work with all dwelling types is shown here. Yet they are the builders the public sector fail to work with.



(graph 1-43) This graph shows the construction type used by each builder. Masonry proved its popularity while concrete is mostly associated with large contractor.



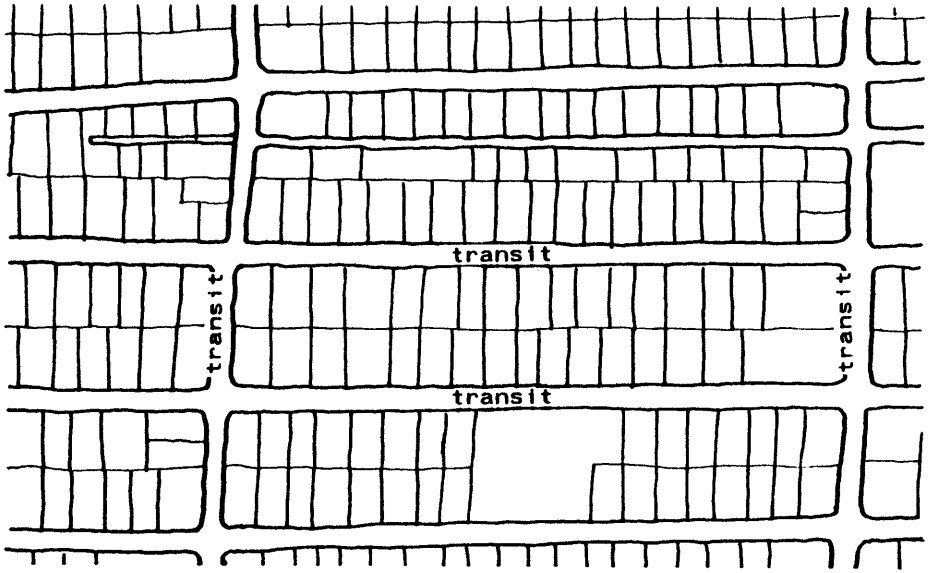
(graph 1-44) The mode of development of each builder is shown in this graph. To better mobilize the potential of human resource, the progressive mode of development should be encouraged whenever possible.

2. land subdivision

Land subdivision lays the foundation for all physical developments in an urban area. This chapter is concerned with the elements of land subdivision, with emphasis on their relations with the cost of infrastrucure. The following elements are included in the study: layout, circulation, block, lot, prevate and semi-private land. The relationship of those physical elements and the population density is also discussed.

2-1 CIRCULATION AND LAYOUT

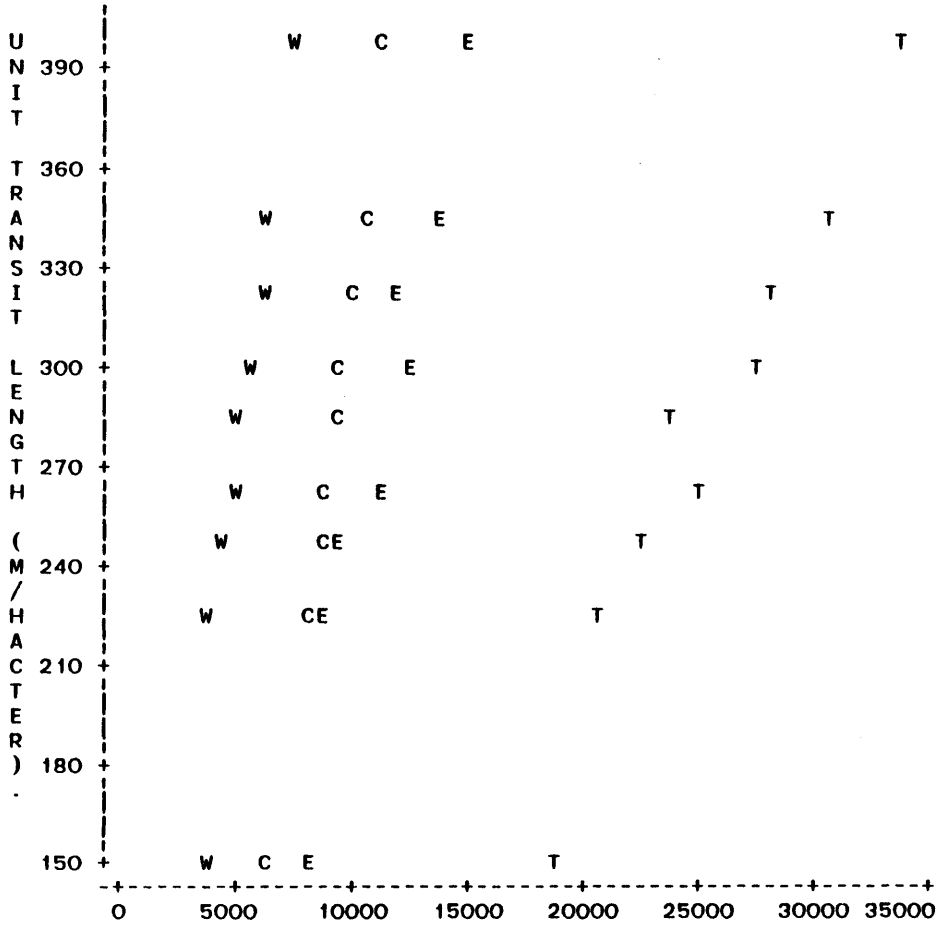
Two primary types of circulation are identified during the case studies- LINES OF TRANSIT and LINES OF ACCESS. The former is for the public to travel from one point of the urban area to another; while the later is for a limited group of user to access from the line of tansit to their dwellings. The concept of these two types of circulation is discussed in detail in URBANIZATION PRIMER (H. Caminos and R. Goethert. '81) and the PH.D theses of C. Caminos (University College, Londen. '81) With the same concept, two types of layout can also be identified- the GRID LAYOUT and the GRIDIRON LAYOUT. The grid layout contains lines of access, thus the block size is independent of the lot size. The gridiron layout does not contain line of access- all lots on the block are accessed directly from the lins of transit, therefore the block size is a function of the lot size.

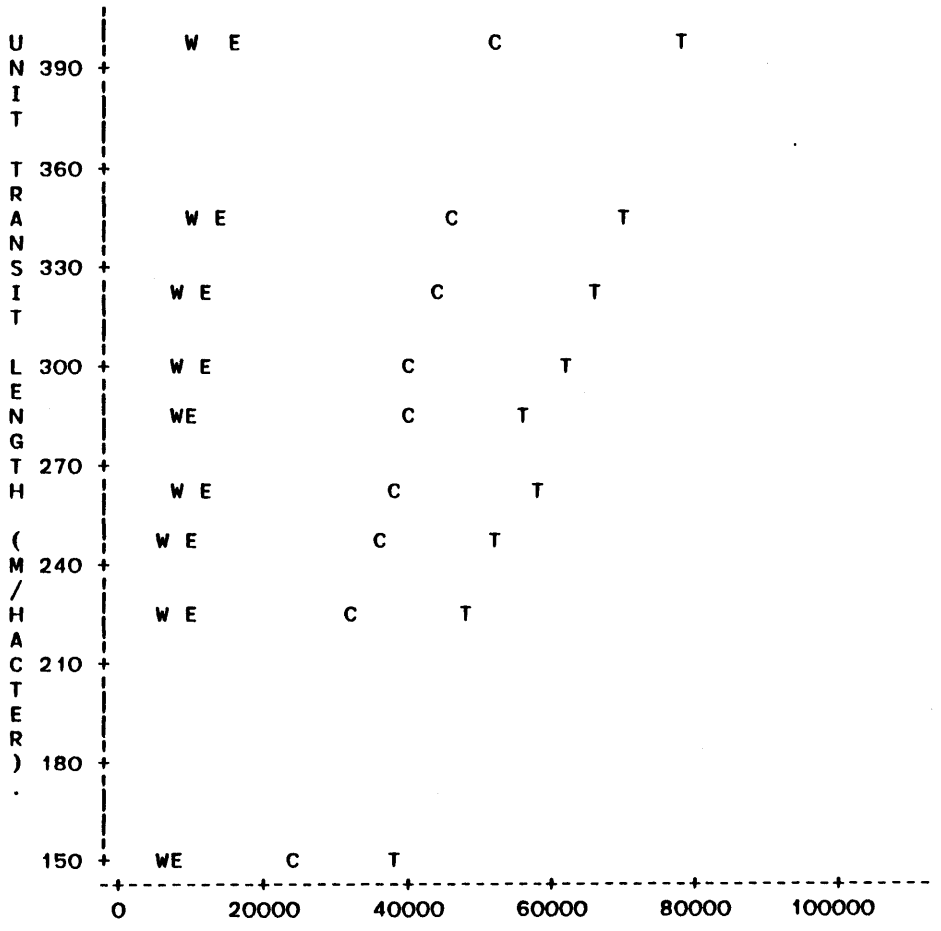


GRIDIRON LAYOUT (EAST SANTURCE, PUERTO RICO. survey no.147)
1:2500

GRID LAYOUT (ZEYREK, ISTANBUL. survey no.82)
1:2500

2-2 TRANSIT AND INFRASTRUCTURE NETWORK





NOTE: 1 OBS HIDDEN

(graph 2-3 and Graph 2-4) The close rlationship between the infrastructure network cost and the unit transit length is shown in these two graphs. The two graphs are obtained from 'URBANIZATION PRIMER' (H. Caminos and R. Goethert, '78) by plotting network costs with unit transit lengthes of 20 comparative modles.(pp. 109-195) The cost is the sum of material, labor and equipment costs, and should be used for comparative purpose only.

STANDARD LEVELS are levels set up and established by authority, custom or general consent. MINIMUM LEVELS are acceptable or possible levels below the standard.

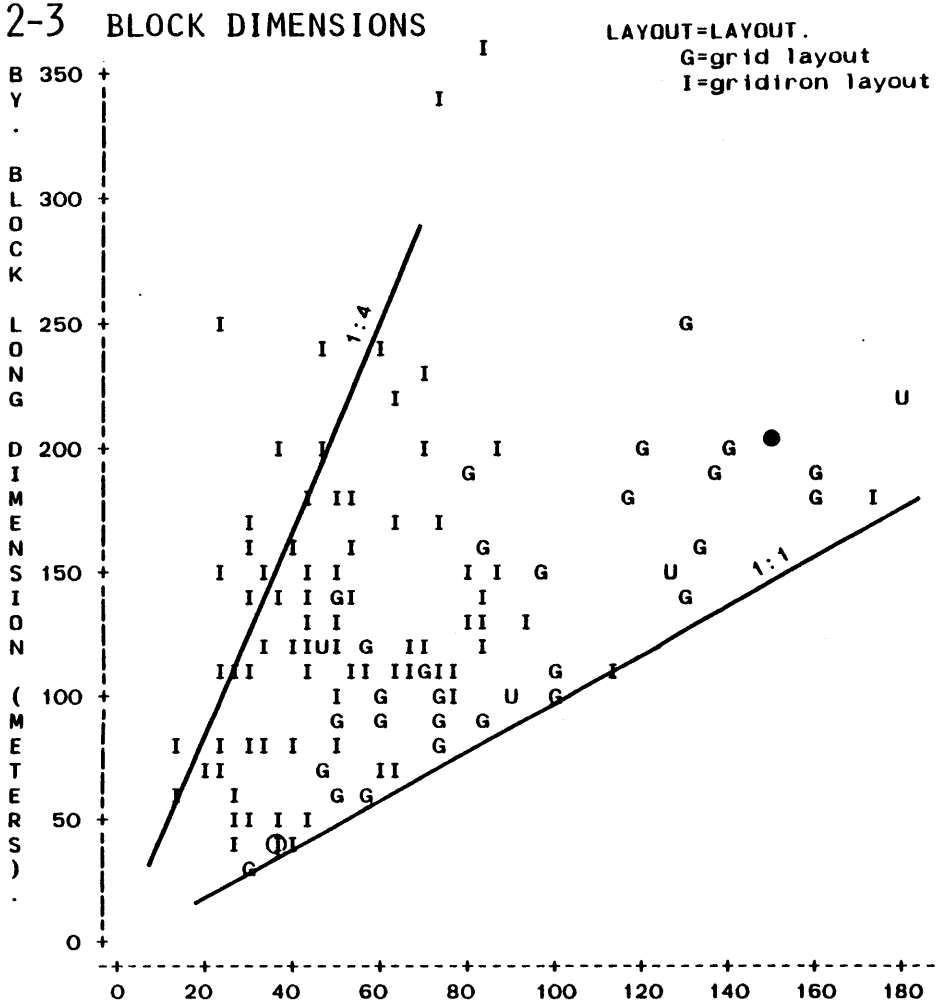
Values: W= water supply and sewage trement.

C= circulation and storm drainage.

E= electricity and street lighting.

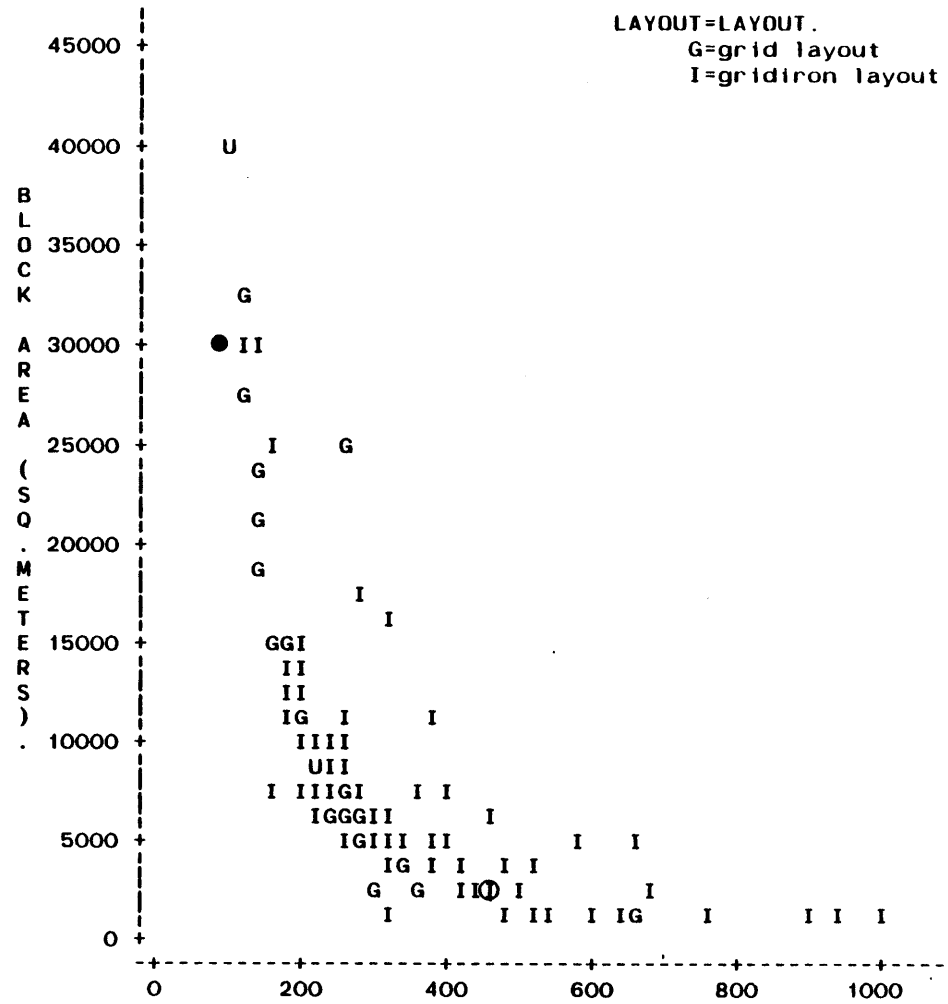
T= total unit network cost.

2-3 BLOCK DIMENSIONS



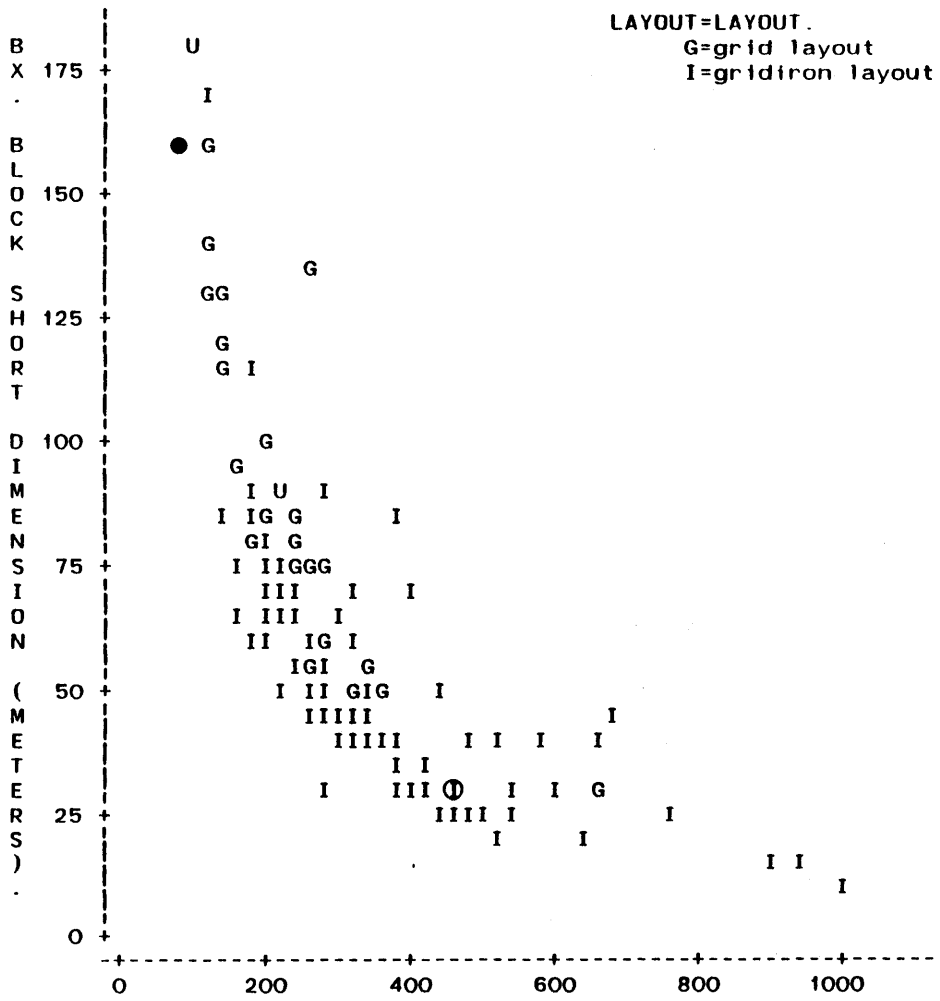
NOTE: 54 OBS HAD MISSING VALUES 19 OBS HIDDEN

(ghaph 2-5, correlation=0.38) The low correlation indicates that BX and BY are independent of each other. This graph also shows that A) 88% of the blocks fall between the proportion of 1:1 to 1:4. B) grid blocks are more square than gridiron blocks, thus may have shorter unit transit length for the same block area.



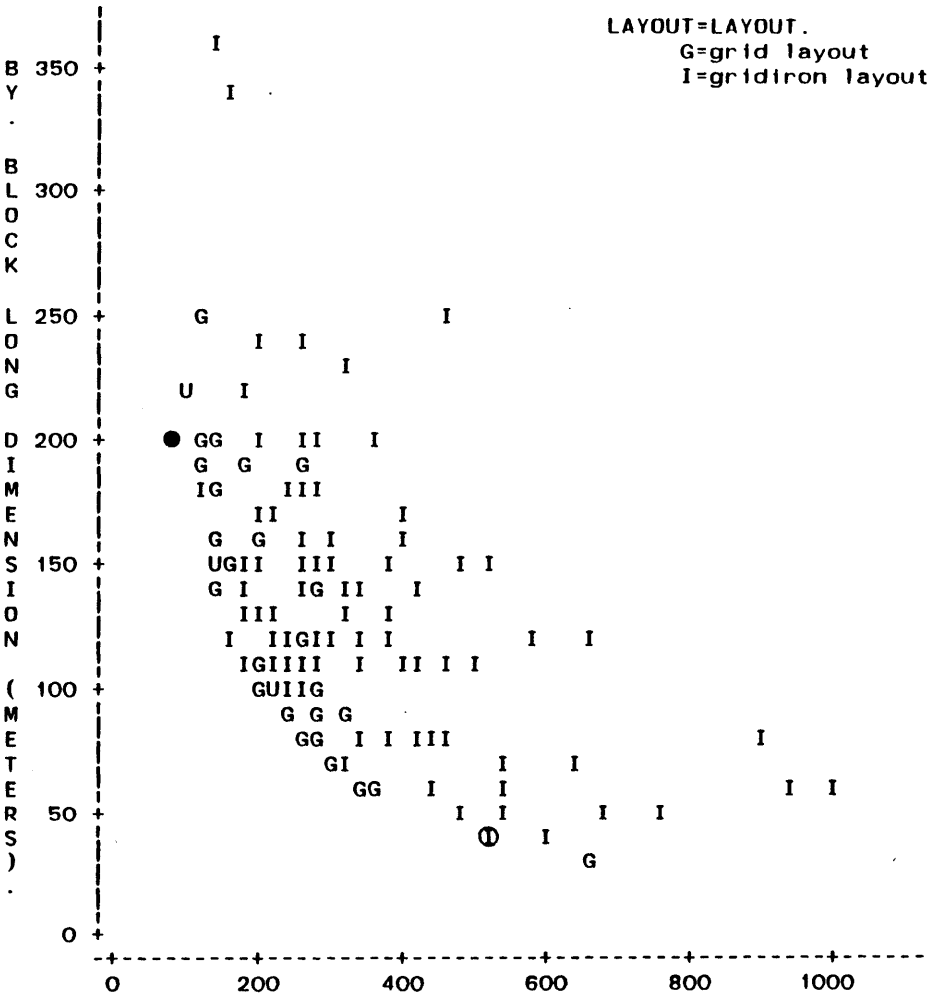
NOTE: 55 OBS HAD MISSING VALUES 48 OBS HIDDEN

(graph 2-6, correlation=-0.64) The negative correlation indicates that the larger the block area, the shorter the unit transit length, and the lower the network cost.



NOTE: 55 OBS HAD MISSING VALUES 35 OBS HIDDEN

(graph 2-7, correlation=-0.70) This graph shows that unit transit length is related to the BX. The larger the BX value, the shorter the UTL, thus the lower the cost of infrastructure.

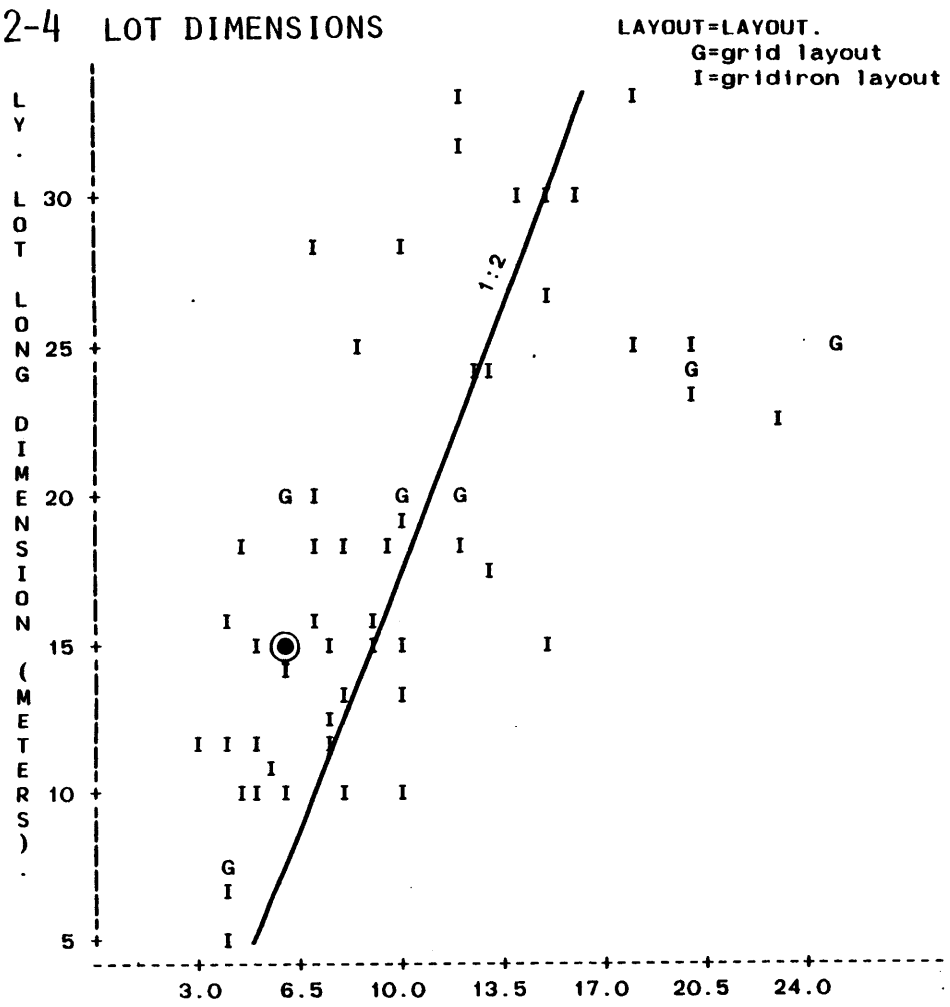


NOTE: 55 OBS HAD MISSING VALUES 18 OBS HIDDEN

(graph 2-8, correlation=-0.51) Compare with BX, BY is less significent in effecting the unit transit length and the network. Yet gridiron block tend to have longer BY dimensions in order to achieve a reasonable network efficiency. (see Graph 2-5)

○Survey no.112, KUO-MAO, KAOHSIUNG, Taiwan, see Appendix 4-2.
●La Pas site and services' project, see Appendix 4-3.

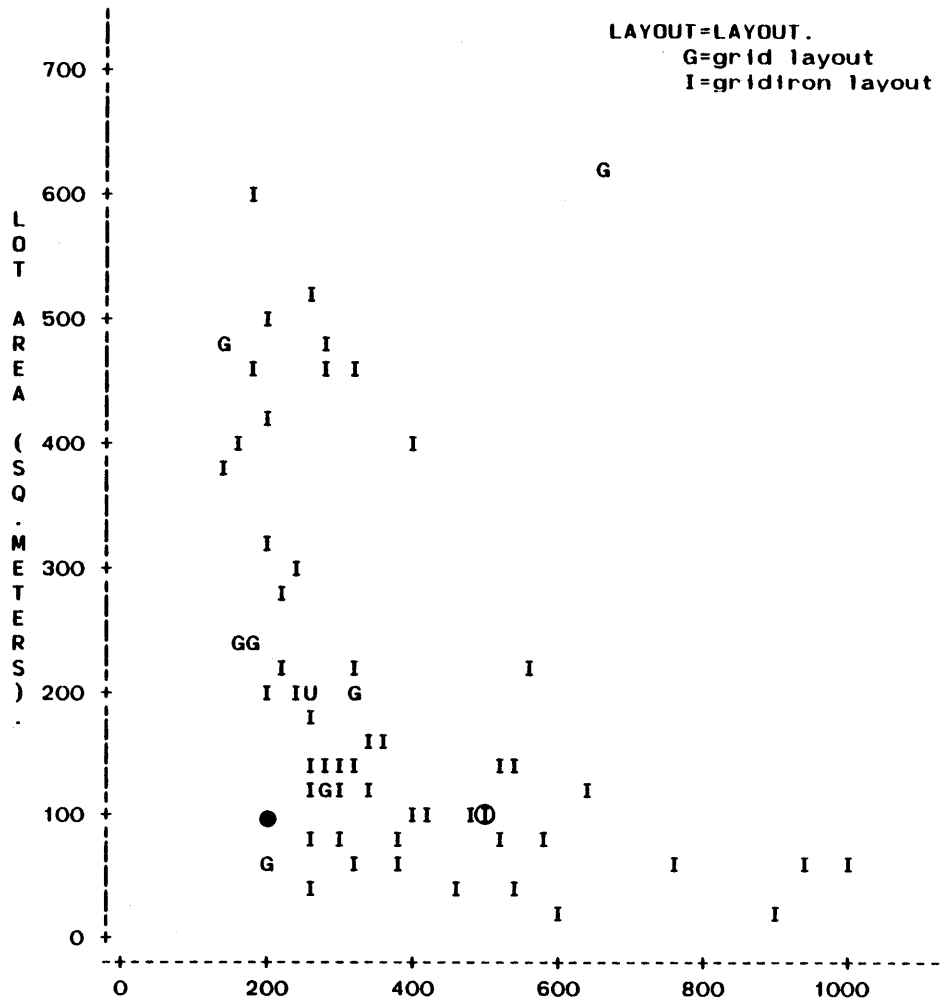
2-4 LOT DIMENSIONS



LX. LOT SHORT DIMENSION (METERS).

NOTE: 110 OBS HAD MISSING VALUES 11 OBS HIDDEN

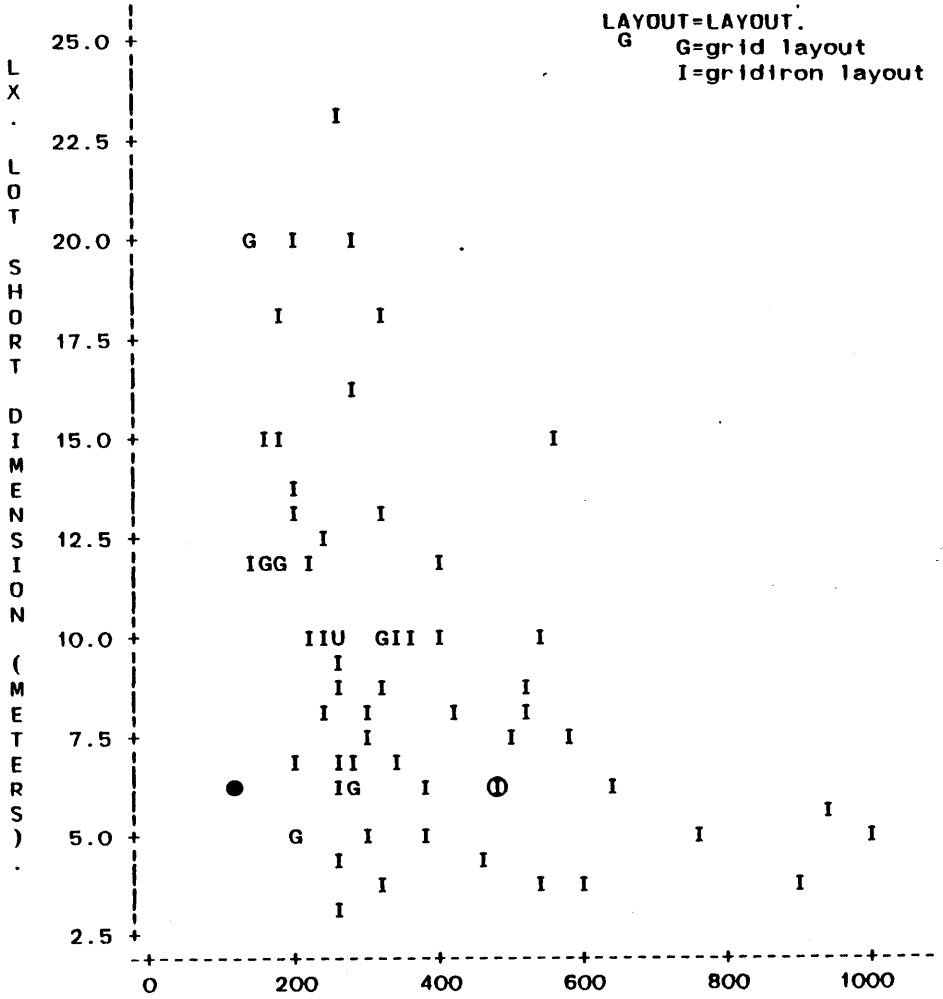
(graph 2-9, correlation=0.96) The very high correlation signifies that LX and LY are highly dependent on each other. The means of these two variables fall close to the ratio of 1:2. (see appendix 1)



UNIT TRANSIT LENGTH (METERS/HECTARE).

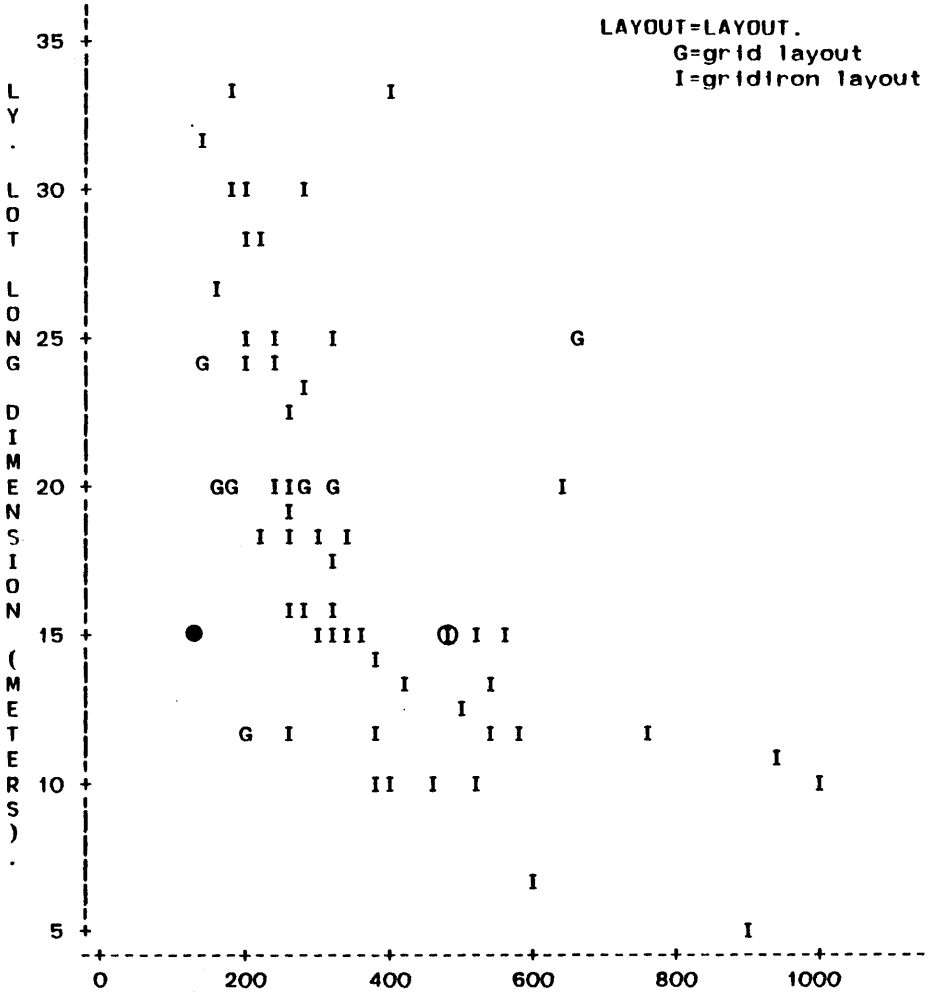
NOTE: 112 OBS HAD MISSING VALUES 5 OBS HIDDEN

(graph 2-10, correlation=0.24) Lot area and unit transit length are two independent variables, as indicated in this graph. However, for the same lot area, grid blocks tend to have lower UTL than gridiron blocks.



NOTE: 112 OBS HAD MISSING VALUES 3 OBS HIDDEN

(graph 2-11, correlation=-0.32) Lot short dimension (LX) does not effect the unit transit length. However, this graph shows that for the same LX, grid blocks tend to have lower UTL than the gridiron blocks.

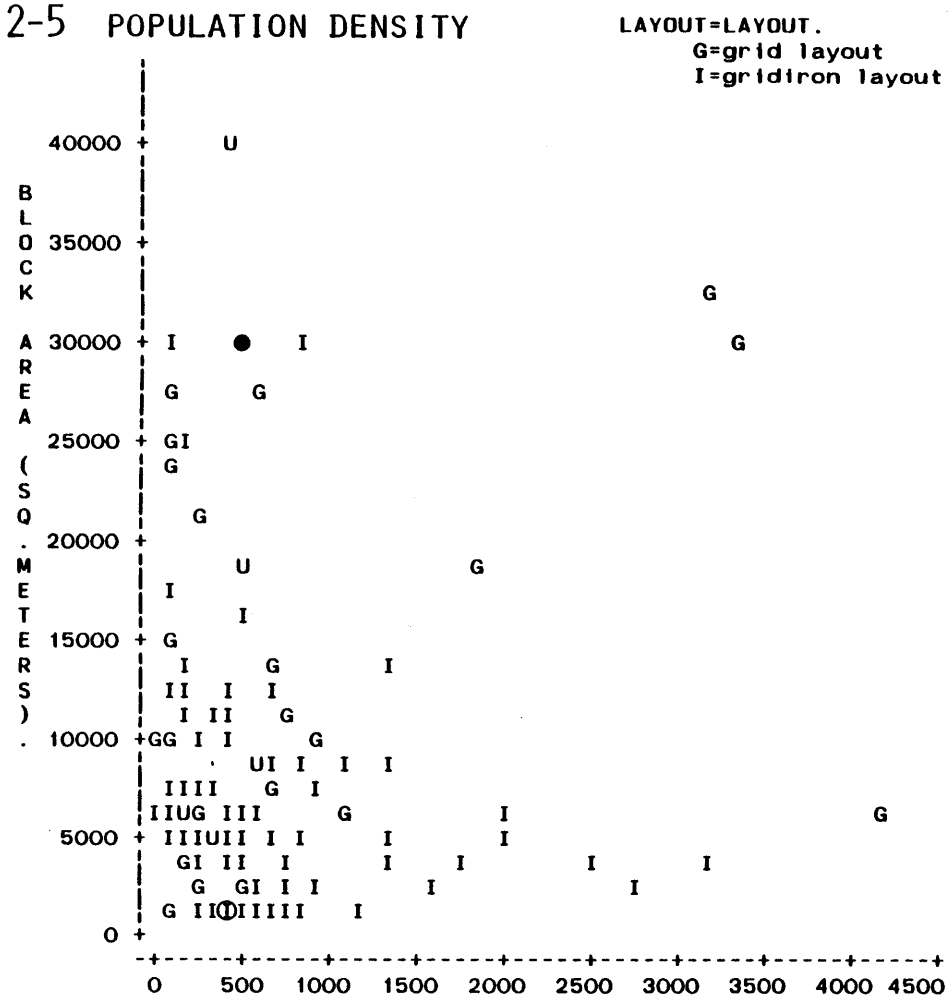


NOTE: 111 OBS HAD MISSING VALUES 6 OBS HIDDEN

(graph 2-12, correlation=-0.42) This graph indicates that in grid layout, lot long dimension and unit transit length are two independent variables; but in gridiron layout, UTL increases as BY decreases.

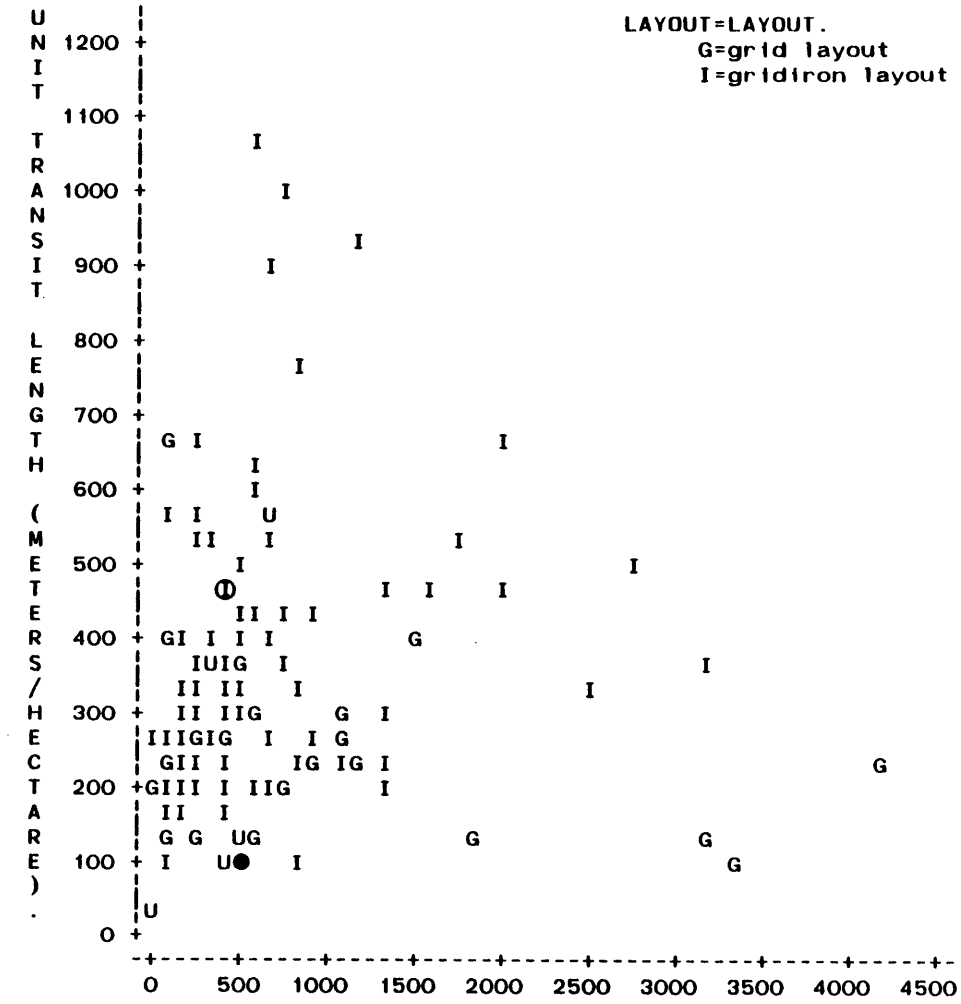
○ Survey no.112, KUO-MAO, KAOHSIUNG, Taiwan, see Appendix 4-2.
● La Pas site and services' project, see Appendix 4-3.

2-5 POPULATION DENSITY



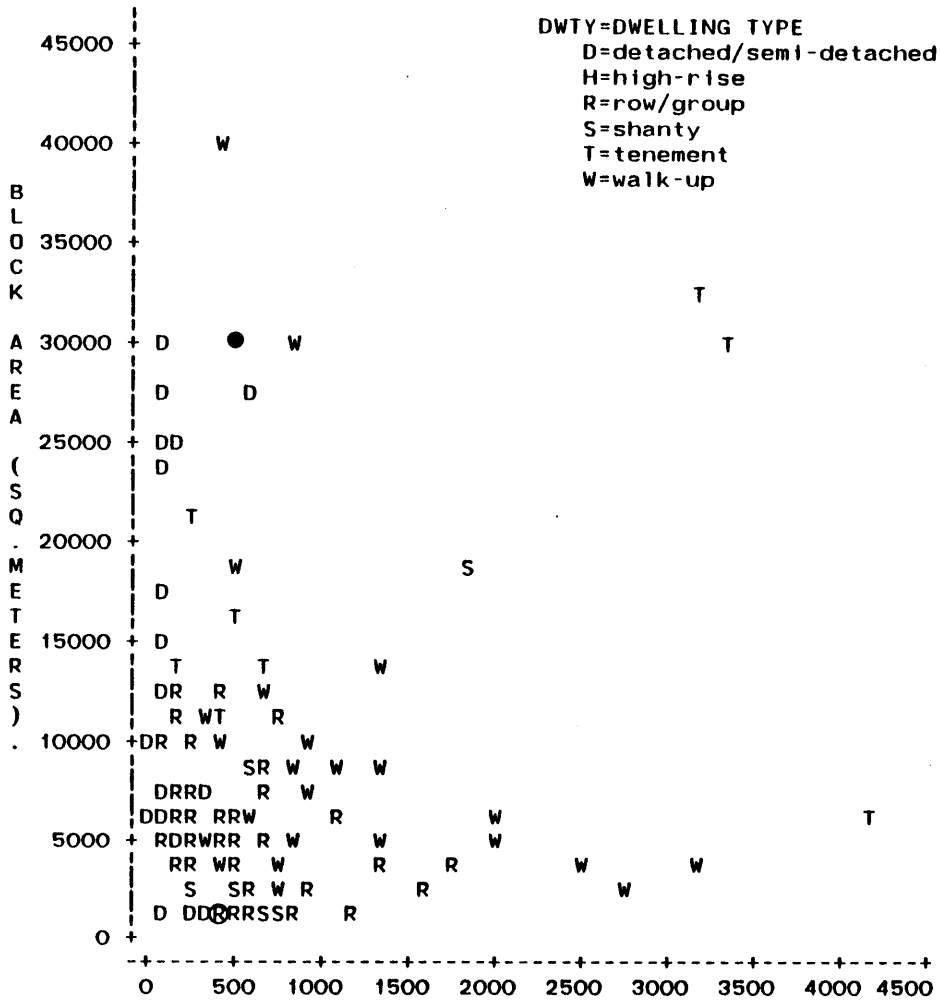
NOTE: 60 OBS HAD MISSING VALUES 32 OBS HIDDEN

(graph 2-13, correlation=0.04) The graph shows that the block area is independent of population density. However, for each range of population density, the grid layout has larger block areas than the gridiron layout. This inmplies that the grid layout may have better network efficiency.



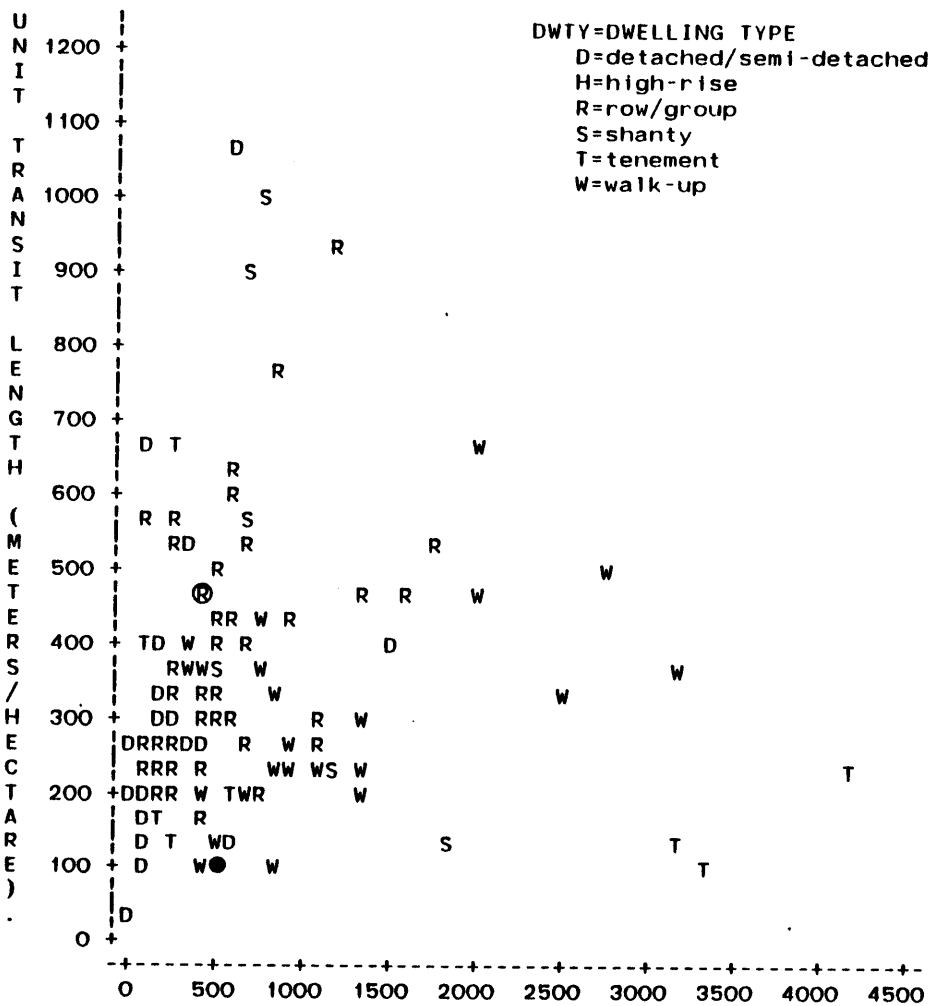
NOTE: 47 OBS HAD MISSING VALUES 40 OBS HIDDEN

(graph 2-14, correlation=0.10) This low correlation shows that population density does not effect unit transit length. This graph also shows that for the same population density, grid layout tends to be more efficient than gridiron layout.



NOTE: 60 OBS HAD MISSING VALUES 32 OBS HIDDEN

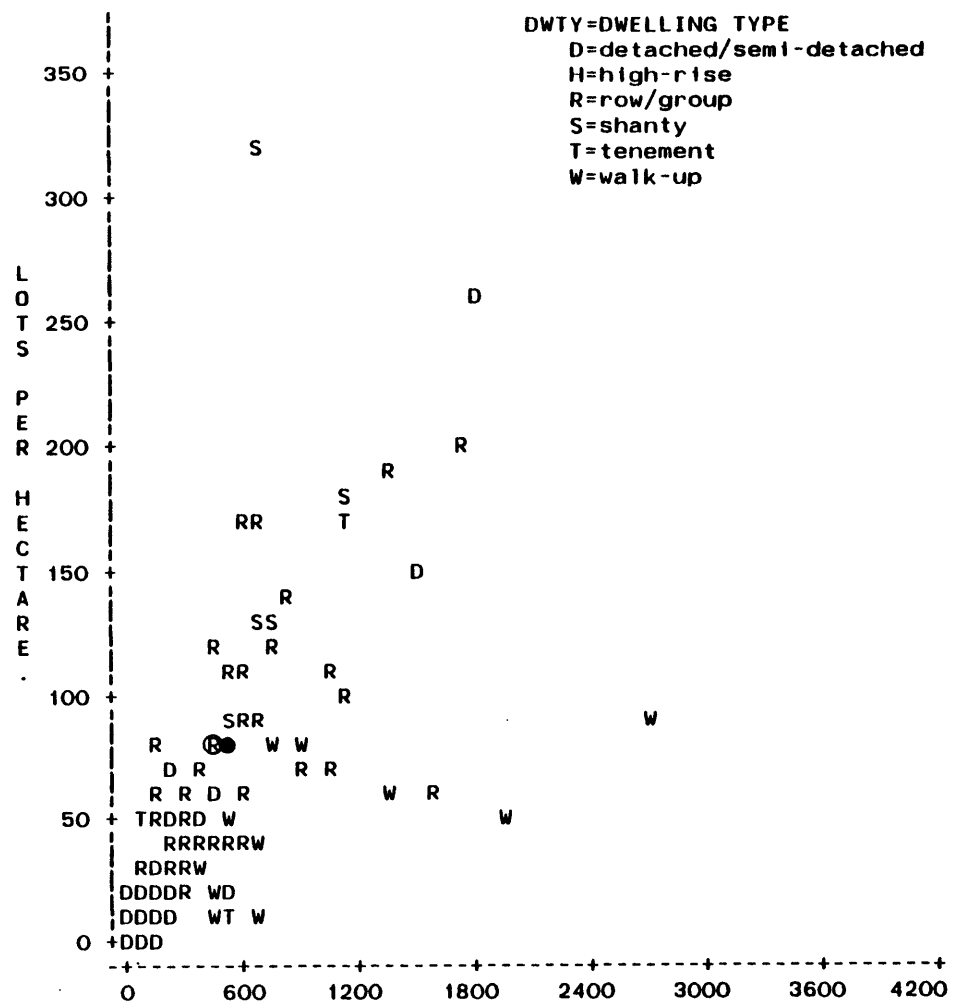
(graph 2-15, correlation=0.04) The graph indicates that walk-up and tenement can reach very high population densities. For the same block area, they also tend to have higher net density.



NOTE: 47 OBS HAD MISSING VALUES 40 OBS HIDDEN

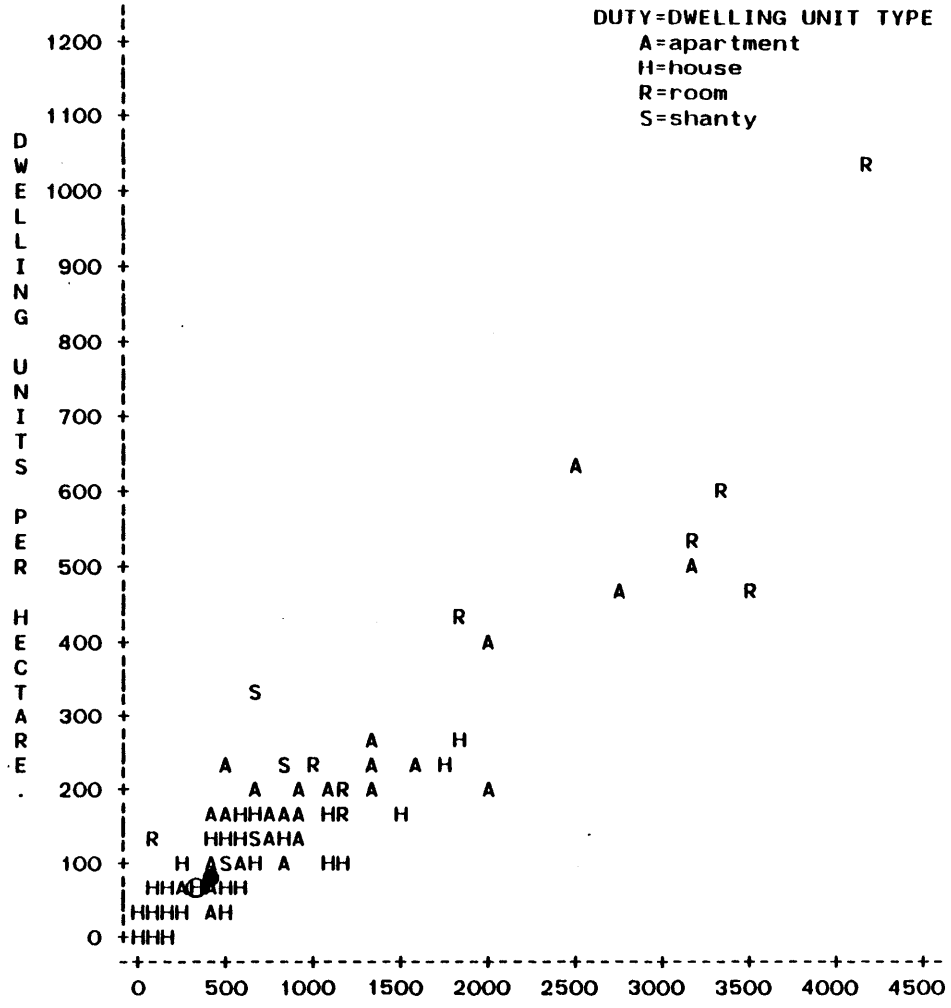
(graph 2-16, correlation=0.10) For the same range of unit transit length, the order of population density for all dwelling types tend to be: detached/semi-detached, row/group, walk-up and tenement. This also implies the order of network cost per capita.

○ Survey no.112, KUO-MAO, KAOHSIUNG, Taiwan, see Appendix 4-2.
● La Pas site and services' project, see Appendix 4-3.



NOTE: 64 OBS HAD MISSING VALUES 45 OBS HIDDEN

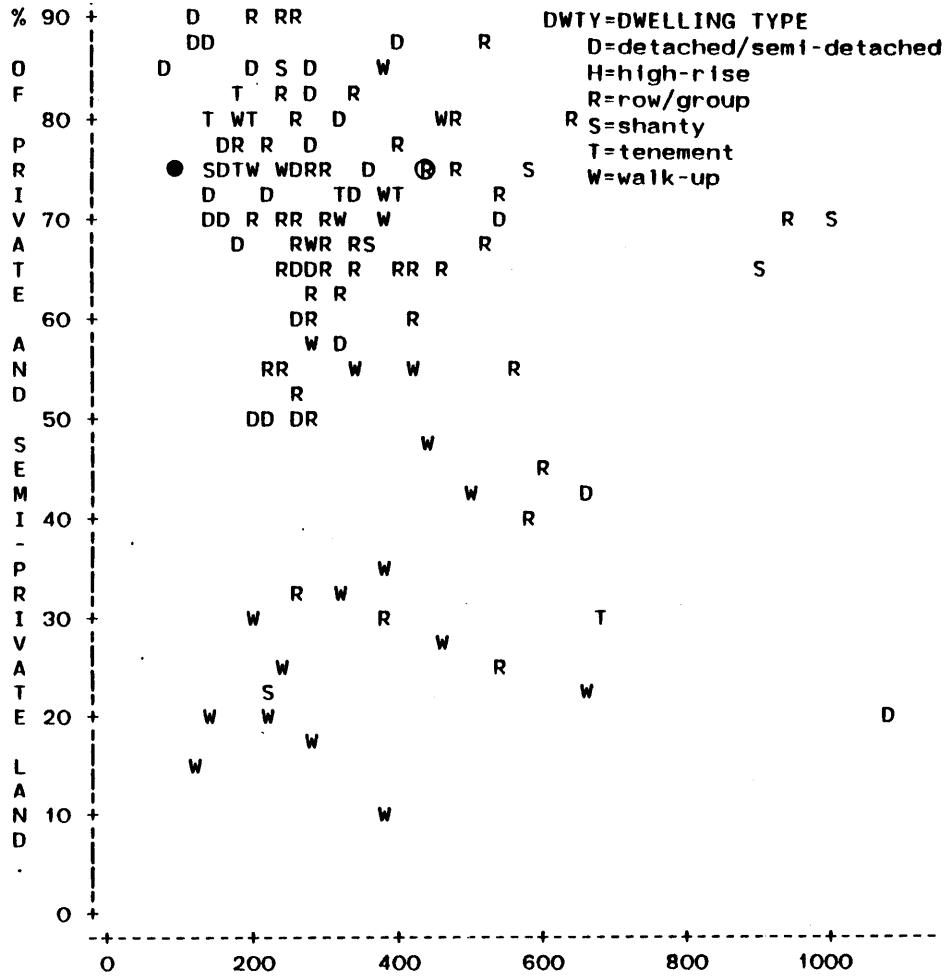
(graph 2-17, correlation=0.60) This graph shows the relationship between the population density and the lot density. The relationship is strongly inffluenced by the presents of walk-up.



NOTE: 28 OBS HAD MISSING VALUES 87 OBS HIDDEN

(graph 2-18, corelation=0.92) This graph shows the direct relationship between population density and dwelling unit density. It also shows that in the very high density range,(ie. >2000p/ha) the dwelling unit type is either apartment or room.

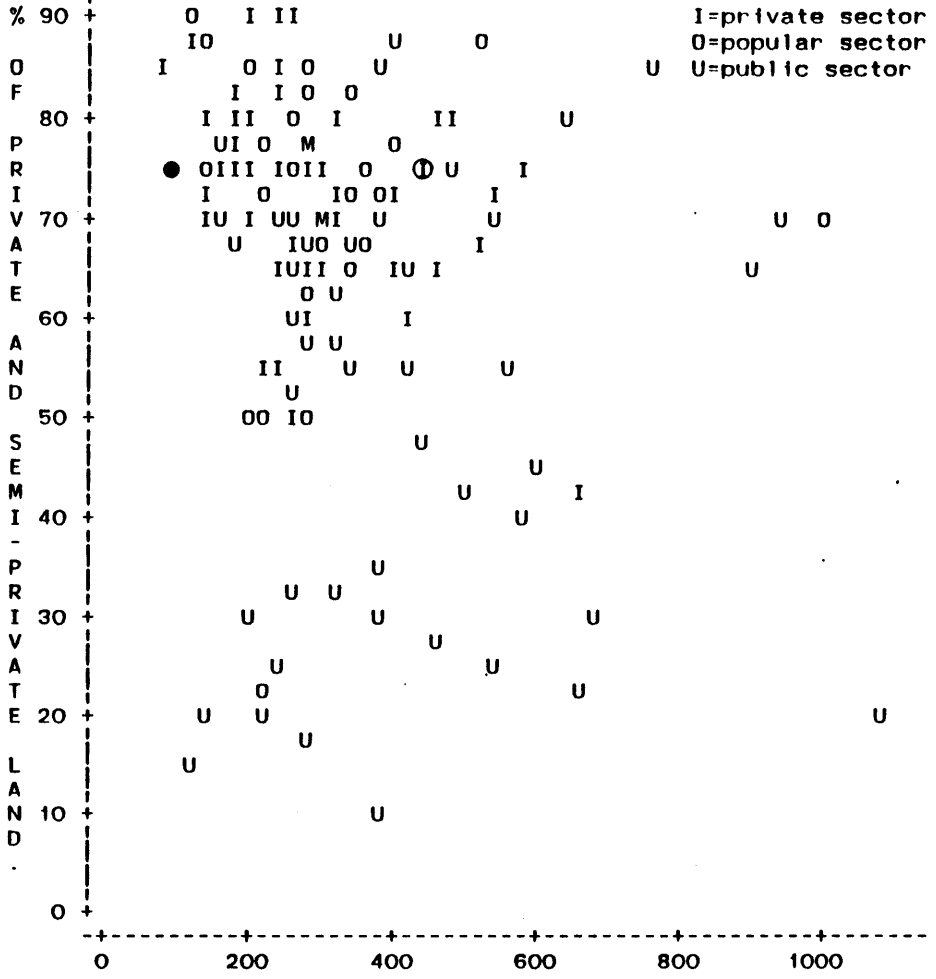
2-6 PRIVATE AND SEMI-PRIVATE LAND



NOTE: 45 OBS HAD MISSING VALUES 19 OBS HIDDEN

(graph 2-19, correlation=-0.19) The walk-up being grouped at the lower left part of the graph have both low UTL and percentage of private land. This implies A) they may have lower network cost. B) there exists a potential problem of control and maintanence.

○ Survey no.112, KUO-MAO, KAOHSIUNG, Taiwan, see Appendix 4-2.
● La Pas site and services' project, see Appendix 4-3.



NOTE: 45 OBS HAD MISSING VALUES 19 OBS HIDDEN

(graph 2-20, correlation=-0.19) The most obvious character of this graph is that cases developed by public sector tend to have lower percentage of private land. This character not only indicates the higher cost of control and maintanence, but also implies the possibility of undefined, under-utilized and even potentially troublesome spaces.

3. environmental transformation

The changing use of dwellings and dwelling units are discribed in this chapter. Althought the source of information is limited to the simple documentation of initial, present and projected future use of dwellings and dwelling types of each survey, as a whole those documentation illustrates the dynamics of dwelling environments.

This chapter is divided into two parts: DWELLING TYPE and DWELLING UNIT TYPE. Each part contans 3 sets of graphs. The first set is a collection of frequency bar charts of each dwelling/dwelling unit type for the initial, present and future stages. The second set is made of 3 plots of dwelling unit area vs. year of construction for the 3 stages. The last set is a selection of initial dwelling/dwelling types, with their present use listed of the horizontal axis and the future use listed on the vertical bars. In these vertical bar charts the changes of use for each dwelling/dwelling unit type is clearly shown, the flexibility of each type is also implied.

On the whole, the environmental transformation indicates the following trend:

- Shanty, detached/semi-detached dwellings are popular at the initial stage. They have the ability of accommodating the future growth by transforming into row/group or walk dwellings, and they are easy to built.

- Row/group dwellings are able to achieve medium to medium-high density. They were traditionally the most popular urban dwelling type. In the present stage, many of the row/group dwelling are changing into walk-up apartments. This trend indicates the transformation of sigle families lots to multi-family lots or condominuim ownership.

3-1 DWELLING TYPE

FREQUENCY BAR CHART

IDWTY		FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
DETACHED	******	29	29	16.02	16.02
HIGH RISE		1	30	0.55	16.57
NON-	**********	59	89	32.60	49.17
ROW	*********	50	139	27.62	76.80
SHANTY	*****	23	162	12.71	89.50
TENEMENT	***	15	177	8.29	97.79
WALK-UP	*	4	181	2.21	100.00

20 40 60

FREQUENCY

FREQUENCY BAR CHART

PDWTY		FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
DETACHED	*********	45	45	24.86	24.86
HIGH RISE		2	47	1.10	25.97
ROW	**********	61	108	33.70	59.67
SHANTY	***	16	124	8.84	68.51
TENEMENT	****	20	144	11.05	79.56
WALK-UP	*******	37	181	20.44	100.00

20 40 60

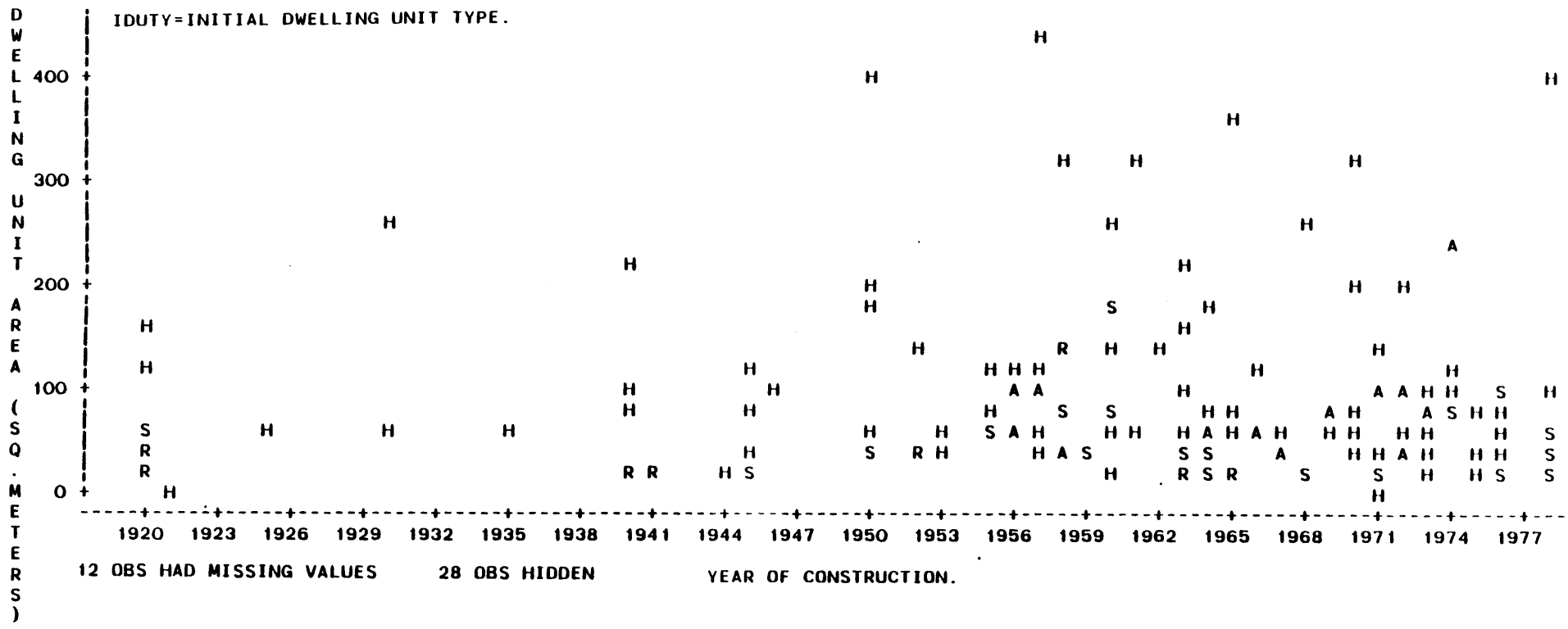
FREQUENCY

FREQUENCY BAR CHART

FDWTY		FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
DETACHED	****	20	20	11.83	11.83
HIGH RISE	*	3	23	1.78	13.61
ROW	**********	62	85	36.69	50.30
SHANTY	*	6	91	3.55	53.85
TENEMENT	*****	25	116	14.79	68.64
WALK-UP	**********	53	169	31.36	100.00

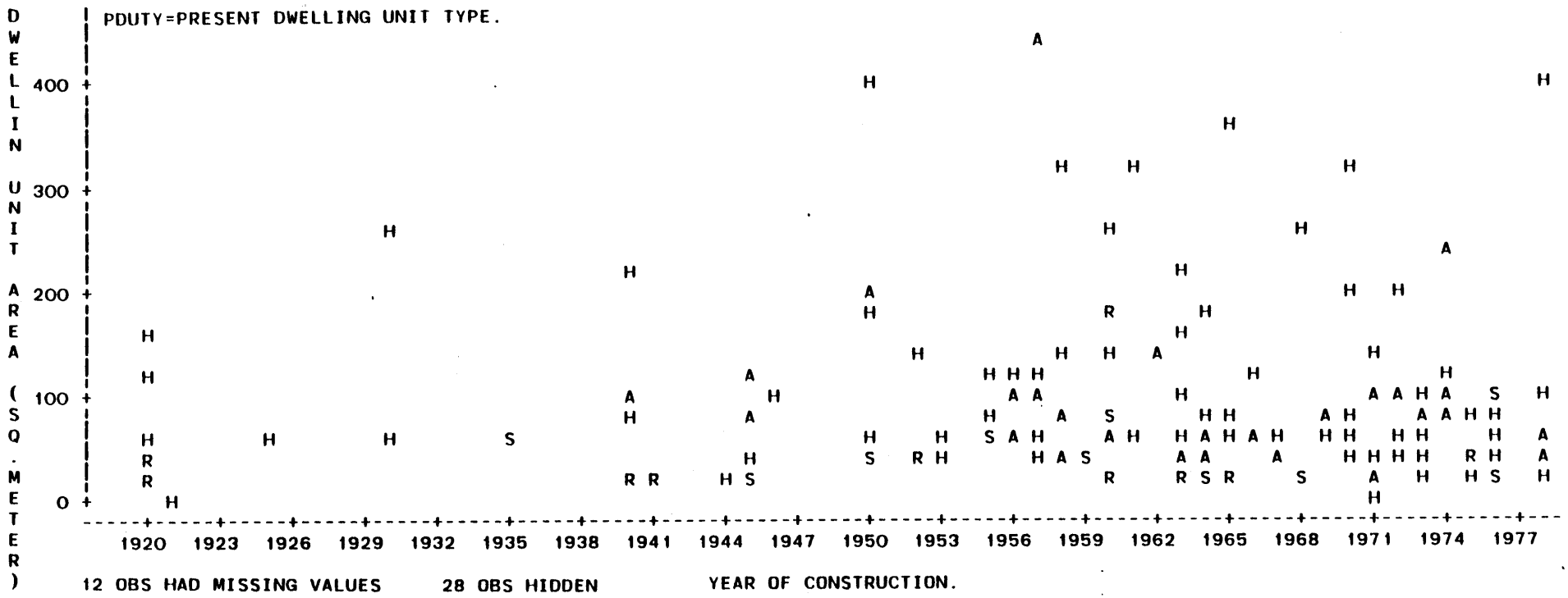
20 40 60

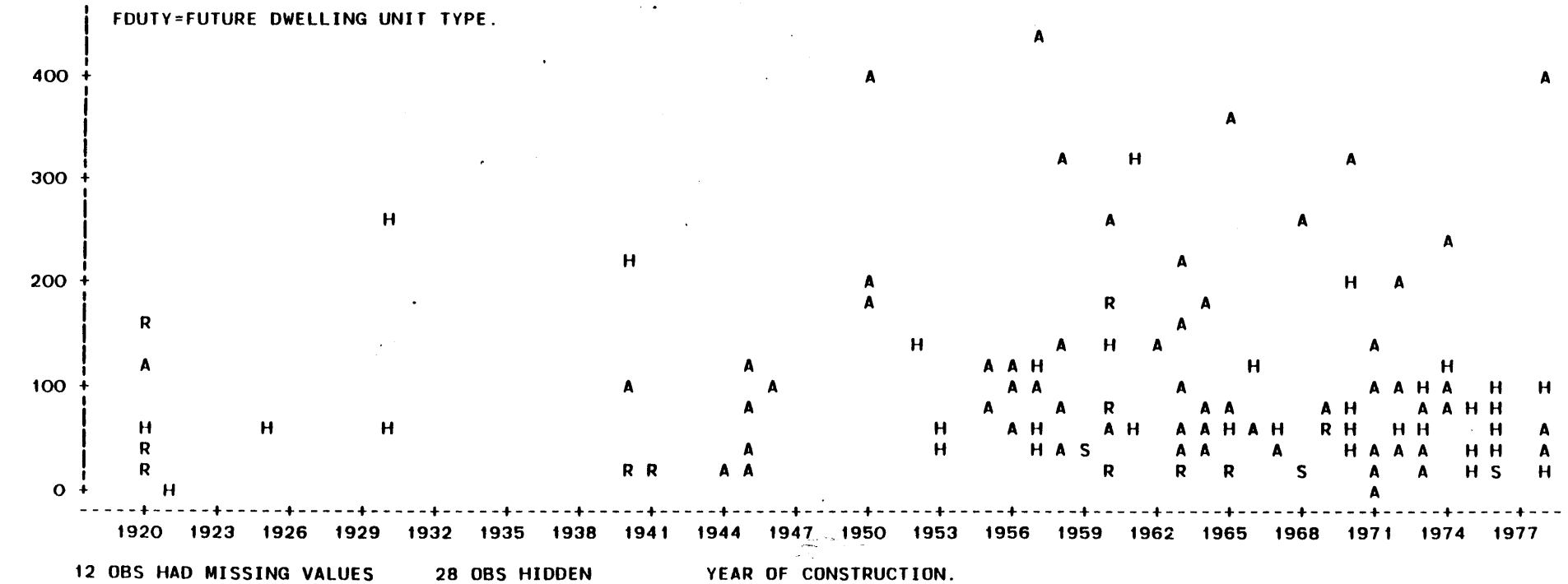
FREQUENCY



- Walk-up apartment became popular at the present stage, and is projected to proliferate in the future stage. By nature they are able to achieve very high densities, with low unit transit length and potential savings on infrastructure. However, by design they were also frequently resulted in high initial cost, low participation of the users during the process of development, larger portions of undefined and under utilized open spaces. It is important to note that walk-up is likely to be the most perdominate dwelling typy in the future. Yet it is the most rigid type, least capable of adapting changes. It reaches its higherest density almost immedialtly proceeding completion, thus leaves no room for future growth. It requires high initial cost, thus can only accommodate smaller number of beneficiaries. There is little indication that this dwelling type is capable of mobilizing the potential human resource toward reliefing the overwhelming issue of urban settlement in developing countries.

DWTY=DWELLING TYPE
D=detached/semi-detached
H=high-rise
R=row/group
S=shanty
T=tenement
W=walk-up

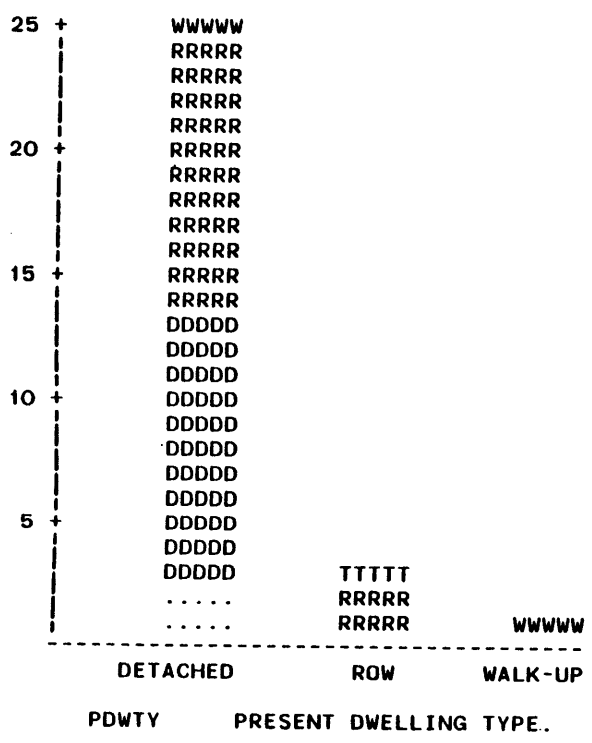

PDUTY=PRESENT DWELLING UNIT TYPE.
DWELLIN UNIT AREA (SQ.METER)
400
300
200
100
0
1920 1923 1926 1929 1932 1935 1938 1941 1944 1947 1950 1953 1956 1959 1962 1965 1968 1971 1974 1977
12 OBS HAD MISSING VALUES 28 OBS HIDDEN
YEAR OF CONSTRUCTION.


FDUTY=FUTURE DWELLING UNIT TYPE.
400
300
200
100
0
1920 1923 1926 1929 1932 1935 1938 1941 1944 1947 1950 1953 1956 1959 1962 1965 1968 1971 1974 1977
12 OBS HAD MISSING VALUES 28 OBS HIDDEN
YEAR OF CONSTRUCTION.

INITIAL DWELLING TYPE.=D

FREQUENCY BAR CHART

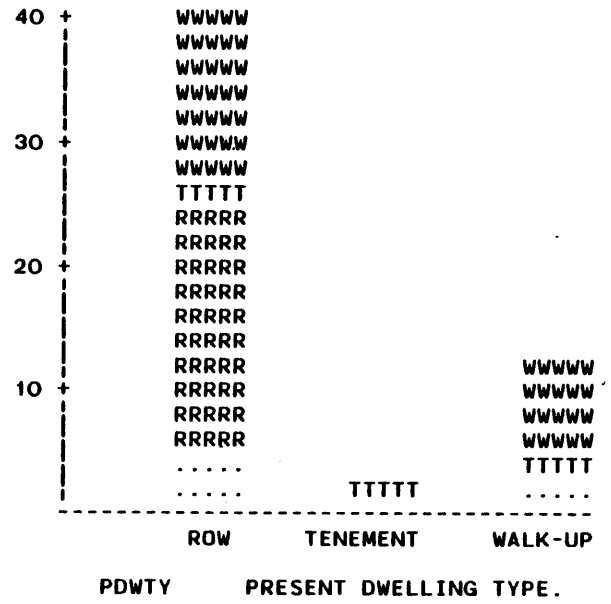
FREQUENCY



INITIAL DWELLING TYPE.=R

FREQUENCY BAR CHART

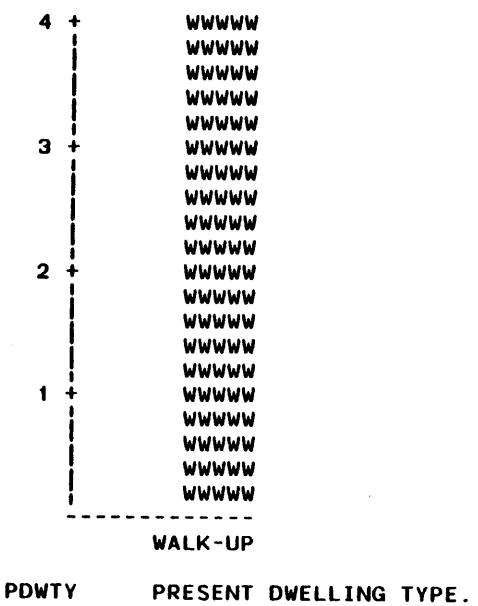
FREQUENCY



INITIAL DWELLING TYPE.=W

FREQUENCY BAR CHART

FREQUENCY

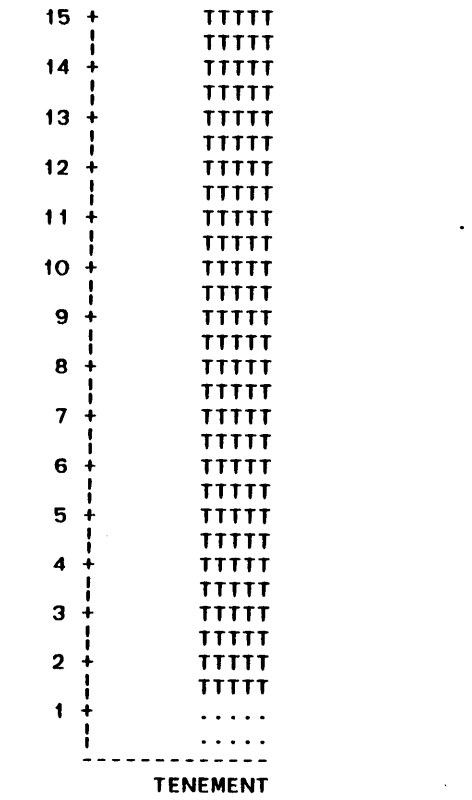


DWTY=DWELLING TYPE
D=detached/semi-detached
H=high-rise
R=row/group
S=shanty
T=tenement
W=walk-up

INITIAL DWELLING TYPE.=T

FREQUENCY BAR CHART

FREQUENCY

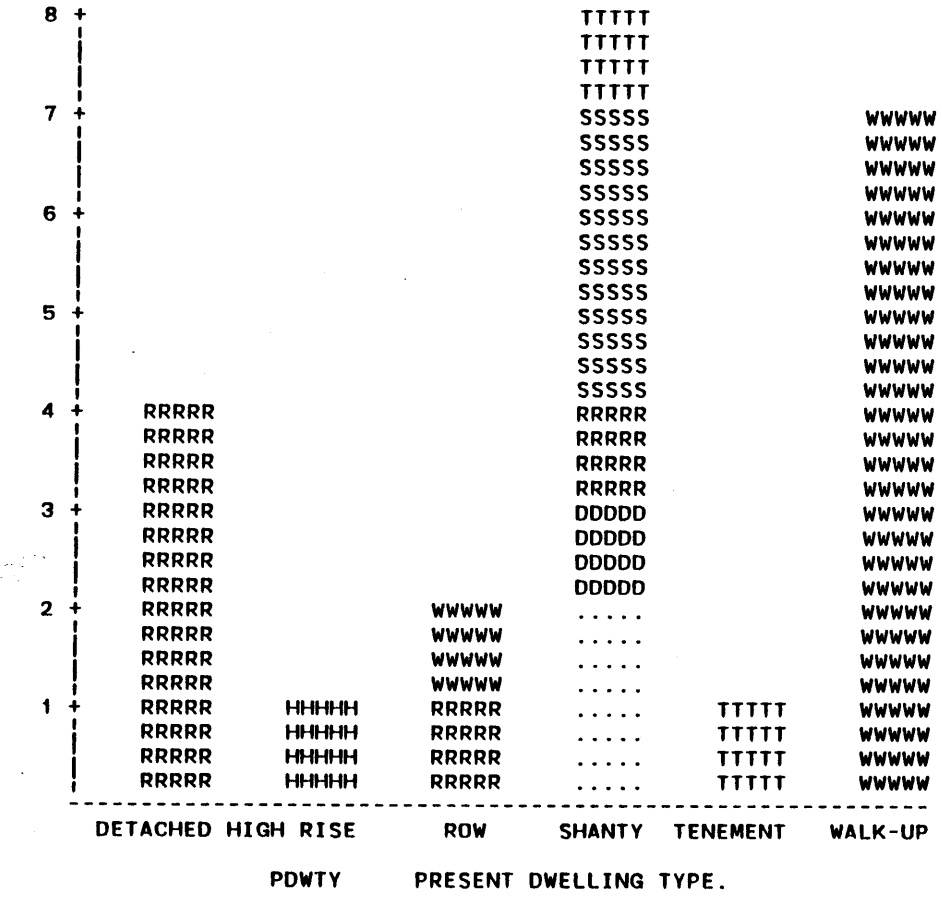


PDWTY PRESENT DWELLING TYPE.

INITIAL DWELLING TYPE.=S

FREQUENCY BAR CHART

FREQUENCY

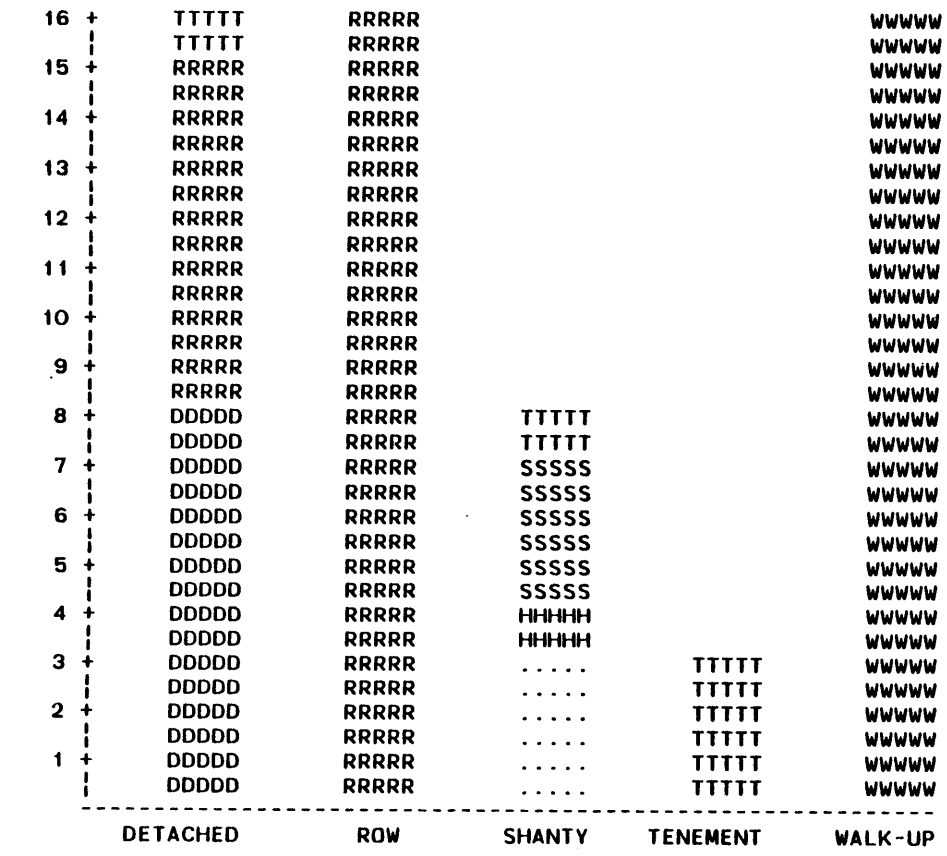


PDWTY PRESENT DWELLING TYPE.

INITIAL DWELLING TYPE.=N

FREQUENCY BAR CHART

FREQUENCY



PDWTY PRESENT DWELLING TYPE.

SYMBOL	FDWTY	SYMBOL	FDWTY	SYMBOL	FDWTY	SYMBOL	FDWTY
.		D	D	H	H	R	R
S	S	T	T	W	W		

DWTY=DWELLING TYPE
D=detached/semi-detached
H=high-rise
R=row/group
S=shanty
T=tenement
W=walk-up

3-2 DWELLING UNIT TYPE

FREQUENCY BAR CHART

IDUTY		FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
APARTMENT	*	6	6	3.31	3.31
HOUSE	**********	77	83	42.54	45.86
NON-	**********	59	142	32.60	78.45
ROOM	***	16	158	8.84	87.29
SHANTY	*****	23	181	12.71	100.00

20 40 60

FREQUENCY

FREQUENCY BAR CHART

PDUTY		FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
APARTMENT	**********	49	49	27.07	27.07
HOUSE	**********	93	142	51.38	78.45
ROOM	****	21	163	11.60	90.06
SHANTY	***	17	180	9.39	99.45
T		1	181	0.55	100.00

20 40 60 80

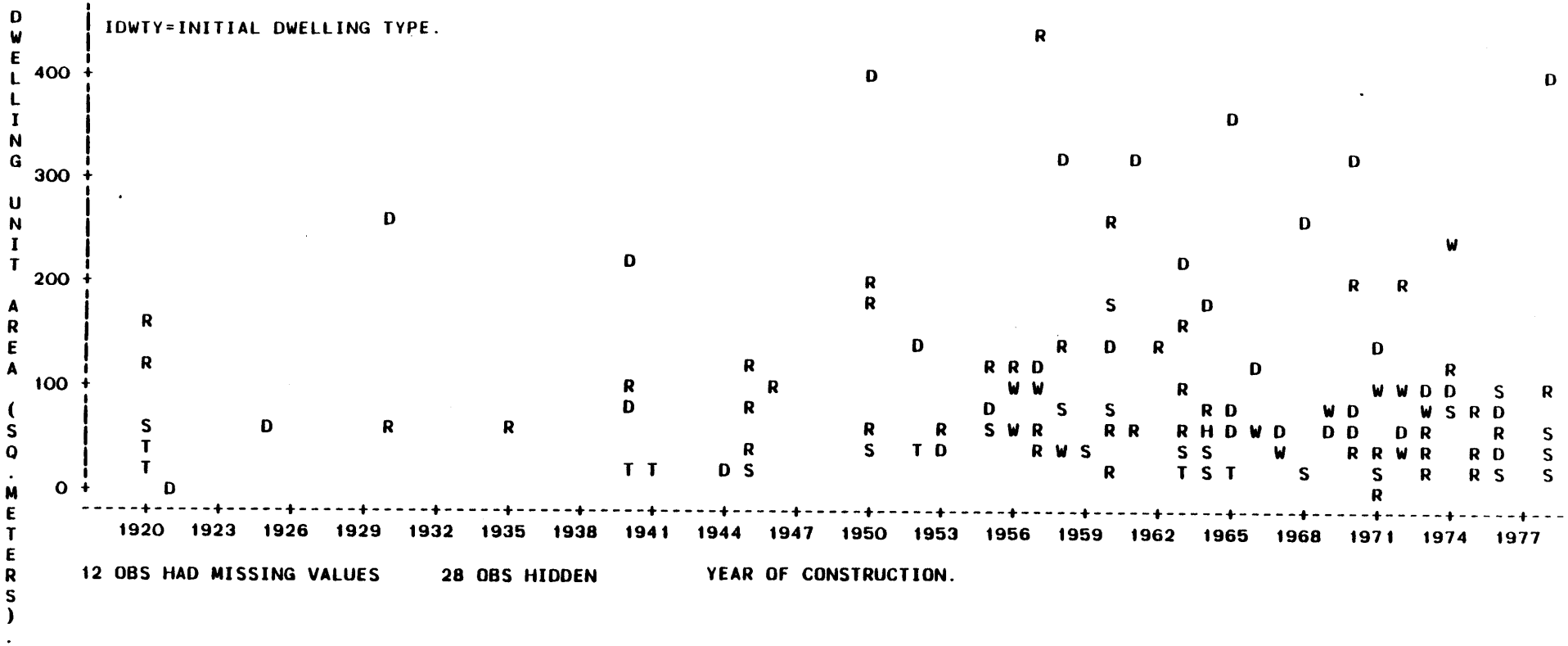
FREQUENCY

FREQUENCY BAR CHART

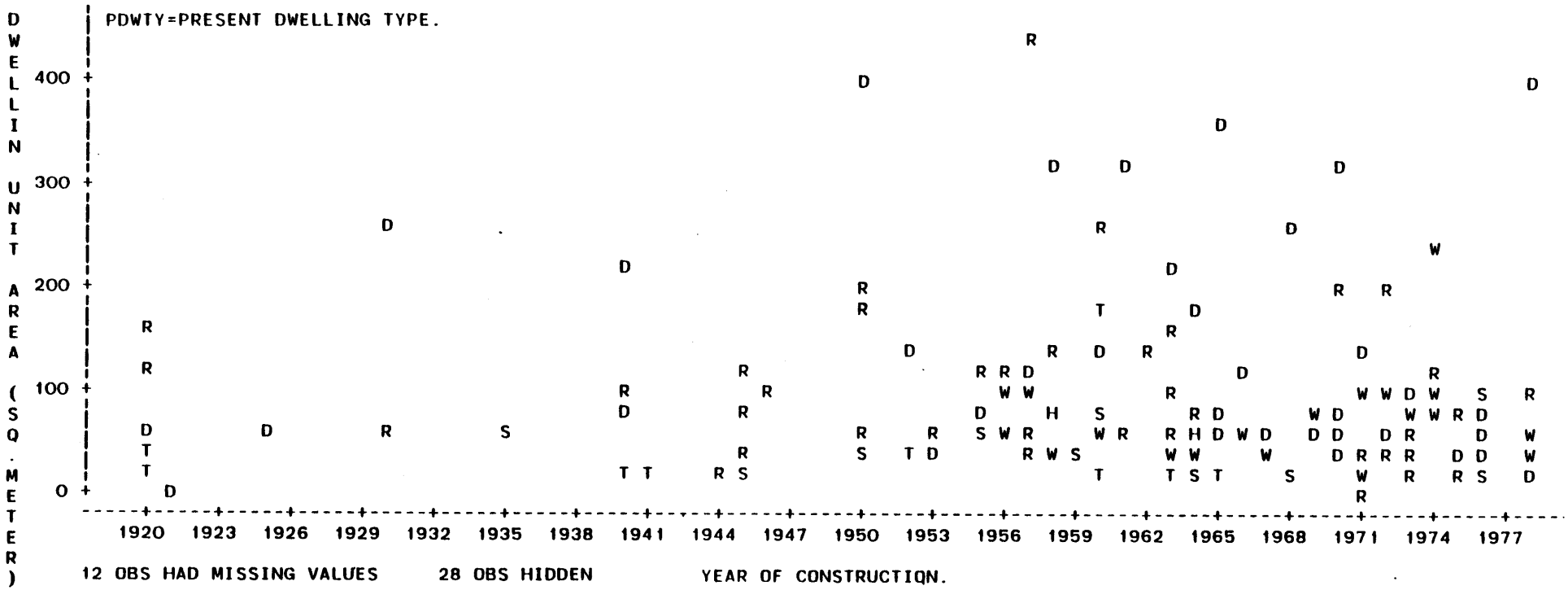
FDUTY		FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
APARTMENT	**********	89	89	52.66	52.66
HOUSE	*********	47	136	27.81	80.47
ROOM	*****	25	161	14.79	95.27
SHANTY	*	7	168	4.14	99.41
T		1	169	0.59	100.00

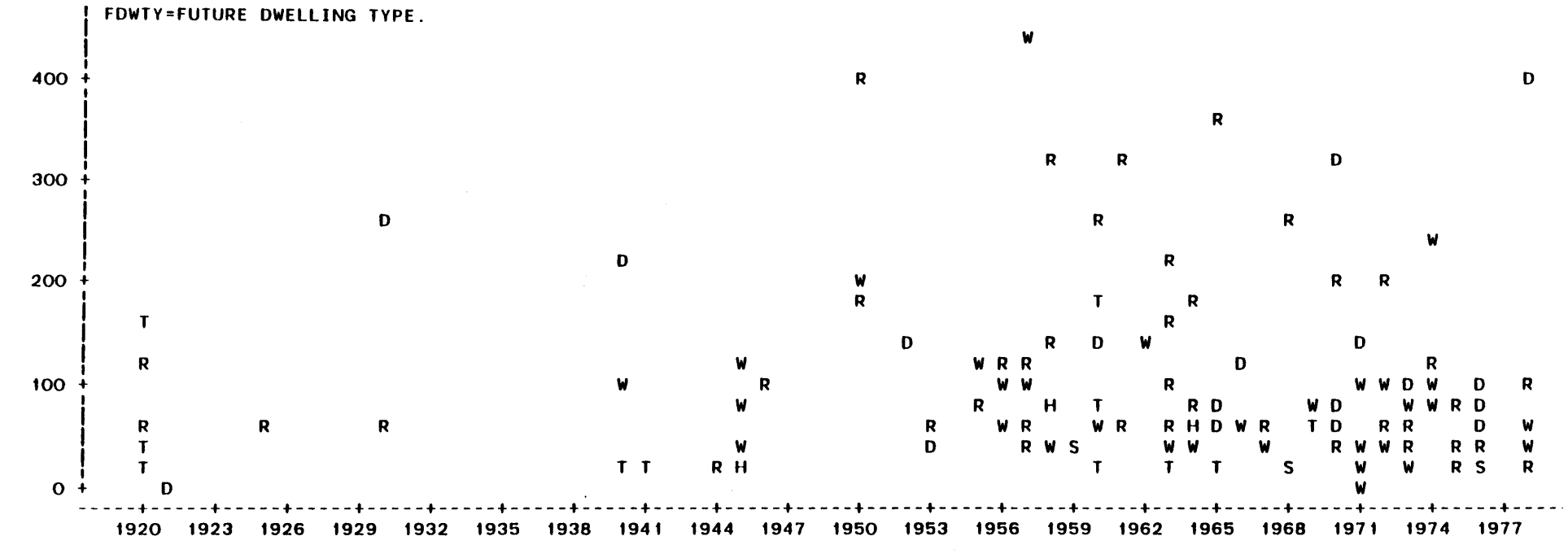
20 40 60 80

FREQUENCY



DUTY=DWELLING UNIT TYPE
A=apartment
H=house
R=room
S=shanty

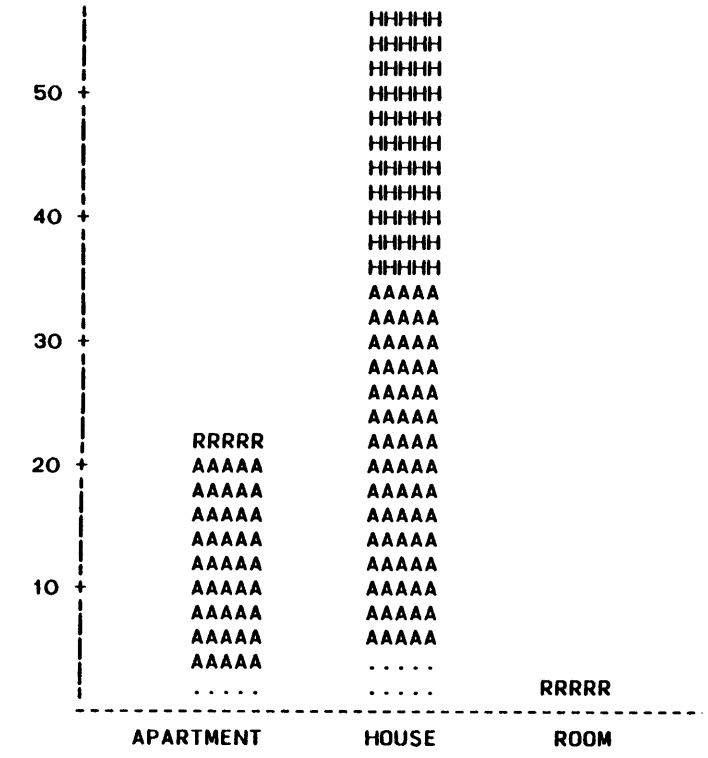

DWELLIN UNIT AREA (SQ.METER)
PDWTY=PRESENT DWELLING TYPE.
400
300
200
100
0
1920 1923 1926 1929 1932 1935 1938 1941 1944 1947 1950 1953 1956 1959 1962 1965 1968 1971 1974 1977
12 OBS HAD MISSING VALUES 28 OBS HIDDEN
YEAR OF CONSTRUCTION.


FDWTY=FUTURE DWELLING TYPE.
400
300
200
100
0
1920 1923 1926 1929 1932 1935 1938 1941 1944 1947 1950 1953 1956 1959 1962 1965 1968 1971 1974 1977
12 OBS HAD MISSING VALUES 28 OBS HIDDEN
YEAR OF CONSTRUCTION.

INITIAL DWELLING UNIT TYPE..=H

FREQUENCY BAR CHART

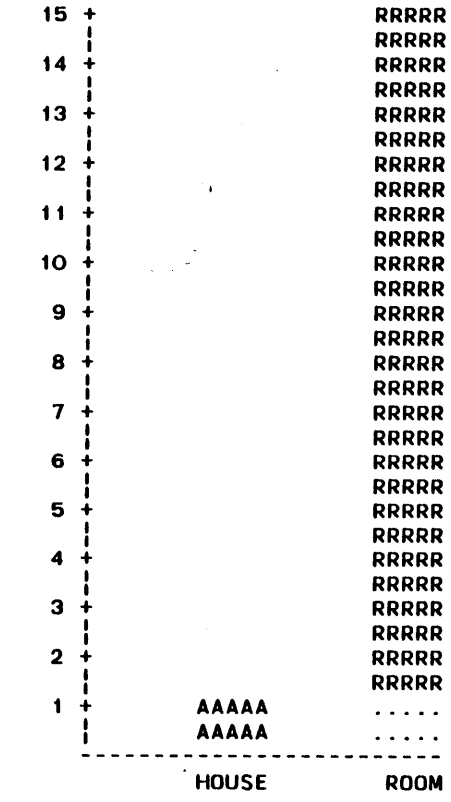
FREQUENCY



INITIAL DWELLING UNIT TYPE..=R

FREQUENCY BAR CHART

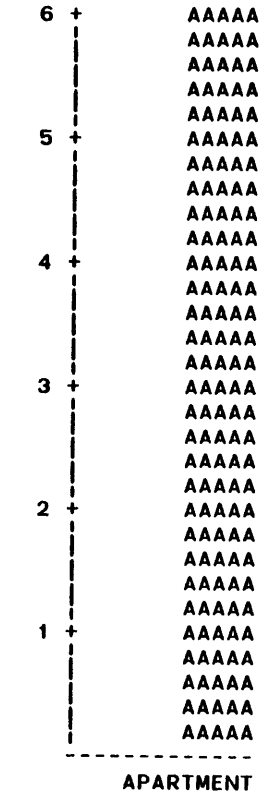
FREQUENCY



INITIAL DWELLING UNIT TYPE..=A

FREQUENCY BAR CHART

FREQUENCY

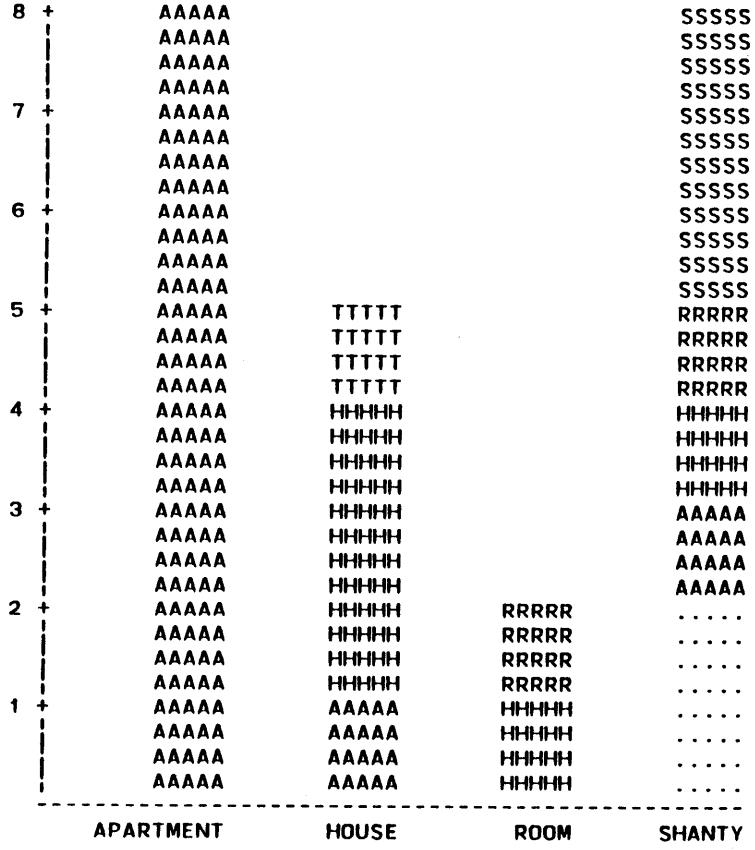


DUTY=DWELLING UNIT TYPE
A=apartment
H=house
R=room
S=shanty

INITIAL DWELLING UNIT TYPE..=S

FREQUENCY BAR CHART

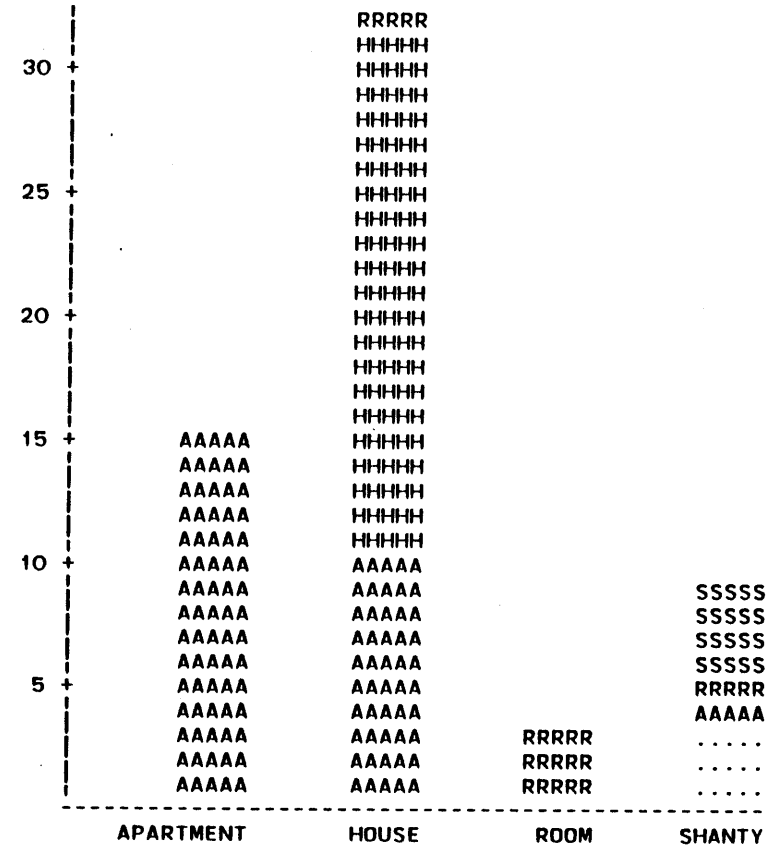
FREQUENCY



INITIAL DWELLING UNIT TYPE..=N

FREQUENCY BAR CHART

FREQUENCY



4. appendix

The appendix provides supporting and complementary references. It is in five parts:

4-1 DATA SET AND CORRELATIONS includes data of the 181 surveys, arreviations, means and correlations of the data set, as well as means of all subgroups discussed in chepter 1.

4-2 A SAMPLE SURVEY for those who might be interested in the format and methodology of the survey. It is also used to illustrate the physical elements disussed in chapter 2.

4-3 A SITE AND SERVICES PROJECT, LA PAS, BOLIVIA. This project demonstrates the close relationship between transit and infrastructure network. It is also used to illustrates the physical elements discussed in chapter 2; particularily in contrast with the samply survey of 4-2.

4-4 GLOSSARY includes definitions of all variables used in the survey.

4-5 BIBLIOGRAPHY lists only the direct references of this work.

DATA SET FROM 181 SURVEYS IN 33 URBAN AREAS. 1:08 SATURDAY, MAY 1, 1982

OBS	CITY	REGION	GNP	P	CASE	LCTN	PPCT	DPR	MODE	BDR	IDWTY	PDWTY	FDWTY	IDUTY	PDUTY	FDUTY	CON	INC
1	AMEDABAD	EA	150	1.60	WALLED CITY	1	30	I	I	A	R	R	W	H	A	A	M	4
2					NAVRANGPNRA LAKHUDI	2	27	O	P	H	S	S	S	S	S	S	S	1
3					RAKHIAL CHAWL	2	20	I	I	S	T	T	T	R	R	R	M	2
4					VASNA	3	7	U	I	S	N	R	R	N	H	H	M	2
5					NAVA WADAJ I	3	15	U	I	T	N	W	W	N	A	A	M	4
6					NAVA WADAJ II	3	15	I	I	S	N	D	D	N	H	H	C	4
7	ANKARA	ME	1110	0.25	KALE	1	60	O	I	H	R	W	T	H	A	R	M	2
8					GULUEREN	2	60	O	P	H	R	R	W	H	A	A	A	2
9					BALGAT	3	60	O	P	H	D	D	R	H	H	A	A	3
10					AKTEPE	3	2	U	I	S	D	D	R	H	H	A	M	2
11					YENIMAHALLE	3	16	I	I	A	N	W	W	N	A	A	M	3
12	BAGHDAD	ME	1550	3.00	KADHEMIYAH	3	9	I	P	A	R	R	R	H	H	A	M	2
13					SALAM CITY	2	50	U	P	T	R	R	R	H	H	A	M	2
14					THAWRA CITY	3	50	I	P	A	N	R	R	N	H	A	M	2
15					OFFICER'S CITY	2	35	U	I	T	N	D	R	N	H	H	C	4
16	BANKOK	EA	420	3.00	MANANG KASILA	1	15	O	P	H	N	S		N	S		W	1
17					KLONG TOEY	3	15	O	P	H	N	S		N	S		W	1
18					DING DANG	3	1	U	I	T	S	W	W	S	A	A	M	2
19					HUAY KWANG-APT	3	1	U	I	T	S	W	W	S	A	A	M	2
20					HUAY KWANG-ROW	3	1	U	I	T	S	R	R	S	H	H	W	2
21					RANG NUM	2	1	U	I	T	R	R	R	H	H	H	M	3
22					YOMMARAG MARKET	2	33	I	I	A	D	D	R	H	H	A	W	3
23					BANG LUMPUE	1	24	I	I	S	R	R	W	H	H	A	M	4
24					GLOYE NUM TAI	3	26	I	I	S	N	D	D	N	H	H	M	5
25					KING PETCH	2	.	U	P	H	S	D	R	S	H	H	W	2
26					KING PETCH-SQ	2	.	O	P	H	S	D	R	S	H	H	W	1
27					KLONG TOEY	2	.	U	I	T	S	W	W	S	A	A	M	2
28					LAD PHRAO	3	.	U	I	H	N	R	R	N	H	H	C	3
29	BEIRUT	ME	.	1.20	MEDAWAR	3	.	I	P	A	T	T		R	R		C	2
30					BORJ HAMMOUD - ROW	2	.	I	P	A	R	R	W	H	A	A	C	3
31					BORJ HAMMOUD - APT	2	.	U	I	T	N	W	W	N	A	A	C	2
32	BOGOTA	LA	720	3.80	SUPERBLOCK 6A	3	.	I	P	H	N	R	R	N	H	A	M	2
33					SUPERBLOCK 2	3	.	U	I	T	N	W	W	N	A	A	C	3
34					EXPERIMENTAL BLOCK	3	.	U	I	T	N	W	W	N	A	A	C	4
35	BOMBAY	EA	150	9.20	BHIWANDIWALA	1	40	I	I	S	T	T	T	R	R	R	M	2
36					PANNALAL	1	40	I	I	S	T	T	T	R	R	R	M	3
37					GANJAWALA	2	20	U	I	S	T	T	T	R	R	R	M	1
38					CHANDANWADI	1	20	U	I	T	T	T	T	R	R	R	C	2
39					VIJAYNAGAR	3	20	U	I	T	T	T	T	R	R	R	C	3
40	CAIRO	ME	320	8.00	EL MOUNIRAH	2	76	O	P	S	N	R	R	N	H	A	M	2
41	CALI	LA	.	1.10	SILOE	2	25	O	P	H	S	S	R	S	S	A	A	1
42					UNION DE VIVIENDA	3	25	O	P	H	N	R	R	N	H	A	A	1
43					PERIQUILLO	3	48	U	I	T	N	R	R	N	H	A	C	2
44					TRADITIONAL	2	19	I	I	S	R	R	T	H	H	R	M	4
45	CARACAS	LA	2660	3.00	PROPATRIA	2	5	U	I	T	R	R	R	H	H	A	C	3
46					EL SILENCIO	1	15	U	I	T	W	W	W	A	A	A	C	4
47					PEDRO CAMEJO	2	15	U	I	T	W	W	W	A	A	A	C	3
48					SIMON RODRIGNEZ	2	5	U	I	T	S	H	H	S	A	A	C	3
49					MORAN	2	42	O	P	A	S	R	W	S	H	A	A	1
50	CHIHUAHUA	LA	1120	0.25	MARGARITA MAZA	2	.	U	I	T	N	D	D	N	H	H	M	2
51					CERRO DE LA CRUZ	2	.	I	P	H	R	R	R	H	H	A	A	1
52					ROSARIO-DALE	2	.	I	P	A	R	R	W	H	A	A	A	3
53	CHONBURI	EA	420	0.05	BANG SAI	2	13	I	P	H	D	D		H	H		W	2
54					BAN KHOT	2	15	M	P	S	D	R	R	H	H	A	W	2
55					MAKARN YONG	1	21	I	I	S	W	W	W	A	A	A	C	5

OBS	PAYMT	LDTN	DWTN	PPDU	DUA	DUC	LDC	GD	MOVE	LAYOUT	BX	BY	BA	UTL	LX	LY	LA	LPHA	DPHA	PRI	YEAR	CODE
1	.	LO	LO	5.8	152.0	.	.	588	1	G	.	.	.	.	.	.	.	90.0	102	92	1880	64
2	.	EO	LO	4.9	12.0	.	.	568	1	U	.	.	.	.	.	.	.	.	.	.	1960	65
3	.	LR	LR	7.0	27.0	.	.	1160	0	G	.	.	.	.	4.0	7.5	30.0	165.0	165	48	1940	66
4	5.0	LO	LO	4.4	20.4	0.32	.	575	4	I	28	43	1204	608	4.0	7.0	28.0	167.0	167	46	1975	67
5	18.0	LO	LO	6.6	90.0	2.95	.	492	3	U	.	.	.	.	.	.	.	.	246	36	1972	68
6	25.0	LO	LO	5.4	81.0	3.70	.	135	1	U	.	.	.	.	.	.	.	.	.	.	1976	69
7	.	LO	L	4.8	254.0	.	150.0	.	1	G	.	.	.	.	.	.	.	.	.	.	1913	56
8	.	E	L	4.9	440.0	.	110.0	.	2	G	57	124	7068	255	.	.	.	.	28	80	1957	57
9	13.0	LO	L	5.0	315.0	.	120.0	.	4	G	116	180	20880	142	.	.	.	.	5	87	1958	58
10	14.0	LO	LO	5.0	263.0	0.97	.	.	2	G	96	154	14784	164	12.0	20.0	240.0	.	37	78	1968	59
11	20.0	LO	L	4.5	96.0	.	250.0	.	2	I	62	223	13826	170	.	.	.	.	32	80	1957	60
12	.	LO	LO	9.4	112.0	.	.	1045	.	G	75	80	6000	266	.	.	.	111.0	111	90	1920	148
13	.	LO	LO	12.0	128.0	15.00	5.0	620	1	I	34	76	2584	426	8.0	13.0	104.0	62.0	62	64	1956	149
14	.	LO	LO	11.0	74.0	10.00	3.5	482	1	I	42	152	6384	302	8.0	18.0	144.0	44.0	44	66	1964	150
15	.	LO	LO	7.0	317.0	44.00	20.0	82	.	I	84	142	11928	188	18.0	33.0	594.0	12.0	12	68	1961	151
16	.	E		5.0	50.0	0.37	286.0	456	1	G	.	.	.	.	.	.	.	.	.	.	1935	75
17	.	E		5.0	50.0	0.08	.	360	1	U	.	.	.	.	.	.	.	.	.	.	1955	76
18	10.0	LR	LR	6.3	40.0	3.00	87.5	1326	.	I	70	118	8260	234	.	.	.	.	194	25	1963	77
19	12.0	LR	LR	7.9	50.0	2.30	87.5	834	.	I	172	175	30100	115	.	.	.	.	106	16	1973	78
20	10.0	LR	LR	7.3	50.0	1.10	87.5	655	.	I	49	182	8918	259	3.0	12.0	36.0	90.0	90	32	1957	79
21	25.0	LR	LR	6.1	50.0	2.90	287.5	413	.	I	.	.	.	.	.	.	.	.	.	.	1953	80
22	.	LO	LO	6.0	75.0	2.50	287.5	270	.	I	.	.	.	.	.	.	.	.	.	.	1955	81
23	24.0	LR	LR	6.1	50.0	2.50	625.0	860	.	I	.	.	.	.	.	.	.	.	.	.	1935	82
24	.	LO	LO	6.3	130.0	32.50	288.0	46	.	G	160	175	28000	120	.	.	.	4.0	12	88	1960	83
25	8.0	L	E	9.9	55.0	1.00	500.0	1484	1	G	.	.	.	393	.	.	.	153.0	150	88	1920	84
26	.	E	E	7.0	22.5	0.12	.	1837	2	G	.	.	.	.	.	.	.	263.0	263	89	1978	85
27	10.0	LR	LR	5.0	40.0	4.50	312.5	2023	4	I	40	120	4800	655	.	.	.	.	405	23	1978	86
28	25.0	CON	LO	6.0	100.0	0.75	125.0	830	2	I	27	50	1350	759	5.0	12.0	60.0	138.0	138	85	1978	87
29	20.0	R	R	5.5	30.0	2.00	2250.0	2417	2	U	.	.	.	.	.	.	.	.	.	.	1952	152
30	10.0	LO	L	6.5	200.0	20.00	800.0	1610	3	I	27	108	2916	465	.	.	.	62.0	247	65	1950	153
31	15.0	LO	LO	6.5	82.0	8.40	2500.0	.	4	I	30	135	4050	412	.	.	.	.	315	56	1969	154
32	6.0	LO	LO	8.0	60.5	2.60	.	289	1	G	60	96	5760	270	6.0	20.0	120.0	28.0	28	60	1963	128
33	20.0		LR	6.5	63.5	4.00	.	691	2	U	.	.	.	.	.	.	.	7.3	107	.	1966	129
34	40.0	LO	LO	6.5	92.2	5.30	.	424	1	U	180	220	39600	101	.	.	.	6.6	65	.	1971	130
35	3.5	LR	LR	5.0	19.0	.	.	4172	1	G	75	90	6750	244	.	.	.	.	1034	.	1920	155
36	7.0	LR	LR	5.6	24.0	.	.	3334	2	G	160	190	30400	115	.	.	.	.	600	.	1911	156
37	3.0	LR	LR	7.7	10.0	.	.	3517	1	U	.	.	.	.	.	.	.	.	458	.	1900	157
38	3.0	LR	LR	6.0	9.0	.	.	3167	1	G	130	250	32500	117	.	.	.	.	524	.	1904	158
39	10.5	CON	LR	4.5	26.0	.	.	993	1	U	.	.	.	.	.	.	.	.	220	.	1963	159
40	15.0	LO	L	4.3	96.0	.	650.0	1716	2	I	22	150	3300	520	8.0	10.0	80.0	203.0	234	88	1963	61
41	16.0	E	ER	5.5	50.0	.	30.0	512	1	G	50	62	3100	361	.	.	.	93.0	93	68	1950	131
42	14.0	LO	L	5.5	60.0	.	30.0	213	2	I	55	113	6215	271	7.0	20.0	140.0	42.0	42	63	1966	132
43	19.0	LO	LO	5.5	60.0	.	25.0	271	2	I	52	155	8060	255	7.0	20.0	140.0	49.0	49	69	1966	133
44	28.0	L	L	6.3	150.0	.	150.0	196	3	I	80	150	12000	192	7.0	28.0	196.0	35.0	35	69	1920	134
45	.	LO	LO	5.9	103.0	9.50	5.5	203	.	I	63	113	7119	248	8.3	25.0	207.5	34.0	34	70	1946	135
46	12.0	CON	LO	5.8	94.4	8.10	.	421	6	I	80	127	10160	204	.	.	.	.	99	71	.	136
47	20.0	CON	L	4.6	66.0	.	.	780	2	I	25	76	1900	446	.	.	.	.	168	48	1956	137
48	21.0		LR	5.2	82.0	10.00	.	720	2	U	.	.	.	.	.	.	.	.	138	11	1958	138
49	10.0	EO	EO	7.0	48.0	0.80	.	640	3	I	30	160	4800	395	.	.	.	92.0	92	77	1972	139
50	.	LO	LO	5.0	59.0	9.70	.	193	1	I	42	130	5460	313	9.0	15.0	135.0	74.0	74	58	1976	27
51	.	LO	LO	7.0	43.0	.	.	210	4	I	51	132	6732	216	12.0	18.0	216.0	30.0	30	55	1973	28
52	.	LO	LO	4.9	140.0	.	.	282	2	I	68	119	8092	231	12.5	24.0	300.0	20.0	34	56	1962	29
53	.	LO	LO	5.0	72.0	0.25	250.0	167	1	U	.	.	.	.	.	.	.	29.0	33	93	1940	88
54	17.0	LR	LO	5.6	28.0	0.55	300.0	310	.	U	.	.	.	.	.	.	.	44.0	70	90	1944	89
55	.	LO	LO	5.0	48.0	14.50	500.0	400	.	I	.	.	.	.	.	.	.	31.0	80	60	1958	90

OBS	CITY	REGION	GNP	P	CASE	LCTN	PPCT	DPR	MODE	BDR	IDWTY	PDWTY	FDWTY	IDUTY	PDUTY	FDUTY	CON	INC
56	CHONBURI	EA	420	0.05	BANG PLA SOI	2	51.0	M	I	S	D	D	D	H	H	A	M	4
57	COLIMA	LA	1120	0.10	COLIMA LUMBER	3	2.0	I	P	A	S	D	R	S	R	H	M	2
58					EL MORALETE	3	35.0	I	P	H	D	D	R	H	H	H	M	2
59					MARIA AUXILIADORA	1	6.0	I	I	A	R	T	T	H	R	R	M	3
60					LA ESTANCIA	3	5.0	U	I	T	N	R	R	N	H	H	M	4
61	CUERNAUACA	LA	1120	0.16	ESTACION	1	8.0	O	I	H	N	S	S	N	S	S	S	1
62					LOS TEPETATES	3	12.0	O	I	H	N	D	R	N	H	H	A	1
63					TETELA	3	12.0	O	I	H	D	D	R	H	H	H	A	2
64					CAROLINA	1	23.0	I	P	A	T	T	T	R	R	R	M	2
65					CENTRO	1	23.0	I	I	S	R	R	W	H	A	A	C	3
66					SATELITE	2	27.0	O	P	A	N	D	D	N	H	H	C	3
67					CIVAC	3	10.0	U	I	T	N	R	R	N	H	H	C	4
68					JIUTEPEC	2	12.0	O	P	A	N	D	R	N	H	H	C	3
69					CUAUHCHILES	2	12.0	O	P	H	N	D	R	N	H	H	C	1
70					VISTA HERMOSA	2	12.0	O	P	H	N	D	D	N	H	H	M	3
71	DACCA	EA	90	2.50	MOHAMMED PUR	3	1.0	M	P	A	R	R	R	R	H	A	M	2
72					JHIGATOLA	2	60.0	O	P	A	D	D	R	H	H	A	S	2
73	GOA	EA	150	0.20	BAJNA	2	5.7	O	P	H	N	S	S	N	S	S	A	1
74					PATRIHATT-CHIMBEL	2	5.7	U	P	S	S	S	S	S	S	S	A	1
75					SADDA	2	7.3	O	P	H	S	S	S	S	S	S	A	2
76					FONTAINHAS	1	77.0	I	I	A	R	R	R	H	H	H	M	3
77					PANAJI	1	77.0	I	I	S	W	W	W	A	A	A	M	4
78	GUADALAJARA	LA	1120	2.00	SAN JUAN DE DIOS	.	17.0	I	P	S	T	T	T	R	R	R	A	1
79					COLONIA ECHEVERRIA	.	16.0	O	P	H	R	R	W	H	H	A	M	1
80					SANTA CECILIA	.	35.0	O	P	H	R	R	W	H	H	A	M	3
81					LA TUZANIA	.	6.0	U	I	T	N	R	R	N	H	H	M	3
82	ISTANBUL	ME	1110	2.30	ZEYREK	1	8.0	I	P	A	R	W	W	H	A	A	W	2
83					RUMELI-HISAR USTU	3	45.0	O	P	A	D	D	R	H	H	A	M	1
84					ZEYTINBURNU	2	45.0	O	P	H	D	D	R	H	H	A	M	2
85					GULTEPE	3	45.0	O	P	A	R	W	W	H	A	A	M	2
86					OSMANIYE	3	2.0	U	I	T	N	W	W	N	A	A	C	2
87					UMRANIYE	3	7.0	I	I	S	D	D	D	H	H	A	C	3
88	JEDDAH	ME	6040	0.56	AL-SABEEL	1	46.0	O	P	A	R	R	W	H	H	A	C	3
89					OLD CITY	1	36.0	I	P	A	R	W		H	A		M	4
90					AL-SAHEIFAH	1	36.0	I	P	A	R	W	W	H	A	A	C	4
91					AL-MEDINA ROAD	3	18.0	M	M	T	N	D	R	N	H	A	C	5
92	K.MUSHAIT	ME	6040	0.06	GHAMBER	1	17.0	I	P	A	R	R	R	H	H	H	A	3
93					KHUTTAN	2	20.0	I	I	S	N	R	R	N	H	H	M	3
94					ARGHAL	3	25.0	O	P	A	S	S	D	S	S	H	W	3
95	KABUL	ME	190	0.50	DEH-AFGHANAN	1	6.0	O	P	A	D	R	R	H	H	A	A	2
96					OLD CITY	1	20.0	I	I	A	R	R	W	H	H	A	A	2
97					NADER SHAH MAINA	2	2.0	U	I	T	N	W	W	N	A	A	C	5
98	KAMPALA	AF	270	0.35	OLD KAMPALA	1	10.0	I	M	S	D	D	D	H	H	H	M	5
99					KIRA ROAD	2	10.0	U	I	T	D	D	D	H	H	H	C	5
100					NTINDA	3	2.0	I	M		D	D	D	H	H	H	A	4
101					KISWA	2	2.0	I	M	S	D	D	D	H	H	H	M	4
102					KISENYI	1	70.0	O	P	A	T	T	T	R	R	R	M	1
103					KIBULI	2	70.0	O	P	A	D	D	D	H	H	A	M	1
104					MULAGO	2	70.0	O	P	A	D	R	T	H	H	R	A	1
105					NSAMBYA COMMON	2	10.0	I	I	T	D	D	R	H	H	H	M	4
106					NAKASERO	1	10.0	I	I	S	D	D	D	H	H	H	M	4
107					KATALI	2	2.0	U	P	H	N	D	R	N	H	H	M	3
108					NAKAWA	2	3.0	U	I	T	N	R	R	N	H	H	M	3
109					NAGURA	2	3.0	U	I	T	N	D	D	N	H	H	M	3
110					NSAMBYA RAILWAYS	1	15.0	U	I	T	N	W	W	N	A	A	C	3

OBS	PAYMT	LDTN	DWTN	PPDU	DUA	DUC	LDC	GD	MOVE	LAYOUT	BX	BY	BA	UTL	LX	LY	LA	LPHA	DPHA	PRI	YEAR	CODE
56	.	LO	LO	4.60	75.0	8.00	450.0	79	.	G	.	.	.	.	.	.	.	11.0	40.0	87	1965	91
57	8	LO	LO	7.00	49.0	.	.	364	2	I	50	146	7300	258	6.0	20.0	120.0	52.0	52.0	49	1975	30
58	16	EO	LO	6.00	67.0	.	.	79	3	I	66	115	7590	164	.	.	.	11.0	11.0	75	1972	31
59	6	LR	LR	6.00	22.0	.	.	157	1	I	88	150	13200	180	.	.	.	33.0	.	76	1960	32
60	11	LO	LO	7.00	67.0	.	.	120	1	I	50	100	5000	262	4.5	18.0	81.0	60.0	60.0	53	1973	33
61	.	EO	LO	6.50	38.4	0.24	50.0	.	2	U	.	.	.	432	.	.	.	.	75.0	.	1959	13
62	.	LO	LO	6.00	30.0	0.48	100.0	243	1	I	.	.	.	213	.	.	.	14.0	18.0	73	1970	14
63	.	LO	LO	6.00	60.0	0.96	100.0	26	.	G	100	105	10500	196	30.0	50.0	1500.0	5.7	8.5	51	1925	15
64	.	LR	LR	5.30	25.0	0.80	160.0	48	2	G	.	.	.	393	.	.	.	54.0	125.0	73	1960	16
65	15	LR	LR	6.00	113.0	5.80	600.0	78	2	G	70	110	7700	234	.	.	.	27.0	117.0	64	1945	17
66	.	LO	LO	6.20	84.0	4.70	120.0	232	2	I	67	114	7638	228	.	28.0	.	15.5	20.0	49	1970	18
67	6	LR	LR	6.00	82.0	5.20	.	274	2	I	43	105	4515	333	7.0	18.0	126.0	62.0	48.0	67	1970	19
68	.	EO	LO	7.00	120.0	2.40	64.0	68	1	G	135	188	25380	252	.	.	.	5.6	9.6	75	1957	20
69	.	EO	LO	5.00	40.0	2.00	76.0	194	2	I	38	200	7600	350	10.0	15.0	150.0	51.0	39.0	75	1976	21
70	.	EO	LO	7.00	90.0	0.36	24.0	71	1	I	65	110	7150	194	20.0	25.0	500.0	15.0	10.0	85	1973	22
71	.	LO	LO	7.00	130.0	.	.	378	1	I	45	123	5535	303	7.5	15.0	112.5	54.0	54.0	70	1958	176
72	25	LO	L	7.00	.	.	800.0	560	1	G	140	200	28000	121	25.0	35.0	875.0	16.0	80.0	90	1955	177
73	.	ER	LR	3.00	12.0	.	.	800	6	G	.	.	.	.	.	.	.	.	.	.	1968	70
74	.	LR	LR	2.50	12.0	.	.	660	5	I	14	75	1050	890	4.0	5.0	20.0	320.0	320.0	64	1976	71
75	.	L	L	5.70	25.0	.	.	379	1	U	.	.	.	.	.	.	.	.	.	.	1960	72
76	.	L	LR	5.70	65.0	.	.	167	.	G	.	.	.	.	.	.	.	.	.	.	1930	73
77	.	L	L	5.60	98.0	.	.	209	.	G	85	85	7225	236	.	.	.	17.0	51.0	69	1900	74
78	30	LR	LR	6.00	20.0	0.60	20.0	413	.	I	92	125	11500	186	.	.	.	39.0	84.0	82	1941	23
79	.	EO	L	6.00	24.0	1.20	0.9	219	.	I	63	165	10395	219	10.0	28.0	280.0	37.0	48.0	77	1973	24
80	13	L	L	6.00	5.2	2.50	1.8	487	2	I	39	163	6357	300	5.0	15.0	75.0	118.0	118.0	67	1971	25
81	13	LO	LO	6.00	75.0	4.00	1.8	453	3	I	44	140	6160	318	4.0	16.0	64.0	120.0	120.0	63	1975	26
82	6	LO	LR	4.80	57.0	.	.	680	4	I	75	170	12750	197	.	.	.	36.0	186.0	75	1500	50
83	.	EO	LO	5.80	218.0	.	.	209	3	I	50	120	6000	275	.	.	.	46.0	46.0	82	1963	51
84	.	LO	LO	4.10	400.0	.	.	420	1	G	75	80	6000	272	.	.	.	56.0	112.0	84	1950	52
85	.	EO	LO	.	255.0	0.40	.	440	5	I	32	148	4736	382	5.0	12.0	60.0	119.0	164.0	72	1960	53
86	.	LO	LR	6.00	45.0	.	.	333	1	U	32	150	4800	379	.	.	.	.	65.0	9	1967	54
87	14	LO	LR	4.50	312.0	.	.	278	3	I	41	142	1722	315	13.0	17.5	227.5	34.0	86.0	81	1970	55
88	.	LR	LO	3.50	.	.	.	158	2	G	57	60	3420	342	.	.	.	76.0	76.0	82	1949	39
89	.	LO	L	20.00	.	.	.	454	1	I	59	68	4012	317	.	.	.	23.0	23.0	70	1920	40
90	.	L	L	3.25	.	.	.	154	1	G	.	.	.	.	.	.	.	.	.	.	1950	41
91	.	L	L	3.50	.	25.00	50.0	37	1	I	55	110	6050	275	20.0	23.0	460.0	17.0	17.0	77	1969	42
92	.	LO	LR	6.70	122.0	.	30.0	289	1	G	82	86	7052	240	.	.	.	43.0	43.0	83	.	47
93	.	LO	LO	5.90	200.0	15.20	27.3	211	2	G	50	90	4500	311	10.0	20.0	200.0	18.0	36.0	71	1970	48
94	.	E	LO	4.70	100.0	1.80	.	283	2	G	46	65	2990	303	.	.	.	60.0	60.0	67	1976	49
95	.	EO	EO	7.40	81.0	.	.	575	3	G	.	.	.	305	.	.	.	42.0	78.0	70	1965	145
96	.	LO	LO	7.00	114.0	.	.	1051	1	G	.	.	.	286	.	.	.	66.0	151.0	77	1910	146
97	.	CON	LO	5.00	90.0	7.00	.	325	10	I	85	130	11050	388	.	.	.	.	72.0	84	1972	147
98	.	LR	LO	4.50	228.0	10.00	3.0	123	0	I	88	200	17600	277	16.0	30.0	480.0	14.0	14.0	65	1940	124
99	.	LR	LR	4.00	132.0	8.00	.	160	1	I	75	340	25500	166	15.0	27.0	405.0	16.0	16.0	70	1952	125
100	.	LR	LO	6.00	.	.	.	110	2	I	84	356	29904	147	12.0	32.0	384.0	18.0	18.0	73	1954	126
101	.	LR	LO	6.00	123.0	6.90	.	152	2	I	72	110	7920	396	12.0	33.0	396.0	19.0	19.0	78	1966	127
102	.	L	L	6.40	10.0	.	.	320	.	I	.	.	.	.	.	.	.	15.0	50.0	90	1965	166
103	.	L	L	6.10	140.0	.	4.0	280	.	U	.	.	.	.	.	.	.	.	46.0	90	1971	167
104	.	L	L	6.00	30.0	0.70	.	300	.	U	.	.	.	.	.	.	.	.	50.0	92	.	168
105	.	LO	LO	6.00	69.0	6.00	.	120	.	G	120	200	24000	133	20.0	24.0	480.0	20.0	20.0	69	1972	169
106	.	L	L	4.50	2.6	10.00	4.0	18	.	I	.	.	.	.	44.0	80.0	3520.0	2.0	4.0	85	1921	170
107	.	LO	LO	6.00	54.0	3.00	.	84	.	G	80	190	15200	178	12.0	20.0	240.0	11.0	14.0	75	1967	171
108	.	LR	LR	3.00	30.0	0.90	.	240	.	I	30	50	1500	533	.	.	.	.	80.0	25	1957	172
109	.	LR	LR	5.90	35.0	2.00	.	160	.	I	.	.	.	.	.	.	.	.	27.0	10	1953	173
110	.	LR	LR	6.00	61.0	.	.	540	.	U	.	.	.	.	.	.	.	.	90.0	18	1961	174

OBS	CITY	REGION	GNP	P	CASE	LCTN	PPCT	DPR	MODE	BDR	IDWTY	PDWTY	FDWTY	IDUTY	PDUTY	FDUTY	CON	INC
111	KAMPALA	AF	270	0.35	BUGOLOBI	3	15.0	U	I	T	N	W	W	N	A	A	C	3
○ 112	KAOHSIUNG	EA	1170	1.20	KUO-MAO	3	.	U	M	T	R	R	R	H	H	H	C	3
113					SHIH CHUAN	1	.	I	P	S	R	R	W	H	H	A	C	3
114					MING TSU	2	.	U	I	T	S	W	W	S	A	A	C	4
115					TSAO YA	3	.	I	P	A	S	S		S	S		S	2
116	LAHORE	EA	190	2.20	GUJJARPURE	2	.	I	P	H	R	R	W	H	A	A	M	2
117					IQBAL	3	.	U	I	T	N	W	W	N	A	A	M	3
118	MECCA	ME	6040	0.50	AL-GARARA	1	.	I	P	A	R	R		H	A		W	4
119					AL-HINDAWI YYAH	1	.	I	P	H	R	R	R	A	A	A	C	2
120					JARWAL	1	.	I	P	S	N	W	W	N	A	A	C	4
121					AL-NUZHAH	1	.	I	I	S	N	D	D	N	H	A	C	5
122	MEXICO	LA	1120	8.60	BUENOS AIRES	2	2.3	O	P	H	N	S	H	N	S	A	S	1
123					JAPALPA	3	38.4	O	P	A	N	R	R	N	H	A	M	2
124					LOMAS DE AGUSTIN	3	38.4	O	P	A	R	R	R	H	H	A	M	2
125					NETZAHUALCOYOTL	3	38.4	I	I	A	R	R	R	H	H	A	C	2
126					PRO HOJAR	3	38.4	I	I	A	R	R	R	H	H	A	C	3
127					VALLEJO	2	38.4	I	I	S	R	R	W	H	A	A	C	3
128					LAS VIZCAINAS	1	23.2	I	P	S	T	T	T	R	R	R	M	3
129					LA CASA BLANCA	1	23.2	I	P	S	T	T	T	R	R	R	M	2
130					LA FLORIDA	1	23.2	I	P	S	T	T	T	R	R	R	M	2
131					SAN JUAN DE ARAGON	3	5.8	U	I	T	D	D	R	H	H	A	C	4
132					IZTACALCO	3	5.8	U	I	T	N	W	W	N	A	A	C	4
133					NONOALCO TLATELOLCO	2	5.8	U	I	T	H	H	H	A	A	A	C	4
134	NAIROBI	AF	270	0.50	KAREN	3	12.0	I	P		D	D	D	H	H	H		5
135					PARKLAND	3	12.0	I	P		D	D	D	H	H	H	C	4
136					VILLAGE NGEI I	3	8.0	O	P	H	N	S	T	N	S	R	S	1
137					KAWANGWARE	3	36.0	O	P	H	S	T	T	S	R	R	W	2
138					EASTLEIGH	2	23.0	I	P		T	T	T	R	R	R	W	4
139					KIMATHI	2	6.0	U	I	T	N	D	D	N	H	H	C	4
140					MATHARE I - SQU.	2	5.0	O	P	H	S	S	T	S	S	R	S	1
141					MATHARE II - TEN	2	5.0	O	I	S	N	T	T	N	R	R	W	1
142					MATHARE REDEVELOP	3	6.0	U	P	H	N	R	R	N	H	H	M	1
143					KARIOBANGI	3	36.0	U	P	T	N	D	T	N	H	R	A	2
144					MAKONGENI	2	36.0	U	I	T	N	T	T	N	R	R	M	2
145					KALOLENI	2	36.0	U	P	T	N	T	T	N	R	R	M	2
146	PUERTO RICO	LA	.	1.00	VIEJO SAN JUAN	1	.	I	P	S	R	R	R	H	A	A		.
147					EAST SANTURCE	1	.	I	P	S	D	D		H	H		W	.
148					BUENA VISTA	1	.	O	P	A	S	D	R	S	H	T	W	.
149					LUIS LORENS TORRES	1	.	U	I	T	N	W	W	N	A	A	C	.
150					LAS VEGAS	3	.	I	I	T	N	D	R	N	H	A	C	.
151	RAJKOT	EA	150	0.40	GAM TAL	1	15.0	I	P	A	R	R	R	H	H	H	M	3
152					KARAN PARA	2	35.0	I	P	A	R	R	R	H	H	A	M	4
153					BHILVAS	2	5.0	U	I	S	T	T	T	R	R	R	A	1
154					MAFATIYA PARA	3	10.0	O	P	H	N	S	S	N	S	S	S	1
155					ANAND NAGAR - ROW	3	7.0	U	I	T	R	R	R	H	H	H	M	3
156					ANAND NAGAR - APR	3	5.0	U	I	T	N	W	W	N	A	A	C	4
157	RIRADH	ME	6040	0.30	AD-DIRA	1	78.0	I	P	S	R	R	W	H	A	A	A	4
158					MANFOHA	2	78.0	I	P	A	R	R	W	H	H	A	A	2
159					KHAZZAN	1	11.0	I	I	S	D	D	R	H	H	A	C	4
160					MALAZZ	2	6.0	U	I	T	D	D	W	H	H	A	C	4
161					KHURAIS	3	6.0	U	I	T	N	R	R	N	H	H	C	3
162	SOEUL	EA	820	8.00	CHUNGRYUNGRI	2	5.0	U	I	T	R	R	R	H	H	H	M	2
163					SANGGAEDONG	3	11.0	O	P	A	S	S		S	S		S	1
164					JANSIL	3	12.0	U	I	T	N	W	W	N	A	A	C	3
165					GALHYUNDONG	3	15.0	U	I	T	D	D	D	H	H	H	M	3

OBS	PAYMT	LDTN	DWTN	PPDU	DUA	DUC	LDC	GD	MOVE	LAYOUT	BX	BY	BA	UTL	LX	LY	LA	LPHA	DPHA	PRI	YEAR	CODE
111	.	LR	LR	6.1	108	.	.	340	.	U	.	.	.	280	.	.	.	.	56.0	18	1972	175
112	.	L	LO	5.5	69	.	.	435	1	I	38	48	1824	471	6.0	15.0	90.0	80.0	80.0	75	1950	108
113	.	LO	LO	5.0	42	10.000	.	537	1	I	30	110	3300	424	.	.	.	110.0	110.0	61	1971	109
114	.	CON	LO	4.8	57	14.000	.	1293	1	I	70	195	13650	194	.	.	.	.	267.0	29	1978	110
115	.	E	LO	5.0	40	.	.	652	0	U	.	.	.	571	.	.	.	133.0	130.0	75	.	111
116	.	LO	LO	5.9	57	15.000	10.0	376	1	G	60	85	5100	284	.	.	.	.	64.0	75	1976	62
117	.	CON	LO	5.0	64	.	.	820	2	I	60	85	5100	321	.	.	.	.	164.0	32	1976	63
118	.	LO	LR	5.0	98	.	.	909	1	I	50	60	3000	443	.	.	.	72.0	181.0	74	.	43
119	28.0	LO	LR	5.0	.	.	.	395	1	I	65	70	4550	297	.	.	.	65.0	79.0	74	1968	44
120	.	LO	LR	5.0	240	.	.	561	2	I	45	150	6750	289	.	.	.	52.0	112.0	75	1974	45
121	.	LO	LR	5.0	400	.	.	100	3	G	30	30	900	667	25.0	25.0	625.0	7.0	20.0	42	1978	46
122	20.0	ER	LO	6.0	28	0.012	400.0	1800	3	G	130	142	18460	147	.	.	.	.	.	75	1945	1
123	20.0	LO	LO	6.0	200	0.400	40.0	200	2	U	48	120	5760	250	10.0	20.0	200.0	38.0	33.0	76	1972	2
124	18.0	LO	LO	10.0	250	0.500	80.0	530	2	I	40	115	4600	337	10.0	15.0	150.0	43.0	50.0	65	1960	3
125	.	LO	LO	6.0	153	1.200	160.0	163	3	I	46	244	11224	258	9.0	16.0	144.0	46.0	28.0	67	1963	4
126	20.0	LO	LO	9.5	175	5.000	350.0	410	3	I	53	182	9646	245	10.0	20.0	200.0	35.0	45.0	71	1950	5
127	20.0	LO	LR	6.0	100	4.000	500.0	423	3	I	114	114	12996	176	15.0	30.0	450.0	17.0	70.0	77	1940	6
128	5.0	LO	LR	7.1	96	.	1600.0	230	.	G	132	158	20856	139	.	.	.	.	.	81	1734	7
129	7.0	LR	LR	5.5	25	0.120	571.0	644	1	G	85	160	13600	194	.	.	.	.	.	81	1900	8
130	10.0	LR	LR	5.5	24	0.160	800.0	1442	2	I	.	.	.	.	.	.	.	.	.	81	1900	9
131	5.0	LO	LO	9.5	175	4.000	400.0	176	4	I	52	144	7488	262	10.0	19.0	190.0	29.0	29.0	59	1964	10
132	25.0	LO	LO	5.2	80	6.400	24.0	433	2	I	82	123	10086	.	.	.	.	.	84.0	25	1973	11
133	15.0	LO	LO	6.0	53	3.200	800.0	525	1	I	.	.	.	.	.	.	.	.	.	.	1964	12
134	12.5	LO	LO	.	250	.	.	5	.	U	.	.	.	37	130.0	160.0	20800.0	0.4	0.4	92	1930	112
135	.	LO	LO	5.0	110	.	.	120	.	I	.	.	.	88	48.0	80.0	3840.0	3.0	5.4	84	1910	113
136	.	E	E	2.0	42	.	.	1600	.	U	.	.	.	.	.	.	.	.	.	72	1964	114
137	.	LO	LO	4.0	180	.	.	552	.	I	.	.	.	201	14.0	30.0	420.0	10.4	109.0	70	1960	115
138	.	L	L	4.0	40	.	.	480	.	I	70	230	16100	329	18.0	25.0	450.0	15.0	120.0	72	.	116
139	.	LO	LO	5.0	63	.	.	120	.	I	.	.	.	.	10.0	20.0	200.0	20.0	20.0	63	1970	117
140	.	E	E	3.8	72	.	.	819	.	U	.	.	.	.	.	.	.	.	234.0	52	1960	118
141	.	L	L	4.4	72	.	.	1859	.	I	.	.	.	.	.	.	.	.	423.0	40	1970	119
142	.	L	L	3.0	46	.	.	262	.	I	40	120	4800	583	7.5	11.5	86.3	23.0	23.0	39	1973	120
143	.	L	L	3.8	55	.	.	606	.	I	.	.	.	1072	.	.	.	.	133.0	20	1969	121
144	.	L	L	4.0	192	.	.	283	.	I	45	45	2025	670	.	.	.	.	80.0	29	.	122
145	.	L	L	4.0	166	.	.	200	.	I	.	.	.	.	.	.	.	.	72.0	20	.	123
146	15.0	L	LR	.	.	27.900	.	.	.	I	78	97	7566	230	.	.	.	22.0	168.0	83	1930	140
147	.	L	L	6.3	.	12.200	.	270	.	I	47	204	9588	261	9.5	18.0	171.0	42.0	47.0	69	1940	141
148	.			3.3	.	5.100	.	270	.	I	38	140	5320	336	.	.	.	47.0	79.0	72	1950	142
149	.	LR		5.0	.	.	.	463	.	U	128	146	18688	146	.	.	.	.	172.0	21	1950	143
150	.	L		4.5	.	16.000	.	109	.	I	60	240	14400	208	13.0	24.0	312.0	24.0	24.0	71	1965	144
151	.	LO	LO	5.6	47	.	.	780	1	G	100	110	11000	190	5.0	12.0	60.0	116.0	139.0	74	1810	160
152	.	LO	LO	6.3	136	.	.	502	1	I	38	40	1520	513	9.0	15.0	135.0	53.0	80.0	67	1905	161
153	10.0	LR	LR	5.6	30	.	.	1165	1	G	.	.	.	.	.	.	.	.	208.0	59	1920	162
154	.	EO	EO	4.5	18	.	.	557	1	U	90	100	9000	211	.	.	.	.	123.0	22	1971	163
155	6.0	LR	LR	5.7	58	1.100	.	288	2	I	40	80	3200	375	6.0	10.0	60.0	50.0	50.0	31	1961	164
156	16.0	CON	LO	5.5	47	2.200	.	788	2	I	30	82	2460	450	.	.	.	.	144.0	28	1972	165
157	.	L	L	7.0	77	7.000	150.0	260	1	G	75	100	7500	233	.	.	.	37.0	37.0	89	1945	34
158	.	L	LO	7.0	121	3.000	4.3	460	1	I	29	170	4930	404	10.0	10.0	100.0	64.0	64.0	66	1955	35
159	.	L	L	7.0	351	28.200	11.9	120	1	I	53	110	5830	881	.	.	.	24.0	24.0	74	1965	36
160	5.0	L	LO	7.0	625	8.500	27.0	80	2	I	58	108	6264	262	23.0	22.5	517.5	13.0	13.0	65	1960	37
161	.	L	LO	7.0	110	.	.	120	.	I	.	.	.	564	15.0	15.0	225.0	23.0	23.0	55	1974	38
162	.	LO	LO	10.0	68	.	1700.0	1128	2	I	13	60	780	935	5.5	11.0	60.5	100.0	104.0	71	1957	178
163	.	EO	E	7.0	27	.	.	778	1	I	12	60	720	1000	5.0	10.0	50.0	132.0	132.0	69	1964	179
164	.	CON	LO	4.0	43	15.000	.	801	2	I	76	110	8360	222	.	.	.	.	229.0	20	1975	180
165	.	LO	LO	6.0	50	.	1300.0	353	2	I	25	72	1800	539	10.0	13.0	130.0	51.0	51.0	71	1965	181

OBS	CITY	REGION	GNP	P	CASE	LCTN	PPCT	DPR	MODE	BDR	IDWTY	PDWTY	FDWTY	IDUTY	PDUTY	FDUTY	CON	INC
166	TAICHUNG	EA	1170	0.45	CHIEN KOU	1	.	U	I	T	R	W	W	H	A	A	C	2
167					LIU CHUAN CANAL	1	.	O	I	S	R	R		H	H		W	2
168					HUEI LAI MILITARY	3	.	U	M	T	R	R	R	H	H	H	C	3
169					SI TUN	3	.	I	I	S	R	R	R	H	H	H	C	3
170					LU LIAO	3	.	I	P	A	R	R	R	H	H	H	M	2
171	TAIPEI	EA	1170	2.20	CHU AN	1	7	I	P	A	R	R		H	T		M	1
172					LU LIU	1	25	I	P	H	N	S		N	S		S	1
173					HUA CHIANG	1	23	U	I	T	S	W	W	S	A	A	C	2
174					NAN CHI CHANG III	1	23	U	I	T	S	W	W	S	A	A	C	3
175					NAN CHI CHANG I	1	23	U	I	T	S	W	W	S	A	A	C	2
176					CHEN HO	1	13	U	I	T	N	W	W	N	A	A	C	3
177					TZU SHENG	1	14	I	I	S	R	W	W	H	A	A	M	3
178					KWANG JAN III	1	.	U	I	T	R	W	W	H	A	A	C	3
179					WU FENG PU	3	29	U	I	T	D	W	W	H	A	A	C	3
180					TSAI LIO	1	24	I	P	S	R	R	W	H	H	A	M	2
181					LUNG MENG	1	30	I	I	S	R	W	W	H	A	A	C	2

OBS	PAYMT	LDTN	DWTN	PPDU	DUA	DUC	LDC	GD	MOVE	LAYOUT	BX	BY	BA	UTL	LX	LY	LA	LPHA	DPHA	PRI	YEAR	CODE
166	23	L	L	5.0	36	9.00	.	892	1	I	45	180	8100	278	.	.	.	84	186	57	1970	103
167	22	E	L	6.0	60	4.50	.	644	2	G	50	140	7000	271	.	.	.	92	107	51	1950	104
168	.	L	L	5.3	58	.	.	580	1	I	20	70	1400	643	6.0	20.0	120.00	110	110	80	1950	105
169	21	L	L	4.2	67	10.00	.	707	3	I	28	55	1540	539	4.0	12.0	48.00	170	170	72	.	106
170	.	L	L	4.0	39	.	.	85	0	G	100	100	10000	200	.	.	.	21	21	30	.	107
171	19	M	L	.	.	.	3660	262	0	G	.	.	.	206	.	.	.	.	.	90	1870	92
172	20	E	L	6.5	36	.	3200	1146	1	G	.	.	.	238	.	.	.	177	177	85	1950	93
173	19	LO	LO	6.3	84	5.00	3200	1072	2	I	70	118	8260	223	.	.	.	.	214	54	1974	94
174	20	L	L	5.0	33	2.50	2400	3195	1	I	40	80	3200	375	.	.	.	.	494	35	1964	95
175	19	L	L	5.0	24	0.75	2400	2469	3	I	50	82	4100	336	.	.	.	.	639	54	1971	96
176	20	L	L	5.0	90	.	3660	780	1	I	35	117	4095	370	6.0	14.0	84.00	78	156	70	1956	97
177	20	L	L	8.0	55	.	12700	892	1	G	54	184	9936	245	.	.	.	68	118	75	1902	98
178	.	LO	LO	5.0	40	4.00	1200	2720	2	I	24	108	2592	508	7.5	12.5	93.75	92	461	42	1975	99
179	28	L	L	5.0	90	7.50	3500	1314	2	I	32	148	4736	288	7.0	16.0	112.00	60	239	67	1974	100
180	20	L	L	5.0	44	0.50	.	1370	1	I	24	150	3600	483	.	.	.	186	274	80	1945	101
181	20	L	L	5.0	54	1.00	.	1987	1	I	24	248	5952	453	4.5	10.0	45.00	45	185	80	1960	102

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BA=BLOCK AREA (SQ.METERS).

BDR=BUILDER.
  A=artisan
  H=self-help
  S=small contractor
  T=large contractor
BX=BX. BLOCK SHORT DIMENSION (METERS).
BY=BY. BLOCK LONG DIMENSION (METERS).
CON=CONSTRUCTION TYPE.
  A=adobe
  C=reinforced concrete
  M=masonry
  W=wood
DPHA=DWELLING UNITS PER HECTARE.
DPR=DEVELOPER.
  I=private sector
  O=popular sector
  U=public sector
DUA=DWELLIN UNIT AREA (SQ.METERS)
DUC=DWELLING UNIT COST (1977 $)
DUTY=DWELLING UNIT TYPE
   A=apartment
   H=house
   R=room
   S=shanty
DWTN=DWELLING UNIT TENTURE.
   E=extralegal
   L=legal
   O=ownership
   R=rental
DWTY=DWELLING TYPE
   D=detached/semi-detached
   H=high-rise
   R=row/group
   S=shanty
   T=tenement
   W=walk-up
FDUTY=FUTURE DWELLING UNIT TYPE.
   (see DUTY)
FDWTY=FUTURE DWELLING TYPE.
   (see DWTY)
GD=NET DENSITY (PEOPLE/HECTARE).
IDUTY=INITIAL DWELLING UNIT TYPE..
   (see DUTY)
IDWTY=INITIAL DWELLING TYPE.
   (see DWTY)
INC=INCOME LEVEL.
  1=very low
  2=low
  3=moderate
  4=middle
  5=high
LA=LOT AREA (SQ.METERS).
LAYOUT=LAYOUT.
     G=grid layout
     I=gridiron layout
LCTN=LOCATION.
   1=city center
   2=inner ring
   3=periphery
LDC=LAND COST (1977 $)
LDTN=LAND TENURE.
  (see DUTN)
LPHA=LOTS PER HECTARE.
LX=LX. LOT SHORT DIMENSION (METERS).
LY=LY. LOT LONG DIMENSION (METERS).
M=MIX;
MODE=MODE OF DEVELOPMENT.
   I=instant development
   P=progressive development
MOVE=NUMBER OF MOVES.
PAYMT=% OF INCOME FOR HOUSING PAYMENT.
PDUTY=PRESENT DWELLING UNIT TYPE.
   (see DUTY)
PDWTY=PRESENT DWELLING TYPE.
   (see DWTY)
PPCT=% OF POPULATION.
PPDU=PEOPLE PER DWELLING UNIT.
PRI=% OF PRIVATE AND SEMI-PRIVATE LAND.
UTL=UNIT TRANSIT LENGTH (METERS/HECTARE).
YEAR=YEAR OF CONSTRUCTION.;
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CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / NUMBER OF OBSERVATIONS

	P	GNP	INC	PAYMT	GD	DUA	PPDU	MOVE	DUC	LDC	BX	BY	LX
P	1.00000 0.0000 181	-0.16127 0.0362 169	-0.09851 0.1933 176	-0.17815 0.1186 78	0.41148 0.0001 173	-0.09265 0.2323 168	0.21405 0.0042 177	0.01325 0.8793 134	-0.12755 0.2107 98	0.03630 0.7508 79	0.14421 0.1058 127	0.08491 0.3425 127	-0.15318 0.2022 71
GNP	-0.16127 0.0362 169	1.00000 0.0000 169	0.24531 0.0013 169	0.11057 0.3622 70	-0.17665 0.0241 163	0.40011 0.0001 161	0.14728 0.0583 166	-0.07485 0.4029 127	0.30618 0.0032 91	-0.09207 0.4418 72	-0.14931 0.1097 116	-0.24469 0.0081 116	0.00585 0.9628 66
INC	-0.09851 0.1933 176	0.24531 0.0013 169	1.00000 0.0000 176	0.10958 0.3428 77	-0.25190 0.0010 169	0.30208 0.0001 168	0.02536 0.7405 173	0.06558 0.4515 134	0.50375 0.0001 94	-0.03040 0.7902 79	0.17611 0.0523 122	0.08623 0.3450 122	0.40017 0.0007 69
PAYMT	-0.17815 0.1186 78	0.11057 0.3622 70	0.10958 0.3428 77	1.00000 0.0000 78	-0.21983 0.0617 73	-0.04318 0.7149 74	-0.16989 0.1451 75	-0.14836 0.2273 68	0.01064 0.9416 50	0.16779 0.2763 44	0.05375 0.6808 61	0.06306 0.6292 61	-0.04819 0.8076 28
GD	0.41148 0.0001 173	-0.17665 0.0241 163	-0.25190 0.0010 169	-0.21983 0.0617 73	1.00000 0.0000 173	-0.28510 0.0002 161	-0.01534 0.8426 170	-0.04823 0.5903 127	-0.19360 0.0615 94	0.30781 0.0081 73	0.01140 0.9012 121	0.00304 0.9736 121	-0.28235 0.0179 70
DUA	-0.09265 0.2323 168	0.40011 0.0001 161	0.30208 0.0001 168	-0.04318 0.7149 74	-0.28510 0.0002 161	1.00000 0.0000 168	0.08031 0.3037 166	0.10024 0.2641 126	0.40811 0.0001 93	-0.15549 0.1799 76	-0.00739 0.9372 116	-0.07532 0.4216 116	0.26460 0.0318 66
PPDU	0.21405 0.0042 177	0.14728 0.0583 166	0.02536 0.7405 173	-0.16989 0.1451 75	-0.01534 0.8426 170	0.08031 0.3037 166	1.00000 0.0000 177	-0.11310 0.1966 132	0.00793 0.9389 96	0.05852 0.6108 78	0.04388 0.6270 125	-0.02789 0.7575 125	-0.14014 0.2508 69
MOVE	0.01325 0.8793 134	-0.07485 0.4029 127	0.06558 0.4515 134	-0.14836 0.2273 68	-0.04823 0.5903 127	0.10024 0.2641 126	-0.11310 0.1966 132	1.00000 0.0000 134	-0.07768 0.5136 73	-0.11430 0.3804 61	-0.06266 0.5274 104	-0.02569 0.7958 104	-0.09663 0.4870 54
DUC	-0.12755 0.2107 98	0.30618 0.0032 91	0.50375 0.0001 94	0.01064 0.9416 50	-0.19360 0.0615 94	0.40811 0.0001 93	0.00793 0.9389 96	-0.07768 0.5136 73	1.00000 0.0000 98	-0.09632 0.4641 60	0.13674 0.2453 74	-0.00262 0.9823 74	0.26212 0.0978 41
LDC	0.03630 0.7508 79	-0.09207 0.4418 72	-0.03040 0.7902 79	0.16779 0.2763 44	0.30781 0.0081 73	-0.15549 0.1799 76	0.05852 0.6108 78	-0.11430 0.3804 61	-0.09632 0.4641 60	1.00000 0.0000 79	-0.13782 0.2979 59	0.05704 0.6679 59	-0.20158 0.2529 34
BX	0.14421 0.1058 127	-0.14931 0.1097 116	0.17611 0.0523 122	0.05375 0.6808 61	0.01140 0.9012 121	-0.00739 0.9372 116	0.04388 0.6270 125	-0.06266 0.5274 104	0.13674 0.2453 74	-0.13782 0.2979 59	1.00000 0.0000 127	0.37790 0.0001 127	0.59993 0.0001 64
BY	0.08491 0.3425 127	-0.24469 0.0081 116	0.08623 0.3450 122	0.06306 0.6292 61	0.00304 0.9736 121	-0.07532 0.4216 116	-0.02789 0.7575 125	-0.02569 0.7958 104	-0.00262 0.9823 74	0.05704 0.6679 59	0.37790 0.0001 127	1.00000 0.0000 127	0.17101 0.1767 64
LX	-0.15318 0.2022 71	0.00585 0.9628 66	0.40017 0.0007 69	-0.04819 0.8076 28	-0.28235 0.0179 70	0.26460 0.0318 66	-0.14014 0.2508 69	-0.09663 0.4870 54	0.26212 0.0978 41	-0.20158 0.2529 34	0.59993 0.0001 64	0.17101 0.1767 64	1.00000 0.0000 71

CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / NUMBER OF OBSERVATIONS

	LY	UTL	LPHA	DPHA	PRI	YEAR	LCTN	BA	LA
P	-0.17214	-0.00000	0.15377	0.37321	0.03604	-0.13707	0.08972	0.16356	-0.11020
	0.1482	1.0000	0.0964	0.0001	0.6520	0.0738	0.2350	0.0662	0.3603
	72	142	118	160	159	171	177	127	71
GNP	-0.10280	0.02768	-0.13535	-0.18278	0.12362	0.06895	-0.20265	-0.24830	-0.08893
	0.4078	0.7536	0.1605	0.0257	0.1344	0.3878	0.0090	0.0072	0.4777
	67	131	109	149	148	159	165	116	66
INC	0.41106	-0.15771	-0.39836	-0.21293	0.00188	0.00791	-0.06001	0.19739	0.30261
	0.0004	0.0657	0.0001	0.0078	0.9815	0.9194	0.4342	0.0293	0.0115
	70	137	114	155	154	166	172	122	69
PAYMT	-0.00632	0.00268	-0.05000	-0.24747	0.11234	0.26141	0.04314	0.07630	-0.06141
	0.9745	0.9832	0.7414	0.0435	0.3692	0.0226	0.7132	0.5589	0.7563
	28	64	46	67	66	76	75	61	28
GD	-0.32719	0.09300	0.60434	0.93789	-0.14120	-0.08629	-0.21030	0.03701	-0.17242
	0.0054	0.2833	0.0001	0.0001	0.0817	0.2734	0.0061	0.6869	0.1535
	71	135	117	153	153	163	169	121	70
DUA	0.17251	-0.10083	-0.28502	-0.29627	0.17103	0.04412	0.05671	-0.04558	0.16225
	0.1627	0.2537	0.0028	0.0002	0.0383	0.5820	0.4708	0.6270	0.1931
	67	130	108	149	147	158	164	116	66
PPDU	-0.12128	-0.09736	-0.07004	-0.14305	0.13052	-0.06225	0.00161	0.01445	-0.14203
	0.3173	0.2559	0.4570	0.0739	0.1055	0.4242	0.9832	0.8729	0.2444
	70	138	115	157	155	167	173	125	69
MOVE	-0.12481	0.13078	0.13792	0.01381	-0.01639	0.03307	0.11766	-0.06198	-0.11791
	0.3639	0.1674	0.1923	0.8815	0.8614	0.7109	0.1791	0.5319	0.3958
	55	113	91	119	116	128	132	104	54
DUC	0.23195	-0.19443	-0.29397	-0.12835	0.06416	0.05079	-0.08113	0.09764	0.15555
	0.1394	0.0902	0.0166	0.2361	0.5549	0.6250	0.4370	0.4079	0.3315
	42	77	66	87	87	95	94	74	41
LDC	-0.22384	0.03248	0.20597	0.32980	0.01848	-0.23846	-0.28337	-0.07994	-0.15526
	0.1961	0.7989	0.1390	0.0064	0.8784	0.0355	0.0138	0.5472	0.3806
	35	64	53	67	71	78	75	59	34
BX	0.75261	-0.70122	-0.54554	-0.02837	0.06980	-0.22130	-0.07657	0.87719	0.65556
	0.0001	0.0001	0.0001	0.7554	0.4430	0.0151	0.3999	0.0001	0.0001
	65	126	96	123	123	120	123	127	64
BY	0.29795	-0.50522	-0.27476	-0.06799	0.13878	-0.08530	-0.01395	0.72131	0.17159
	0.0159	0.0001	0.0067	0.4550	0.1258	0.3543	0.8783	0.0001	0.1752
	65	126	96	123	123	120	123	127	64
LX	0.95739	-0.34305	-0.37050	-0.30310	0.33241	-0.22518	0.00328	0.47448	0.95014
	0.0001	0.0042	0.0016	0.0102	0.0046	0.0628	0.9789	0.0001	0.0001
	71	68	70	71	71	69	68	64	71

CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / NUMBER OF OBSERVATIONS

	P	GNP	INC	PAYMT	GD	DUA	PPDU	MOVE	DUC	LDC	BX	BY	LX
LY	-0.17214 0.1482 72	-0.10280 0.4078 67	0.41106 0.0004 70	-0.00632 0.9745 28	-0.32719 0.0054 71	0.17251 0.1627 67	-0.12128 0.3173 70	-0.12481 0.3639 55	0.23195 0.1394 42	-0.22384 0.1961 35	0.75261 0.0001 65	0.29795 0.0159 65	0.95739 0.0001 71
UTL	-0.00000 1.0000 142	0.02768 0.7536 131	-0.15771 0.0657 137	0.00268 0.9832 64	0.09300 0.2833 135	-0.10083 0.2537 130	-0.09736 0.2559 138	0.13078 0.1674 113	-0.19443 0.0902 77	0.03248 0.7989 64	-0.70122 0.0001 126	-0.50522 0.0001 126	-0.34305 0.0042 68
LPHA	0.15377 0.0964 118	-0.13535 0.1605 109	-0.39836 0.0001 114	-0.05000 0.7414 46	0.60434 0.0001 117	-0.28502 0.0028 108	-0.07004 0.4570 115	0.13792 0.1923 91	-0.29397 0.0166 66	0.20597 0.1390 53	-0.54554 0.0001 96	-0.27476 0.0067 96	-0.37050 0.0016 70
DPHA	0.37321 0.0001 160	-0.18278 0.0257 149	-0.21293 0.0078 155	-0.24747 0.0435 67	0.93789 0.0001 153	-0.29627 0.0002 149	-0.14305 0.0739 157	0.01381 0.8815 119	-0.12835 0.2361 87	0.32980 0.0064 67	-0.02837 0.7554 123	-0.06799 0.4550 123	-0.30310 0.0102 71
PRI	0.03604 0.6520 159	0.12362 0.1344 148	0.00188 0.9815 154	0.11234 0.3692 66	-0.14120 0.0817 153	0.17103 0.0383 147	0.13052 0.1055 155	-0.01639 0.8614 116	0.06416 0.5549 87	0.01848 0.8784 71	0.06980 0.4430 123	0.13878 0.1258 123	0.33241 0.0046 71
YEAR	-0.13707 0.0738 171	0.06895 0.3878 159	0.00791 0.9194 166	0.26141 0.0226 76	-0.08629 0.2734 163	0.04412 0.5820 158	-0.06225 0.4242 167	0.03307 0.7109 128	0.05079 0.6250 95	-0.23846 0.0355 78	-0.22130 0.0151 120	-0.08530 0.3543 120	-0.22518 0.0628 69
LCTN	0.08972 0.2350 177	-0.20265 0.0090 165	-0.06001 0.4342 172	0.04314 0.7132 75	-0.21030 0.0061 169	0.05671 0.4708 164	0.00161 0.9832 173	0.11766 0.1791 132	-0.08113 0.4370 94	-0.28337 0.0138 75	-0.07657 0.3999 123	-0.01395 0.8783 123	0.00328 0.9789 68
BA	0.16356 0.0662 127	-0.24830 0.0072 116	0.19739 0.0293 122	0.07630 0.5589 61	0.03701 0.6869 121	-0.04558 0.6270 116	0.01445 0.8729 125	-0.06198 0.5319 104	0.09764 0.4079 74	-0.07994 0.5472 59	0.87719 0.0001 127	0.72131 0.0001 127	0.47448 0.0001 64
LA	-0.11020 0.3603 71	-0.08893 0.4777 66	0.30261 0.0115 69	-0.06141 0.7563 28	-0.17242 0.1535 70	0.16225 0.1931 66	-0.14203 0.2444 69	-0.11791 0.3958 54	0.15555 0.3315 41	-0.15526 0.3806 34	0.65556 0.0001 64	0.17159 0.1752 64	0.95014 0.0001 71

CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / NUMBER OF OBSERVATIONS

	LY	UTL	LPHA	DPHA	PRI	YEAR	LCTN	BA	LA
LY	1.00000 0.0000 72	-0.44162 0.0001 69	-0.41798 0.0003 71	-0.35065 0.0025 72	0.35930 0.0019 72	-0.28736 0.0159 70	0.02080 0.8653 69	0.61065 0.0001 65	0.90798 0.0001 71
UTL	-0.44162 0.0001 69	1.00000 0.0000 142	0.56836 0.0001 108	0.13161 0.1253 137	-0.19452 0.0227 137	0.19617 0.0231 134	0.08026 0.3494 138	-0.63543 0.0001 126	-0.24552 0.0420 69
LPHA	-0.41798 0.0003 71	0.56836 0.0001 108	1.00000 0.0000 118	0.71493 0.0001 117	0.03277 0.7270 116	0.03278 0.7315 112	-0.04629 0.6248 114	-0.45806 0.0001 96	-0.20425 0.0899 70
DPHA	-0.35065 0.0025 72	0.13161 0.1253 137	0.71493 0.0001 117	1.00000 0.0000 160	-0.25687 0.0014 152	-0.10441 0.2035 150	-0.28535 0.0003 156	-0.02168 0.8118 123	-0.18048 0.1320 71
PRI	0.35930 0.0019 72	-0.19452 0.0227 137	0.03277 0.7270 116	-0.25687 0.0014 152	1.00000 0.0000 159	-0.21295 0.0091 149	-0.19197 0.0167 155	0.11444 0.2075 123	0.28960 0.0143 71
YEAR	-0.28736 0.0159 70	0.19617 0.0231 134	0.03278 0.7315 112	-0.10441 0.2035 150	-0.21295 0.0091 149	1.00000 0.0000 171	0.32273 0.0001 167	-0.17456 0.0565 120	-0.21155 0.0810 69
LCTN	0.02080 0.8653 69	0.08026 0.3494 138	-0.04629 0.6248 114	-0.28535 0.0003 156	-0.19197 0.0167 155	0.32273 0.0001 167	1.00000 0.0000 177	-0.02559 0.7787 123	0.07469 0.5450 68
BA	0.61065 0.0001 65	-0.63543 0.0001 126	-0.45806 0.0001 96	-0.02168 0.8118 123	0.11444 0.2075 123	-0.17456 0.0565 120	-0.02559 0.7787 123	1.00000 0.0000 127	0.49599 0.0001 64
LA	0.90798 0.0001 71	-0.24552 0.0420 69	-0.20425 0.0899 70	-0.18048 0.1320 71	0.28960 0.0143 71	-0.21155 0.0810 69	0.07469 0.5450 68	0.49599 0.0001 64	1.00000 0.0000 71

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
P	181	2.1026	2.6468	380.6	0.050	9.200
GNP	169	1260.7101	1640.8950	213060.0	90.000	6040.000
INC	176	2.6080	1.1057	459.0	1.000	5.000
PAYMT	78	15.6474	7.4127	1220.5	3.000	40.000
GD	173	641.3757	738.2996	110958.0	5.000	5172.000
DUA	168	93.6708	90.4234	15736.7	2.600	625.000
PPDU	177	5.8184	1.8063	1029.8	2.000	20.000
MOVE	134	1.8806	1.3267	252.0	0	10.000
DUC	98	6.0953	7.5989	597.3	0.012	44.000
LDC	79	742.5063	1660.3013	58658.0	0.900	12700.000
BX	127	62.5591	33.8178	7945.0	12.000	180.000
BY	127	129.0787	56.6516	16393.0	30.000	356.000
LX	71	12.9479	16.3068	919.3	3.000	130.000
LY	72	22.7847	20.7405	1640.5	5.000	160.000
UTL	142	319.9789	176.1123	45437.0	37.000	1072.000
LPHA	118	58.0297	54.4860	6847.5	0.400	320.000
DPHA	160	117.0431	136.0045	18726.9	0.400	1034.000
PRI	159	64.1887	20.7956	10206.0	9.000	93.000
YEAR	171	1950.3041	45.3102	333502.0	1500.000	1978.000
LCTN	177	2.0565	0.8099	364.0	1.000	3.000
BA	127	8793.3307	7477.6771	1116753.0	720.000	39600.000
LA	71	615.4296	2507.3798	43695.5	20.000	20800.000

LARGE CITY (P>=2M).

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
P	72	4.4722	2.7962	322.00	2.000	9.200
GNP	72	965.0000	620.1090	69480.00	90.000	2660.000
INC	72	2.3889	0.9277	172.00	1.000	5.000
PAYMT	48	15.9583	7.9632	766.00	3.000	40.000
GD	72	944.4306	897.6477	67999.00	46.000	4172.000
DUA	70	84.9471	77.3792	5946.30	5.200	400.000
PPDU	70	6.3586	1.6688	445.10	4.000	12.000
MOVE	59	1.9153	1.1339	113.00	0	6.000
DUC	48	5.1638	8.1118	247.86	0.012	44.000
LDC	45	1091.9444	2087.6199	49137.50	0.900	12700.000
BX	57	64.6842	41.4105	3687.00	12.000	180.000
BY	57	132.9298	48.4605	7577.00	42.000	250.000
LX	28	8.6893	4.6340	243.30	3.000	25.000
LY	28	17.4286	6.9265	488.00	10.000	35.000
UTL	59	316.5763	180.3956	18678.00	101.000	1000.000
LPHA	42	74.2833	58.9953	3119.90	4.000	263.000
DPHA	61	173.6230	183.7564	10591.00	12.000	1034.000
PRI	59	65.0678	22.0328	3839.00	9.000	90.000
YEAR	71	1944.1690	63.7733	138036.00	1500.000	1978.000
LCTN	68	2.1176	0.8381	144.00	1.000	3.000
BA	57	9431.8421	8689.1085	537615.00	720.000	39600.000
LA	28	176.7411	184.1458	4948.75	36.000	875.000

MEDIUM CITY (0.5M<P<2M);

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
P	26	1.14000000	0.33134876	29.64000000	0.56000000	1.60000000
GNP	14	2124.28571429	2607.10188136	29740.00000000	150.00000000	6040.00000000
INC	21	2.85714286	1.19522861	60.00000000	1.00000000	5.00000000
PAYMT	11	16.81818182	6.40028408	185.00000000	5.00000000	28.00000000
GD	24	565.37500000	551.26059588	13569.00000000	37.00000000	2417.00000000
DUA	17	71.90588235	51.45046733	1222.40000000	12.00000000	200.00000000
PPDU	25	5.80200000	3.13928336	145.05000000	3.25000000	20.00000000
MOVE	21	1.66666667	1.15470054	35.00000000	0	4.00000000
DUC	13	11.35153846	8.90771374	147.57000000	0.32000000	27.90000000
LDC	8	729.37500000	1050.44357127	5835.00000000	25.00000000	2500.00000000
BX	18	54.55555556	24.48101839	982.00000000	27.00000000	128.00000000
BY	18	121.33333333	55.40121043	2184.00000000	43.00000000	240.00000000
LX	9	8.61111111	5.08538210	77.50000000	4.00000000	20.00000000
LY	9	18.05555556	7.15211701	162.50000000	7.00000000	28.00000000
UTL	19	333.63157895	129.79950801	6339.00000000	146.00000000	608.00000000
LPHA	18	70.94444444	47.47565596	1277.00000000	17.00000000	167.00000000
DPHA	22	120.63636364	87.35671013	2654.00000000	17.00000000	315.00000000
PRI	22	63.50000000	17.76500037	1397.00000000	21.00000000	92.00000000
YEAR	25	1951.92000000	22.15648889	48798.00000000	1880.00000000	1978.00000000
LCTN	26	2.03846154	0.87089697	53.00000000	1.00000000	3.00000000
BA	18	6964.61111111	4907.75387871	125363.00000000	1204.00000000	18688.00000000
LA	9	174.11111111	138.18144272	1567.00000000	28.00000000	460.00000000

SMALL CITIES (P<0.5M);

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
P	113	0.56256637	0.48803867	63.57000000	0.05000000	2.00000000
GNP	101	1465.94059406	2036.10715740	148060.00000000	150.00000000	6040.00000000
INC	108	2.73148148	1.19661892	295.00000000	1.00000000	5.00000000
PAYMT	33	15.46969697	6.76611432	510.50000000	5.00000000	30.00000000
GD	105	414.58095238	401.44335219	43531.00000000	5.00000000	2417.00000000
DUA	102	97.20196078	97.70505017	9914.60000000	2.60000000	625.00000000
PPDU	111	5.48423423	1.78219709	608.75000000	2.00000000	20.00000000
MOVE	77	1.87012987	1.45412887	144.00000000	0	10.00000000
DUC	54	6.62555556	6.89956074	357.78000000	0.24000000	28.20000000
LDC	38	251.18421053	539.20117067	9545.00000000	0.90000000	2500.00000000
BX	74	60.75675676	25.99726583	4496.00000000	14.00000000	135.00000000
BY	74	127.14864865	61.30201061	9409.00000000	30.00000000	356.00000000
LX	46	15.10869565	19.69966527	695.00000000	4.00000000	130.00000000
LY	47	25.77659574	24.74056880	1211.50000000	5.00000000	160.00000000
UTL	86	322.10465116	169.98581457	27701.00000000	37.00000000	1072.00000000
LPHA	80	50.52000000	49.97173733	4041.60000000	0.40000000	320.00000000
DPHA	103	82.58155340	76.90975708	8505.90000000	0.40000000	423.00000000
PRI	104	64.00000000	19.85725761	6656.00000000	10.00000000	93.00000000
YEAR	104	1955.05769231	24.32339835	203326.00000000	1810.00000000	1978.00000000
LCTN	109	2.01834862	0.79327791	220.00000000	1.00000000	3.00000000
BA	74	8291.21621622	6191.24946398	613550.00000000	900.00000000	29904.00000000
LA	46	851.42934783	3098.13304475	39165.75000000	20.00000000	20800.00000000

AFRICA

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
P	26	0.419	0.076	10.90	0.350	0.500
GNP	26	270.000	0	7020.00	270.000	270.000
INC	26	2.808	1.415	73.00	1.000	5.000
PAYMT	1	12.500	0	12.50	12.500	12.500
GD	26	378.962	444.142	9853.00	5.000	1859.000
DUA	25	92.424	68.019	2310.60	2.600	250.000
PPDU	25	4.780	1.220	119.50	2.000	6.400
MOVE	4	1.250	0.957	5.00	0	2.000
DUC	9	5.278	3.729	47.50	0.700	10.000
LDC	3	3.667	0.577	11.00	3.000	4.000
BX	10	70.400	26.399	704.00	30.000	120.000
BY	10	184.100	107.203	1841.00	45.000	356.000
LX	13	27.577	33.220	358.50	7.500	130.000
LY	13	44.038	40.787	572.50	11.500	160.000
UTL	15	339.333	275.563	5090.00	37.000	1072.000
LPHA	14	13.343	7.157	186.80	0.400	23.000
DPHA	25	68.952	90.960	1723.80	0.400	423.000
PRI	26	58.115	27.274	1511.00	10.000	92.000
YEAR	22	1957.136	17.299	43057.00	1910.000	1973.000
LCTN	26	2.154	0.675	56.00	1.000	3.000
BA	10	14454.900	10127.986	144549.00	1500.000	29904.000
LA	13	2438.558	5655.998	31701.25	86.250	20800.000

EAST ASIA

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
P	67	2.5500	2.6379	170.85	0.050	9.200
GNP	67	562.3881	434.4801	37680.00	90.000	1170.000
INC	67	2.4776	1.0351	166.00	1.000	5.000
PAYMT	34	16.0000	7.4274	544.00	3.000	28.000
GD	67	978.6866	899.8760	65572.00	46.000	4172.000
DUA	65	53.2446	31.1890	3460.90	9.000	152.000
PPDU	66	5.6848	1.2798	375.20	2.500	10.000
MOVE	55	1.5455	1.1518	85.00	0	6.000
DUC	36	5.1650	6.5683	185.94	0.080	32.500
LDC	28	1578.7143	2516.0061	44204.00	10.000	12700.000
BX	42	58.8810	41.8943	2473.00	12.000	172.000
BY	42	116.5000	54.5421	4893.00	40.000	250.000
LX	20	6.7000	4.6578	134.00	3.000	25.000
LY	20	13.2000	6.1546	264.00	5.000	35.000
UTL	47	374.5957	221.3691	17606.00	81.000	1000.000
LPHA	37	97.2973	69.7344	3600.00	4.000	320.000
DPHA	56	200.5000	183.8656	11228.00	12.000	1034.000
PRI	52	61.0000	23.0957	3172.00	16.000	93.000
YEAR	64	1949.3281	31.3976	124757.00	1810.000	1978.000
LCTN	67	2.0149	0.8437	135.00	1.000	3.000
BA	42	8009.9286	8720.5684	336417.00	720.000	32500.000
LA	20	112.4875	182.9432	2249.75	20.000	875.000

LATIN AMERICA

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
P	50	2.9950	3.3614	149.75	0.100	8.600
GNP	41	1278.5366	531.6839	52420.00	720.000	2660.000
INC	45	2.4667	1.0357	111.00	1.000	4.000
PAYMT	32	15.7500	7.9393	504.00	5.000	40.000
GD	48	367.8958	326.4850	17659.00	26.000	1800.000
DUA	45	78.7156	52.3776	3542.20	5.200	250.000
PPDU	49	6.1551	1.2100	301.60	3.300	10.000
MOVE	40	2.1250	1.0424	85.00	1.000	6.000
DUC	37	4.5252	5.4815	167.43	0.012	27.900
LDC	30	242.8000	351.4734	7284.00	0.900	1600.000
BX	43	69.2791	33.0132	2979.00	25.000	180.000
BY	43	139.9535	40.0410	6018.00	62.000	244.000
LX	25	10.0720	5.4333	251.80	4.000	30.000
LY	26	21.7308	7.3352	565.00	15.000	50.000
UTL	45	253.4222	78.1061	11404.00	101.000	446.000
LPHA	39	40.3513	28.1701	1573.70	5.600	120.000
DPHA	44	65.4568	44.7438	2880.10	8.500	172.000
PRI	46	65.2826	15.7221	3003.00	11.000	85.000
YEAR	49	1952.8571	36.7157	95690.00	1734.000	1976.000
LCTN	46	2.1304	0.8058	98.00	1.000	3.000
BA	43	9936.3023	6653.3911	427261.00	1900.000	39600.000
LA	25	246.7000	281.6847	6167.50	64.000	1500.000

MEDDLE EAST

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
P	38	1.2124	1.5066	46.07	0.060	8.000
GNP	35	3312.5714	2561.1341	115940.00	190.000	6040.000
INC	38	2.8684	1.0442	109.00	1.000	5.000
PAYMT	11	14.5455	6.5477	160.00	5.000	28.000
GD	32	527.3125	535.4249	16874.00	37.000	2417.000
DUA	33	194.6364	139.0501	6423.00	30.000	625.000
PPDU	37	6.3122	2.9770	233.55	3.250	20.000
MOVE	35	2.2000	1.7456	77.00	1.000	10.000
DUC	16	12.2794	11.9942	196.47	0.400	44.000
LDC	18	397.7222	754.0939	7159.00	3.500	2500.000
BX	32	55.9063	22.3972	1789.00	22.000	116.000
BY	32	113.7813	44.7767	3641.00	30.000	223.000
LX	13	13.4615	6.3063	175.00	5.000	25.000
LY	13	18.3846	6.6054	239.00	10.000	33.000
UTL	35	323.9143	113.9882	11337.00	142.000	667.000
LPHA	28	53.1071	40.1759	1487.00	7.000	203.000
DPHA	35	82.7143	74.9206	2895.00	5.000	315.000
PRI	35	72.0000	15.0743	2520.00	9.000	90.000
YEAR	36	1944.3889	78.0565	69998.00	1500.000	1978.000
LCTN	38	1.9737	0.8538	75.00	1.000	3.000
BA	32	6516.4375	4312.7227	208526.00	900.000	20880.000
LA	13	275.1538	202.1087	3577.00	60.000	625.000

GNP UNDER $500.

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
P	67	1.400	2.3035	93.80	0.200	9.200
GNP	55	208.182	61.3759	11450.00	90.000	270.000
INC	62	2.597	1.2605	161.00	1.000	5.000
PAYMT	21	13.405	7.4509	281.50	3.000	28.000
GD	65	696.385	867.9533	45265.00	5.000	4172.000
DUA	60	74.950	58.5649	4497.00	2.600	250.000
PPDU	65	5.274	1.2136	342.80	2.000	7.700
MOVE	38	2.026	1.8525	77.00	0	10.000
DUC	23	7.451	6.9786	171.37	0.320	27.900
LDC	12	550.500	903.5769	6606.00	3.000	2500.000
BX	37	68.351	34.7117	2529.00	14.000	160.000
BY	37	139.432	76.4306	5159.00	40.000	356.000
LX	26	17.942	25.3272	466.50	4.000	130.000
LY	26	30.346	32.1032	789.00	5.000	160.000
UTL	45	317.000	206.2275	14265.00	37.000	1072.000
LPHA	35	50.251	62.2264	1758.80	0.400	320.000
DPHA	60	138.147	174.0895	8288.80	0.400	1034.000
PRI	56	59.839	23.3260	3351.00	10.000	92.000
YEAR	63	1948.429	29.8284	122751.00	1810.000	1976.000
LCTN	67	2.060	0.7564	138.00	1.000	3.000
BA	37	10744.486	9200.6458	397546.00	1050.000	32500.000
LA	26	1306.952	4087.9717	33980.75	20.000	20800.000

4-2 A SAMPLE SURVEY

The following section contains case studies of selected dwelling environments within the Kaohsiung city area. The case studies have been selected on the basis of income group, housing type, location, and are representative of all the major dwelling systems of the city. The case studies are represented at four levels:

LOCALITY: A locality is defined as a relatively self-contained area. It is generally confined within physical boundaries.

LOCALITY SEGMENT: All localities differ in size and shape; for purposed of comparison, a segment of 400 meters by 400 meters is taken from each locality.

LOCALITY BLOCK: Within each locality segment, a typical residential block is selected in order to compare land utilization (patterns, percentages, densities and circulation).

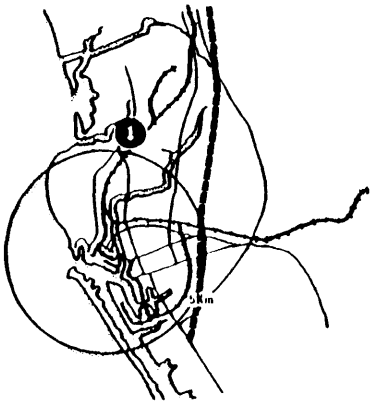
DWELLING UNIT: A typical self-contained unit for an individual, a family or a group is selected in each locality segment.

The case studies are arranged as follows:

1. KUO-MAO MILITARY HOUSING
   Public, Row house, Low/Middle income
2. SHIH-CHUAN PRIVATE DEVELOPMENT
   Private, Row house, Middle income
3. MING-TSU PUBLIC HOUSING
   Public, Apartment, Low/Middle income
4. TSAO-YA SQUATTER SETTLEMENT
   Popular/Private, Row house, Low/Middle income

1 Kuo-mao military housing

Developer: PUBLIC
Type of development: INSTANT/INCREMENTAL
Dwelling type: ROW HOUSE
1-2 stories
Income type: LOW/MIDDLE INCOME



LOCATION: The case is located in Tzuo-ying district along the western side of the main railway line that runs north-south. It is about 4km north from the city.

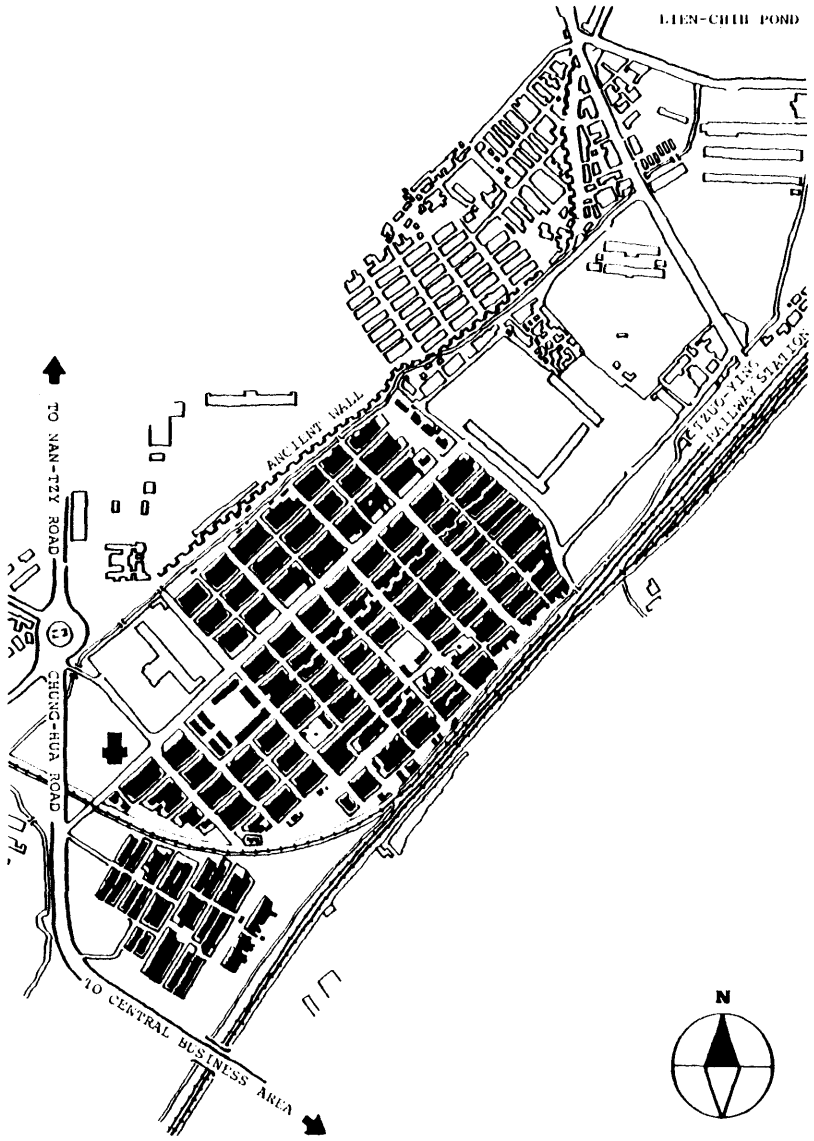
ORIGIN: Tzuo-ying district has been developed since 1661. Most of the Chinese people migrated to this area during Ming Dynasty after Cheng Chen-kung had taken over Taiwan from the Dutch. Tzuo-ying was one of the villages which had developed by these ancient people.
While Japanese controlled Taiwan, Tzuo-ying had been developed as a harbour military base. After World War II, Taiwan was returned to China and central government recovered the control of this area. A large number of military housing was built with the purpose of settling the soldiers and their families. Kuo-mao military housing was one of these projects. Row houses were built by the public sector in several stages from August, 1960 till November, 1976.

LAYOUT: The locality is bound by the Lien-chih Pond at the north, an ancient wall at the west, and the railway at the west and south. Also, a hilly area is located near the locality on its north-west side. A deep ditch which provides storm drainage, surrounds the site at the east and south boundary along the railway. The layout is based on a grid patte pattern. Most of the lots are facing the access lanes parallel to the railway line. The back of two lots had access to a fire-lane, that in most cases had been encroached by the expansion of the dwellings.

LAND USE: The area is predominantly residential. Community center, market and limited shops are located along the main street. The recreational area is well organized and mentained by the community committee. Local residents are served by primary and secondary schools located within the area or in the surroundings.

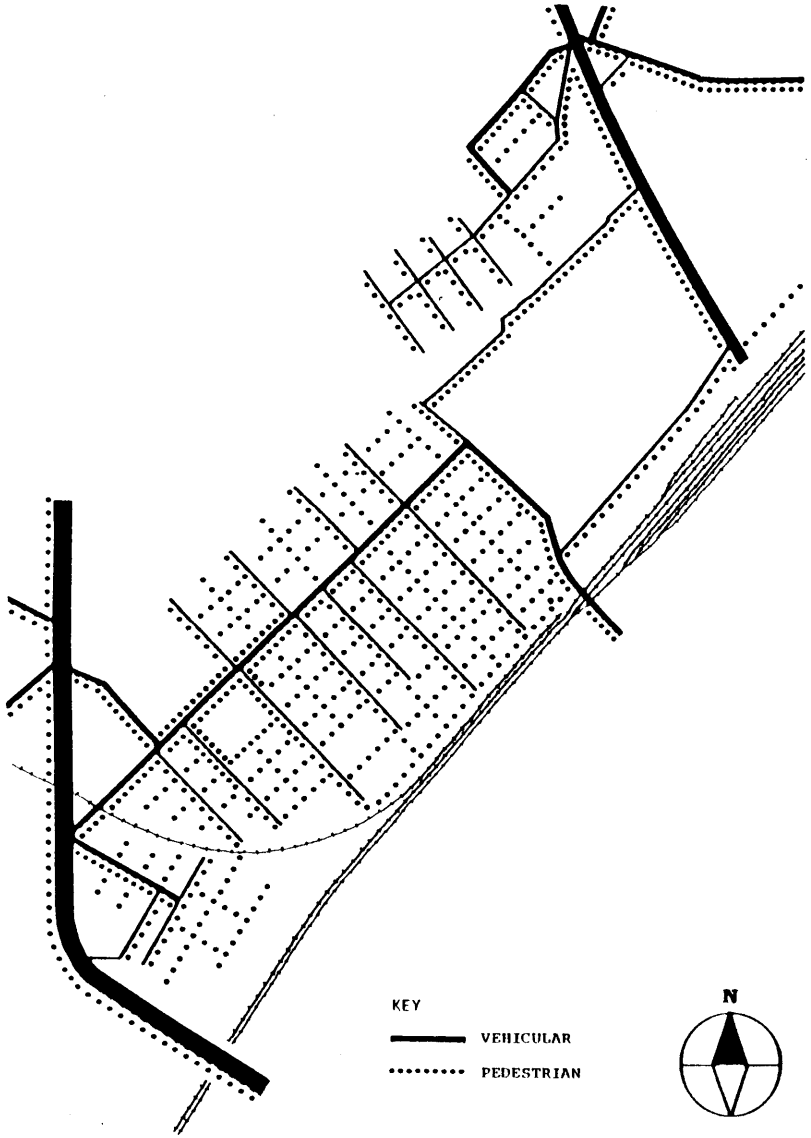
CIRCULATION: Chung-hua Road is the main existing approach to this area from the city center. A road has been proposed along the railway to connect Chung-hua Road and Nan-tzy Road at north and to serve Tzuo-ying railway station. The internal circulation pattern includes one main street parallel to the railway and collector roads perpendicular to the main street having limited vehicular traffic. Paved pedestrian roads dominate in this area.

POPULATION AND INCOME: This area is inhabited by middle and low income group households. There are 1,747 households living in this area representing 9840 persons. Around 40 percent of the inhabitants are working in the army, 60 percent of them are retired military personnel and working for private business enterprises.



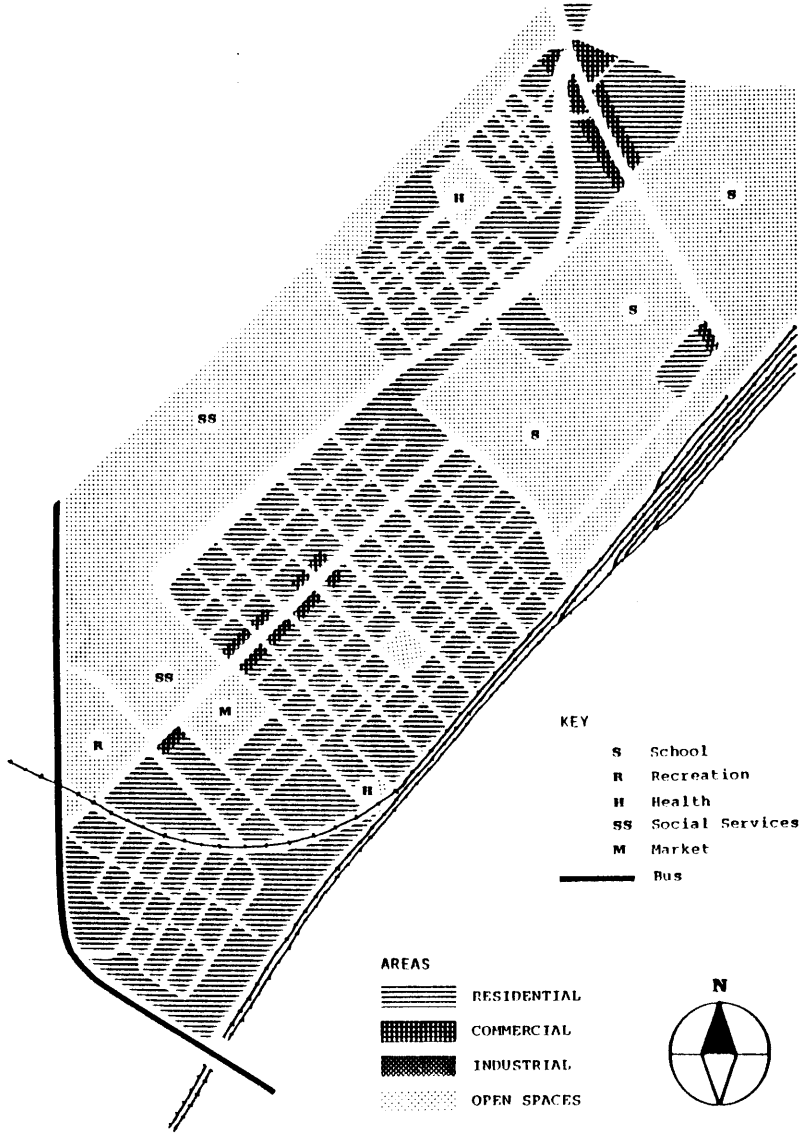
LOCALITY PLAN

1:10000



LOCALITY CIRCULATION PATTERN

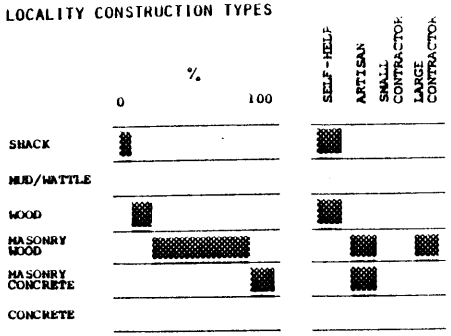
1:10000



LOCALITY LAND USE PATTERN

1:10000

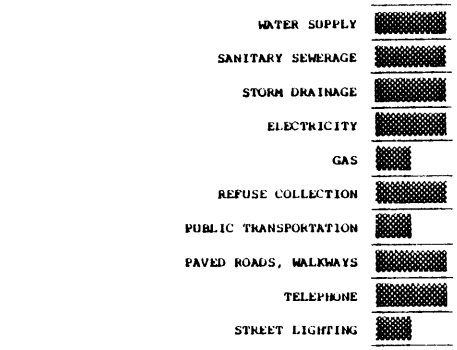
LOCALITY CONSTRUCTION TYPES



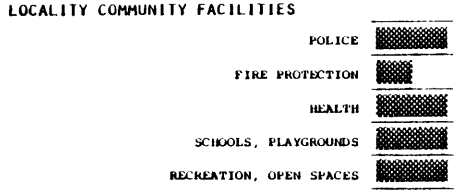
The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information:

LOCALITY UTILITIES AND SERVICES



LOCALITY COMMUNITY FACILITIES



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

Quality of information:

SELECTED BLOCK

LOCALITY SEGMENT PLAN

1:2500

N

0 10 50m

1:1000

LOCALITY BLOCK
LAND UTILIZATION DATA

LOCALITY BLOCK PLAN

PATTERN

Public: streets/walkways

Semi-Public: playgrounds

Semi-Private: cluster courts

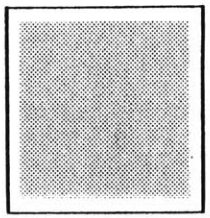
Private: lots

dwellings

LAND UTILIZATION DIAGRAMS

BLOCK a

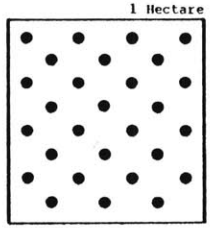
1 Hectare



PERCENTAGES

Streets/Walkways	25
Playgrounds	-
Cluster Courts	-
Dwellings/Lots	75

1 Hectare

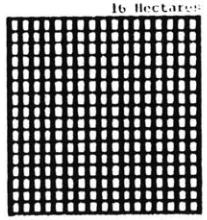


DENSITY

Persons/Hectare

20 Persons	575

16 Hectares

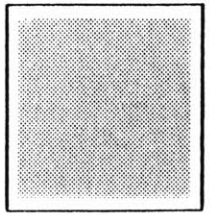


CIRCULATION EFFICIENCY

Meters/Hectare 814

BLOCK b

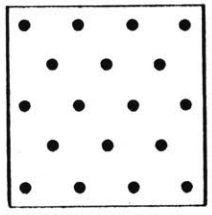
1 Hectare



PERCENTAGES

Streets/Walkways	21
Playgrounds	-
Cluster Courts	-
Dwellings/Lots	79

1 Hectare

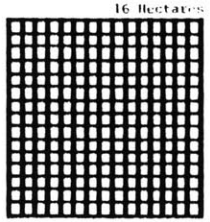


DENSITY

Persons/Hectare

20 Persons	368

16 Hectares

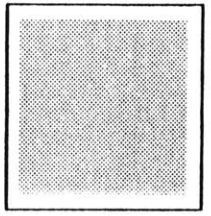


CIRCULATION EFFICIENCY

Meters/Hectare 740

BLOCK c

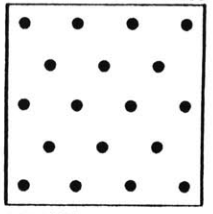
1 Hectare



PERCENTAGES

Streets/Walkways	28
Playgrounds	-
Cluster Courts	-
Dwellings/Lots	72

1 Hectare

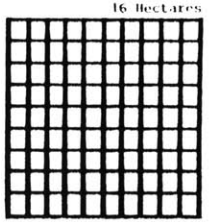


DENSITY

Persons/Hectare

20 Persons	361

16 Hectares



CIRCULATION EFFICIENCY

Meters/Hectare 471

DENSITIES	Total Number	Area Hectares	Density N/Ha	Total Number	Area Hectares	Density N/Ha	Total Number	Area Hectares	Density N/Ha
LOTS	17	0.16	106	13	0.19	68	12	0.18	67
DWELLING UNITS	17	0.16	106	13	0.19	68	12	0.18	67
PEOPLE	92	0.14	575	70	0.19	368	65	0.18	361

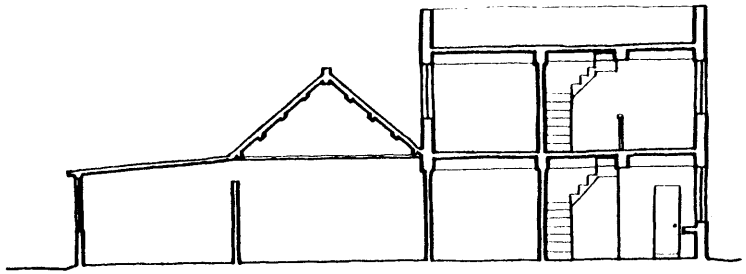
AREAS	Hectares	Percentages	Hectares	Percentages	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	0.04	25%	0.04	21%	0.05	28%
SEMI-PUBLIC (open spaces, schools, community centers)	-	-	-	-	-	-
PRIVATE (dwellings, shops, factories, lots)	0.12	75%	0.15	79%	0.13	72%
SEMI-PRIVATE (cluster courts)	-	-	-	-	-	-
TOTAL	0.16	100%	0.19	100%	0.18	100%

NETWORK EFFICIENCY

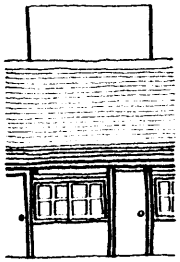
$\frac{\text{Network length (streets, walkways)}}{\text{Areas served (total area)}}$ = 814 m/Ha | 740 m/Ha | 471 m/Ha

LOTS

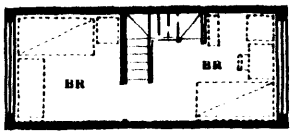
Average area, dimensions = 69 m^2 | 115 m^2 | 112 m^2



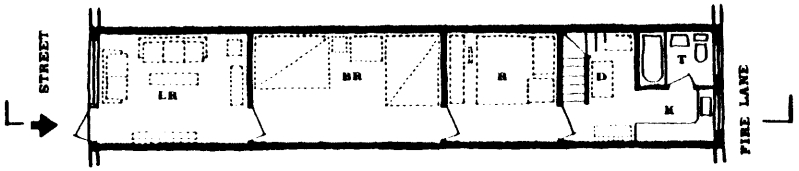
SECTION



ELEVATION



SECOND FLOOR



GROUND FLOOR

KEY

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

0 1 5 10m

1:200

LOCALITY SEGMENT/BLOCK: The segment is representative of the existing layout. One story row houses dominate this area. People add more rooms building one or two stories after buying the houses from the public sector. Around 80 percent of the fire-lanes were encroached upon because of added facilities such as kitchen,toilet, etc..

The streets and access lanes are paved with tar and gravel. Secondary streets and access lanes are essentially for pedestrians, and access lanes are used as walkways and open space by the residents. Lots vary in size (80 m^2, 86 m^2, 96 m^2, 112 m^2) according to the different ranks of the military employees.

TYPICAL DWELLING

CASE STUDY SOURCES:

Locality Plan:	(accurate) Kaohsiung City Government.
Land Use Pattern:	(accurate) IBID
Circulation Pattern:	(approximate) City Master Plan, Survey By Author, 1980.
Locality Segment Plan:	(accurate) Kaohsiung City Government.
Locality Block Plan:	(accurate) IBID
Block Land Utilization:	(accurate) Survey By Author, 1980
Typical Dwelling:	(approximate) IBID
Socio-Economic Data:	(approximate) IBID
Photographs:	Author, 1980
General Information:	Survey By Author, 1980

PHYSICAL DATA
(related to dwelling and land)

DWELLING UNIT
type: ROW-HOUSE
area (sq m): 69
tenure: LEGAL OWNERSHIP

LAND/LOT
utilization: PUBLIC
area (sq m): 48
tenure: PUBLIC/USUFRUCT

DWELLING
location: PERIPHERY
type: ROW-HOUSE
number of floors: 2
utilization: SINGLE FAMILY
physical state: FAIR

DWELLING DEVELOPMENT
mode: INSTANT/INCREMENTAL
developer: PUBLIC
builder: PUBLIC
construction type: BRICK/WOOD
year of construction: 1950

MATERIALS
foundation: BRICK/CONCRETE
floors: CONCRETE
walls: BRICK
roof: CLAY-TILES/WOOD

DWELLING FACILITIES
wc: 1
shower: 1
kitchen: 1
rooms: 5
other: -

SOCIO-ECONOMIC DATA
(related to user)

GENERAL: SOCIAL
user's ethnic origin: ANHWEI PROVINCE
place of birth: ANHWEI PROVINCE
education level: MILITARY OFFICER

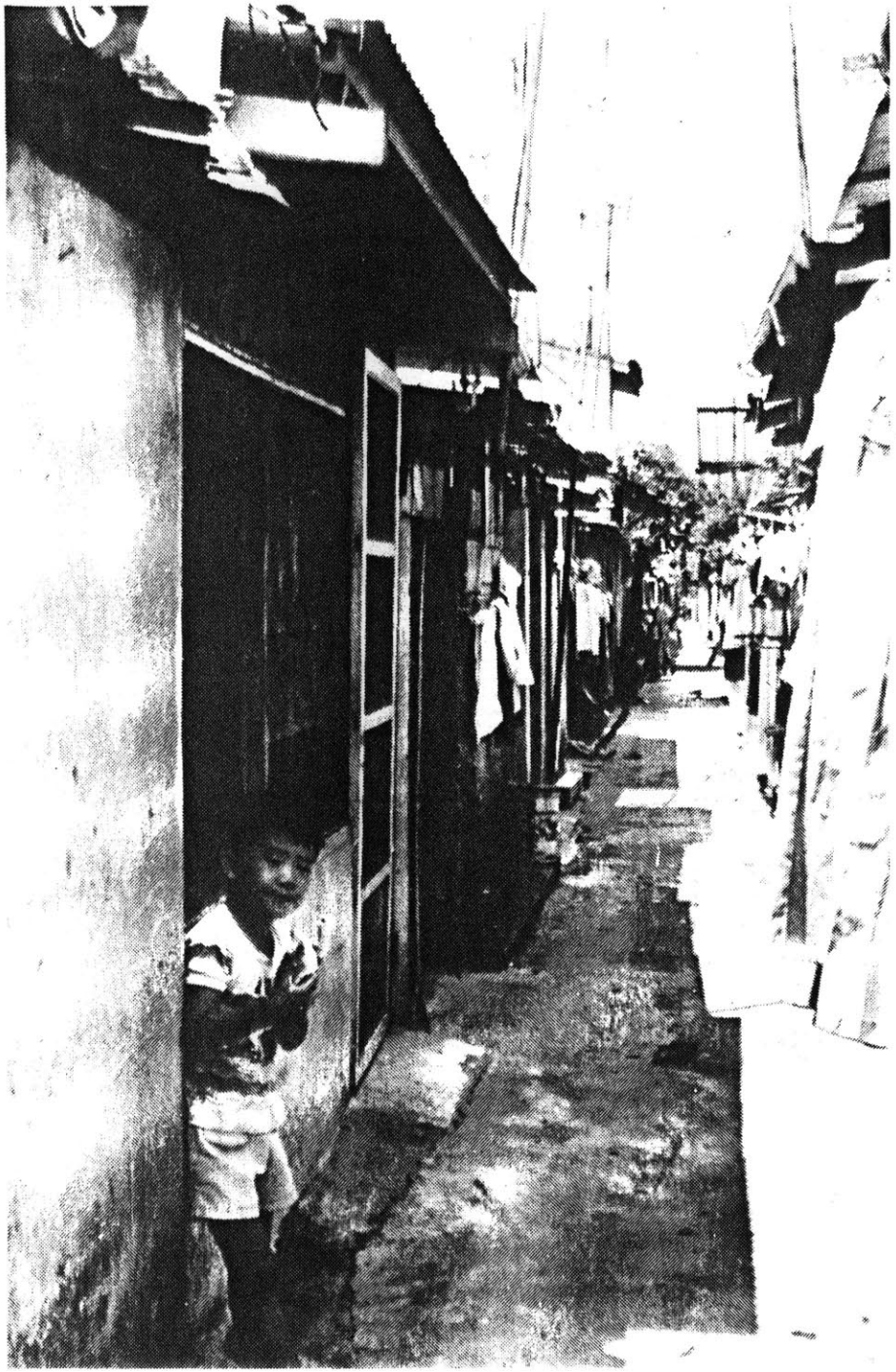
NUMBER OF USERS
married: 2
single: -
children: 4
total: 6

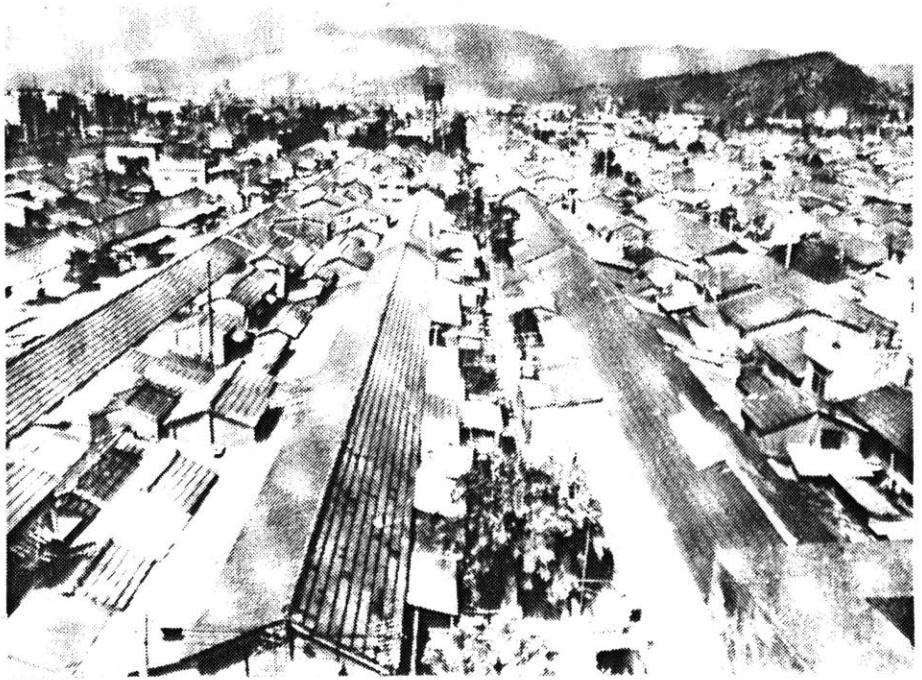
MIGRATION PATTERN
number of moves: 1
rural - urban: 1951
urban - urban: -
urban - rural: -
why came to urban area: MILITARY SERVICE

GENERAL: ECONOMIC
user's income group: MODERATE
employment: BUS DRIVER
distance to work: 3 Km
mode of travel: BUS/MOTORCYCLE

COSTS
dwelling unit: -
land - market value: -

DWELLING UNIT PAYMENTS
financing: GOVERNMENT
rent/mortgage: -
% income for rent/mortgage: -





PHOTOGRAPH:
(LEFT) View of the narrow alley - can only be used by pedestrians.
(TOP) Birds view of this development, land is covered by roofs, only a few narrow alleys are visible.
(BOTTOM) The secondary street; few cars, mainly motor-bike and pedestrian traffic.

PRELIMINARY DESIGN STUDIES OF A SITE AND SERVICES PROJECT·II

La Paz, Bolivia

4-3

URBAN SETTLEMENT DESIGN PROGRAM. M.I.T.

INTRODUCTION

The alternatives presented in this report were prepared by members of the Urban Settlement Design Program in the Spring Semester, 1981. Although the designs are preliminary, it is assumed that this study could be used as a reference in the actual elaboration of the project.

The project is located in Bolivia, to the Southwest of La Paz, and is the third program in this area being considered by the World Bank for low-income families. It is intended as a "site and services" project where the land is sub-divided into lots and that dwellings would be progressively developed, utilizing the efforts and resources of the users.

Primary emphasis is placed upon the physical plan: land subdivision, land utilization, and the utility infrastructure, with block layouts composed of clustered lots. The design of dwellings has not been considered other than to establish a lot width which is consistent with local practice. Detailed designs of the utility networks were prepared to understand the interdependence of these systems with the physical layout. Design parameters are included in the appendix, but the detailed calculations have been omitted. The use of grid blocks is emphasized to underscore the economics intrinsic to such layouts and to utilize their propensity toward small group formation.

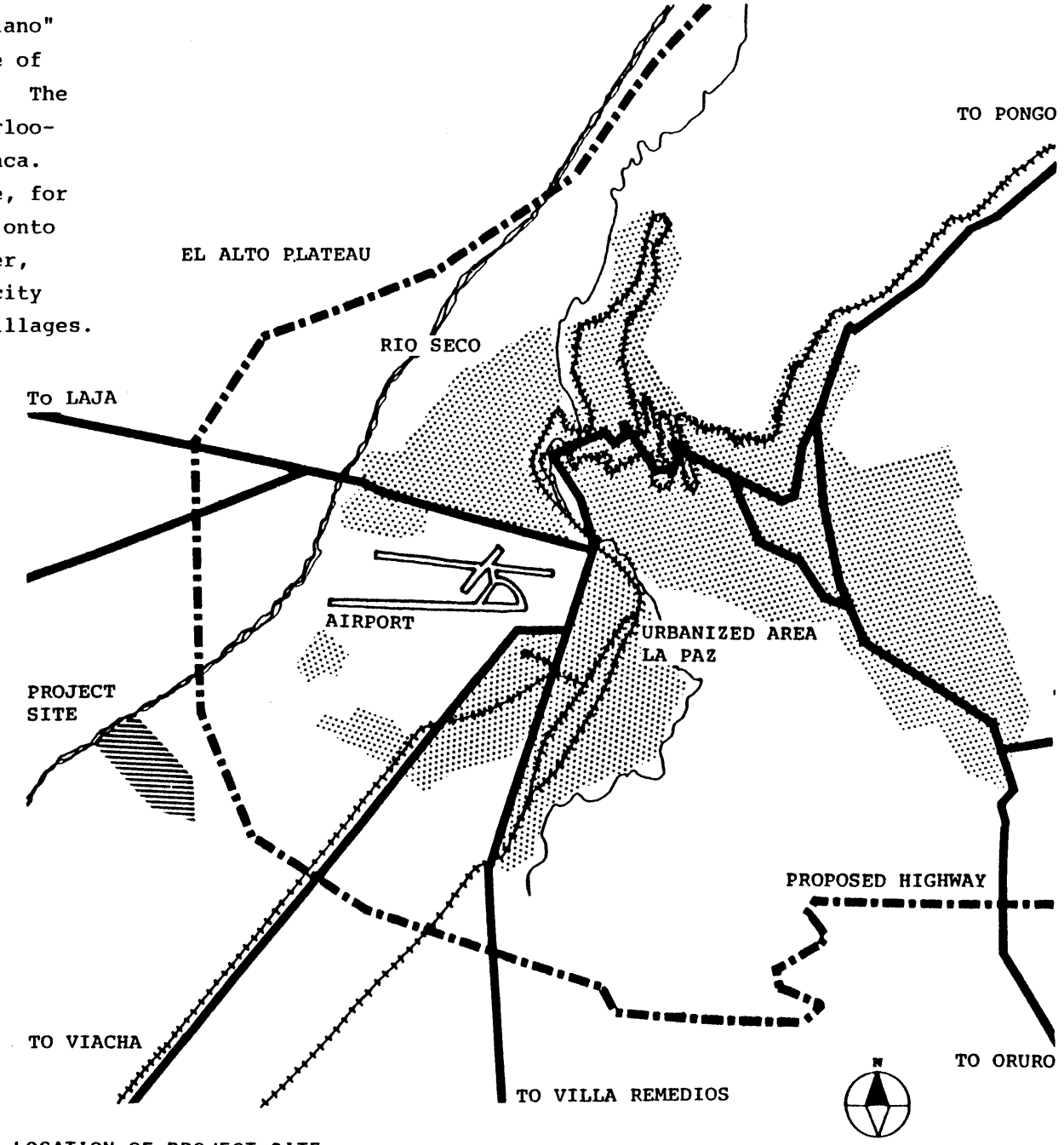
In some of the designs, sewage disposal is through conventional water-borne networks. In others, alternative technologies of 'On-site' systems, utilizing 'wet' and 'dry' options are considered, which indicate benefits of lower cost, and less environmental pollution.

A summary of background information on Bolivia and on La Paz is included in the appendix.

H.C., J.M. Spring 1981

The site is located on the "alto plano" (high plain) which is essentially bare of vegetation except for various grasses. The flat plain stretches from the rim overlooking La Paz to the distant Lake Titicaca.

The land is relatively inexpensive, for only recently has development spilled onto the Altoplano. Access is good, however, with good network connections to the city center, industrial areas, and other villages.



LOCATION OF PROJECT SITE

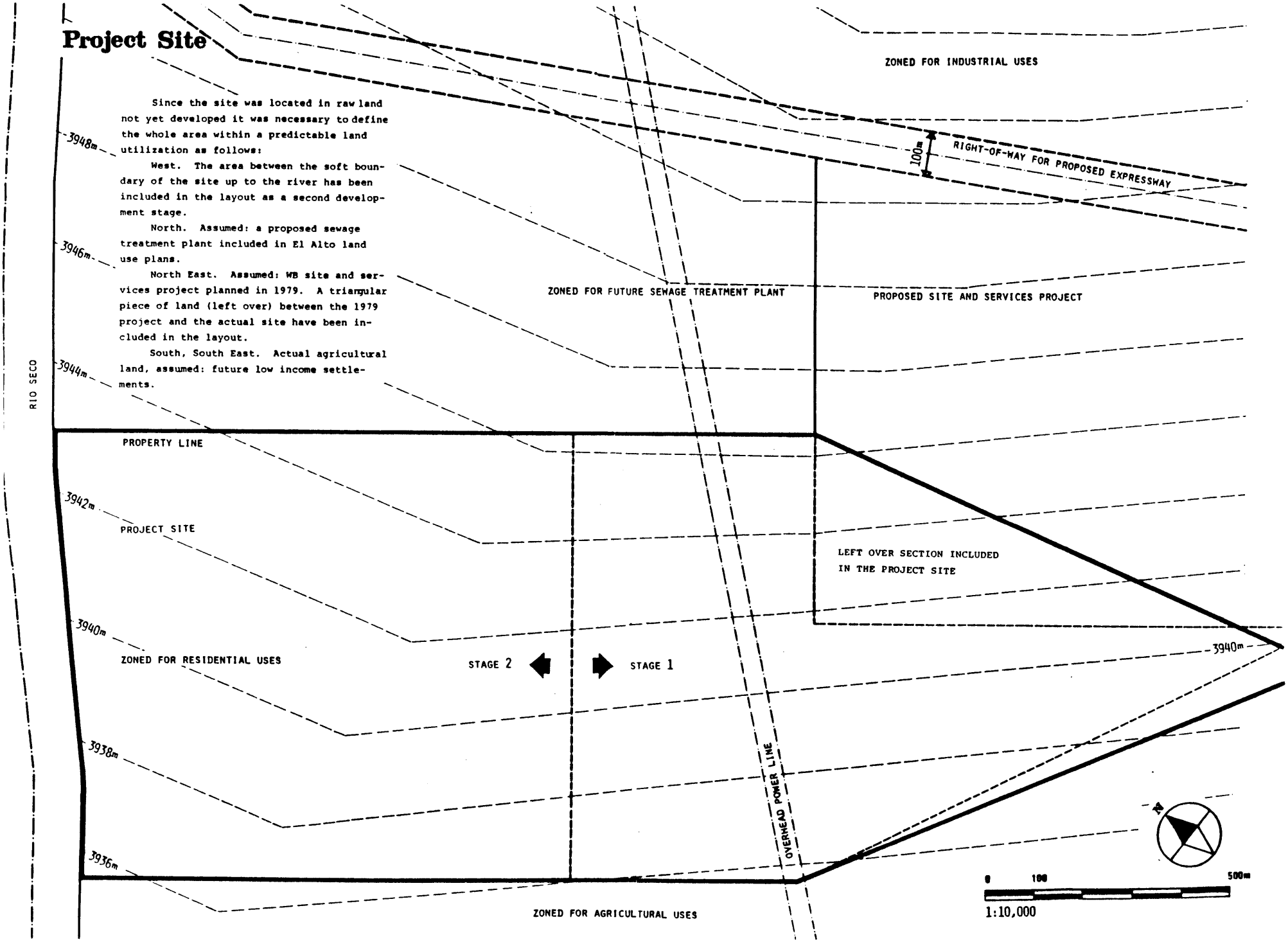
Scale 1:125,000

Site Data

LOCATION	EL ALTO, 8.5 km. south of airport
Land Utilization Pattern	Residential, small/large industries
Population Density Pattern	225 persons/Hectare
Income Group Pattern	Low
Land Cost Pattern	Compatible with project
Infrastructure Available	Water supply-none existing, available 7km
	(P) Sewage disposal-feasible
	(P) Storm drainage-feasible
	(P) Refuse disposal-feasible
	(E) Electricity- available
	(E) Telephone-available
Community Facilities	None, limited bus service on Viacha Road
Sources of Employment	Nearby industries
APPROACHES	Viacha Road, future highway
ACCESSES	future highway, country road
SIZE, SHAPE	180 Hectares, irregular
TOPOGRAPHY	Slope 1.0% and less
SOIL	Compacted gravel and sand, stone; no bearing capacity determined; quarries nearby
CLIMATE	Winter: humidity - low (dry) temperature - moderate wind - from West(cold) Summer: humidity - high (rainy) temperature - moderate wind - from East(warm)
BOUNDARIES	South: Agricultural land North: Rio Seco river East: Sewage treatment plant, planned residential area West: Agricultural land
VIEWS	Positive; snow-capped mountains
FLOODING, SMOKE, NOISE FIRE HAZARDS	None
AIRPORT, ZONING RESTRICTIONS	Nearby airport, no restrictions
STRUCTURES, EASEMENTS, ETC	High tension line
LAND TENURE	Public agency legal owner
LAND COST	15.50 Bolivia peso/m^2 (US $ 0.80)
GOVERNMENT REGULATIONS	Zoning laws of La Paz

Project Program

TOTAL AREA	180 hectares
GROSS DENSITY	240 P/Ha.
NET DENSITY	400 P/Ha.
POPULATION	43,000
LAND UTILIZATION	
Public	20%; 36 hectares
Semipublic	20%; 36 hectares
Private/Semiprivate	60%; 108 hectares
UNIT CIRCULATION LENGTH	100m/Ha. to 200m/Ha.
RESIDENTIAL AREAS	
Number of lots	4000 lots
Lot area	$90m^2$, $60m^2$
INDUSTRIAL AREAS	
Number of lots	280 lots
Lot area	$400m^2$ (10% of private/semi-private area, one family in each industrial lot.)
COMMUNAL FACILITIES	
Primary School	8000 pupils 6 to 8 schools 20% of population 2 shifts of 500 or 700 pupils.
Secondary School	800 students 1 school 2% of population
Community Center	Each center contains Market, Chapel, Post Office, Health Centre, Administration; 1 or 2 bus terminals in site
DEVELOPMENT	Progressive, in stages


Project Site
Since the site was located in raw land not yet developed it was necessary to define the whole area within a predictable land utilization as follows:
West. The area between the soft boundary of the site up to the river has been included in the layout as a second development stage.
North. Assumed: a proposed sewage treatment plant included in El Alto land use plans.
North East. Assumed: WB site and services project planned in 1979. A triangular piece of land (left over) between the 1979 project and the actual site have been included in the layout.
South, South East. Actual agricultural land, assumed: future low income settlements.
3948m
3946m
3944m
3942m
3940m
3938m
3936m
RIO SECO
ZONED FOR INDUSTRIAL USES
100m
RIGHT-OF-WAY FOR PROPOSED EXPRESSWAY
ZONED FOR FUTURE SEWAGE TREATMENT PLANT
PROPOSED SITE AND SERVICES PROJECT
PROPERTY LINE
PROJECT SITE
LEFT OVER SECTION INCLUDED IN THE PROJECT SITE
ZONED FOR RESIDENTIAL USES
STAGE 2
STAGE 1
OVERHEAD POWER LINE
ZONED FOR AGRICULTURAL USES
0
100
500m
1:10,000

Summary of Projects

The seven design alternatives are schematically presented to the right. All alternatives fall into a reasonable range of indeces in land utilization, unit circulation length, net density and number of lots. Variations occur primarily in circulation patterns in response to the boundary conditions and secondarily, in block sizes.

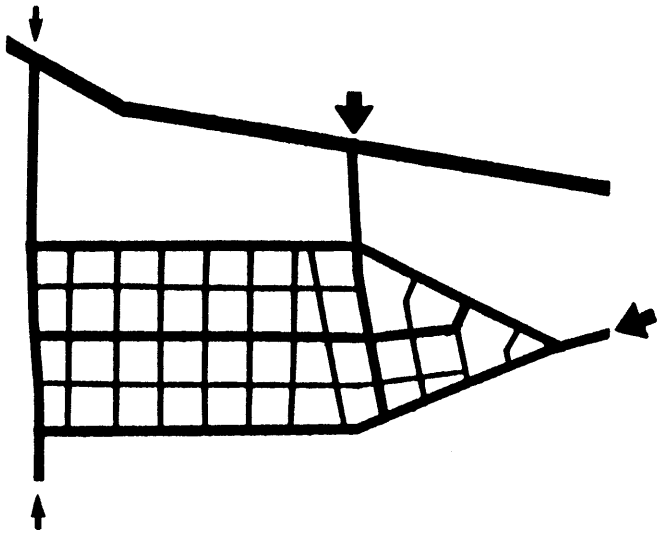
The common characteristics of the alternatives include: Central spine of circulation, communal and commercial activities. Secondary streets perpendicular to central spine. Main access from proposed highway or adjacent development. Periphery streets on the perimiter of the site.

SUMMARY TABLE

		Alternative Designs						
	Average	**A**	**B**	**C**	**D**	**E**	**F**	**G**
•LAND UTILIZATION %								
PUBLIC (streets)	16.5	18	20	15	16	18	14	15
SEMIPUBLIC (community facilities)	12.5	17	13	9	9	11	16	12
PRIVATE/SEMIPRIVATE (lots, courts)	71.0	65	67	76	75	71	70	73
•CIRCULATION meters/Hectare	125	112	128	153	134	113	113	122
•NET DENSITY people/Hectare	501	532	520	480	480	547	516	432
•NUMBER OF LOTS	9162	7760	8980	9720	9900	9940	9500	8337

ALTERNATIVE **A**

Designed by Yousef Alohali



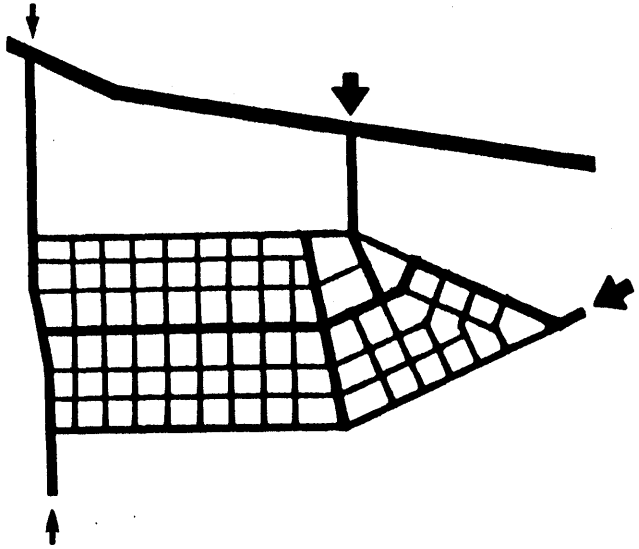
KEY

Primary Access

Secondary Access

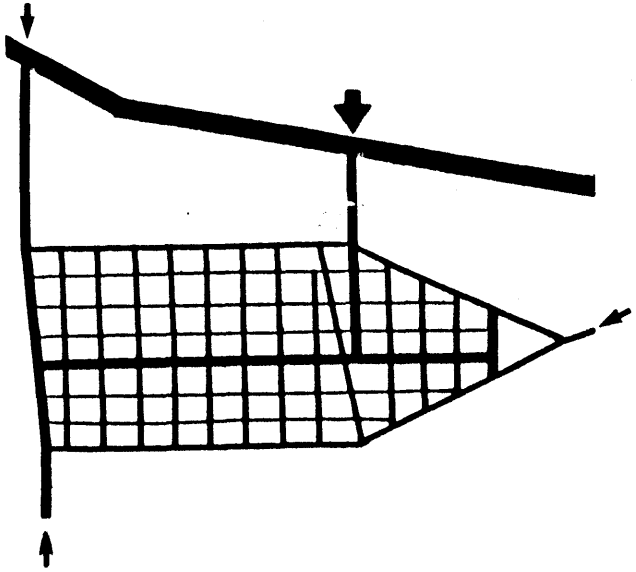
ALTERNATIVE **B**

Designed by Hae Seong Je



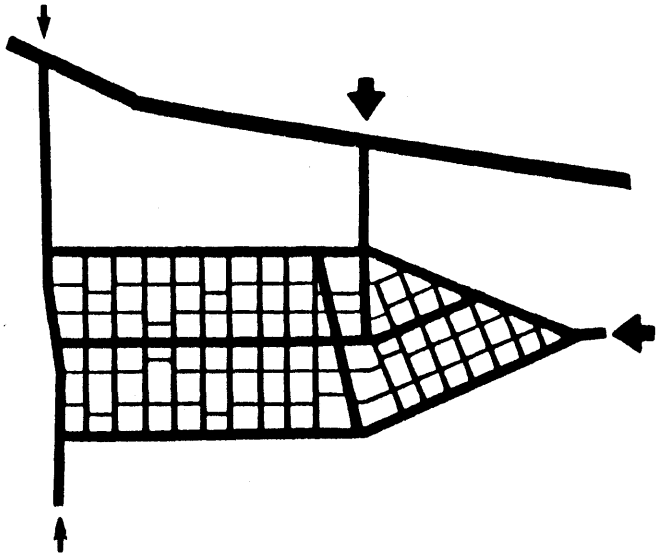
ALTERNATIVE **C**

Designed by Aminul Khan



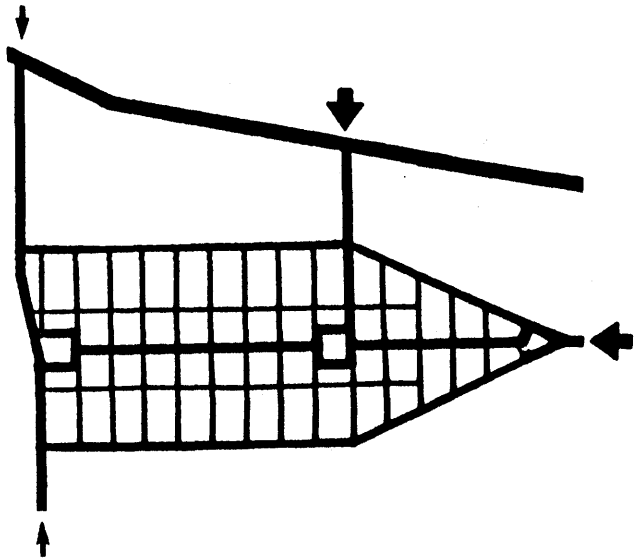
ALTERNATIVE **D**

Designed by Hsin-pao Lin



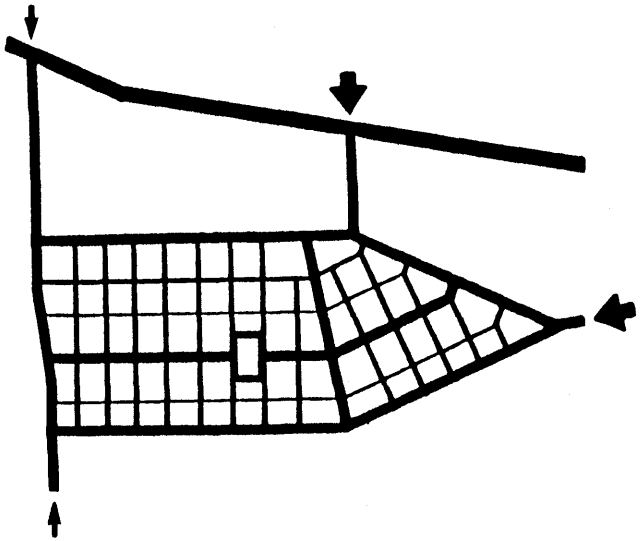
ALTERNATIVE **E**

Designed by Rajagopalan Palamadai



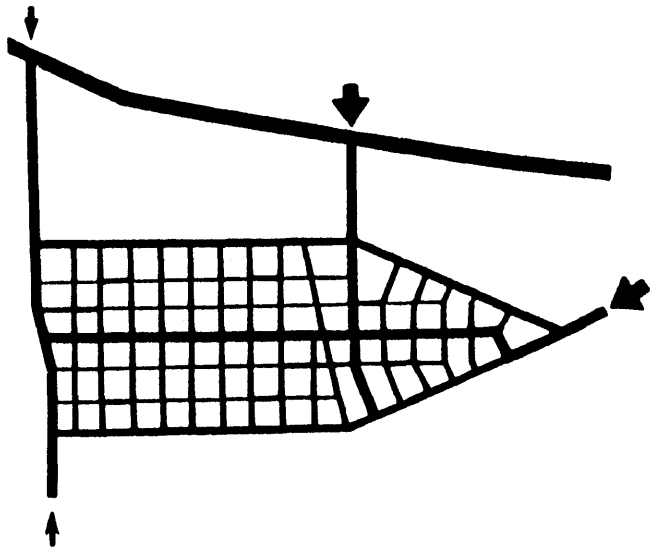
ALTERNATIVE **F**

Designed by Chih-chien Wang



ALTERNATIVE **G**

Designed by Nora Aristizabal



ALTERNATIVE F

SUMMARY: This design is based upon the notion that this community will be developed in two stages, due to the land acquistion and the sheer size of the communtiy. The circulation pattern, land utilization pattern and all service systems are designed to accommodate this requirement.

The following criterion governs the process of design and the evaluation of the result:

(1) to minimize the in-put of the public sector and to maximize the in-put of the private sector,

(2) to maximize the private/semi-private land and to optomize the public/semi-public land,

(3) to simplify the overall circulation pattern and to obtain a sense of orientation,

(4) to establish an hierarchy of privacy, control and sense of grouping from one-family lots to the entire community,

(5) to minimize the cost of services and to optimize the level of services,

(6) to respond to the boundary conditions in terms of access, circulation pattern and land utilization pattern.

(7) to maintain the flexibility of the extent of development and future up-grading.

Designed by Chih-chien Wang

SUMMARY DATA TABLE

	Hectares	*Percents*
AREAS		
PUBLIC (streets)	24.5	13.5
SEMIPUBLIC (schools, facilities)	29.2	16.2
PRIVATE/SEMIPRIVATE (lots, courts)	127.3	70.3
residential	110.8	60.3
industrial	18.0	10.0
Total	180.0Ha.	100%

CIRCULATION

$$\frac{\text{network length}}{\text{areas served}} = \frac{20{,}420\text{m}}{180\text{Ha}} = 107\text{m/Ha}$$

	Total (No.)	*Area* (Ha.)*	*Density (u/Ha.)*
NET DENSITIES			
LOT*	9500	110.8	86
DWELLING UNITS	9500	110.8	86
PEOPLE	57000	110.8	516

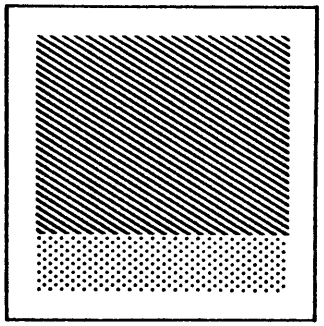
LOTS

AVERAGE AREA $90m^2$
AVERAGE DIMENSIONS 6m x 15m

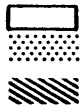
**Does not include lots and area of industry*

SUMMARY DIAGRAMS

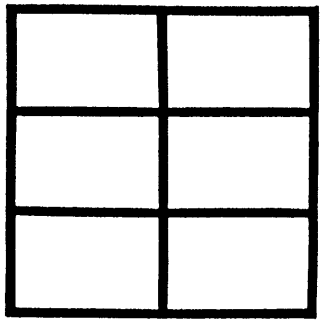
1 Ha.



LAND UTILIZATION
14% public
16% semipublic
70% private semiprivate

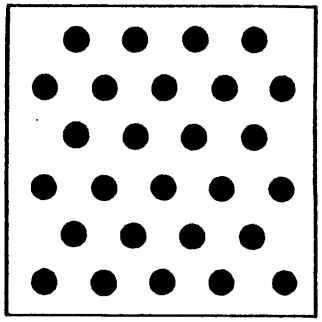


16 Ha.



CIRCULATION
113 meters/Hectare

1 Ha.



NET DENSITY *20 persons* ●
516 people/Hectare

ALTERNATIVE **F**

Land Subdivision

LAND SUBDIVISION: Rectangular grid system is chosen as the basic network for the following reasons:

- to minimize the cost of all services,
- to maximize the efficiency of land utilization,
- to provide privacy and control for each block.

The network includes the following elements:

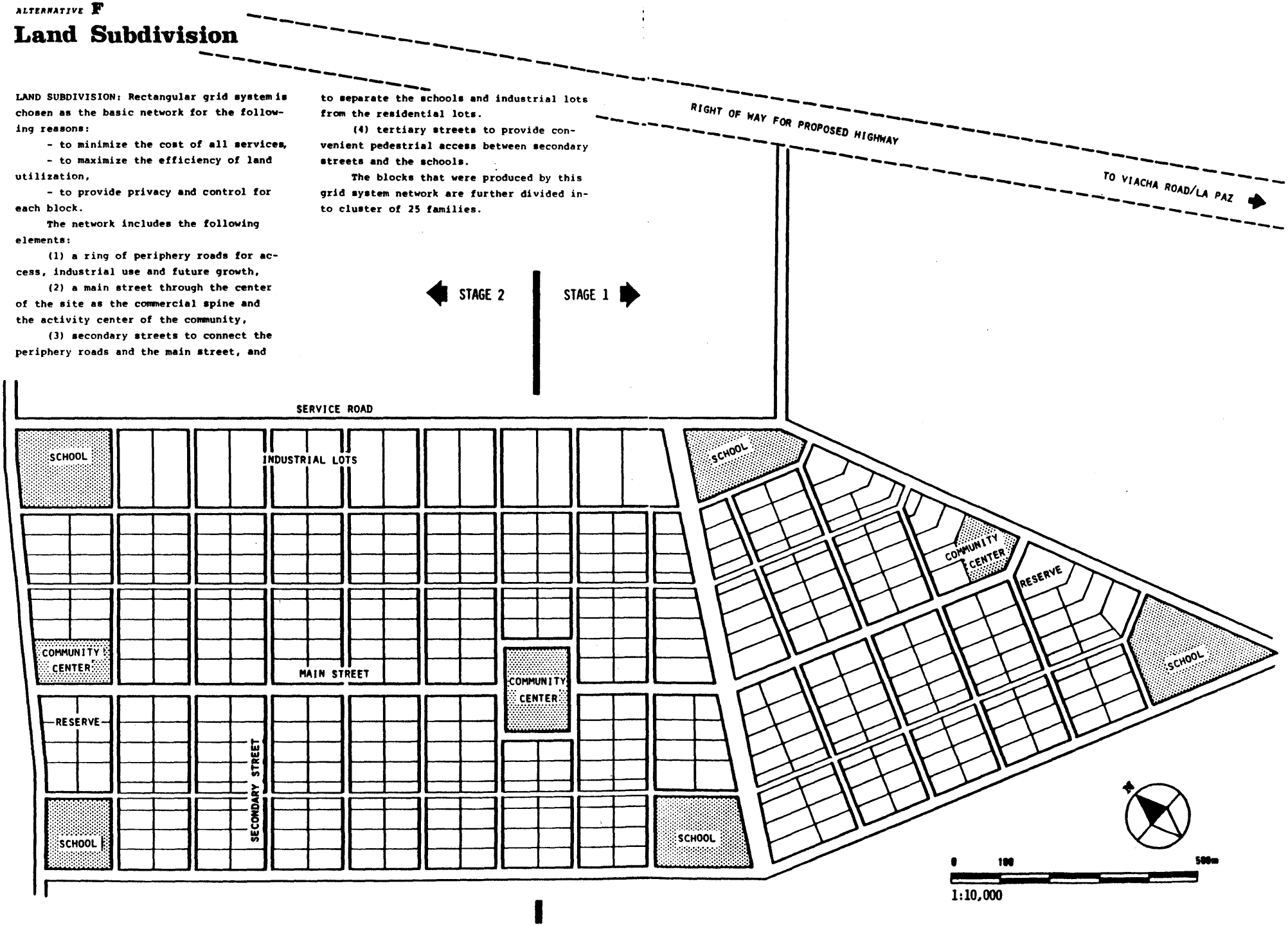
(1) a ring of periphery roads for access, industrial use and future growth,

(2) a main street through the center of the site as the commercial spine and the activity center of the community,

(3) secondary streets to connect the periphery roads and the main street, and to separate the schools and industrial lots from the residential lots.

(4) tertiary streets to provide convenient pedestrial access between secondary streets and the schools.

The blocks that were produced by this grid system network are further divided into cluster of 25 families.



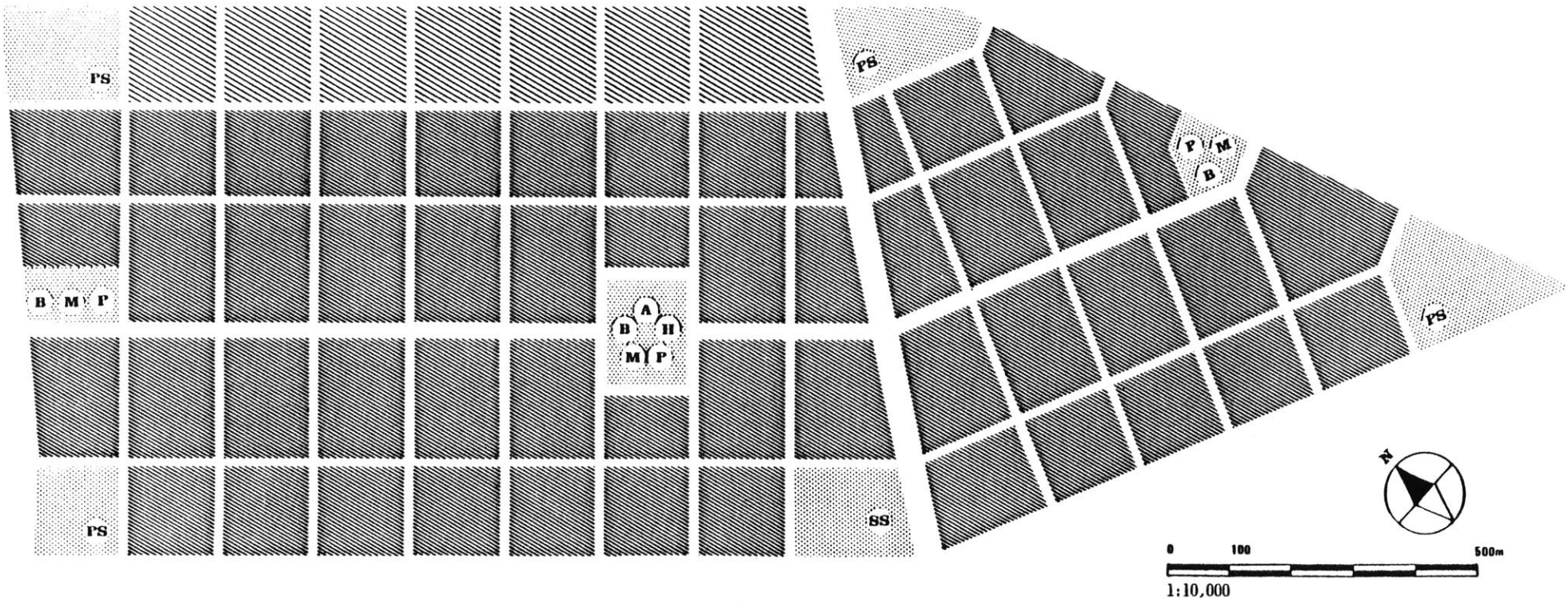
ALTERNATIVE **F**

Land Utilization

LAND UTILIZATION: The land utilization is a product of the boundary conditions, the major circulation constraints and the development potentiality.

The basic elements of the land utilization pattern are:

- three commercial/community centers, each located at the beginning and the end of each stage of development. This arrangement provides convenient access from all lots, also encourages the commercial spine to grow to the maximum length,
- industrial lots are located to the North end of the site. They serve as a buffer between the future sewage treatment plant and the residential lots, while obtaining the most direct access to the future express-way. The nature of the industry is viewed as small and family-oriented.
- the schools are kept at the minimum number of 5, but compensate by providing a larger area of growth, as a more realistic solution which responds to the local conditions. They are placed at the less costly locations and evenly spread throughout the site.
- a group of semi-public spaces were located near the river to enhance the natural congregation of activities.



ALTERNATIVE **F**

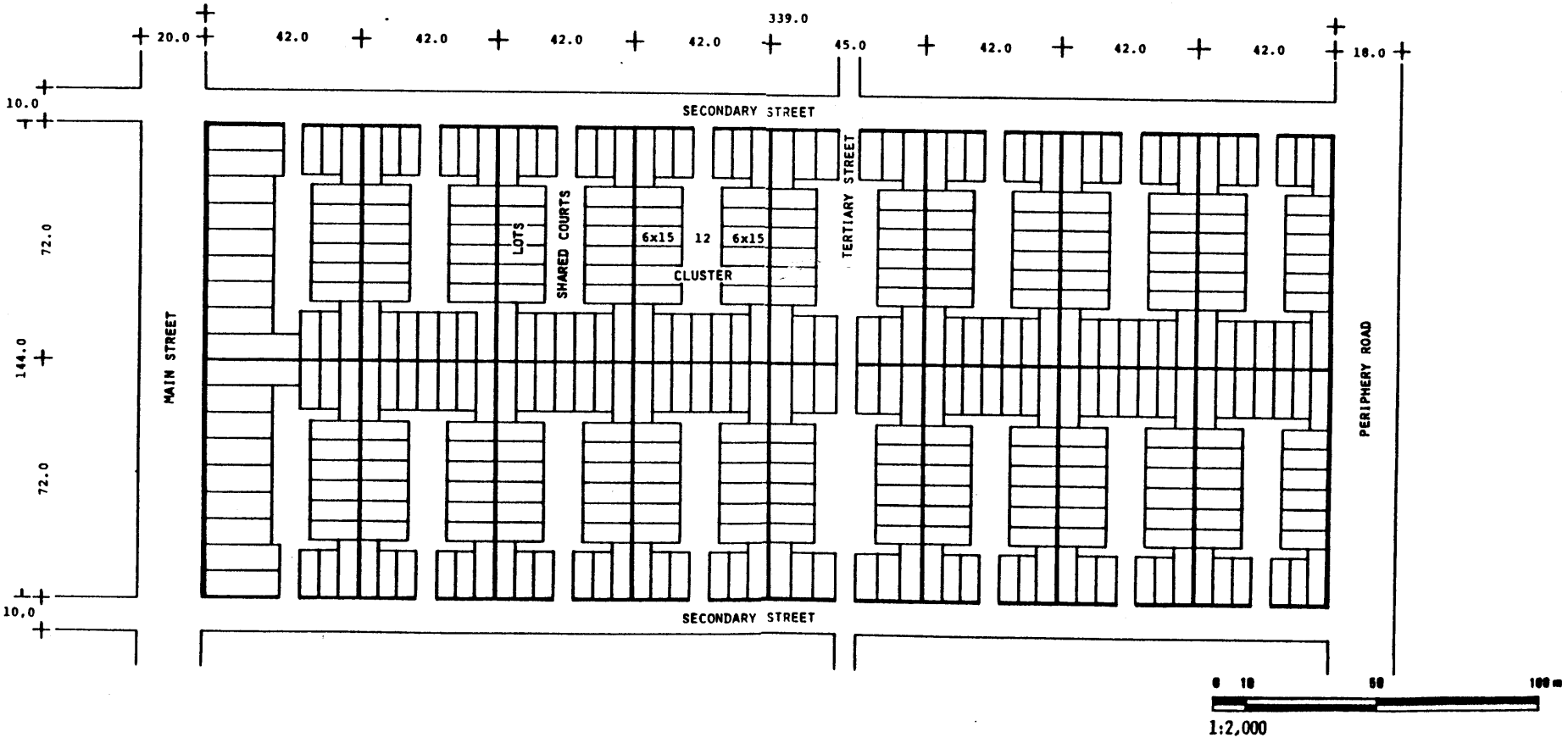
Block Layout and Grading

TYPICAL BLOCK LAYOUT: A typical block is defined by the main street, the periphery road and two secondary streets.

The block is subdivided into clusters. Each typical cluster contains 25 lots and a shared court to encourage grouping and interaction among families.

The two clusters adjacent to the main street are wider with larger lots fronting the street for potential commercial/residential use.

A pedestrian walkway is introduced through two clusters for easy access between two secondary streets. This walkway has two narrow entrances to facilitate a degree of control by the cluster residents.



ALTERNATIVE **F**

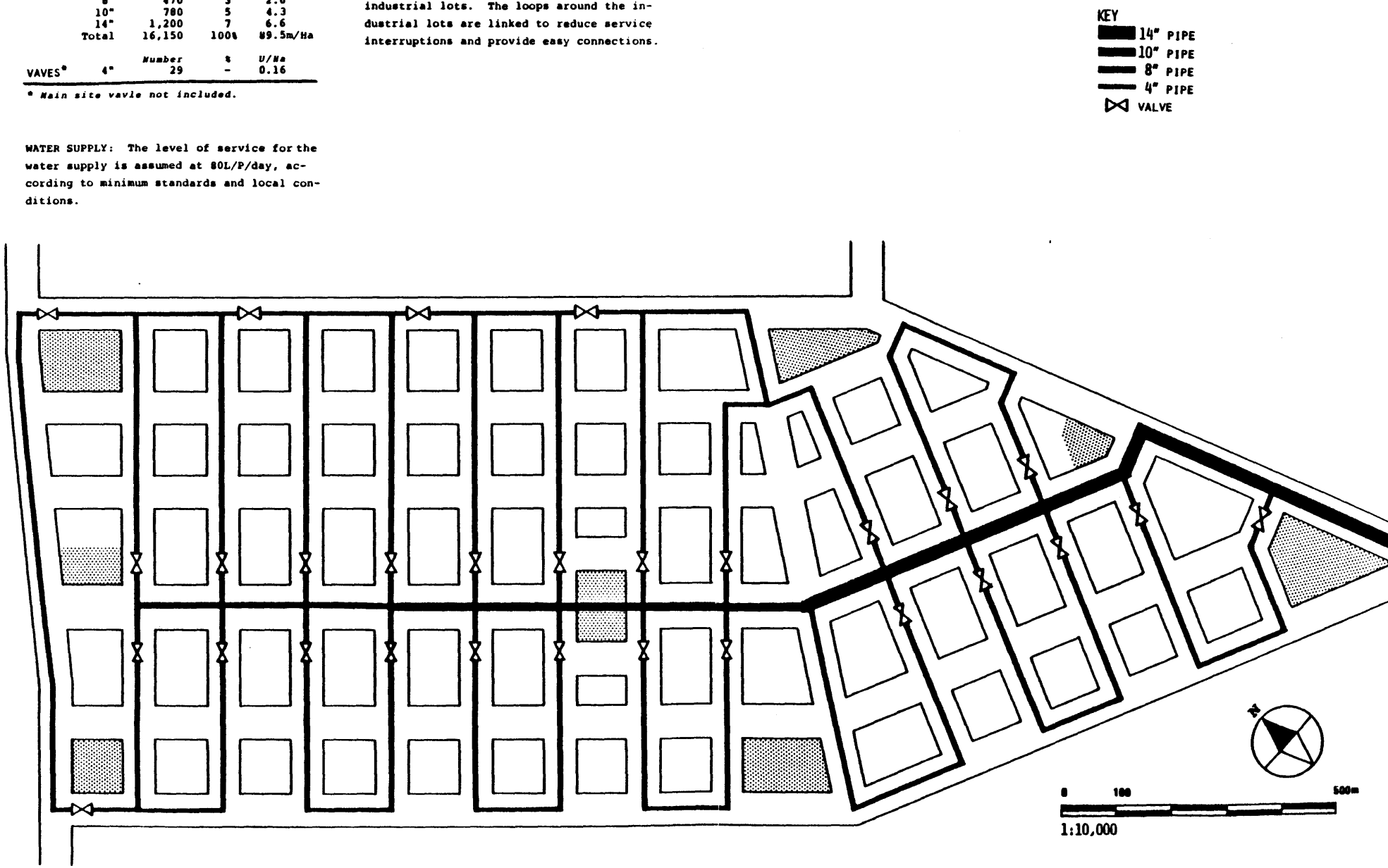
Water Supply

WATER SUPPLY: BASIC NETWORK				
		Length	*%*	*U/Ha*
PIPES	4"	13,700	85	76.0
	8"	470	3	2.6
	10"	780	5	4.3
	14"	1,200	7	6.6
	Total	16,150	100%	89.5m/Ha
		Number	*%*	*U/Ha*
VAVES*	4"	29	-	0.16

* *Main site vavle not included.*

WATER SUPPLY: The level of service for the water supply is assumed at 80L/P/day, according to minimum standards and local conditions.

The design of the system consists of a main line through the center of the site, with 4" loops which serve all clusters and industrial lots. The loops around the industrial lots are linked to reduce service interruptions and provide easy connections.



ALTERNATIVE **F**

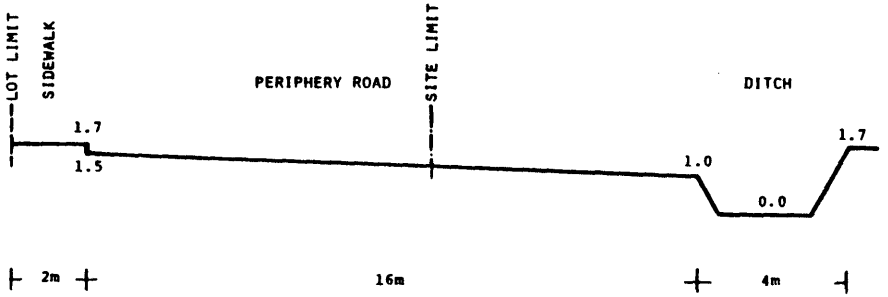
Storm Drainage

CIRCULATION AND STORM DRAINAGE: BASIC NETWORK					
		Width	Length	%	U/Ha
STREETS	Main	20m	2,100	11	11.7
	Periphery	18m	4,750	23	26.4
	Secondary	10m	13,470	66	74.8
	Total		20,420	100%	112.9m/Ha
		Area	Length	%	U/Ha
DITCH		$4m^2$	2,800	-	15.6m/Ha

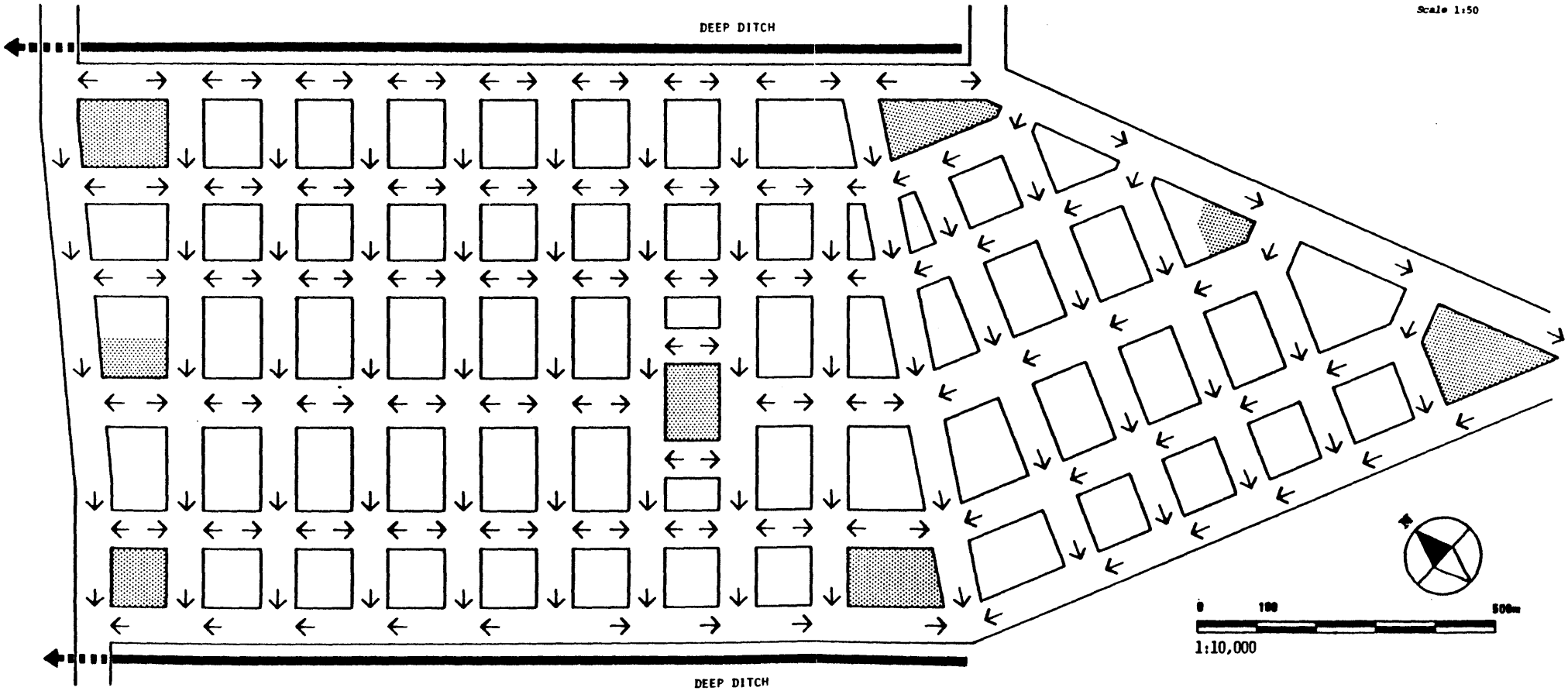
STORM DRAINAGE: The principle design criteria for the storm drainage is to maximize the use of natural contour.

The secondary streets are perpendicular to the contour with approximately 1% slope uniformly. They serve as primary interceptors. The periphery road with a 4m x 1m ditch to the South serves as the flow collector for the entire site.

Off-site storm water is collected and drained by the 4m x 1m ditch next to the North periphery road.



Scale 1:50



ALTERNATIVE **F**

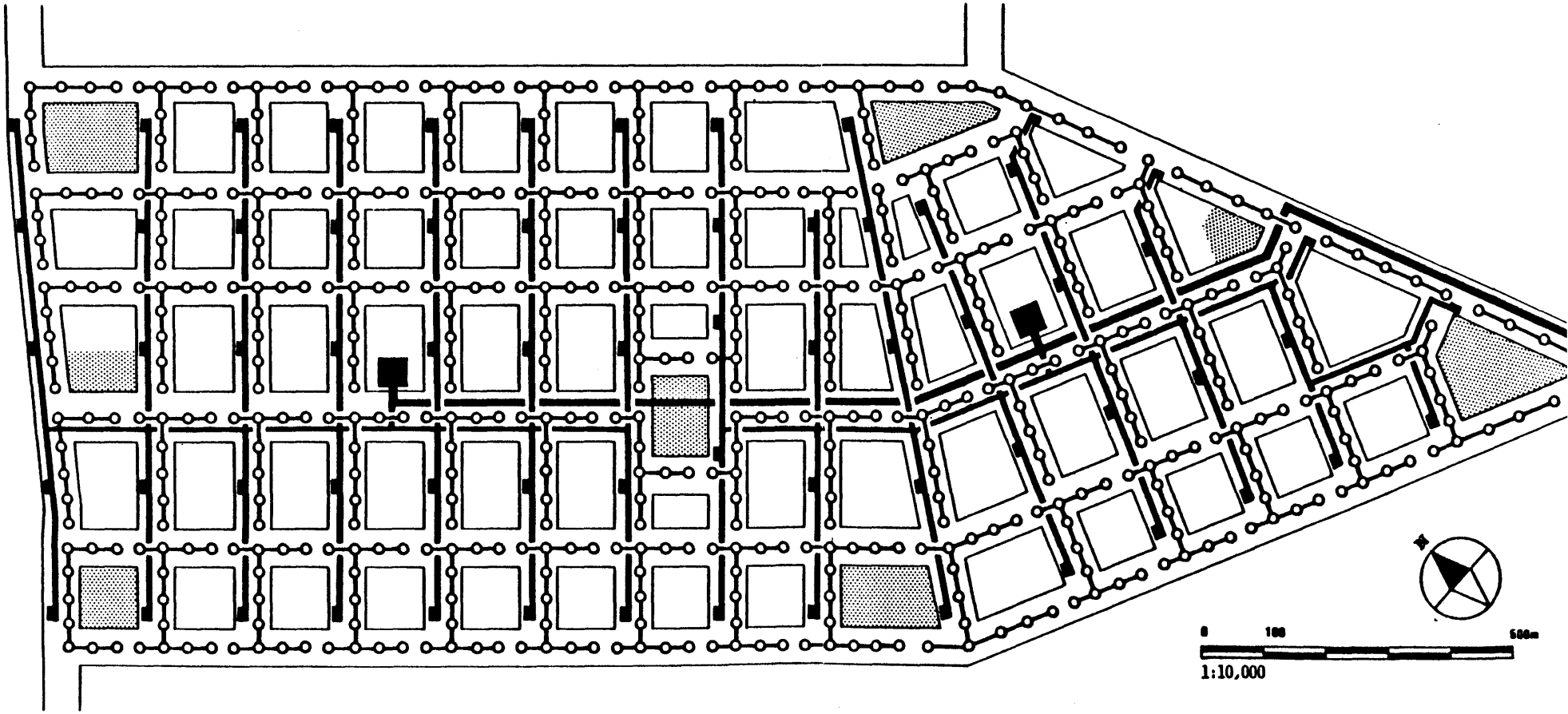
Electricity and Street Lighting

ELECTRICITY AND STREET LIGHTING: BASIC NETWORK			
	Number	%	*U/Ha*
TRANSFORMERS 150 KVA	67	-	0.37
	Length	%	*U/Ha*
CABLES: HIGH TENSION	15,670	43	87.0
LOW TENSION	20,420	57	113.4
TOTAL	36,090	100%	200.4m/Ha
	Number	%	*U/Ha*
POLES	576	-	3.2
	576	-	3.2
LAMPS	576	-	3.2
SERVICE CONNECTIONS (RESIDENTIAL CLUSTERS)	374	-	2.1

ELECTRICITY AND STREET LIGHTING: Similar to the water supply system, the main electricity supply line follows the main street and distributes to the secondary streets to each transformer.

The service level for electricity supply is assumed at 1.5 KVA per lot. Each 150 KVA transformer serves 8 clusters or the residential portion of 2 industrial clusters. The maximum length of low-tension circuits does not exceed 150m.

The minimum level of street lighting is assumed at 0.3 footcandle. Three hundred watt lamps mounted at 7.5m high on poles illuminate all streets. Poles with lamps are located at cluster entrances and street corners with approximately 42m spacing.



ALTERNATIVE **F**

Sewage Disposal

SEWAGE DISPOSAL: Three sewage disposal options have been studied for this project - the conventional water borne system with sewage treatment plant, the communal septic tank with grey-water percolation field and the pit-latrine individual with grey-water percolation field.

The conventional water-borne system may be considered as the most technologically advanced and sanitary system, providing that it is properly designed, built and maintained. This system includes a water-borne sewage network and a sophisticated sewage treatment plant. While it is the most popular option in most high density urban environments of western countries, the system carries a very high price tag and requires maximum public in-put in construction and maintenance. It cannot be considered as a viable solution for this project.

The communal septic-tank with on-site percolation field provides a complete sewage treatment within each cluster when the design of the shared court accommoates the requirement for leaching. It is an attractive option because of its relatively long life span and moderate cost. It can also be built by mutural -help with the assistance from skilled labor.

However, reservation has to be made when using this option:

(1) It is an inflexible system which cannot be built progressively.

(2) It is not a commonly used system in this area thus requires time and effort to establish cultural acceptance.

(3) When the court is designed to accommodate leaching for a given volume, further growth in population density may couse serious pollution problems.

The individual pit-latrine with percolation field separates the treatment of excreta and grey-water. It is the most economical and flexible system. An evaluation chart combined health and socio-economic criteria indicates that the pit-latrine is the most suitable option for projects of this nature. (Joe Morog. USDP. '80)

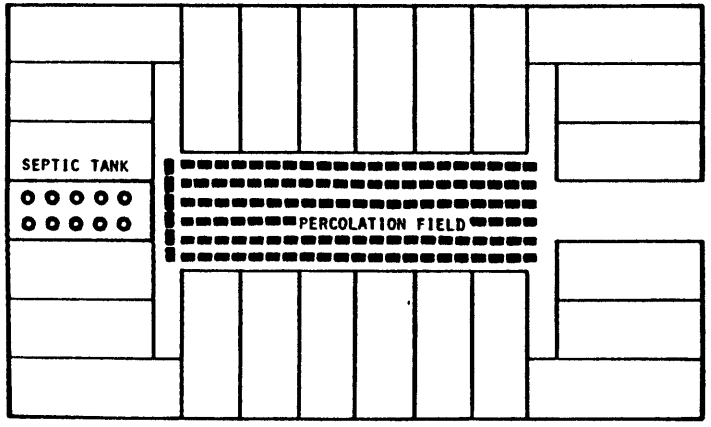
Variations of the pit-latrine system have been experimented and evaluated by the World Bank. (P.V. Report No. Res 22. '80) Some of these variations have been proven satisfactory, therefore worth careful investigation for this project:

(1) Displaced Pit-latrine: The latrine is placed outside of the base of the toilet with an exposed vent pipe to draw fresh air into the latrine via the toilet, thus keeping the toilet odorless.

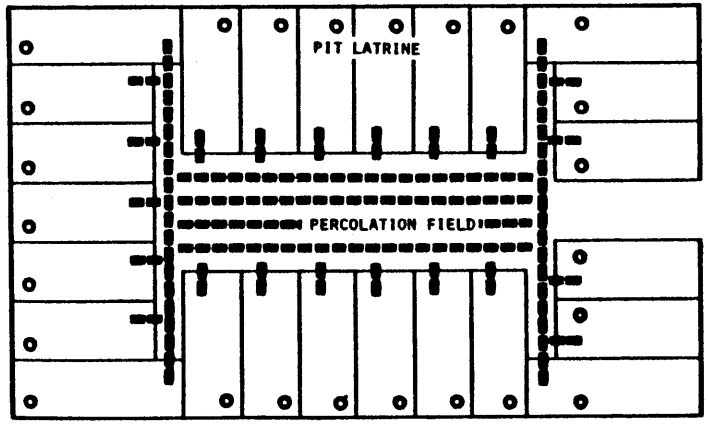
(2) Water-seal-bowl with S trap: The bowl is cleaned and sealed with a small volume of water. While it proves to be satisfactory in keeping the toilet from insect breeding and odor; it may cause soil and ground water contamination in the long-run when sufficient spacing is not provided.

(3) Double-vault latrine: The latrine is built in two compartments to permit removal of waste material.

The final selection of sewage disposal option should be made with further analysis of soil condition, seasonal water table and locally available construction technology.



COMMUNAL SEPTIC TANK



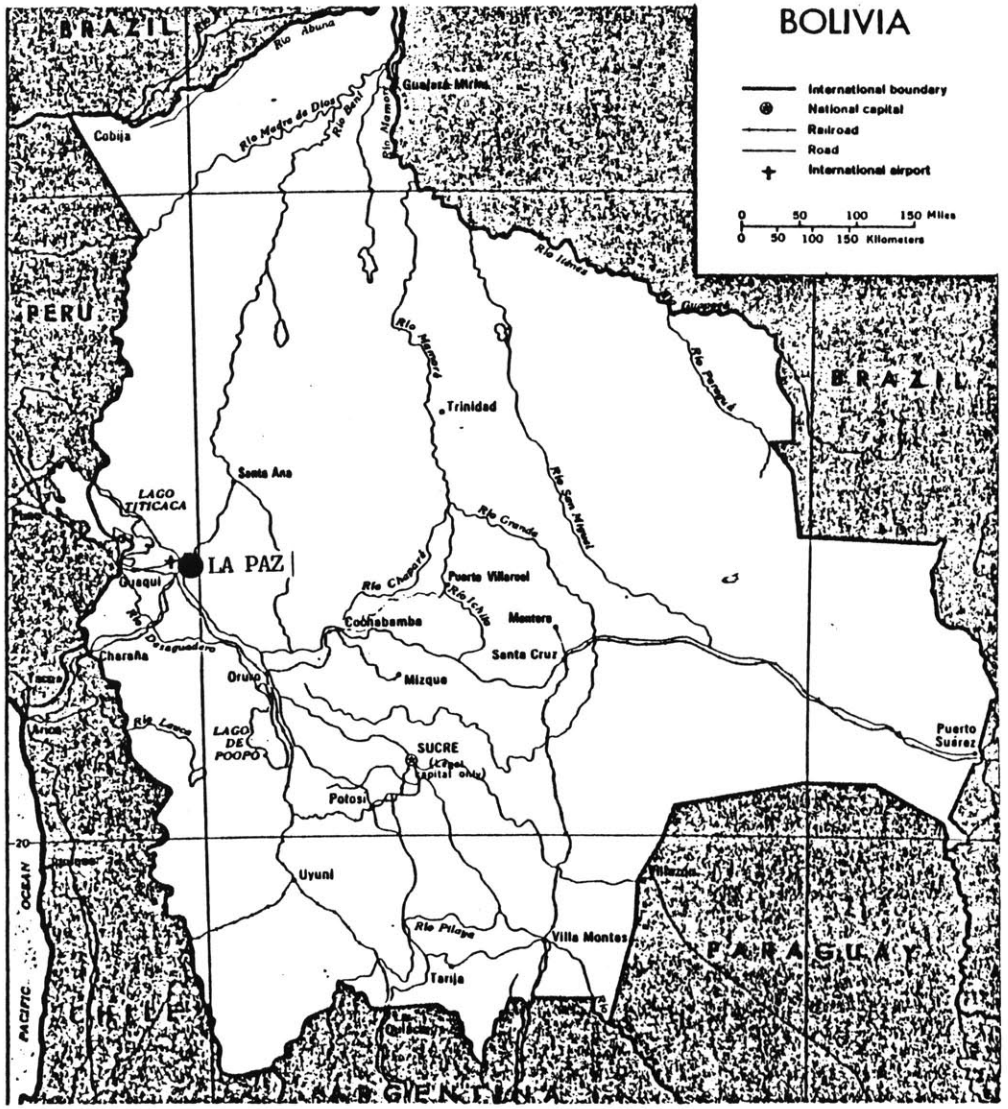
INDIVIDUAL PIT LATRINE

Scale 1 : 800

Bolivia

GENERAL INFORMATION

Area	424,000 sq. miles
Population (est.)	5.5 million (1979), 9 million (2010)
Pop. Growth Rate	2.6% in 1973, 3.8% in 1976
Urban Population	34% (2 million)
Population Density	11.3 persons per sq. mile (It ranges from less than one person per sq. mile in the southeastern plains to 25 persons per sq. mile in the Altiplano, yungas, valleys.)
Ethnic Groups	55% Indian: 25% Aymara, 30% Quechua 10% Europeans (primarily Spanish) 30% Mestizos (mixed)
Currency	Bolivian peso (24.51 per US$ 1)
GNP	2.71 billion, GNP per capita 444 US$
Economic Statistics	21% agriculture 4% construction 12% manufacturing 9% transportation 28% trade & service 15% mining (major share of the country's exports)
Religion	Roman Catholic (95%)
Language	Spanish (official, 55%), Quechua, Aymara
Literacy	40% of the overall adult population 20% of the rural population
Life Expectancy	47 year (Bolivia has one of the highest mortality rates in Latin America)
Topography	Inland, three distinct topographical regions: 1. Altiplano - bleak plateau; 2. yungas - semitropical rain forests & drier valleys; 3. Amazon-Chaco - lowlands
Major Cities	La Paz (655,000) capital Santa Cruz (240,000) Oruro (110,000) Cochabamba (200,000) Sucre (107,000)



La Paz

PRIMARY INFORMATION

La Paz is located at the western slope of the Andean mountains at an altitude of between 3,500 to 4,000 meters. The city itself is located in a basin (*cuenca*) surrounded by steep slopes that fall off the eastern edge of the Altiplano plateau. It is characterized by very harsh climatic conditions typical of its location, and unusually difficult physical constraints. The formations constituting the La Paz basin are made up of unconsolidated soil that is erodible and varies in texture and permeability. Under these conditions, the possibility of extension of the *cuenca* of La Paz is extremely limited and the future growth of the city will need to concentrate mainly in the Altiplano area.

HISTORY

The city of La Paz was founded by the Spanish in 1548 in the northern end of the Altiplano, near a military post "Laja". In the 16th century parishes were established outside the first Spanish settlement by the native population, serving or trading with the Spanish for livelihood.

Urban expansion began but proceeded slowly until the end of the 19th century. The growth of the city gathered speed in 1898, when the central power was transfered from Sucre to La Paz. In 65 years, between 1910 and 1976, the population rose from 69,000 to 655,000 inhabitants.

The development on the Altiplano began in 1960, when there began to be a shortage of land in the *cuenca*, in the area where the main road linking La Paz to Bolivia joins the plateau. At present, nearly 100,000 people are settled on the plateau.

This population now occupies all the usable parts of the *cuenca* and in addition the 3,000 hectares in the low valleys and on the Altiplano, thus covering a total area of 6,000 hectares.

ECONOMY

La Paz is characterized by its functions of government, administration, financial matters, commerce and services for the whole of Bolivia.

The city's gross domestic product is US $530 million (1975 estimate). It will rise to US $3,300 million in 2010. The average family income permonth is Sb6,000 (US $306). It will rise to Sb13,000 (US $680) in 2010 (in constant value terms). At present, 42% of the La Paz families have a monthly income of under Sb2,500 (US $125) and only 16% have an income level above Sb10,000 (US $500). In 1976, only 31.4% of the total population was economically active.

DEMOGRAPHY

The estimated population of La Paz in 1976 was 655,000 people, with an average annual growth rate of 3.5% since 1950. The projected population figures for 1990 are 1,000,000 and in 2010, 1,615,000.

The immigration to La Paz has little impact on the total population growth. In 1976:

total population	655,000	(100%)
immigrant	216,000	(33%)
native	439,000	(67%)

Between 1990 and 2010 it is assumed that the natural growth will be twice as large as the flow of immigration. In the same period, the volume of migration alone would account for 13% of the total population of the city.

SOCIO-CULTURAL, SOCIO-ECONOMIC

The low-income population of La Paz is approximately 62% of the total population, more than 400,000 people out of its 655,000 total population in 1976.

The average annual growth rate of the low-income population of La Paz is as follows:

40%	below	Sb1,000 (US $50)
53%	between	Sb1,000-2,500
7%	above	Sb2,500 (US$125)

The demographic structure of the low-income population is characterized by a large portion of people in the younger age groups:

- 43% are children under 15 years old
- 27% are in the 15-29 age group
- 23% are in the 30-49 age group
- 7% are 50 years old or older

The principle sources of employment of the low-income population of La Paz is:

- 13% commerce (food, clothing, etc.)
- 11% employees (porters, guards, etc.)
- 11% artisans
- 7% construction workers
- 5% services (maids, etc.)
- 5% wage workers
- 32% of the adult population are housewives
- 30% unemployed or severely underemployed

HOUSING INSTITUTIONS

BANVI - Bank of Housing; CONAVI - National Council of Housing; HAMLP - La Paz Municipality; ACCION COMUNAL - Private Community Groups; JUNTAS VECINALES - Neighborhood Communities; BISA - Industrial Bank; National Council for Mineral Workers' Housing; National Council for Workers' Housing; BIRF - International Bank for Reconstruction & Upgrading; Ministry of Urbanism & Housing

URBAN DEVELOPMENT

Between 1910 and 1976, the area covered by the city has increased to nearly 6,000 hectares.

The present area per person is 90 sq.m. In 2010 the corresponding figure will be 140 sq. m. per person, making up an urban area of 22,000 hectares (over three times the present area). The distribution would be as follows: 10,000 hectares in the basin of La Paz, Achocalla, El Bajo; Rio Abajo; 12,000 hectares on the Altiplano, some 10,000 of which will be around the present Alto area.

CLIMATE

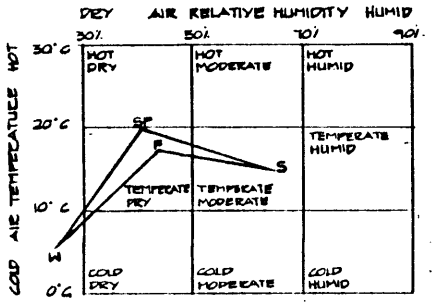
RAIN The climate of La Paz is marked by an alternating wet season (summer) and dry season (winter). The wet season lasts from December to March, with 70% of the annual precipitation. The dry season lasts from May to August, with almost no rain at all. The annual rainfall is 730mm on the Alto and 620mm in the center of La Paz.

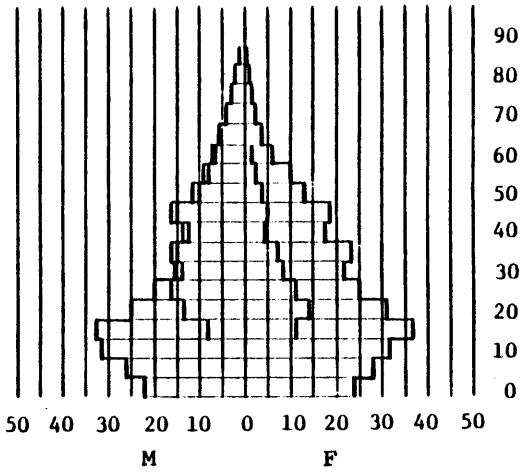
WIND There are two main prevailing winds: a warm wind from the east (Atlantic Zone), prevailing in the summer; and a cold wind from the west (Altiplano), prevailing in the winter.

SUN The duration of sunshine is 200 days annually and 240 hours monthly. The coldest period is from May to October.

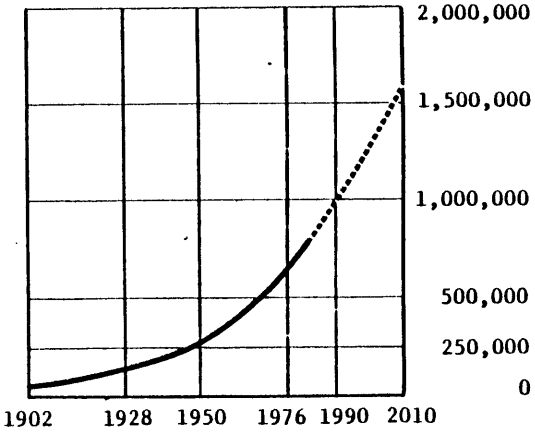
TEMPERATURE

The maximum temperatures vary little throughout the year, from 19°C to 16°C with the absolute maximum in November. The minimum temperature is 5°C, with an absolute minimum in July.

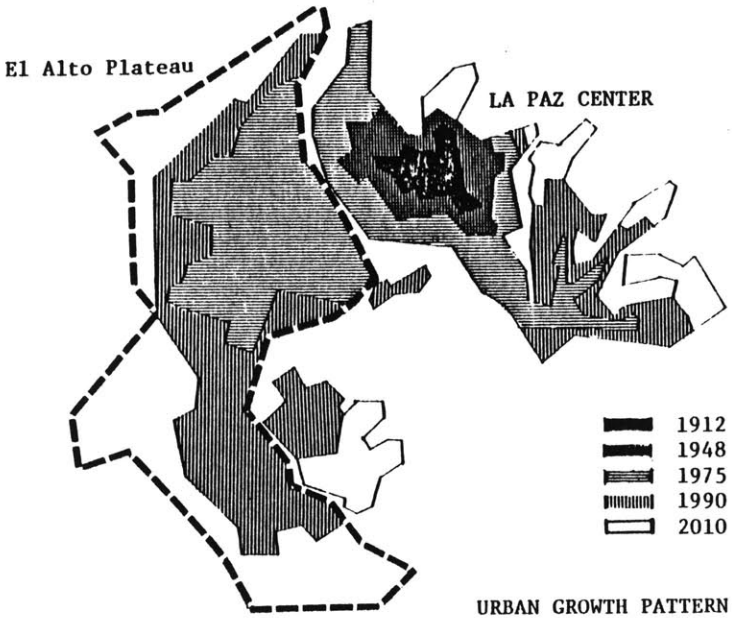




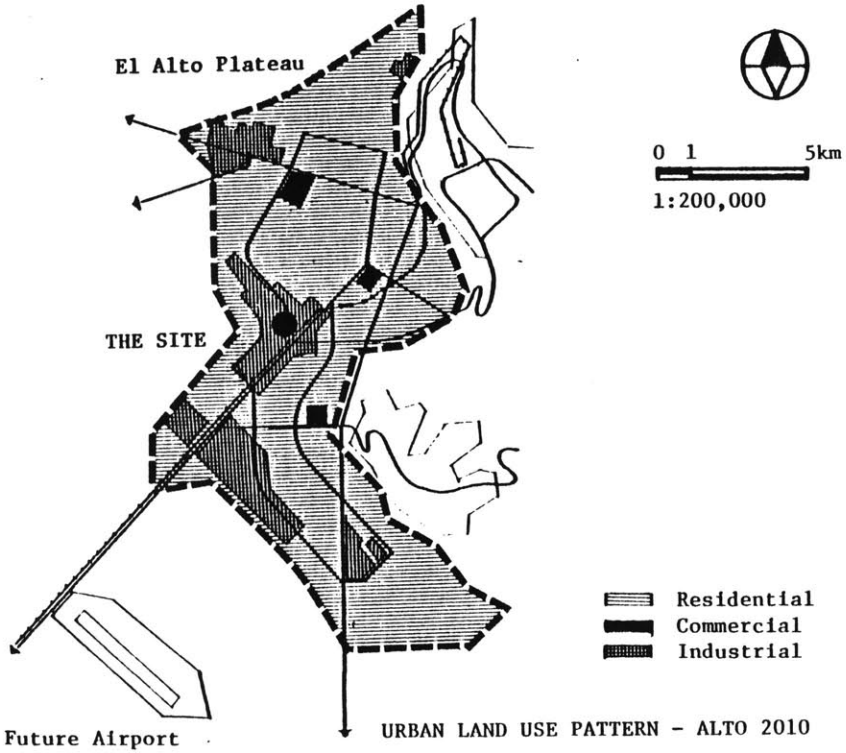
URBAN POPULATION DISTRIBUTION



URBAN POPULATION GROWTH



URBAN GROWTH PATTERN



URBAN LAND USE PATTERN - ALTO 2010

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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 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 single dwelling units or single complexes.

Large Contractor Built: where the dwelling unit is totally built by a large organization hired by a developer; 'large' contractor 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.

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. infill - rough hewn wood planks.*
- *Floor: structure/infill - compacted earth, wood joists, flooring.*

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. infill - metal, wood, masonry, plastic.*
- *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 FLOORS: the following number are considered:
One: single story; generally associated with detached, semi-detached and row/ grouped dwelling types.
Two: double story; generally associated with detached, semi-detached and row/ grouped dwelling types.
Three or More: generally associated with walk-up and high rise dwelling types.

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

DWELLING LOCATION: three sectors of the urban area are considered:
City Center: the area located within a walking distance (2.5 km radius) of the commercial center of a city; relatively high residential densities.
Inner Ring: the area located between the urban periphery and the city center (2.5 to 5 km radius); relatively lower residential densities.
Periphery: the area located between the rural areas and the urban inner ring (5 or more km radius); relatively low residential densities.

DWELLING PHYSICAL STATE: a qualitative evaluation of the physical condition of the dwelling types: room, apartment, house; (the shanty unit is not evaluated).
Bad: generally poor state of structural stability, weather protection and maintenance.
Fair: generally acceptable state of structural stability, weather protection and maintenance with some deviation.
Good: generally acceptable state of structural stability, weather protection and maintenance without deviation.

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 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 (m^2) 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.

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.

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

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.

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

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.

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

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