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PROPOSALS FOR LOW-INCOME HOUSING IN THE TAIPEI URBAN AREA

by

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Signature of Author
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Chairman, Department Committee

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ABSTRACT

The thesis has two sections: case studies of urban housing environments in Taipei, and a model for high density steep sloping site developments.

The first section identifies and evaluates existing low-income dwelling environments in the Taipei urban area, Taiwan. The study focuses on four selected case studies. The localities are representative of low to middle-low income, very high density areas in Taipei city and San-Chung City. The physical environment of each locality is described in terms of land utilization layout efficiency and the dwelling.

General information about urbanization and housing policies in Taiwan, together with the above four case studies, formed a framework for an alternative design for the "140 High-Land Public Housing Project", which is being prepared under the new public housing law and Taipei City government's annual housing goals. The project is planned on a steep sloping mountain site of 54Ha, to accommodate approximately 3700 housing units and supporting facilities to form a self-sufficient neighborhood.

A new building type is used based on the structural assumption of balancing opposing buildings across the mountain ridge. It can be built on slopes of more than 30% which were originally prohibited as building sites by codes for safety reasons.

The proposed project provides an alternative to site planning and care is taken on reducing cost, efficient layout and decent housing units that design methodology is emphasized also to guide a sound attitude on housing problems.

Thesis Supervisor: Horacio Caminos, Professor of Architecture.

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**PROPOSALS FOR LOW-INCOME HOUSING IN THE
TAIPEI URBAN AREA**

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Massachusetts institute of technology, Cambridge, Massachusetts, May 1977.

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Thanks should be to Mr. Reinhard Goethert for his encouragement and suggestions in problem solving and inputs from his early study of sloped land development contained in the report prepared together with Prof. Waclaw. P. Zalewski, "Building on Slopes: an approach".

Thanks also to Mr. Hwung, Vice Chief Engineer of the Taipei City government, Housing Department, for his many valuable suggestions and the basic project information.

My parents' long support through financial assistance and in the many other aspects made my study here come true. Their help cannot be counted. My special thanks to my parents as well as to my wife, Feng-Chih, for her many suggestions, inputs, and cares.

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PREFACE

Housing is an integral component in the standard of living. Its improvement is expected to have multiplying effects in the people's quantitative and qualitative style of life. The increase and concentration of the population cause problems of uneven sharing of this national resource and people struggle to compete over limited national land resources and available materials. Despite the world wide concern and recognition of the magnitude of the problem of shelter, the local economic mechanism and the government's efficiency are the major forces in balancing these activities. A wider economical and social point of view is needed to shape housing programme policies with the aim of improving the welfare of the society. Lack of adequate housing is the basis for many social and economic problems in urban areas, especially in those countries in developing stages.

A fast changing society like Taiwan, Republic of China, after years of rapid economic development urgently needs new policies to catch up with the fast growth of national industrialization and with the demand from the private sectors. The pace was stepped up three years ago. In 1975 until now several strategies have been started, for example: a public housing programme provides alternative accommodations, a resettlement program undertakes clearance, an urban renewal programme redevelops the central area in cities and a new land policy equalizes the land ownership in urban and rural the same.

Some of these with no previous experience are

still in experimental stages like renewal and mass housing. In this part, the roles, responsibilities and limitations of the government's participation are still facing constant alteration. Self-less dedication by government officials is a major factor in a successful government housing policy as shown by the typical model in the Singapore housing policy. Their policies are based on sound financial programs and officers of good quality and character. Aside from this, the government is still testing many practical problems of organization, planning and design, financial and property management, land acquisition, construction methods, housing standards, etc, for the purpose of lowering the government's financial burden.

The study attempts to focus on better physical site planning to achieve a real contribution but includes other aspects of the development process. There is little argument that a good site plan can lower housing development costs. Though today the site and services method is used in many places for housing however the work in this thesis seeks other housing options because of the different requirements. A site layout is used to demonstrate better land use on a steep sloping site for about 4,000 dwelling units. Four case studies are used as background to clarify some existing urban situations in various aspects for evaluation. It is hoped that this review will be truly useful to those people concerned and responsible.

INTRODUCTION

Taiwan, the Republic of China, has a total area of 36,000 km² and a population of 16.2 million in 1976. The density on the island is the highest in the world. Total gross density reaches 441 p/km², compared to the density of Holland 387, Korea 326, Belgian 318, and Japan 280. The density of only₂habitable land in Taiwan reaches 1638 p/km². Because 63.5% is mountainous area and 7.2% is non-useful land, only 24.3% which is plain and 5% which is useful as terraced land can be easily developed and suitable for dwellings.

Economic activities are based on strong foreign trade of an open economic system without natural resources. The tendency is toward rapid industrial development and a wealthy society. Although there was a high rate of inflation in the 1970's, the income ratio of white collar employees and workers is 9:1, and the unemployment rate was 2.4% in 1975, with an average annual income reaching U.S. \$700.

Till 1970, 40% population lived on farm land. From 1920 to 1970, the population of the five biggest cities increased 10 times and the other urban centers on the island increased 4 times. Young men, higher educated people, non-farm workers and wealthy farmers are major migrants to those cities. The major industries are also centered here: in the Keelung-Chungli corridor, Kaoushium-Tainan area, and Taichung area.

Among them, 37% is heavy industry. Major categories are food production, textiles, wood-

board production, plastic manufacturings and electronic production. The whole situation points to future problems with the change toward more professional specialization, increasing wages, and in family planning, social welfare, and urbanization.

The national planning agency grades urban settlements for the purpose of controlling urbanization into six sizes: 1) 6,000 to 7,000 people is a farm settlement, 80% are farmers, spacing is 1-3 km. 2) 10,000 people is a small town, 50% are farmers and spacing is 5-7 km. 3) 20,000 to 60,000 people is an area center town having service businesses and small industries. 4) 70,000 to 150,000 people is a city and the administrative location of a county with₂a density of approximately 1,500-3,000 p/km². 5) 200,000 to 1.8 million is regional center city, six cities belong in this range. 6) the capital city. The area of the major urban centers are different and scattered on the island into four groupings.

The population increase of Taipei and the surrounding satellite towns and cities from 1950 to 1970 are as followings: Taipei 187%, Sin-Dien 252%, Youn-Ho 1422%, Pam-Chiao 299%, Hsinchuang 208%, San-Chung 557%. The first three primarily contain middle and high income groups. The second two mainly contain middle and low income groups. The last one contains primarily low income groups. All these developments need the government's coordination as electricity; road construction; water and sewer system; health facilities; recreation, social, cultural, education and administrative services, and investment.

The following study concentrates on the Taipei area; from its formation, to its development, to its newest policies.

TAIPEI URBAN AREA

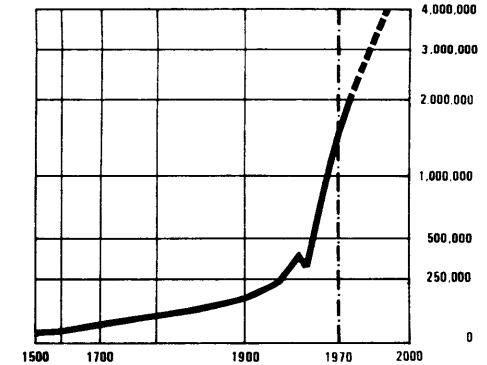
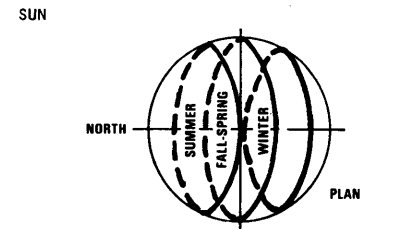
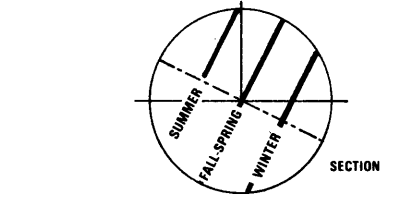
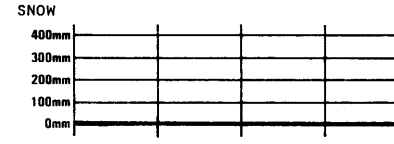
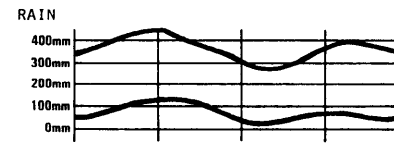
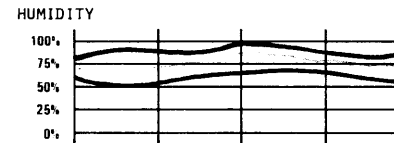
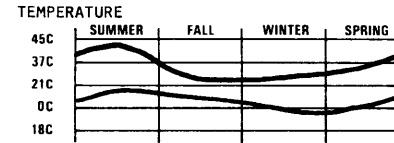
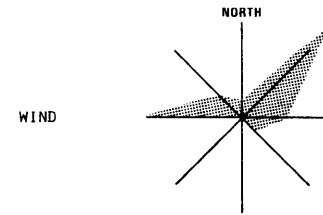
URBAN CONTEXT

1. PRIMARY AND GEO. INFORMATION: Taipei basin is located at 121 degrees east and 25 degrees north. On the east, south and north sides are mountains. Tatun and Seven stars are two well-known peaks, which have an altitude of more than 1,000 meters. The rest is slope land. On the west is the Linko plateau. Surrounded by mountains and protected from the extremities of the weather, the Taipei basin has provided man with safe refuge for more than 5,000 years. It is triangular in shape and has an area of 243 km². The four rivers which cross the basin floor also connect it with all points in north Taiwan. Taipei central area is about 5 meters above sea level and the lowest point in this basin- Luchou is about 1.1 meter about sea level. According to modern geologist, Taipei basin is a large lake in pre-historic days. Silting continued and the lake finally dried up. Most part of the northern area is volcanic rock, Shihlin, Tamsui and the old city district are an alluvial stratum and the rest are either rocky stratum or Sungshan formation. Southeast slope land is the only potential level land which may provide for future development as sites for building constructions. The other parts in this basin are always under pressure of flood invasion in typhoon season.

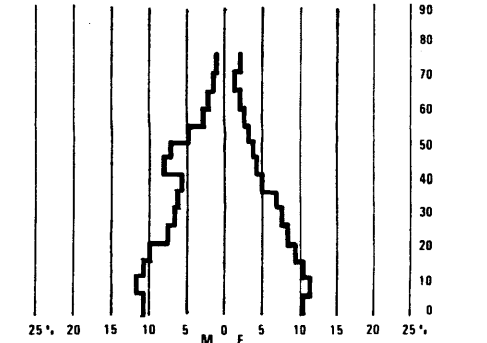
2. WEATHER: Taipei is in the subtropics but the ocean nearby makes its climate balmy. In fact, there are no winter and autumn. Average temperature between September and November is 20 degrees and between May to October is 22 degrees ; this we may call it the summer season. Spring is from December to March with an average temperature of 15 degrees. From April and November, with average temperatures of 27.7 and 20 degrees respectively, may be called transitional season. The mean annual rainfall is about 2,118 mm. Taipei belongs to seasonal wind weather

zone. The wind influences the weather. In the winter, mostly east northeast wind blows with the average velocity of 3.6 meters and top velocity of 14.5 meter per second. In the summer, the westerly and northeasterly wind blows with average velocity of 2.4 meters per second. The period from July to September is typhoon season. With top and lowest velocity of 31 and more than 10 meters per second. Typhoon always is a threat to the island.

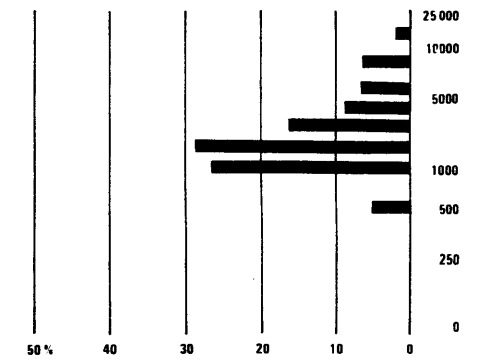
3. THE URBAN REGION: The dominant physical fact which will shape the form of the future Taipei metropolitan area is its location in a basin subject to flooding. A glance at the map of the physical features of the region centering on Taipei shows the city located in the eastern half of the Taipei basin floor. The basin receives water from the east via the Keelung River which extends almost to the Keelung harbor itself, from the high mountain to the south via the Hsintien River, and from the west via the Takokan River. These rivers units in the basin to form the Tamsui River, which empties into the sea. During typhoons very heavy rainfall occurs, and as most of the basin floor is less than 20m above mean high tide, flooding is likely. In 1963 typhoon Gloria put virtually all of the basin under water. Typhoon Gloria resulted in flood control measures devised to protect Taipei City. These proposals have now been largely completed in the eastern half of the basin, the half occupied by the City of Taipei and the suburbs east of the Tamsui. It has been recognized that the presently largely vacant western half of the basin floor - west of the Tamsui River - should not be further urbanized for two meteorological reasons: first, to provide a flood plain and second, because control measures intended to give the same protection as now afforded the City of Taipei and the east half of the basin floor are of doubtful utility. Certain meteorological conditions - an extraordinarily high tide, a typhoon from the north, and very heavy rain - would raise the level of the sea and impede the flow of the water through the gorge. The excess rainfall would have to be held in the "flood plain" formed by the un-urbanized western half of the basin. Even under less severe conditions this flood plain would provide a larger overflow stream bed for the swollen waters to reach the now enlarged gorge and escape to the sea. Thus the



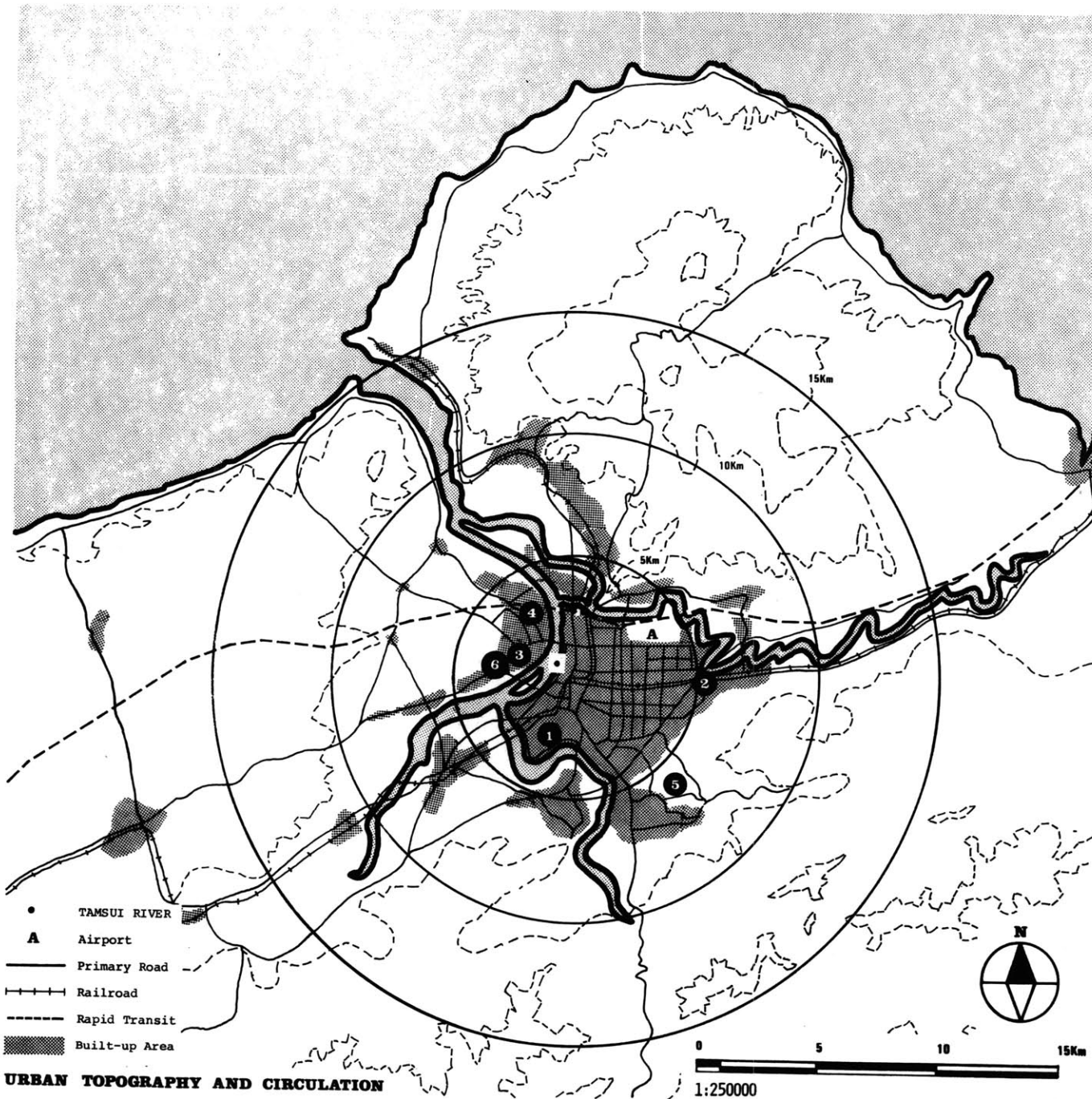
URBAN POPULATION GROWTH
horizontal: dates vertical: population
Source:



URBAN POPULATION DISTRIBUTION
horizontal: percentages vertical: ages
males: M females: F
Source:



URBAN ANNUAL INCOME DISTRIBUTION
horizontal: percentages vertical: dollars
Source:



very existence of the flood plain is a necessary measure of flood protection for Taipei City; to build up the flood plain would destroy much of the value of the flood protection measures built at great cost to protect Taipei City itself. Any attempt to divert the Takokan River by a new channel along the western edge of the basin, besides being very expensive would be of doubtful utility. However efforts to keep the vacant land west of the Tamsui River from being further urbanized will probably not be successful unless terrace is made available for development. The pressure for urbanization due to the population growth described above must have a convenient outlet. This is particularly true for San-Chung City, which should not be further expanded into the flood plain. The island has only about 5,500 km² of first quality agricultural land. The island has little agricultural land to waste. The urbanization expected by the end of the century could, if not planned and directed to less productive land, encroach upon 1,000 or more km² of this amount. With the growing pressure on the island's food supply, good policy calls for urbanizing the buildable slopes and plateaus rather than good rice land.

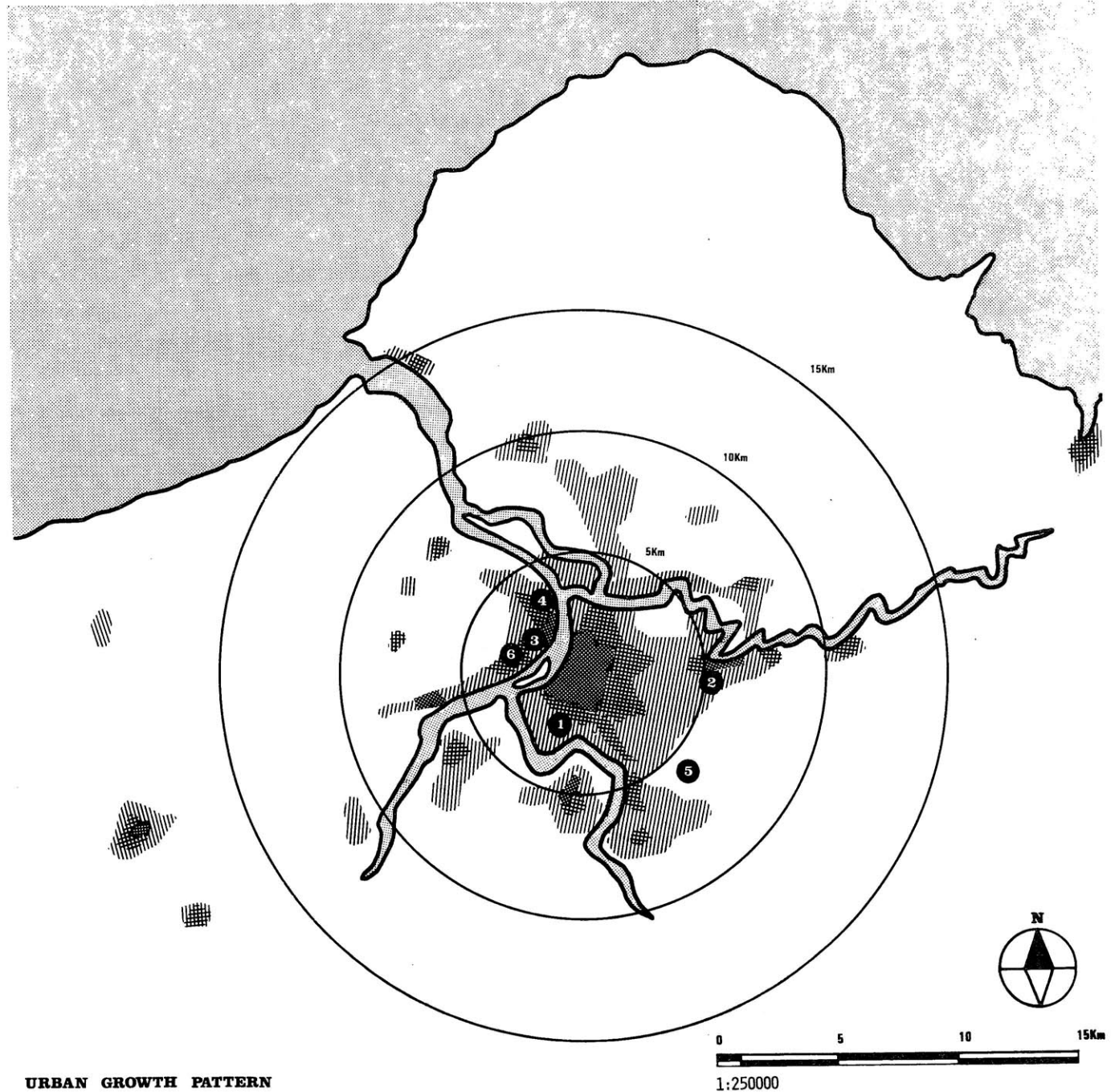
- LINKO REPORT

**1-4 CASE STUDIES
 5-6 PROPOSALS**

- ① KWANG JAN (NO. 3)
- ② WU FENG PU
- ③ TSAI LIO
- ④ LUNG MENG
- ⑤ 140 HIGH LAND
- ⑥ RENEWAL SITE

4. Housing: Taipei municipal government has attacked on the housing problems since 1950. Many sponsoring agencies for the tasks has been established sequently, such as Civil Housing Construction Committee in 1950; Public Housing Construction Committee in 1962; and the Public Housing and Community Development Committee in 1967. All of these agencies had been assigned with varying projects and missions, and the mayor being the chairman to guide all activities. Until late in 1974 it has been reformed again, and establishing the Department of Housing. In order to strengthen this newly erected housing agency, the new director has been assigned and has been given with more administrative power as well as more fund to challenge the urban residential problems. It is a new start for the municipal government to step forward on housing, community development, as well as slum clearance. 23,638 housing units have been completed since 1950 grouped into several categories: 11,161 resettlement housing units; 1,300 units of subsidized housing for public servants and teachers; 504 units of relief housing; 9,310 units of subsidized housing for citizens; 3,090 units of cooperative housing; 2,309 units of assistance to private investment housing. New public housing development is more difficult because of shortage of land resource and its unreasonable high prices. It was estimated that, outside of Taipei City, the adjacent suburbs might reasonably be expected to provide housing sites for 282,000 additional persons.

-TAIPEI MUNICIPAL HOUSING



URBAN GROWTH PATTERN

1:250000

URBAN CASE STUDIES

Till 1973, 62.3% of the total population lived in urban areas. A 4.5% annual urban population increase exceeded the national population increase rate. Social change pushes people to the city and the tendency to go back is small because of the special conditions on Taiwan with its limited agricultural land for people to share and the concentration of industry.

All the urban centers have the functions of service and employment. Many cities are out of control because the central city is surrounded by slum developments. This has happened in many of the largest cities in developing countries. Low income residents are trapped in decaying housing units with few available jobs in the surrounding areas. Developing clear goals for a urban center is essential to the process of designing sound urban policies. Urban goals should represent a set of achievable objectives which residents desire for their city: better transportation systems, creation of new jobs and higher wages, better school systems, better parks and markets, less crime and pollution, and more housing at low rents.

The goals of a city must not be an unattainable utopia. If a city manages to sufficiently improve its standards, additional migrants would flock to the city and the improved urban qualities could further deteriorate as a result of the increased population pressure. Realistic city goals always take the form of tradeoffs among employment, population growth, business development, and residential development. It is understood that a city can not solve all of its problems simultaneously. It

is necessary to have an evaluation of urban policies and select goals which minimize emotional and personal interest factors.

To make arrangements which accept future urbanization and to plan in detail the urban area needs the consent and inspiration of the whole urban area and surrounding communities. The complex situations of interest and disinterest factors especially need policy decisions to work out plans for urban population their livings, health, education, safety, recreation, traffic, economic activities, and land use especially the rights of those low income groups to find and own a living space in the urban area and near employment. The results of urban planning should be directed toward a better allocation of population and social and economic development.

Various proposals have been submitted to restructure the major planning mechanisms to achieve more just and efficient work. Now approximately 220 cities, towns, and villages already have master plans to predict and specify residential, commercial, and industrial land uses, the major road structure, the sewer and drainage system, schools, and other public facilities for the next 25 years including working schedules and financing plans. These plans guide the priority in development and detail plans for construction, land subdivision, and building controls for the future.

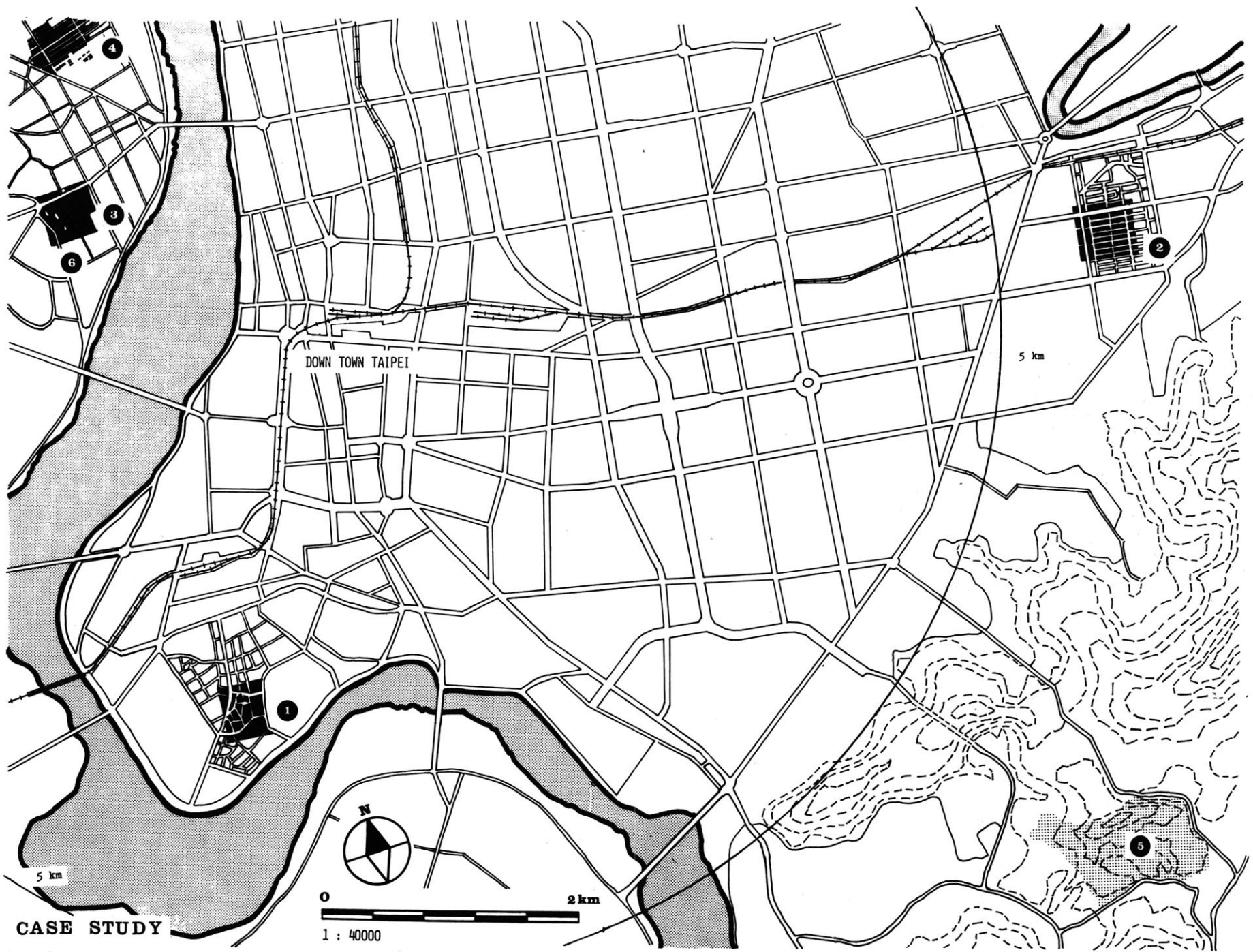
The basis of these plans and with its many difficulties in execution is land ownership and land price. In 1949, the government implemented a 37.5% rental reduction policy, the first step taken in Taiwan's land reform programme. The ceiling of farm rental was fixed at 37.5% of the yield. In 1951, public land

was leased to help owner-farmers. In 1953, land was given to the users as the final phase of the agricultural land reform program. In urban areas up until 1956, the government started to implement equalization of urban land rights - price reporting, taxes, government's buying and capital gains taxes on land. Under this policy, land tax and land value increment tax formed a strong financial base for urban construction. But most urban land without detailed subdivision plans still had no land value specification until 1977. This caused serious land speculation in the fast urban development market and was the reason for the very high price of government urban construction. Although the government used methods of land expropriation and land consolidation in public-works projects, the major base is still a sound and up-to-date policy of equitable land distribution. Without this policy, there will be many urban problems, for example: 1) Difficulties in obtaining reserved land for public facilities as in the master plan-roads, parks, greenland, schools, markets, athletic fields, sewer and water easements. Private investments are encouraged due to the high cost of buying land. 2) Urgent requirement of new land for development like the abundant mountainous sites surrounding urban areas. 3) Public housing shortage. 4) Irregular land subdivision and waste usage. 5) Venders need a permanent market place and stall. 6) Squatter resident need housing units and perhaps encouraged to return to the rural villages.

Four case studies are studied which represent selected special urban conditions. The information will be used as a framework for proposals of mass low-income housing in the Taipei area in the second part of this thesis.

LOCATION OF CASE STUDIES (OPPOSITE PAGE)

- 1) KWANG JAN and NO.3
- 2) WU FENG PU
- 3) TSAI LIO
- 4) LUNG MENG
- 5) SITE OF PROPOSED HOUSING PROJECT
- 6) SUGGESTED RENEWAL SITE



CASE STUDY

0 2 km
1 : 40000

1 KWANG JAN (No 3) (GRID LAYOUT)

Taipei finished its single largest urban renewal project in 1976. The renovation was in two of the city's oldest district, Wan-Hwa and Ta-Tung; a combination of the two names gives the project its moniker - Wanta. The total expenditure of this project was about U.S. \$30.5 million. Although care was taken to preserve historic spots, 21 main streets were widened or resurfaced. New water and sewage lines were laid and about 5,000 squatter's huts and shops were demolished and their owners moved into new market areas.

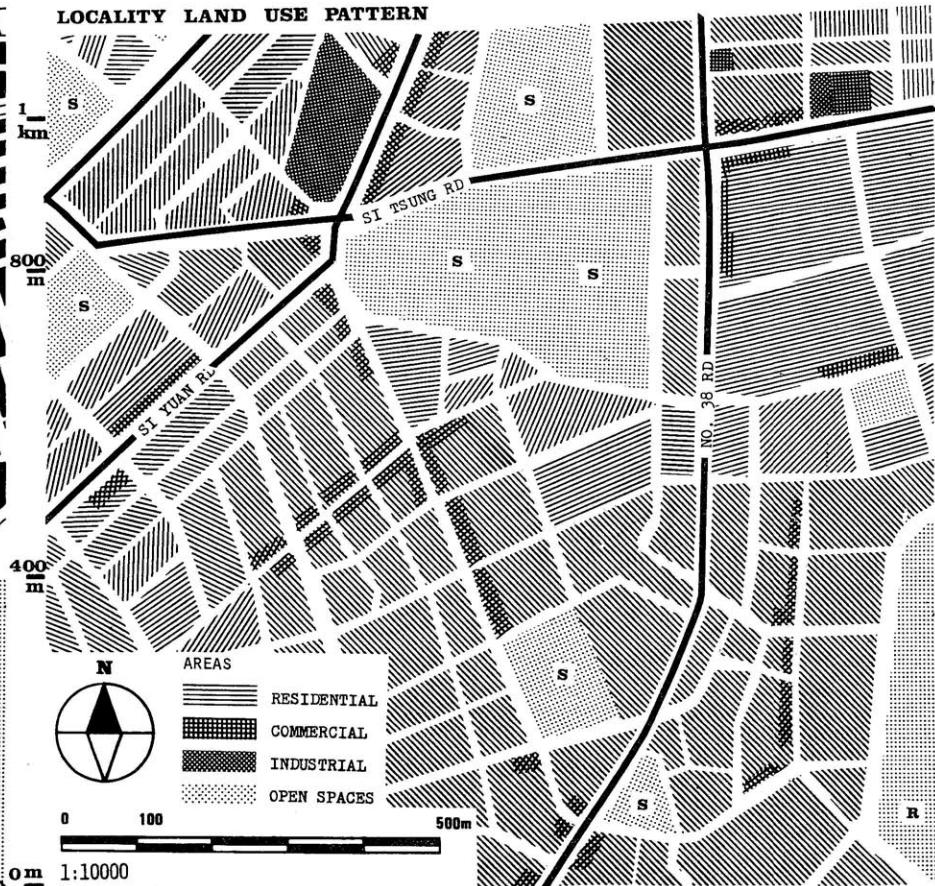
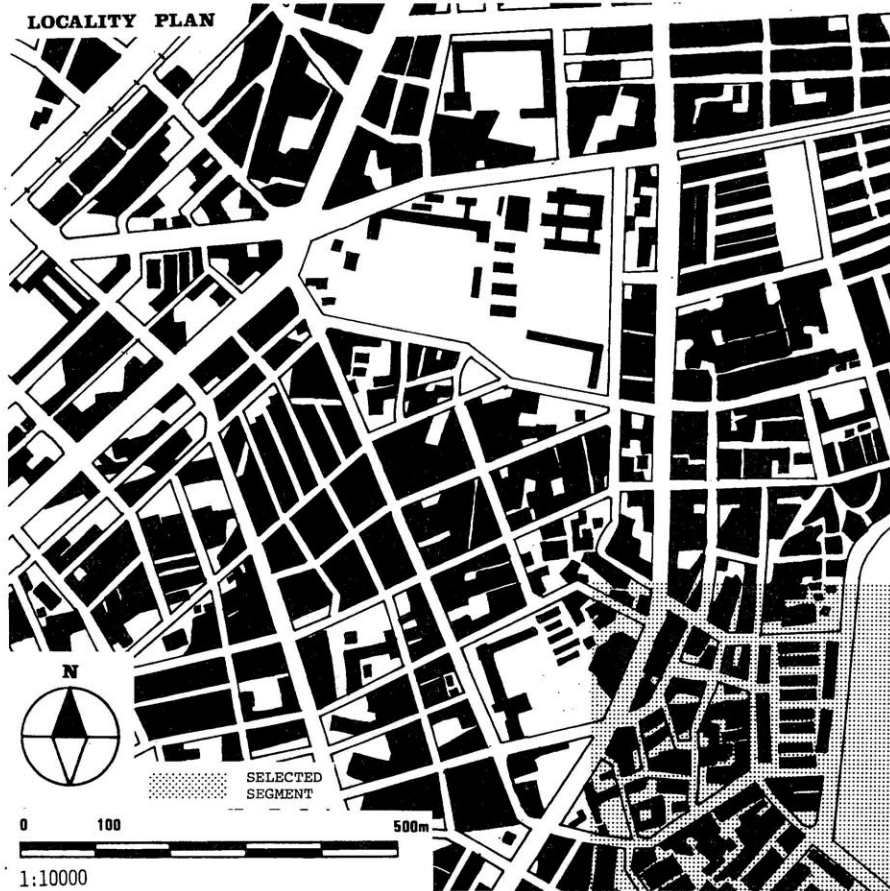
In this segment of land, irregular land use includes a new widened Wan-Ta road, a new youth park, and 3 resettlement housing projects. Subdivision of land and street layout were planned by the landowners and contractors many years ago for their own convenience. Two to three story buildings and simple squatter structures occupy this area.

The housing project is on 7.37 Has. of land with a total of 4,015 units. The unit sizes range from 36 m², 43 m² to 53 m². Except for those used by resettlement families, extra housing units were sold to the public.

The site - No. 3 among a total of five was cleared from this type of localities mentioned above for a housing project. It has

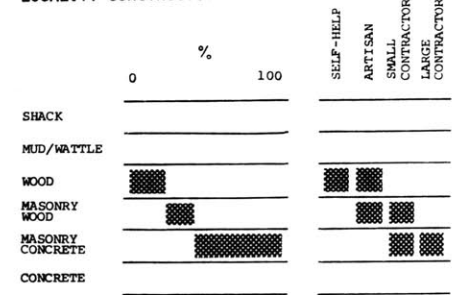
the highest density of them and was designed as a whole block with minimum internal vehicle circulation. Special attention was placed on the potential use of its multi-function room and arrangement of supporting facilities of bath, kitchen, and light-well for the semi-tropical weather. A total of twelve buildings on 1.54 Ha. land for 910 families are all constructed the same -shops at the first floor and apartments from the second to the fifth floors. Basements are used as a market space and for parking.

- KEY
- Pk Parking
 - P Police
 - F Fire Department
 - S School
 - Ch Church
 - R Recreation
 - L Library
 - U University
 - H Health
 - PO Post Office
 - SS Social Services
 - M Market
 - C Cemetery
 - Bus
 - ■ ■ ■ Rapid Transit





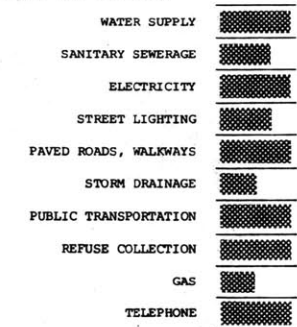
LOCALITY CONSTRUCTION TYPES



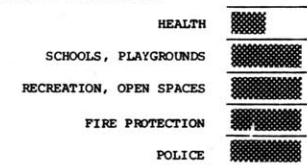
The chart shows (1) approximate percentage of each construction type within the total number of dwellings; and (2) building group that generally produces each type.

Quality of information: Approximate

LOCALITY UTILITIES AND SERVICES



LOCALITY COMMUNITY FACILITIES



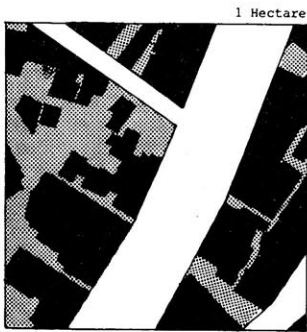
The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.

Quality of information: Approximate

LOCALITY SEGMENT PLAN

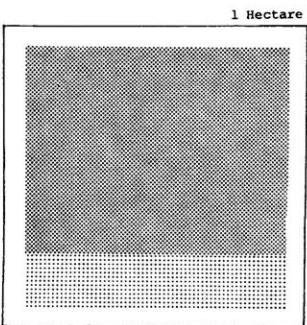


LAND UTILIZATION DIAGRAMS

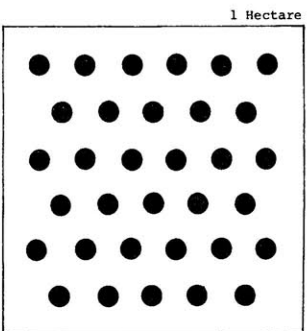


PATTERN

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



PERCENTAGES Streets/walkways 22.52%
 Playgrounds 15.23%
 Cluster Courts
 Dwellings/Lots 62.25%

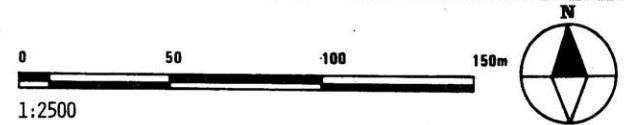


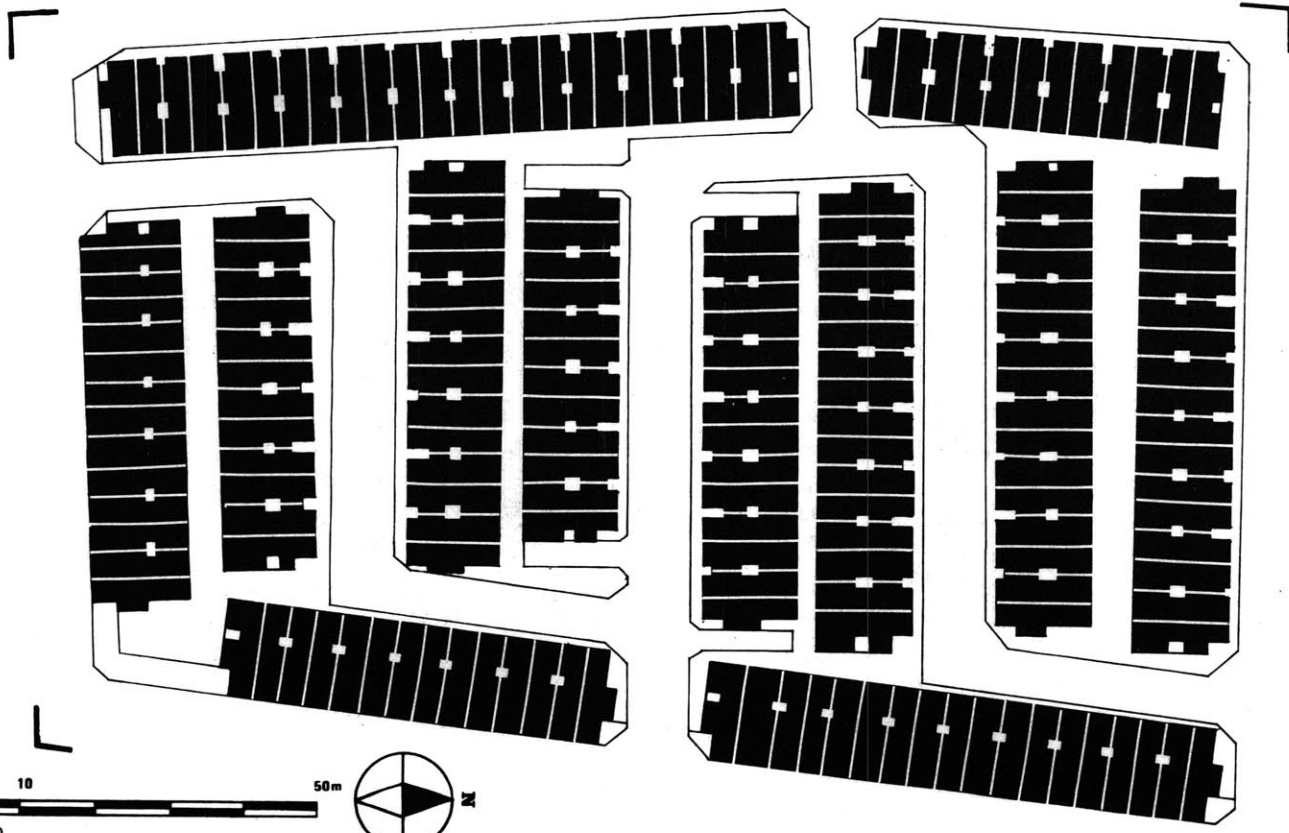
DENSITY Persons/Hectare 660

● 20 Persons



LOCALITY SEGMENT LAND UTILIZATION





1:1000
LOCALITY SEGMENT LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	16		
DWELLING UNITS	1896	16	118
PEOPLE	9430	16	590

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	3.6036	22.52
SEMI-PUBLIC (open spaces, schools, community centers)	2.4364	15.23
PRIVATE (dwellings, shops, factories, lots)	9.9600	62.25
SEMI-PRIVATE (cluster courts)		
TOTAL	16.00	100.00

NETWORK EFFICIENCY
 $R = \frac{\text{network length(circulation)}}{\text{areas served(circulation, lots)}} = 187 \text{ m/Ha}$
 AVERAGE LOT AREA = -

LOCALITY BLOCK LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	182	1.67	109
DWELLING UNITS	910	1.67	545
PEOPLE	4550	1.67	2720

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	0.82	49%
SEMI-PUBLIC (open spaces, schools, community centers)		
PRIVATE (dwellings, shops, factories, lots)	0.85	51%
SEMI-PRIVATE (cluster courts)		
TOTAL	1.67	100%

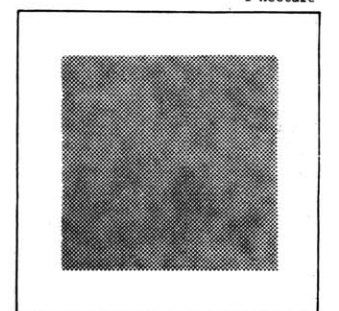
NETWORK EFFICIENCY
 $R = \frac{\text{network length(circulation)}}{\text{areas served(circulation, lots)}} = 557 \text{ m/Ha}$
 AVERAGE LOT AREA = 52 m²

LAND UTILIZATION DIAGRAMS



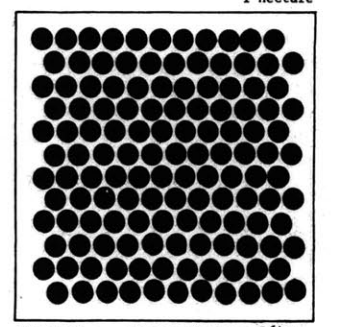
PATTERN

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

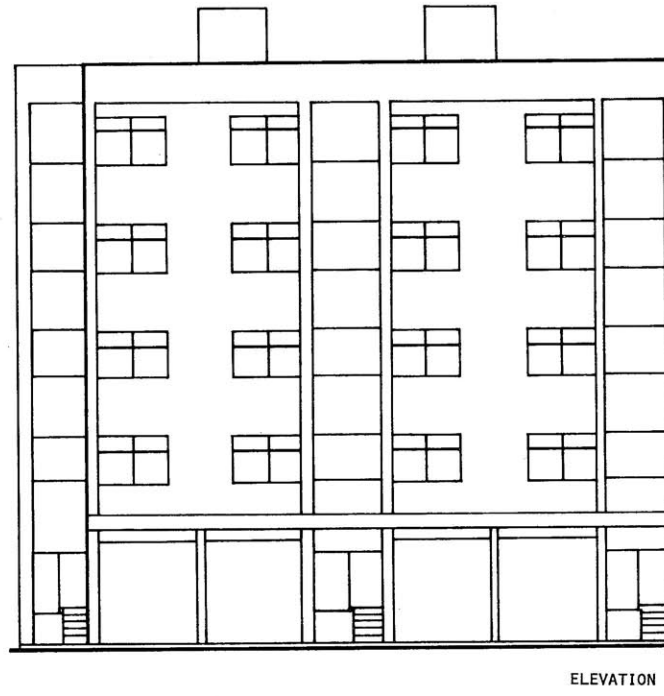
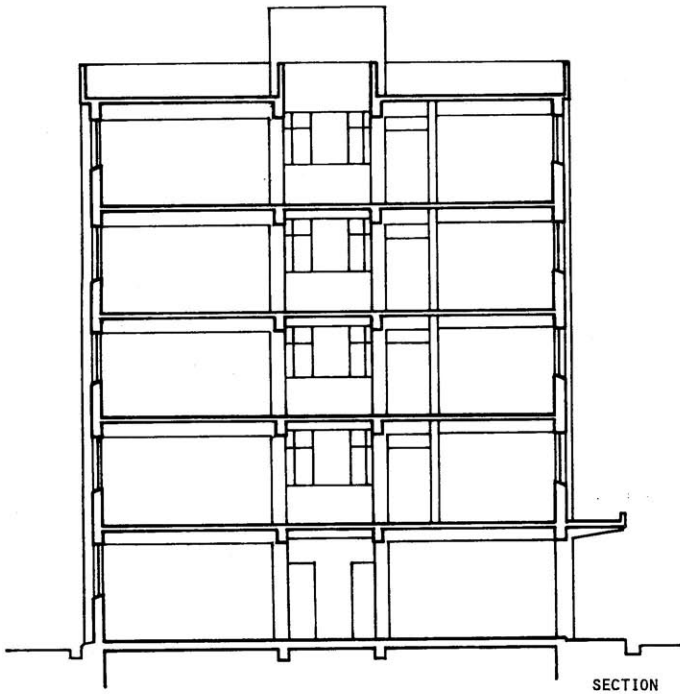


PERCENTAGES

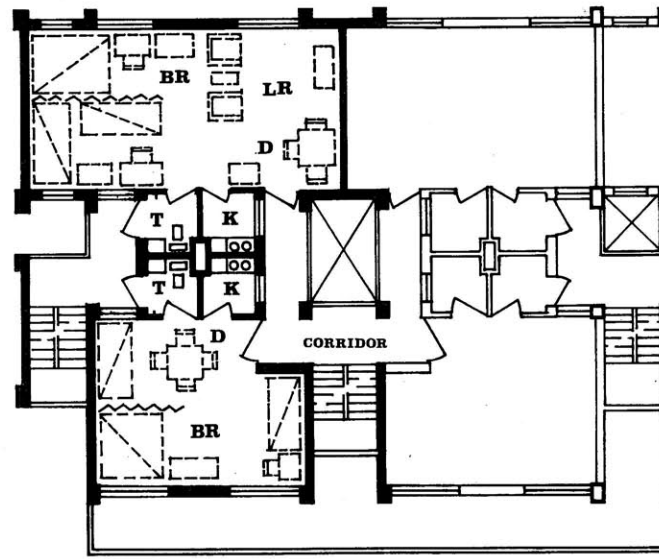
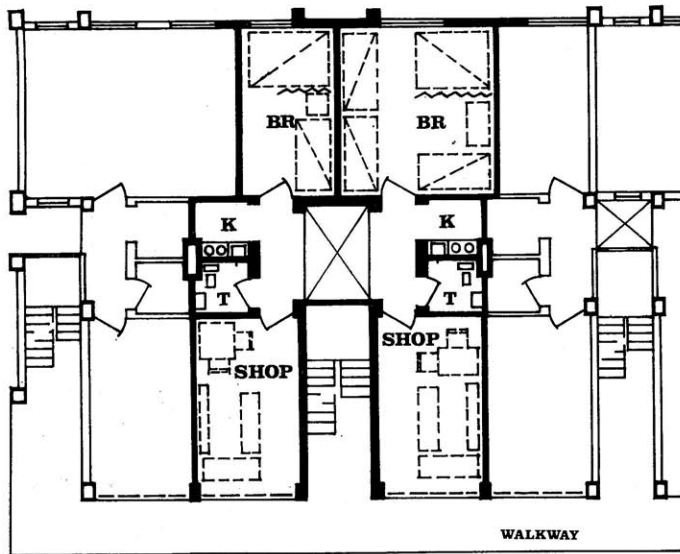
- Streets/walkways 49%
- Playgrounds
- Cluster Courts
- Dwellings/Lots 51%



DENSITY
 Persons/Hectare 2640
 ● 20 Persons



- 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)



TYPICAL DWELLING

CASE STUDY SOURCE

- Locality Segment Plan:* (accurate) Taipei City Government, Public Work Department.
- Locality Block Plan:* (accurate) Taipei City Government, Housing Department.
- Block Land Utilization:* (accurate) Survey By Author in summer of 1975.
- Typical Dwelling:* (accurate) Survey By Author in summer of 1975.
- Physical Data:* (accurate)
- Social-Economic Data:* (approximate)
- Photographs:* City Government Report
- General Informations:* City Government, Housing Department.

PHYSICAL DATA

(related to dwelling and land)

DWELLING UNIT
 type: APARTMENT
 area (sq m): 40
 tenure: LEGAL OWNERSHIP

LAND/LOT
 utilization: PRIVATE
 area (sq m): 52
 tenure: LEGAL OWNERSHIP

DWELLING
 location: CITY CENTER
 type: WALK-UP
 number of floors: 5
 utilization: MULTIPLE
 physical state: GOOD

DWELLING DEVELOPMENT
 mode: INSTANT
 developer: PUBLIC
 builder: LARGE CONTRACTOR
 construction type: MASONRY/CONCRETE
 year of construction: 1975

MATERIALS
 foundation: CONCRETE
 floors: CONCRETE
 walls: BRICK
 roof: CONCRETE

DWELLING FACILITIES
 wc: 1
 shower: 1
 kitchen: 1
 rooms: 1
 other: SHOP/1ST FLOOR

SOCIO-ECONOMIC DATA
(related to user)

GENERAL: SOCIAL
 user's ethnic origin: MIXED PROVINCE
 place of birth: MAINLAND CHINA
 education level: HIGH SCHOOL

NUMBER OF USERS
 married: 2
 single: 0
 children: 3
 total: 5

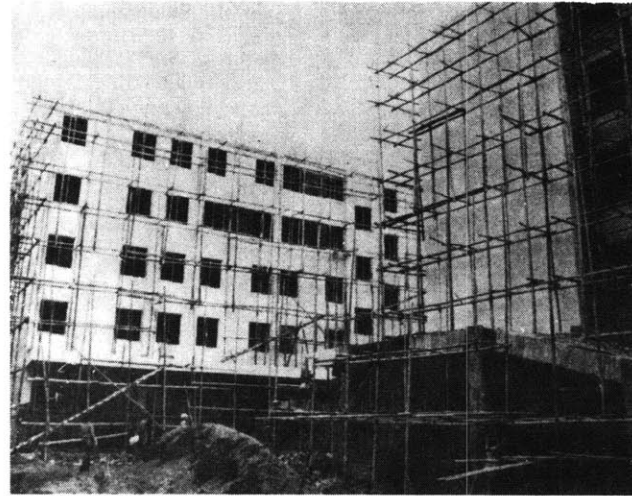
MIGRATION PATTERN
 number of moves: 2
 rural - urban: -
 urban - urban: 1974
 urban - rural: -

why came to urban area: EMPLOYMENT

GENERAL: ECONOMIC
 user's income group: MODERATELY LOW
 employment: PRIVATE BUSINESS
 distance to work: 8KM
 mode of travel: PUBLIC
 TRANSPORTATION

COSTS
 dwelling unit: US\$ 4,000
 land - market value: US\$ 120/M²

DWELLING UNIT PAYMENTS
 financing: PUBLIC SUBSIDIZED
 rent/mortgage: N.A.
 % income for rent/mortgage: N.A.



NO.3: (Left and right-up) Wan-Ta project, resettlement housing. (Right-down) Utilities upgrading in Wan-Ta project.

2 WU FENG PU (GRIDIRON LAYOUT)

Taipei changed its status to a special self-supporting city in 1967 and enlarged its administrative boundary four times. Since then, the city started a series of urban construction projects. The first stage from 1967 to 1971 included new road construction for a total of 53 km of two millions square meters; under-ground storm drainage system, 41 km; 8 new pumping stations; two new parks; tunnels and flood protection works. The total investment reached U.S. \$50 millions.

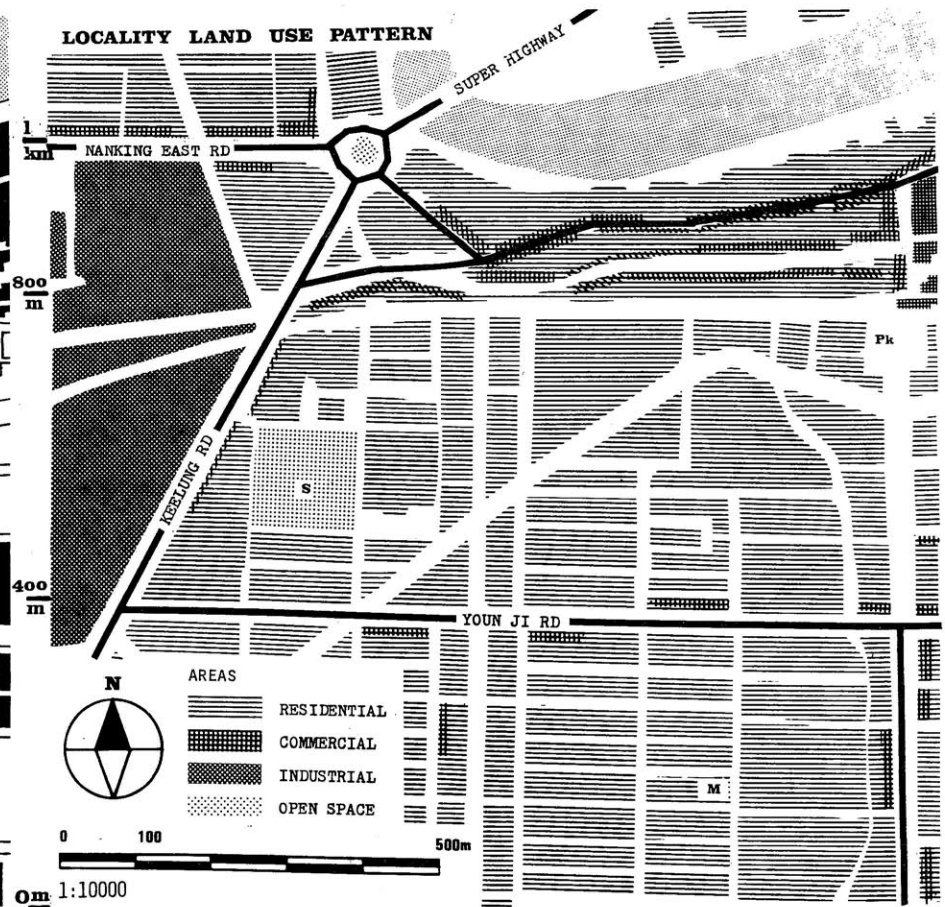
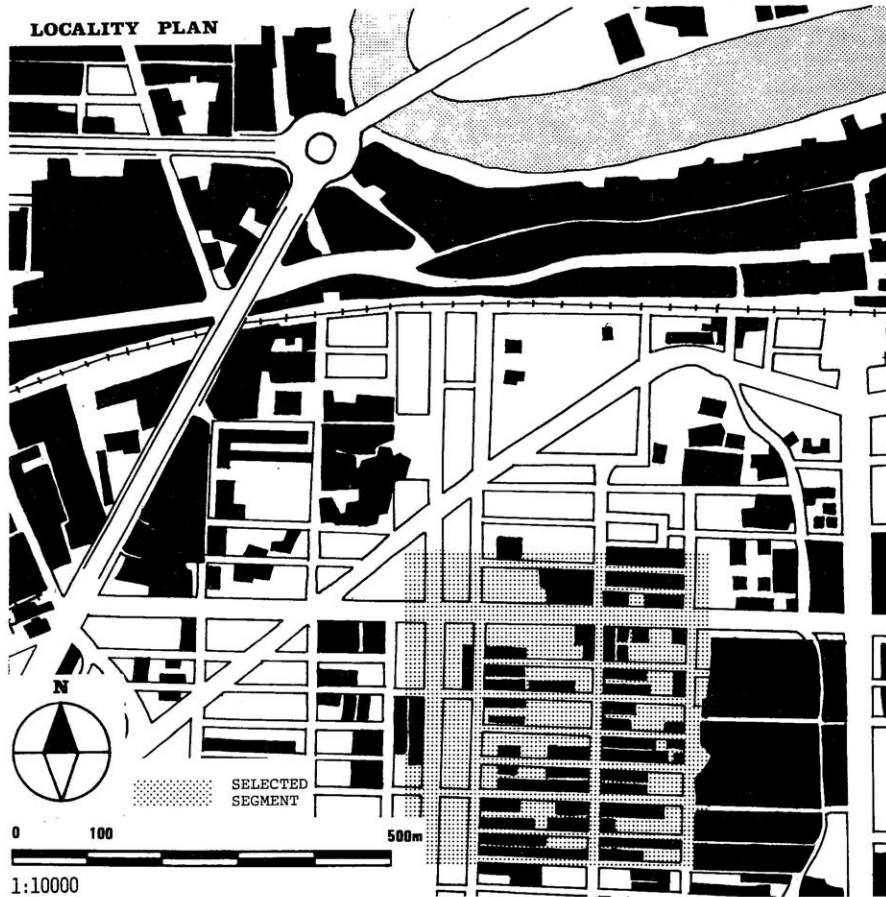
The total volume of this stage with the second stage just finished exceeded the total investment of the passed 20 years.

Wu-Feng-Pu is located at the most eastern part of the city and is the door to the major harbor of northern Taiwan - Keelung. Along the corridor connecting these two cities, there are many light industries and transportation facilities. The major provincial highway passes through the northern part of this segment going into the old Taipei central city. Being in the first stage of the urban construction project, there are new streets, a highway bridge, and storm drains constructed in this segment. The area is becoming a new middle income residential area.

The new land subdivision and street construction with conversion of narrow bumpy streets into major through roads are designed in an orderly form. The majority of housing are privately developed. Developers built fast economical types of apartments in a large parcel, and the segment is almost totally covered by new structures. The tendency is still continuing eastward to the natural boundary of the steep slope mountain areas.

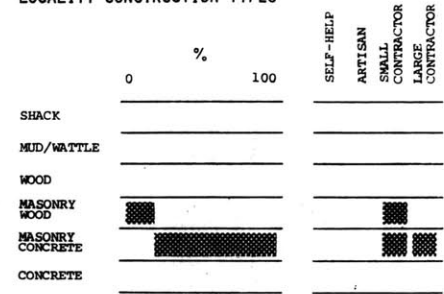
KEY

- Pk Parking
- P Police
- F Fire Department
- S School
- Ch Church
- R Recreation
- L Library
- U University
- H Health
- PO Post Office
- SS Social Services
- M Market
- c Cemetery
- Bus
- Rapid Transit





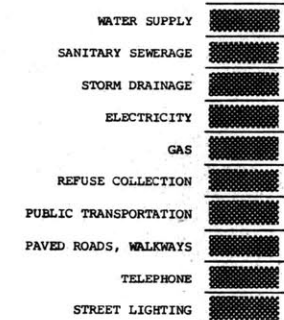
LOCALITY CONSTRUCTION TYPES



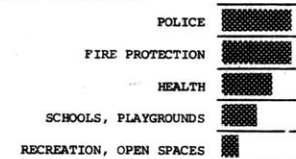
The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: Approximate

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.

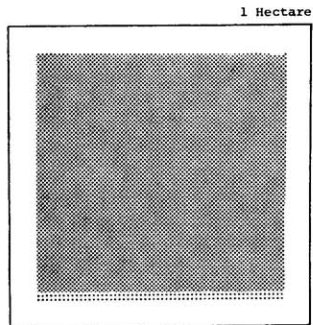
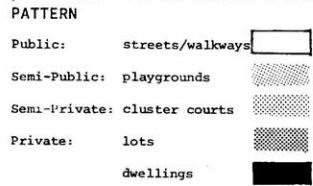
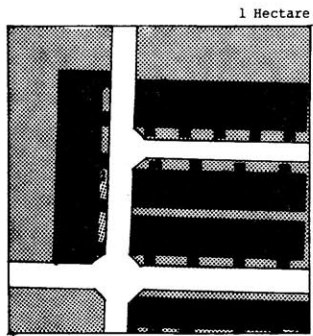
Quality of information: Approximate



1:2500

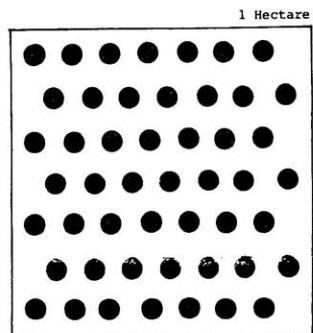


LAND UTILIZATION DIAGRAMS



PERCENTAGES

- Streets/walkways 29.31%
- Playgrounds 1.87%
- Cluster Courts
- Dwellings/Lots 68.82%



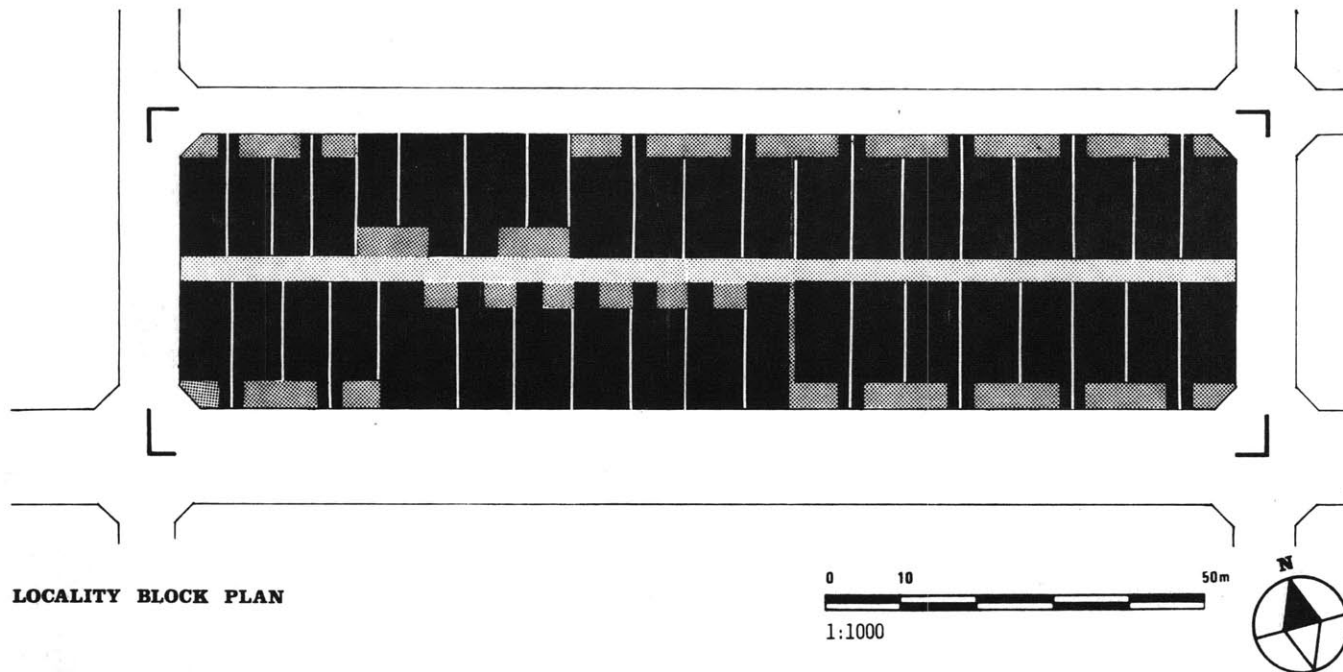
DENSITY Persons/hectare 980

● 20 Persons



LOCALITY SEGMENT LAND UTILIZATION





LOCALITY BLOCK PLAN

CITY PLANNING

The beginning of city planning for Taipei started in 1873. In 1883, when Japanese occupation started, the planning and construction of public facilities began. The city was expanded to include Sunshan district in 1932 and the plan for construction of park and airport was drafted. The present city planning was drafted after Taipei was made a special municipality in 1967. The city planning has been revised several times in the past. The projected population is as following:

First plan (1883)	4,865 Has.	150,000 P.
Second plan (1932)	6,698 Has.	600,000 P.
Third plan (1967)	27,214 Has.	2,500,000 P.

The planning area and the administrative area of the city are the same with a total of 27,214 Has. Among the total, an estimated area of 11,070 Has. (40%) are level land which can be developed into commercial, residential, industrial, administrative, cultural and educational districts. The rest of 16,144 Has., mostly slope land (about 60%) or low-lying grounds, except for some which can be used as construction sites, are listed as farming areas or preservation areas.

SCHOOL LAND

Since the commencement of the nine-year free education program in 1968, primary and junior high school has to play even more vital role. Locations, environment and capacities have to be considered in the planning of land for schools. According to a survey conducted in April 1972, among 120 planned school sites in the old city area, 102 sites (85%) had been developed; as for the 223 sites in the whole city, only 141 site (63%) had been developed. In other words, the development of school land in the old city area has reached the saturation point while that of the new city area, are still room for development. School land in the old city area is about 5.5% of the total land area. With ever increasing population, most schools are already too crowded to accept more students. The principles for planning school land in the new city area are: A primary school will be established in a sub-district area with a population of 10,000. And a junior high school will be established in a two sub-district area with a population of 20,000. And a senior high school will be established in a four sub-district area with a population of 40,000.

MARKET AND OTHER PUBLIC FACILITIES

Repairing and construction of markets is one of the tasks of the city government in making a modern metropolis. Improvement of present wholesale and retail markets, public or private, and vendors is needed to meet the increasing population. Old markets will be over hauled and new ones to be built to resettle illegal vendors and illegal shops and store owners. In the new city area, one market will be built in each sub-district. That means a market in an area of about 5 Has. But more should be built in higher density area. In the whole city, 83 sites for market building have been publicly announced. Other public facilities such as government offices, parking lots, sewage water disposing center and slaughterhouse or abattoir, are being planned according to population density.

PARK PROGRAM

The construction of more small size parks, green belts, plazas and boulevards are listed as top priorities in the city's construction. There are 256 parks in the old city area with a total area of 273 Has. In the new city area, there are 78 parks with a total area of 1,026 Has.

LOCALITY BLOCK LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density %/Ha
LOTS	720	16	45
DWELLING UNITS	2830	16	180
PEOPLE	15840	16	990

AREAS	Hectares	Percentage
PUBLIC (streets, walkways, open spaces)	4.6393	29.31
SEMI-PUBLIC (open spaces, schools, community centers)	0.2991	1.87
PRIVATE (dwellings, shops, factories, lots)	11.0120	68.82
SEMI-PRIVATE (cluster courts)		
TOTAL	16.00	100.00

NETWORK EFFICIENCY

$$R = \frac{\text{network length(circulation)}}{\text{areas served(circulation, lots)}} = 275 \text{ m/Ha}$$

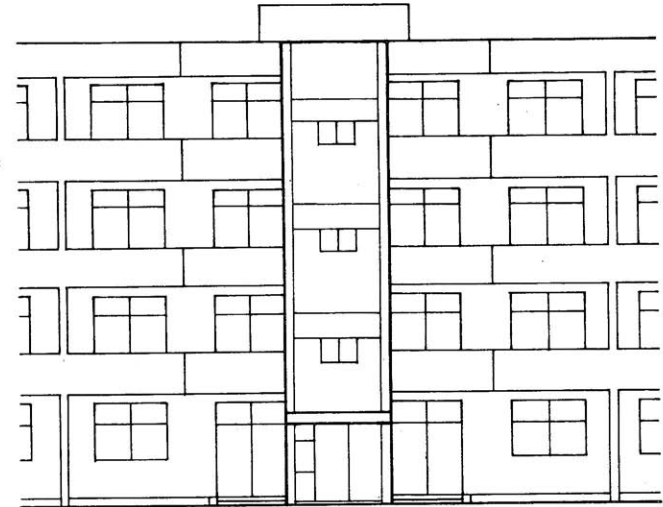
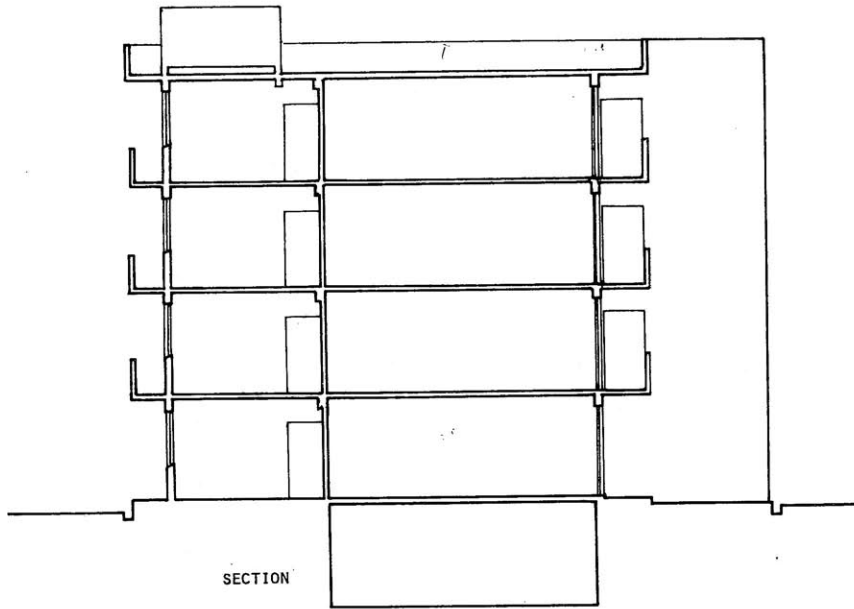
$$\text{AVERAGE LOT AREA} = 152 \text{ m}^2$$

RAIN-WATER DRAINAGE AND SANITATION SEWERS

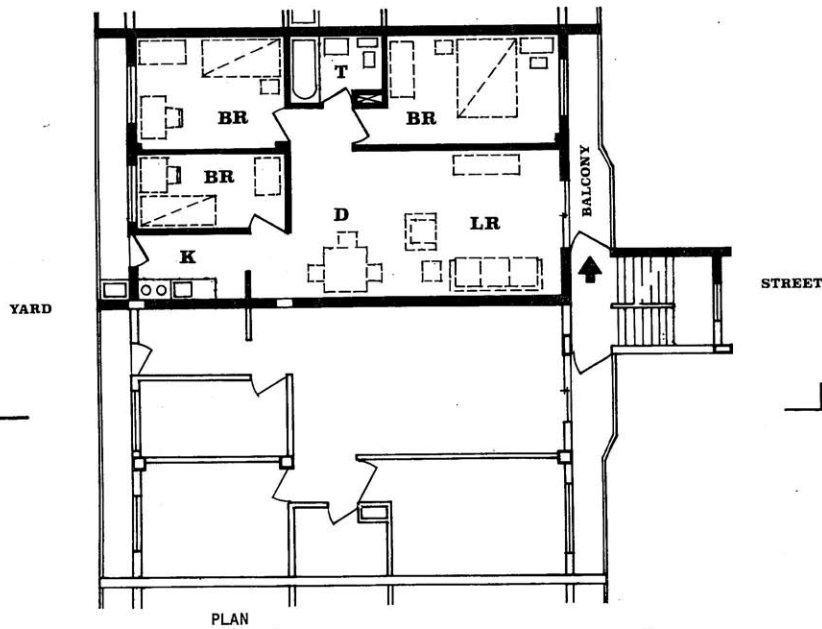
Since Taipei is in a basin, the water level of three major rivers through Taipei basin are higher than the city in raining days. Furthermore, the simple U-shape drainage system built during Japanese occupation more than 70 years ago, is insufficient to meet nowadays' need. So part of the city is flooded when heavy rains fall, especially in the typhoon season. Planning for the rain-water drainage system was started in 1968 and completed in 1969. The construction is expected to be completed in the next two four-year plans. The sewerage system in the whole city has a length of 1,318.8 km. Among this, 215.4 km are uncovered soil sewers, 452.5 km are road sewers, 498.7 km are lane sewers and 152.2 are trunk line sewers.

CITY PLANNING OPERATION PROCEDURES

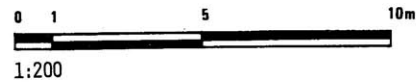
Operation procedures of city planning are divided into four stages. 1. Department of Public Works drafts proposals; 2. Taipei City Government examines the proposals and sends them to the Ministry of Interior affairs; 3. Ministry of Interior Affairs gives approval after examined the proposals; 4. approved proposals are sent to the Executive Yuan to serve as a record.



ELEVATION



PLAN



TYPICAL DWELLING

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)

CASE STUDY SOURCE

- Locality Segment Plan: (accurate) Taipei city government, Public work Department.
- Locality Block Plan: (accurate) Taipei city government, Public work Department.
- Block Land Utilization: (accurate) Survey By Author in summer of 1975.
- Typical Dwelling: (accurate) Survey By Author in summer of 1975.
- Physical Data: (accurate)
- Social-Economic Data: (approximate)
- Photography: City Government Report
- General Informations: City Government Report

PHYSICAL DATA

(related to dwelling and land)

DWELLING UNIT

type: APARTMENT
 area (sq m): 90
 tenure: LEGAL RENTAL OWNERSHIP

LAND/LOT

utilization: PRIVATE
 area (sq m): 152
 tenure: LEGAL RENTAL OWNERSHIP

DWELLING

location: PERIPHERY
 type: WALK-UP
 number of floors: 4
 utilization: RESIDENTIAL
 physical state: GOOD

DWELLING DEVELOPMENT

mode: INSTANT
 developer: PRIVATE
 builder: SMALL CONTRACTOR
 construction type: MASONRY/CONCRETE
 year of construction: 1974

MATERIALS

foundation: CONCRETE
 floors: CONCRETE
 walls: BRICK
 roof: CONCRETE

DWELLING FACILITIES

wc: 1
 shower: 1
 kitchen: 1
 rooms: 3
 other: BALCONY

SOCIO-ECONOMIC DATA

(related to user)

GENERAL: SOCIAL

user's ethnic origin: FU KIEN
 place of birth: TAIWAN
 education level: COLLEGE

NUMBER OF USERS

married: 2
 single: 0
 children: 3
 total: 5

MIGRATION PATTERN

number of moves: 2
 rural - urban: 1960
 urban - urban: 1970
 urban - rural: -

why came to urban area: EMPLOYMENT

GENERAL: ECONOMIC

user's income group: MIDDLE LOW
 employment: MIXED
 distance to work: 8 KM
 mode of travel: PUBLIC TRANSPORTATION

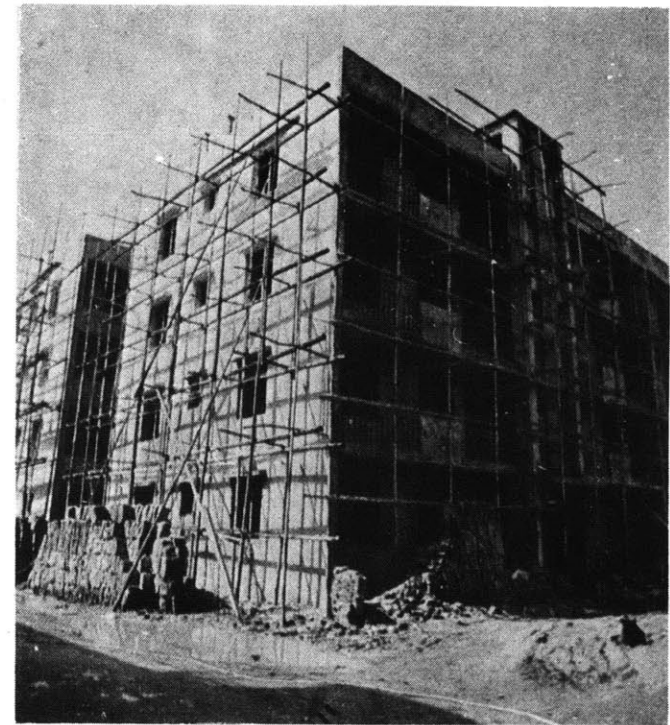
COSTS

dwelling unit: US\$ 7500
 land - market value: US\$ 350/M²

DWELLING UNIT PAYMENTS

financing: PRIVATE
 rent/mortgage: US\$ 90/MONTH
 % income for rent/mortgage: 28%

WU FENG PU SEGMENT: (Left-up) New development and new storm drainage. (Left-down) Typical four floors apartment almost in every new middle income development. (Right-up) Typical masonry concrete structure apartment. (Right-down) Commercial street mixed with living units upstairs.



3 TSAI LIO (GRIDIRON-GRID LAYOUT)

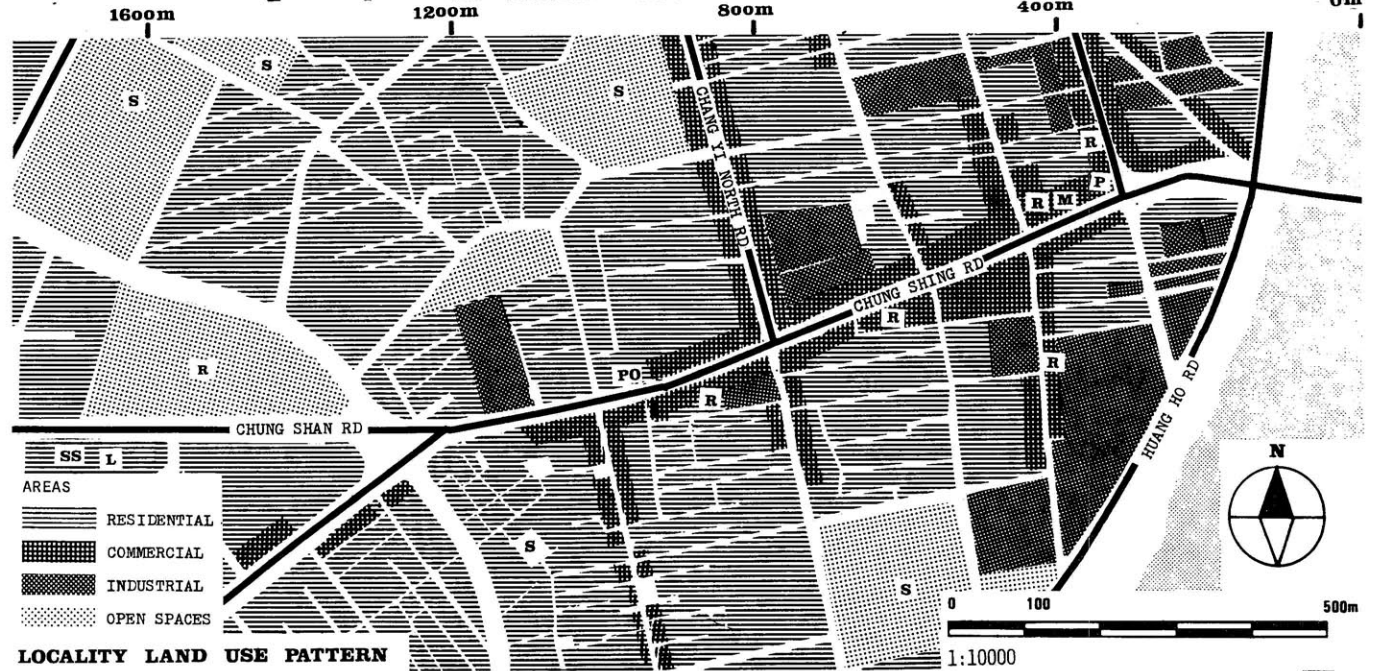
San-Chung city is located at the west side of the Tamsui river, Opposite the center of Taipei. The population was about 220,000 in 1970. Including Pan-Chiao city and the two other surrounding towns of Taipei, the whole area has reached a total of approximately 2.6 million population. They are centering in the Taipei basin and form the biggest metropolitan area on the island. About 250 years ago, San-Chung was suburban farm land of the first settlement of the Taipei basin - Hsinchung. But today, it becomes the major door to the capital Taipei city. It is a satellite city of low income groups with many varied factories. It is as important as another satellite town named Youn-Ho in absorbing middle income residents.

This segment was originally an unplanned settlement as the oldest center of this city developed from small business gathering places and small streets into a large irregular residential area. Because of its important location near the capital, the urban plan has been carried out in San-Chung city in order to control the increasing development. In the master plan, Tsai-Lio area belongs to the redevelopment area.

KEY

- Pk Parking
 - P Police
 - F Fire Department
 - S School
 - Ch Church
 - R Recreation
 - L Library
 - U University
 - H Health
 - PO Post Office
 - SS Social Services
 - M Market
 - C Cemetery
- Bus
 - Rapid Transit

SELECTED SEGMENT

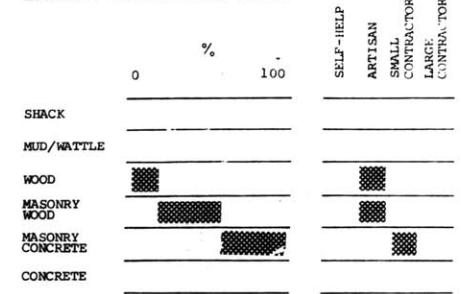


- SS L
- AREAS
- RESIDENTIAL
 - COMMERCIAL
 - INDUSTRIAL
 - OPEN SPACES

LOCALITY LAND USE PATTERN



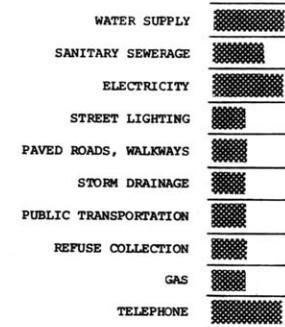
LOCALITY CONSTRUCTION TYPES



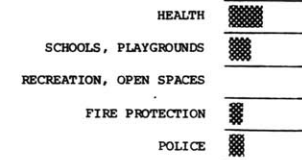
The chart shows (1) approximate percentage of each construction type within the total number of dwellings; and (2) building group that generally produces each type.

Quality of information: Approximate

LOCALITY UTILITIES AND SERVICES



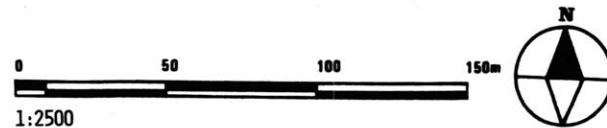
LOCALITY COMMUNITY FACILITIES



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

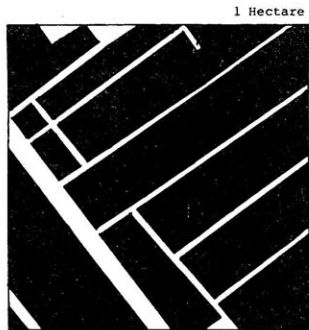
Quality of information: Approximate

LOCALITY SEGMENT PLAN



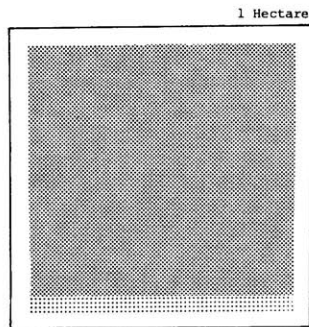
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LAND UTILIZATION DIAGRAMS

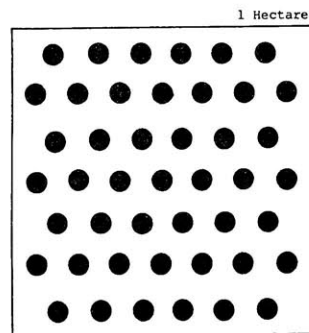


PATTERN

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

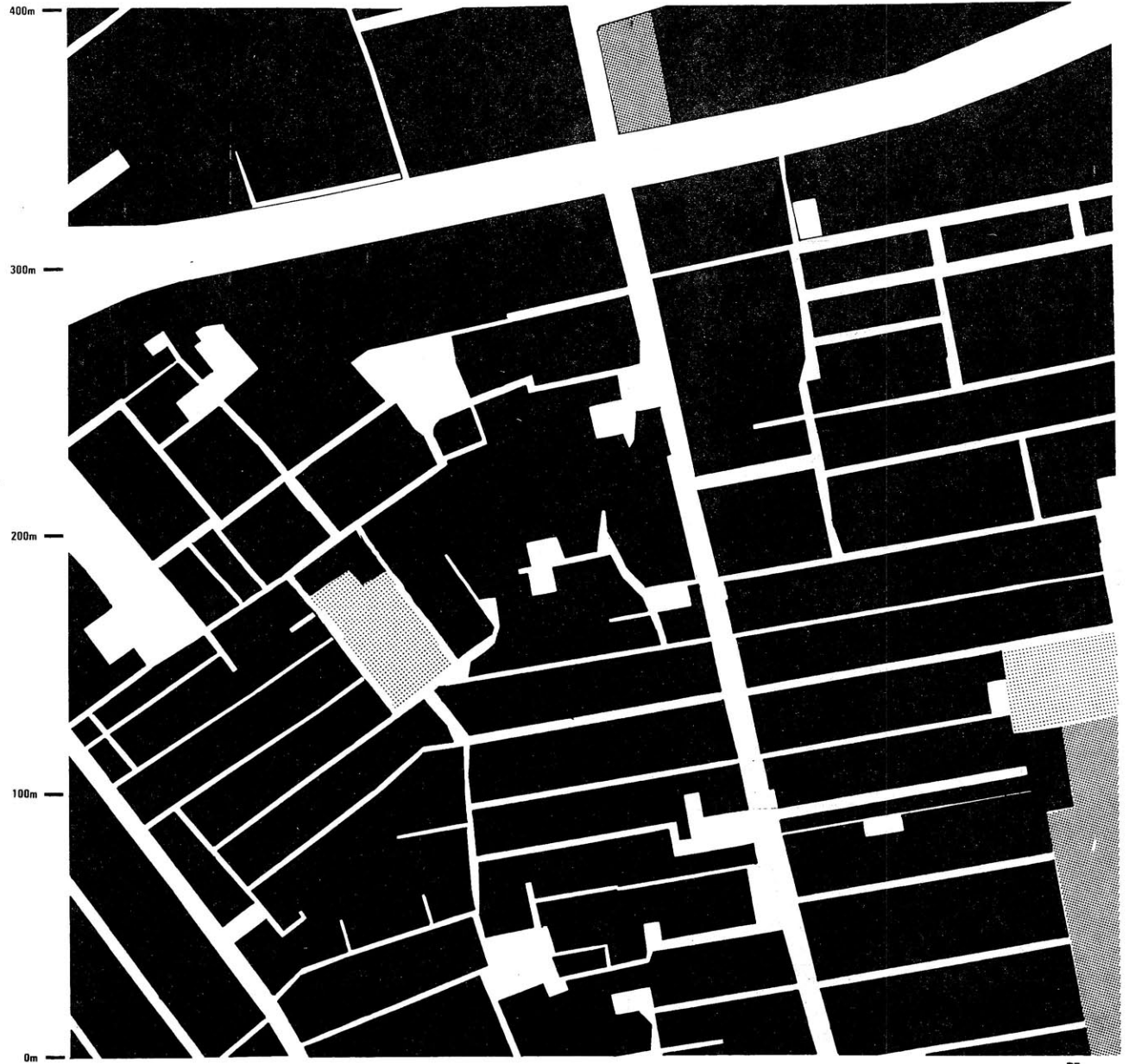


PERCENTAGES Streets/walkways 21.36%
Playgrounds 3.77%
Cluster Courts 74.87%
Dwellings/Lots

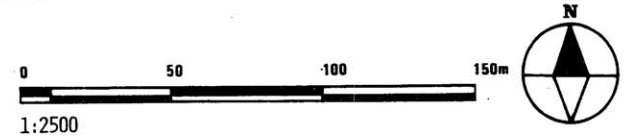


DENSITY Persons/Hectare 900

● 20 Persons



LOCALITY SEGMENT LAND UTILIZATION



LOCALITY BLOCK LAND UTILIZATION DATA

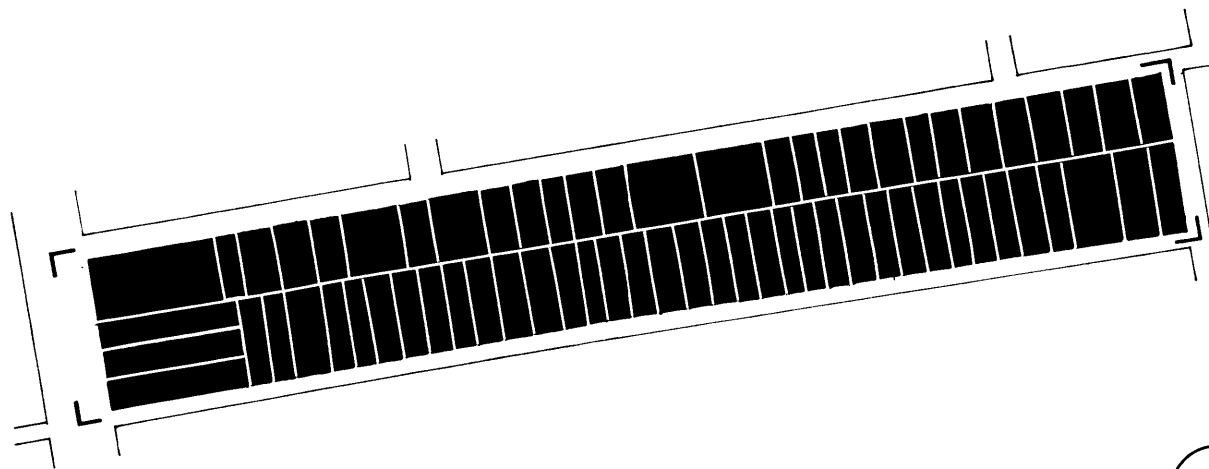
DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	1754	15	110
DWELLING UNITS	2590	15	162
PEOPLE	12950	15	810

AREAS	Hectares	Percentage
PUBLIC (streets, walkways, open spaces)	3.417	21.36
SEMI-PUBLIC (open spaces, schools, community centers)	0.603	3.77
PRIVATE (dwellings, shops, factories, lots)	11.980	74.87
SEMI-PRIVATE (cluster courts)		
TOTAL	16.00	100.00

NETWORK EFFICIENCY

$$R = \frac{\text{network length(circulation)}}{\text{areas served(circulation, lots)}} = 389 \text{ m/ha}$$

$$\text{AVERAGE LOT AREA} = 70 \text{ m}^2$$



1:1000

LOCALITY BLOCK PLAN

USDP DEFINITION USED IN EVALUATION

Gridiron blocks: These are blocks where the distances or intervals between lines of circulation and boundaries are determined by the dimensions of the lots, because they do not have lines of access. The most typical cases of the gridiron consist of rectangular blocks or curvilinear blocks.

Grid blocks: These are blocks where the distances or intervals between lines of circulation and boundaries are independent of the dimensions of the lots because the lots do have lines of access.

Public land: Public land is the urban area for circulation of pedestrians and vehicles. It includes streets, pedestrian lanes, open spaces. Users are crowd, unlimited number, anybody. Responsible agent is public sector with minimum legal control.

Semipublic land: Semipublic land is the urban area of community utilization. It includes open spaces, playing fields, schools, etc. Users are groups, limited number, community. Responsible agent is users or public sector with partial or complete legal, physical control.

Semiprivate land: Semiprivate land is the urban area of shared utilization held in condominium by a group. Users are groups, very limited number, owners, tenants, squatters. Responsible agent is co-users with partial or complete social, legal, physical control.

Private land: Private land is the urban area of residential, commercial, or small industries utilization. It includes lots and dwelling. Users are individuals, very limited number, owners, tenants, squatters. Responsible agent is individual user with complete legal physical control.

TSAI-LIO LAND REHABILITATION PROPOSAL

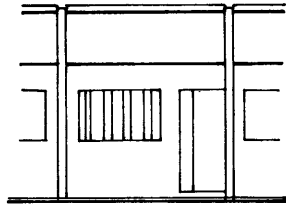
The Tsai-Lio renewal site is bounded by four streets: North side, Chung-Shing south road; East side, Ta-Tung south road; West side, Chung-Cheng road; South side, Tung-An street.

AREA OF THE SITE: 12.3 Has.

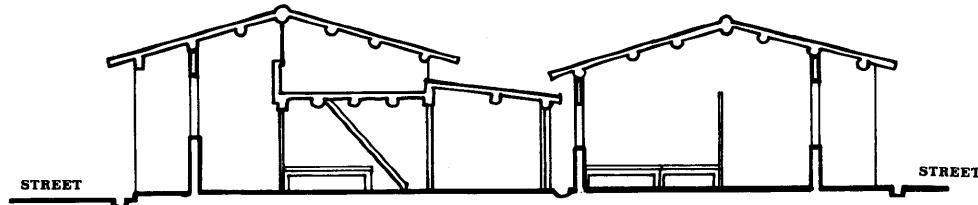
EXISTING DWELLING UNITS: 1,800 units, most are 1-2 floors wood and masonry structure.

EXISTING POPULATION: about 11,250 people.

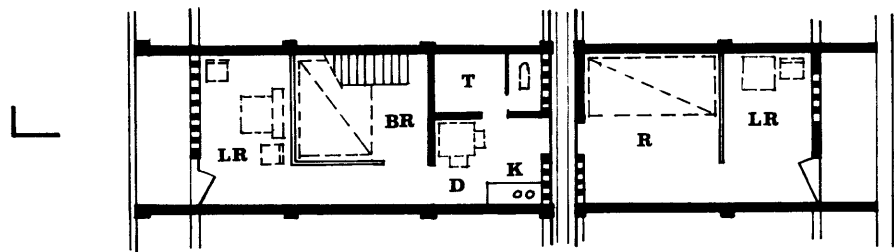
Land rehabilitation is a method to improve and exchange private land for public use in urban area. It is a more reasonable and moderate policy to manage urban work and to reduce constant pressure of land supplies for housing development in cities.



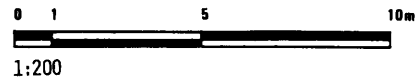
ELEVATION



SECTION



PLAN



TYPICAL DWELLING PLAN

1:200

CASE STUDY SOURCE

Locality Segment Plan: (accurate) Taipei County Government, City Planning Section.
 Locality Block Plan: (accurate) Taipei County Government, City Planning Section.
 Block Land Utilization: (accurate) Survey by Author in summer of 1975.
 Typical Dwelling: (accurate) Survey by Author in summer of 1975.
 Physical Data: (accurate)
 Social-Economic Data: (approximate)
 Photographs: Author
 General Informations: C.I.E.C.D.

PROCEDURE:

1. Survey of site boundary, land use and ownership survey
2. Land price evaluation
3. Land consolidation, land use design and distribution
4. Evaluation of sharing of construction benefits
5. Public exhibition and construction

BASIC ASSUMPTION:

1. Grid layout
2. Landowners who lose their part of land to public use have the priorities to buy, rent or lease the housing units built by government in this area.
3. The land value specification will be based on five groups:
 - A-main commercial
 - B-commercial
 - C-high density
 - D-middle density
 - E-school, open space and playground
4. There are different land uses for different groups as following:
 - a.public housing for original people who lose land and housing units
 - b.public housing under government management for selling or rent
 - c.private housing development
 - d.commercial land development
 - e.commercial land controlled by government for rent
 - f.open space and school developed by government

PLANNING TARGETS:

Total: 12.3 Has.
 Residential area: 57%
 open space and facilities: 25%
 Circulation road: 18%
 Target population: 9,000
 Gross density: 750 p/Ha.
 Net density: 1,300 p/Ha.
 Coverage rate: 0.6
 Floor area ratio: 2.4
 Commercial frontage: 1,600 m
 Persons/unit: 5
 Housing units: 1,800 units

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)

PHYSICAL DATA

(related to dwelling and land)

DWELLING UNIT

type: ROW-HOUSE
 area (sq m): 44
 tenure: LEGAL RENTAL
 OWNERSHIP

LAND/LOT

utilization: PRIVATE
 area (sq m): 44
 tenure: LEGAL RENTAL
 OWNERSHIP

DWELLING

location: CITY CENTER
 type: ROW HOUSE
 number of floors: 1
 utilization: MULTIPLE
 physical state: FAIR

DWELLING DEVELOPMENT

mode: INCREMENTAL
 developer: PRIVATE
 builder: SMALL CONTRACTOR
 construction type: WOOD-MASONRY-CONCRETE
 year of construction: 1945

MATERIALS

foundation: CONCRETE
 floors: WOOD-CONCRETE
 walls: BRICK
 roof: WOOD

DWELLING FACILITIES

wc: 1
 shower: 1
 kitchen: 1
 rooms: 2
 other: SHOP

SOCIO-ECONOMIC DATA

(related to user)

GENERAL: SOCIAL

user's ethnic origin: FU KIEN
 place of birth: TAIWAN
 education level: HIGH SCHOOL

NUMBER OF USERS

married: 2
 single: 0
 children: 3
 total: 5

MIGRATION PATTERN

number of moves: 1
 rural - urban: 1945
 urban - urban: -
 urban - rural: -
 why came to urban area: EMPLOYMENT

GENERAL: ECONOMIC

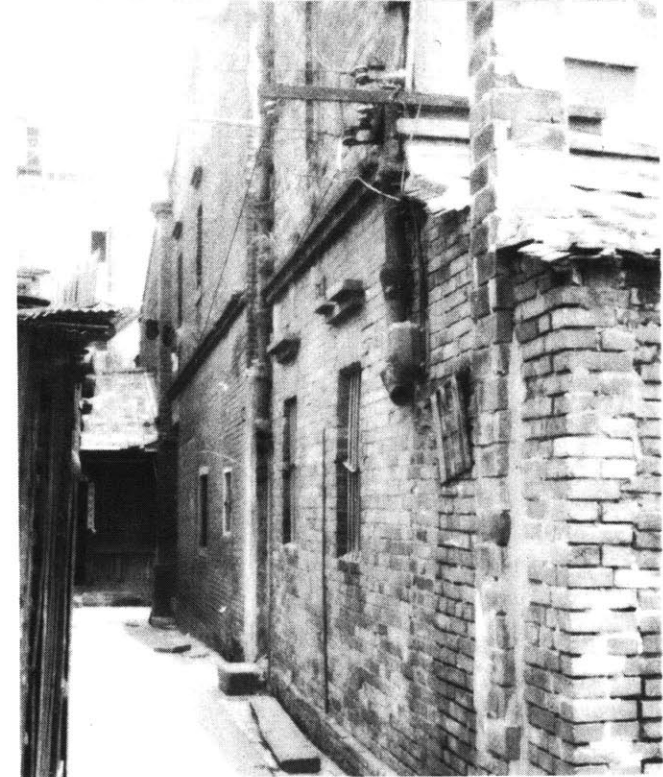
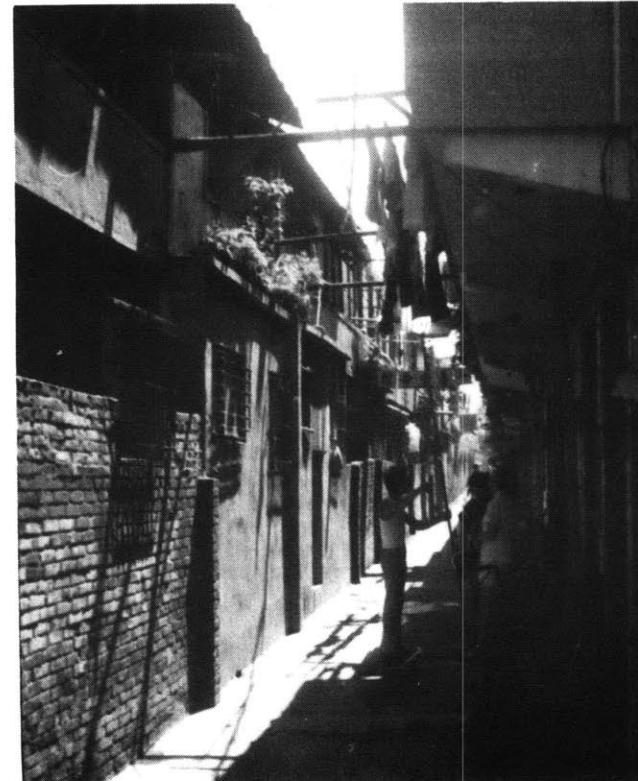
user's income group: LOW
 employment: WORKER
 distance to work: 10 KM
 mode of travel: PUBLIC
 TRANSPORTATION

COSTS

dwelling unit: US\$ 500
 land - market value: N.A.

DWELLING UNIT PAYMENTS

financing: PRIVATE
 rent/mortgage: N.A.
 % income for rent/mortgage: 20%



TSAI LIO SEGMENT: (Left-Up) Typical two story row-house in this area. (Left-down) Back fire lane is also entrance access for the other side row-house. (Right-up) Typical old brick structure in this area. (Right-down) Major circulation street.

4 LUNG MENG (GRIDIRON LAYOUT)

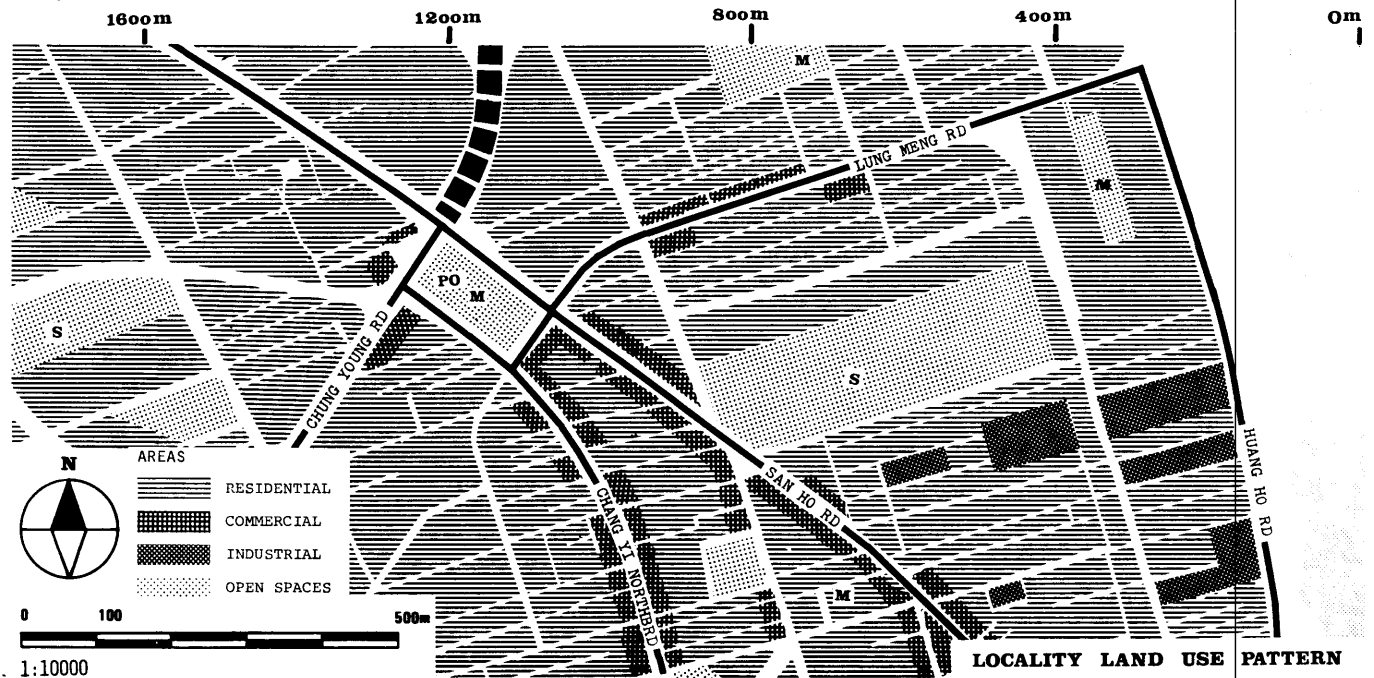
Lung-Meng segment is one of the most severe speculative developments in San-Chung city. It started 15 years ago and was among the oldest one of this kind. Another speculative site with 400m - 500m long, narrow street layout is located at the northern city border of this segment. The former occurred before master plan control and the latter occurred outside of the city's master plan control.

The convenient subdivision of old narrow stripes of farmland to equal small pieces of building lots cause the long row-house developments. But new markets and open spaces in the new urban master plan had been reserved or the whole density situation and safety consideration would have been worse than in the northern part of the segment. The newest provincial high way passes through the northern border of this segment and a major road in the city plan penetrates through the segment bring in much new developments to this site. A new sewer and improved pavements aim to upgrade this residential area.

KEY

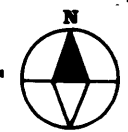
- Pk Parking
- P Police
- F Fire Department
- S School
- Ch Church
- R Recreation
- L Library
- U University
- H Health
- PO Post Office
- SS Social Services
- M Market
- C Cemetery
- Bus
- Rapid Transit

SELECTED SEGMENT

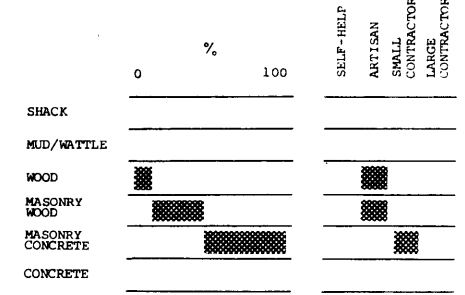




LOCALITY SEGMENT PLAN



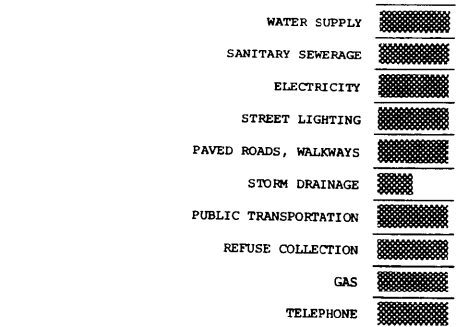
LOCALITY CONSTRUCTION TYPES



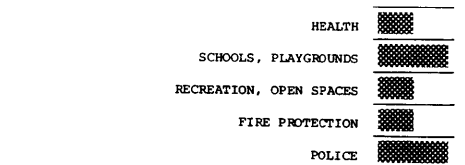
The chart shows (1) approximate percentage of each construction type within the total number of dwellings; and (2) building group that generally produces each type.

Quality of information: Approximate

LOCALITY UTILITIES AND SERVICES



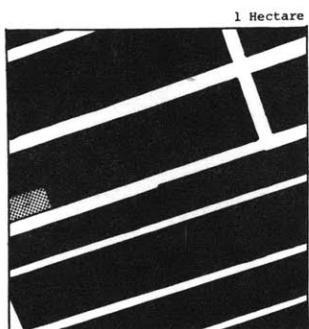
LOCALITY COMMUNITY FACILITIES



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

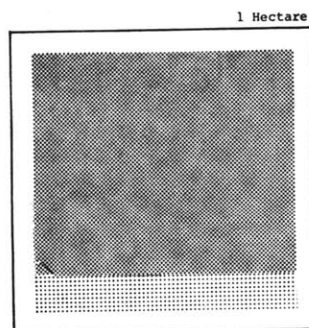
Quality of information: Approximate

LAND UTILIZATION DIAGRAMS

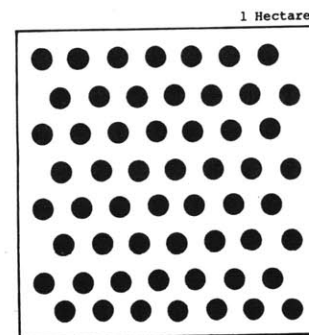


PATTERN

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

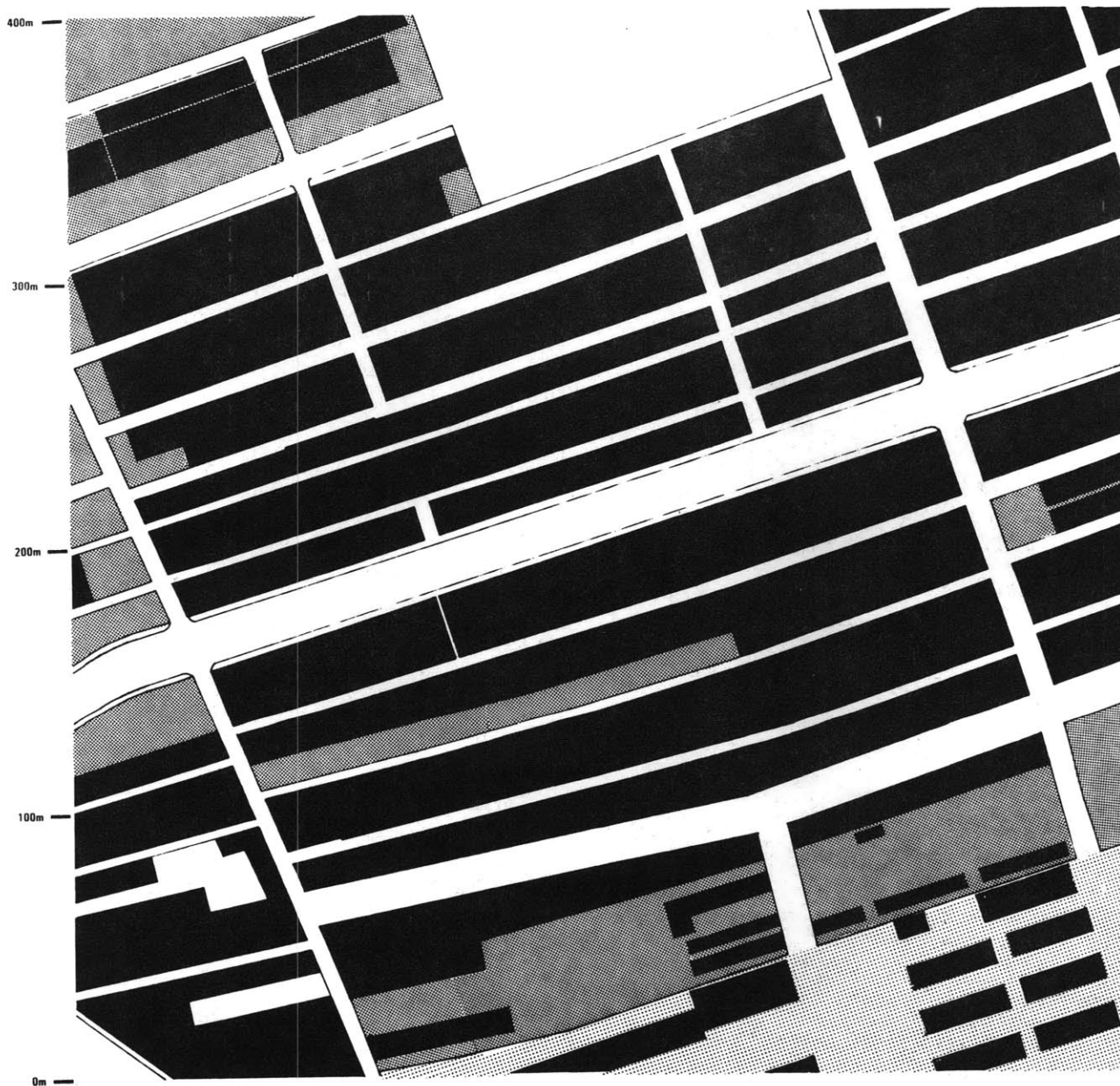


PERCENTAGES Streets/walkways 24.30%
 Playgrounds 10.71%
 Cluster Courts
 Dwellings/Lots 64.98%



DENSITY Persons/Hectare 1120

● 20 Persons

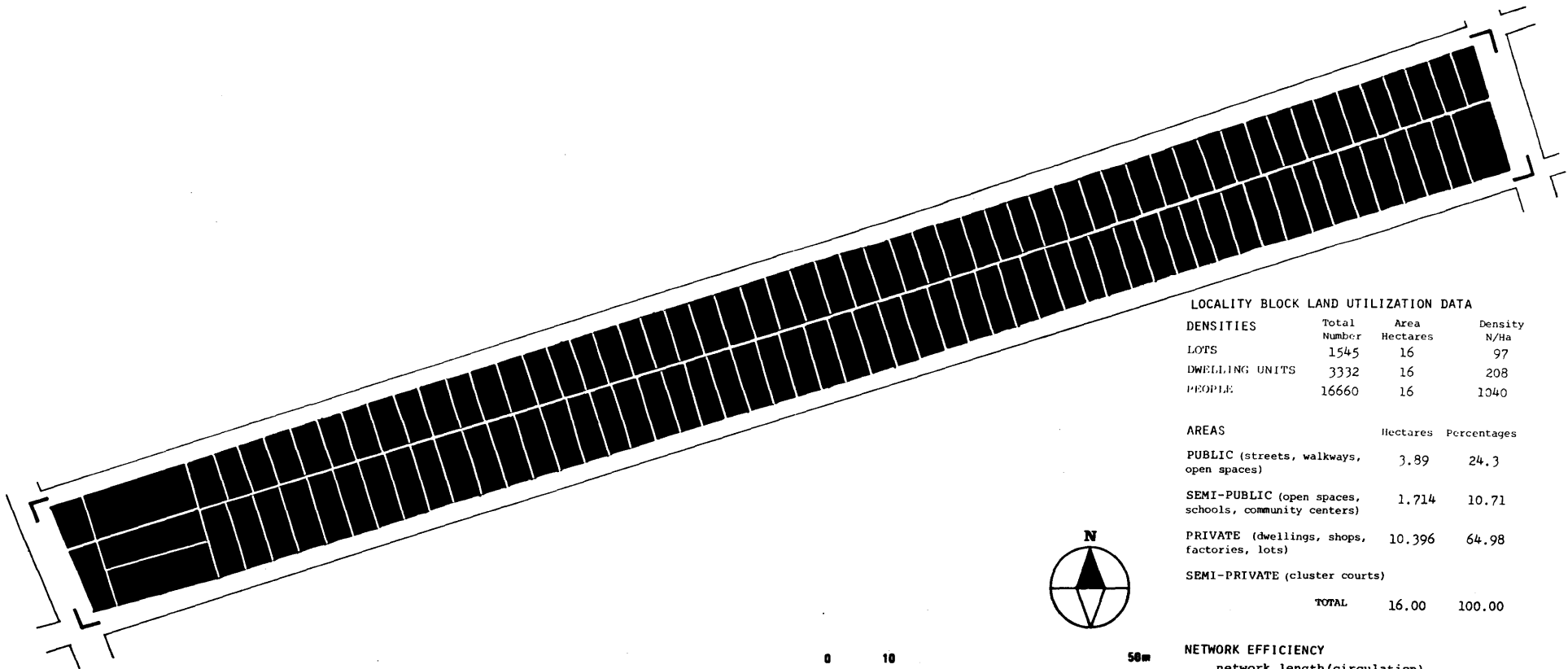


LOCALITY SEGMENT LAND UTILIZATION



Protected in the future by the newly approved flood control and protection scheme with huge budget after many years' study and evaluation, this area and San-Chung city can survive in typhoon season but its urbanization and land speculation in this city will be slowed down due to the Linko new town constructed in the near future.

Segment of thoroughly compulsory long distance between street outlets like this can be meaningful but its fire safety and contingent crowdness are the major disadvantages discouraging further development.



LOCALITY BLOCK PLAN

LOCALITY BLOCK LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	1545	16	97
DWELLING UNITS	3332	16	208
PEOPLE	16660	16	1040

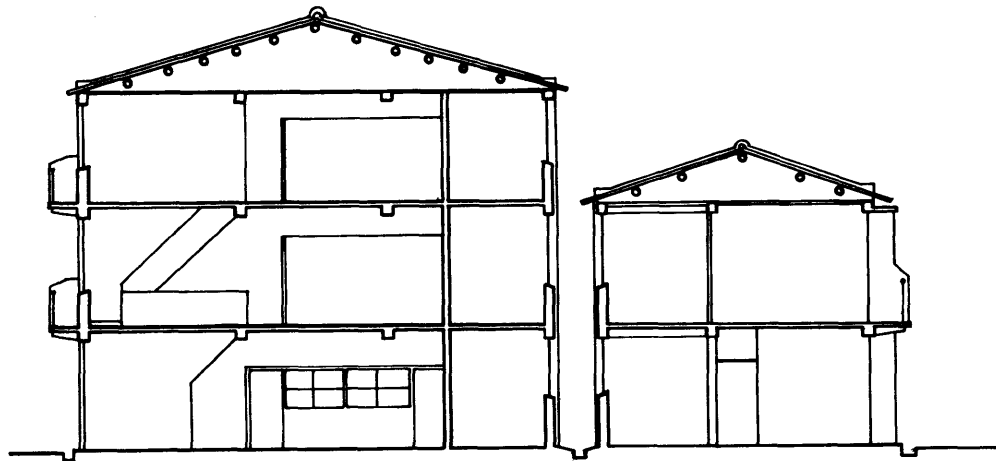
AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	3.89	24.3
SEMI-PUBLIC (open spaces, schools, community centers)	1.714	10.71
PRIVATE (dwellings, shops, factories, lots)	10.396	64.98
SEMI-PRIVATE (cluster courts)		
TOTAL	16.00	100.00



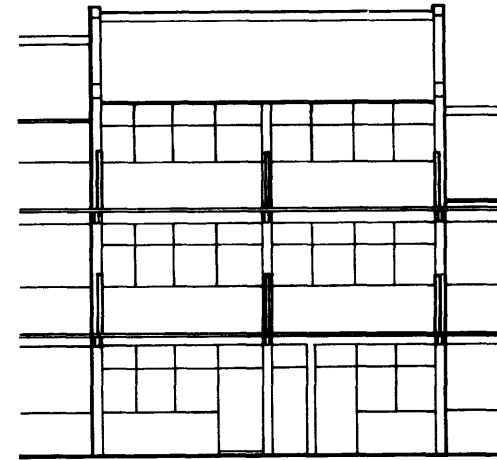
NETWORK EFFICIENCY

$$R = \frac{\text{network length(circulation)}}{\text{areas served(circulation, lots)}} = 332 \text{ m/Ha}$$

$$\text{AVERAGE LOT AREA} = 58.3 \text{ m}^2$$



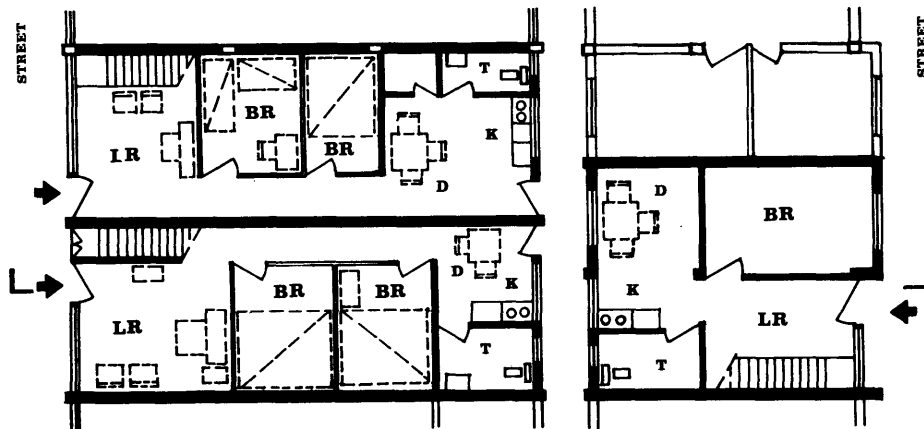
SECTION



ELEVATION

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)

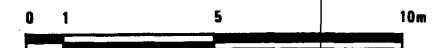


PLAN

TYPICAL DWELLING

CASE STUDY SOURCE

- Locality Segment Plan: (accurate) Taipei County Government, City Planning Section.
- Locality Block Plan: (accurate) Taipei County Government, City Planning Section.
- Block Land Utilization: (accurate) Survey by Author in summer of 1975.
- Typical Dwelling: (accurate) Survey by Author in summer of 1975.
- Physical Data: (accurate)
- Social-Economic Data: (approximate)
- Photographs: Author
- General Informations: C.I.E.C.D.



1:200

PHYSICAL DATA

(related to dwelling and land)

DWELLING UNIT

type: ROW-HOUSE
 area (sq m): 54
 tenure: LEGAL RENTAL OWNERSHIP

LAND/LOT

utilization: PRIVATE
 area (sq m): 58
 tenure: LEGAL RENTAL OWNERSHIP

DWELLING

location: CITY CENTER
 type: ROW-HOUSE
 number of floors: 3
 utilization: MULTIPLE
 physical state: FAIR

DWELLING DEVELOPMENT

mode: INSTANT
 developer: PRIVATE
 builder: SMALL CONTRACTOR
 construction type: MASONRY-CONCRETE
 year of construction: 1960

MATERIALS

foundation: CONCRETE
 floors: CONCRETE
 walls: BRICK
 roof: WOOD

DWELLING FACILITIES

wc: 1
 shower: 1
 kitchen: 1
 rooms: 2
 other:

SOCIO-ECONOMIC DATA

(related to user)

GENERAL: SOCIAL

user's ethnic origin: FU KIEN
 place of birth: TAIWAN
 education level: HIGH SCHOOL

NUMBER OF USERS

married: 2
 single: 0
 children: 3
 total: 5

MIGRATION PATTERN

number of moves: 1
 rural - urban: 1940
 urban - urban: -
 urban - rural: -

why came to urban area: EMPLOYMENT

GENERAL: ECONOMIC

user's income group: LOW
 employment: WORKER
 distance to work: 10 KM
 mode of travel: PUBLIC

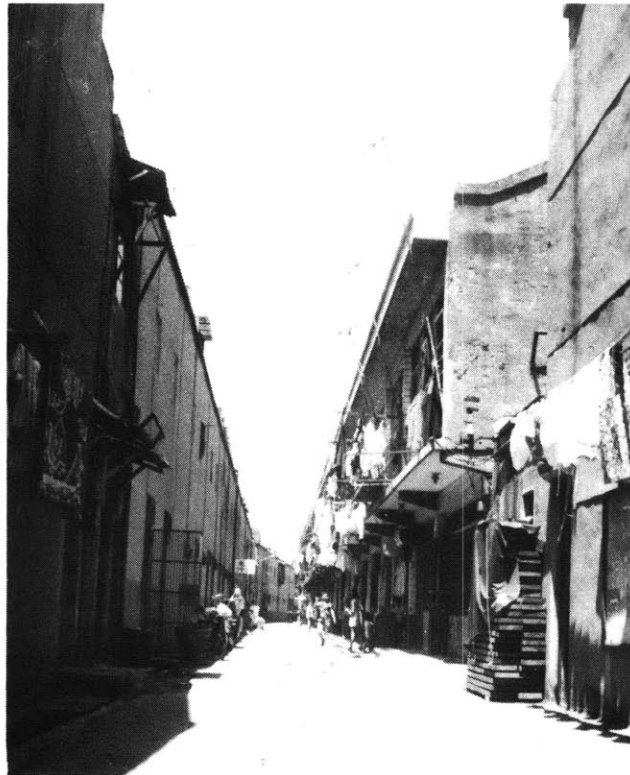
TRANSPORTATION

COSTS

dwelling unit: US\$ 1,000
 land - market value: N.A.

DWELLING UNIT PAYMENTS

financing: PRIVATE
 rent/mortgage: N.A.
 % income for rent/mortgage: 20%



LUNG MENG SEGMENT: (Left-up) 350m long row-house.
 (Left-down) The access of neighborhood. (Right-up)
 The access of neighborhood. (Right-down) Wasted farm
 land, speculative housing and its back yard expansion.

EVALUATIONS

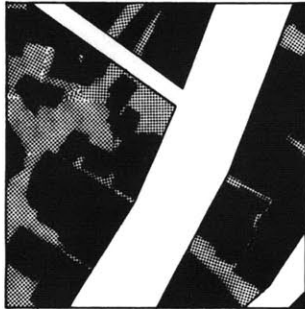
LAND UTILIZATION: PATTERNS, PERCENTAGES, DENSITIES

LOCALITY	DWELLING TYPE	FLOORS	CIRCU- LATION LENGTH	SERVED AREA	TOTAL AREA	UNITS DENSI- TY	UNIT AREA PERSON	AREA UNIT	GROSS DENSI- TY	NET DENSI- TY	P. DWELL- ing
			M	HAS.	HAS.	UNITS HAS.	M ²	M ²	P/HA.	P/HA.	P.
KWANG-JAN	Row-House Houses	2-3	2992	12.4	16	118	10	50	650	1040	5
NO.3	Apartment	5	930	1.43	16	544	8	40	2720	2720	5
WU-FENG-PU	Apartment	4	4402	11.3	16	180	16.4	90	990	1438	5.5
TSAI-LIO	Row-House	1-2	6210	12.58	16	162	8.8	44	810	1080	5
LUNG-MENG	Apartment	2-3	5316	12.11	16	208	9.8	54	1145	1760	5.5

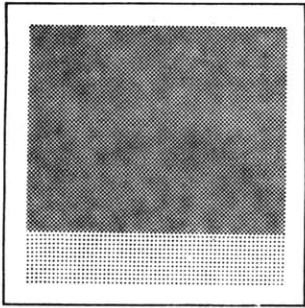
1 KWANG JAN

PRIVATE LOW AND MIDDLE LOW ROWHOUSE

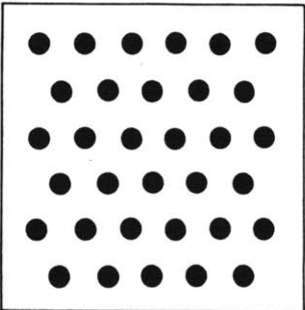
It is one of the oldest and unnoticed area in the city with new widened streets and drainage system that future more renewal in this area is expected.



PATTERN



PERCENTAGES Streets/Walkways 22.52%
Playgrounds 15.23%
Cluster Courts
Dwellings/Lots 62.25%

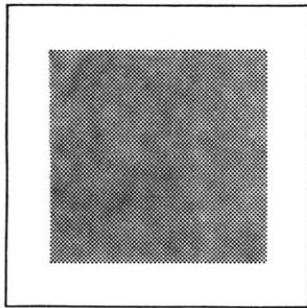
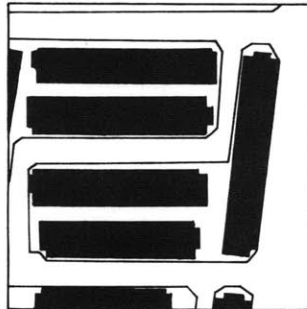


DENSITIES Persons/Hectare 660

2 NO. 3

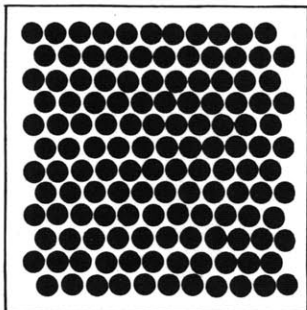
PUBLIC LOW INCOME APARTMENT

This is public resettlement housing. Grid layout with five floors apartment has the highest density in this area. Land utilization is efficient but unit size is too small.



49%

51%

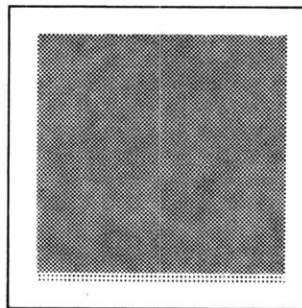
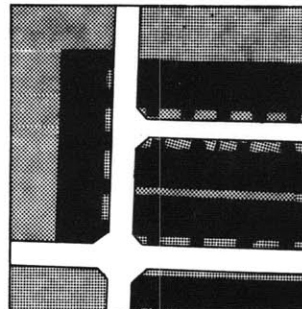


2640 p/Ha

3 WU FENG PU

PRIVATE MIDDLE INCOME APARTMENT

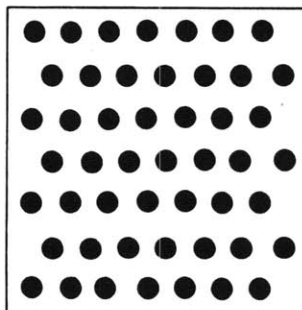
The layout of most new land subdivision in this city are like this-gridiron. Lot configuration is 4:9 or 4:10. Block size from 1:3 to 1:3.5 or 42m x 144m to 50m x 150m.



29.31%

1.87%

68.82%

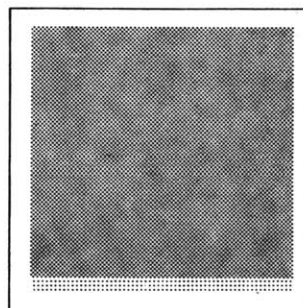
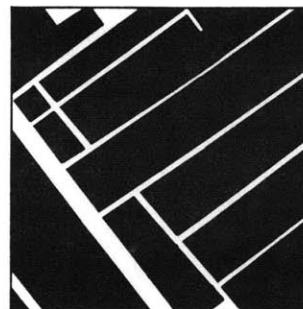


980 p/Ha

4 TSAI LIO

PRIVATE LOW INCOME ROWHOUSE/HOUSES

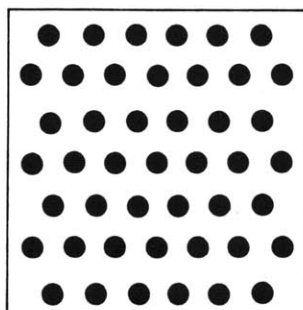
1-2 floors row house with minimum width of access. This grid layout is inefficient in land use and will be disappearing in the future through renewal. Lot configuration from 4:10 to 4:18. Average size is 40 m².



21.36%

3.77%

74.87%

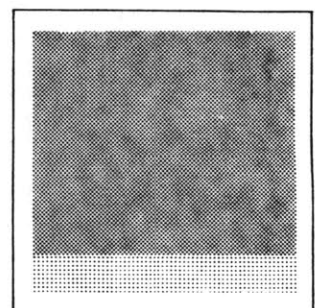
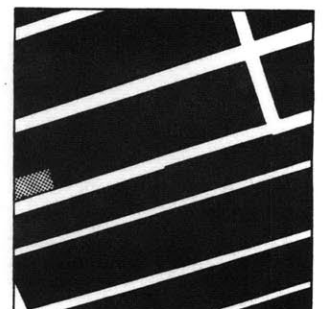


900 p/Ha

5 LUNG MENG

PRIVATE LOW/MIDDLE LOW INCOME ROWHOUSE/APARTMENT

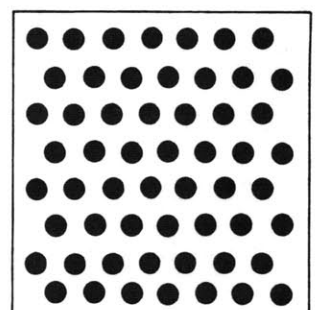
Lot configuration from 4:10 to 4:16. Lot size average from 40 m² to 200 m². Block size is 1:12 with gridiron layout. This kind developments will be stationary for a short time.



24.30%

10.71%

64.98%



1120 p/Ha

EVALUATIONS

PHYSICAL DATA MATRIX

The physical data of the five case studies of dwelling environments existing in the Taipei urban area is summarized in the physical data matrix and in the community facilities/utilities/services matrix. The matrix permits:

- A comprehensive view of the spectrum of low income dwelling types.
- A comparison and determination of trends and pattern.

The second matrix illustrates the approximate availability of community facilities, utilities and services in the five low income dwelling environments. Three levels are indicated as follows:

- No provision at all
- Limited or occasional
- Adequate or normal

Category	Population per Category	% of Total Population	LOCALITIES	USER	DWELLING UNIT					LAND/LOT			DWELLING					DWELLING DEVELOPMENT					
				5 Income	6 Type	7 Area	8 Tenure	9 Rent/Mort.	10 Utilization	11 Area	12 Tenure	13 Location	14 Type	15 No. Floors	16 Utilization	17 Phys. State	18 Mode	19 Developer	20 Builder	21 Construction Type	22 Date	23 Den.	
				Very Low Low Moderately Low Middle High	Shanty Room Apartment House	50m ² or less 51 - 100m ² 101m ² or more	Legal Rental Legal Ownership	20% or less of income 21% or more of income	Public Semi-public Private Semi-private	2 m	Extralegal: rental Extralegal: ownership Legal: rental Legal: ownership	City center Inner Ring Periphery	Detached Semi-Detached Row/Grouped Walk-up High-rise	1 2 3 or more	Single Multiple	Bad Fair Good	Increment Instant	Popular Public Private	Self-Help Artisan Small Contractor Large contractor	Shack Mud and Wattle Wood Masonry/Wood Concrete/Concrete	Year of construction	People/Ha	Locality
A	9,430	17	1. KWANG JAN	■	■	NA	■	NA	■	NA	■	■	■	■	■	■	■	■	■	■	1945	660	1
	4,550		2. NO. 3	■	■	■	■	■	■	46.7	■	■	■	■	■	■	■	■	■	■	1975	2640	2
	15,840	29	3. WU FENG PU	■	■	■	■	■	■	153	■	■	■	■	■	■	■	■	■	■	1974	980	3
B	12,950	23.6	4. TSAI LIO	■	■	■	■	NA	■	68.3	■	■	■	■	■	■	■	■	■	■	1945	900	4
	16,660	30.4	5. LUNG MENG	■	■	■	■	■	■	67.3	■	■	■	■	■	■	■	■	■	■	1960	1120	5

COMMUNITY FACILITIES, UTILITIES/SERVICES MATRIX

Category	Population per Category	% of Total Population	LOCALITIES	COMMUNITY FACILITIES					UTILITIES AND SERVICES										Street lighting	Locality				
				Police	Fire Protection	Health	Schools, Playgrounds	Recreation	Water	Sewerage	Storm Drainage	Electricity	Gas	Refuse Collection	Public Transportation	Paved Roads, Walkways	telephone							
A	9,430	17	1. KWANG JAN	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1
	4,550		2. NO. 3	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	2
	15,840	29	3. WU FENG PU	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	3
B	12,950	23.6	4. TSAI LIO	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	4
	16,660	30.4	5. LUNG MENG	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	5

Photo: Lung Meng segment



PROPOSED PROJECT

140 HIGH-LAND

PUBLIC HOUSING

The growth rate in Taiwan region was 1.8% in 1975, changing from 2.1% in 1971 and from 1.9% in 1973. It means an increase of 300,000 people annually. Every year the demand of new housing units due to population increase amounts to approximately 50,000 units. Moderate and low income people can not afford to buy and build themselves and need the help from the government. So, Legislative Yuan passed the Public Housing Laws in July, 1975. This law is for the purpose of planning jointly and simultaneously housing construction and management. The major parts include a housing financing foundation, loans, public land for housing community, organization, land prices, taxes, mortgage, ownership and payments. All public housing here means built by the government. All housing would be multistories up to 16 floors.

From 1976-1982, the Taiwan government has long range plans to build 144,726 units in five major cities. It includes 30,000 units in Taipei city and 110,000 units distributed in other cities. The nearest goal is to build 19,160 units in two years as the first stage: 4,255 units in Taipei city, 14,408 units in the province and 500 units in outside islands. The total expenditure amounts to U.S. \$160,000,000. In the first year, central bank support U.S. \$16,200,000, the other part comes from provincial lending institutions, city banks and local governments. Each unit can have a 80% loan but not over U.S. \$5,000 total, and increase \$500 annually up to a total of \$7,000 in 1981.

URBAN POLICIES

The 1975 national population survey in Taiwan showed the average size of residence was 5.28 persons/family and 64.85 m²/housing unit. The average usage of residence was 87.55% only for family living and 12.17% having mixed usage like shops. Among them, 70.13% owned their own housing units; 19.27% rent or mortgage; 9.43% allocated and 1.17% other kinds. Except the new public housing law, there are some other important policies in order to control and to match economical development.

1) For the purpose of avoiding urban land monopoly, speculation and to improve land use, the government is beginning to prescribe totally the land price and implement equalization of land rights from 1976. For example, limitation of maximum size of land ownership, its tax and size limitation for selling and buying are studied. Complete control is expected to be achieved within two years.

2) The government with welfare organizations together helps very low income people to get technical training and coordinated with military technical support to help them build their own houses, sizes range from 27 m² to 40 m². After four years under this plan up until now, 7,700 units have been built and 23,000 units are to be built in the future.

3) As previous mentioned first stage provincial 14,408 units package, special purpose housing will be built except in cities as following: 1,750 units for labor workers, 435 units for farmers, 560 units for fishermen, 200 units for mining workers, 50 units for salt-industry workers, 2,716 units for general people in different county, 400 units for high-way resettlement, and 438 units for di-

saster reconstruction. This part project is different from concentrated built housing in cities and projects located in Taipei city. Small amount due to limited resource is characterized by its diversification.

4) Industrial park development till now amounts to a total of 7,115 has., located in 42 different places on the island. Already finished among them are total 3,384 has. and 3,751 has. are under construction now. Another 1,652 has. are prepared to be built in the future. Those parks accommodate chemical, wood, automobil, paper, special farm industries and export processing.

5) Coordinated with regional development planning, the government plans to develop five new towns at the following sites:

	first stage	total
Linko plateau	388 Has.	1,642 Has.
Nankan	200 Has.	3,260 Has.
Taichung harbor	84 Has.	17,700 Has.
Tapingting	284 Has.	2,425 Has.
Chenchinghu	80 Has.	80 Has.

The total area of these five new towns is 27,100 Has., proposed to accommodate 1,150,000 population. First stage includes residential, industrial and commercial areas of total 2,500 Has. and aims to accommodate 700,000 population.

It has been presented in previous case studies the urban sprawl and situations of high density. New town development can solve parts of the problem of backward public facilities in old cities and its overcrowded living environments and this kind project is the first in Taiwan in need of coordination from every aspects mentioned above. Under so many strong policies, the Taipei city government started its housing development with many scheme options. The following project is proposed under this requirement.

URBAN RENEWAL

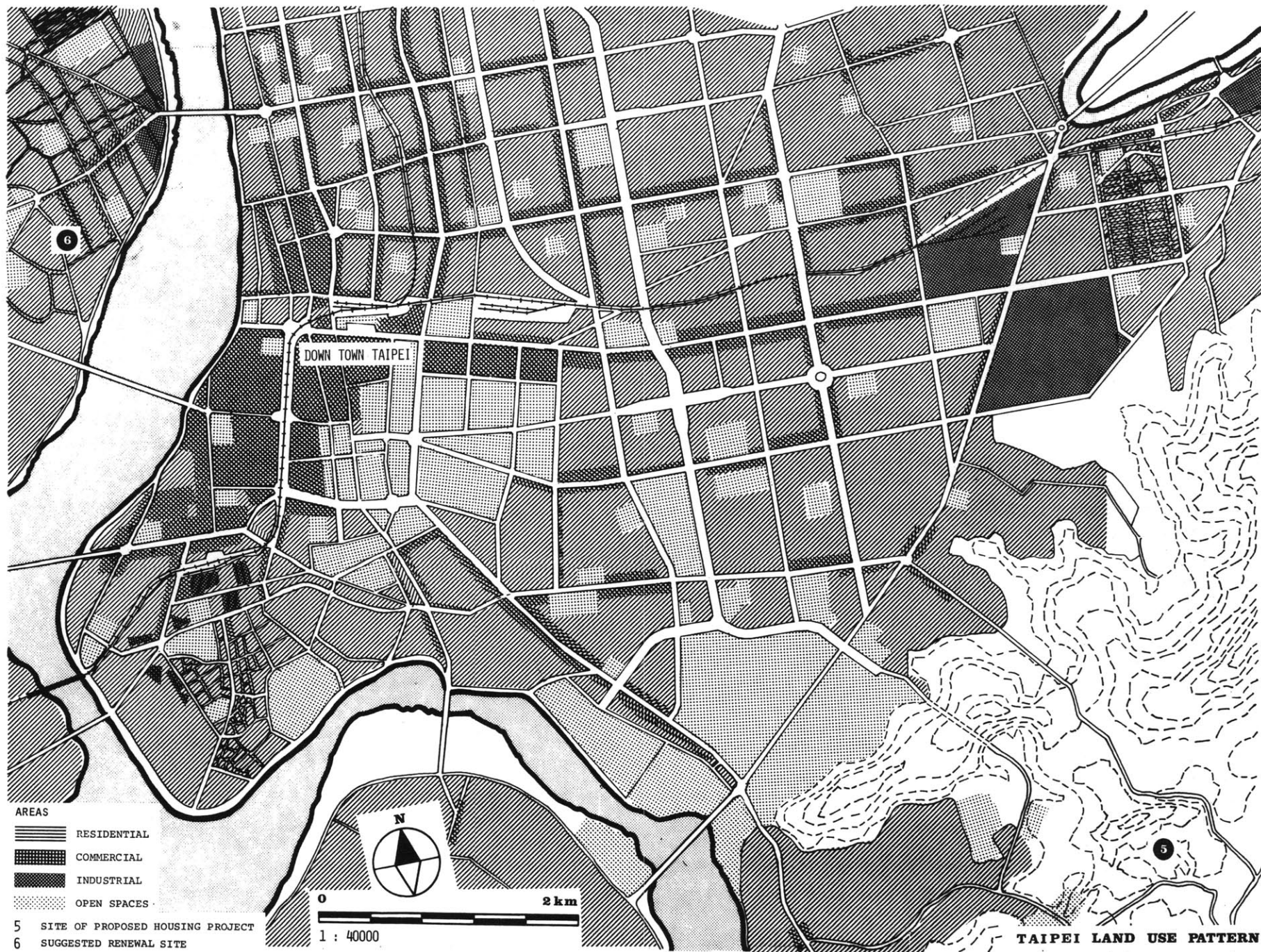
The gross density of Taipei city averages 74 p/Ha. The population is already 2,050,000 with a 4.5% (35,000 p/year) annual population increase in the city and urbanization in surrounding three major satellite cities. This pressure causes urban sprawl and deterioration of public facilities. The land pressure are further increased by floods which result in invasions of suburban settlements during the typhoon season. This is waste of land and difficult for utilities investment. The maximum goal of Taipei city is 3,500,000 population. Highly efficient land use is the major concern, for example, multi-stories for all public housing up to a maximum of 16 stories.

The city government deals with this situation through community renewal or through new developments. To purchase sites for public housing from outside of the city was agreed within the government and the scheme of high rise renewal plans of old military dependent villages due to the low cost and government ownership. Redevelopment is proposed for Tsai-Lio region in San-Chung city. It is the oldest deteriorating area. Public housing is proposed not only for resettlement of existing population but also to accept future demands of urbanization. Coordinating with landowners and occupying people to renew the whole area for better housing for themselves, government can benefits at the same time a new school site actually needed in city master plan and a better commercial area for small business. Financial shemes and compensation plans should be studied carefully to guide this renewal project and physical design.

NEW DEVELOPMENT

The city's rapid growth has touched the surrounding natural boundary. Developing of these sloping mountain areas can help alleviate the problem of land shortage due to low land cost and can help renewal plan in central city. Considerations in changing city's master plan like soil-conservation is as important as financing, purchasing, scheduling and method of construction in this kind development. Though some code control public safety like urban planning law, city building code, housing enforcement by-law, housing planning criteria, there are still potential to check new ways on sloping development.

The proposed site here - 140 high land was chosen by government to be developed to a residential area from 1978 to 1981 among the second 25,500 units package of housing goal. The aims of my proposal is to find alternative in providing suitable shelter with possibilities of high percentage of land use and expansion in units and groupings. Detail considerations are allocated on public and private responsibilities in maintenance and management in the future, utilities services and choice base of building types by government. Public agency has the responsibility to choose suitable rental and buyer types in planning stage, and investment should be tightly controled in channelling site engineering work. Because construction cost trade-offs between standards and designs in every aspect finally will be shared by those that truly need the help. Also self-sufficient neighborhood and employment problems should be given detail consideration within the physical layout.



PLANNING POLICIES, GOALS

This project contains residential areas, commercial areas, elementary school, community center and market as a self-sufficient neighborhood with water, electricity and other utility services.

PRIMARY USE: RESIDENTIAL

There will be about 18,000 people that will live on the 54 Has. of land. The gross density target is 350 P/Ha. Further development can increase the gross density to 400 P/Ha. maximum according to site conditions, capacity of school and requirements of open space.

TARGET INCOME GROUPS: MIDDLE-LOW AND LOW

The project intends to build public housing units for subsidized middle-low and low income groups. The choice of subsidized housing units depends on the family size from 4 to 6² people and is based on the assumption of 13 m²/person. For the purpose of future development, groups like workers in service, farming, recreation; workers of administration, manufacturing, retailing and construction; employees of business, education and government are expected to mix with middle and high income groups by selling part of units at the market rate.

INTENSITIES OF LAND USE: HIGH NET DENSITY

Due to the characteristics of the site topography and to minimize earth work in building construction, the land use is highly concentrated. The net density is about 1,600 P/Ha. in the residential area but the gross density including school land, natural reserved land and major circulation is as low as 350 P/Ha. These two figures reflect special site con-

ditions and potentials of land use.

LAND TENURE: PRIVATE OWNERSHIP

Government will buy the land first. After land consolidation, land use planning and land subdivision, the land with the housing units will be sold to subsidized families and on the market to minimize government's maintenance responsibility.

FINANCING: PUBLIC

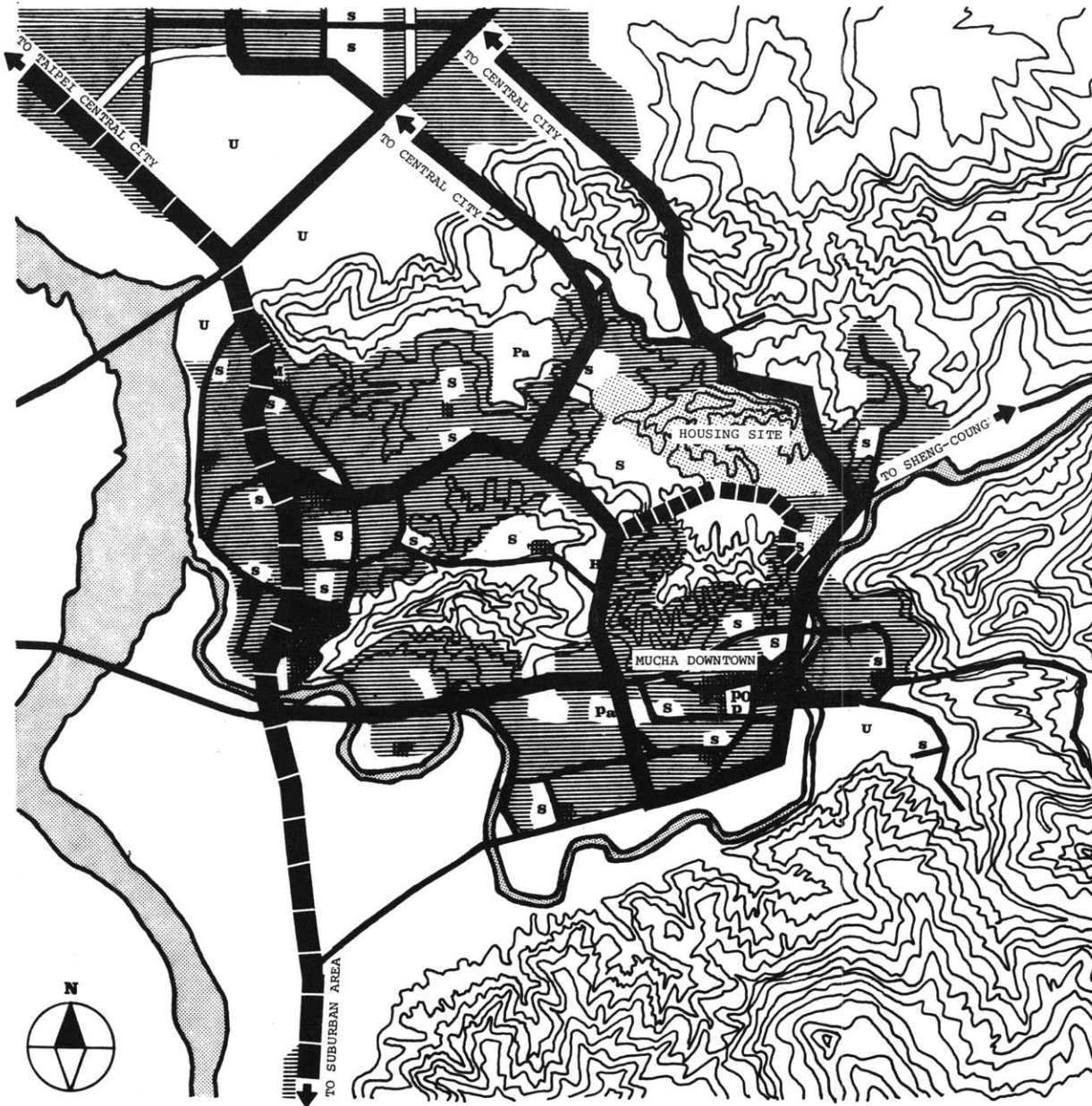
Government's investment in buying land, site development, construction of buildings, markets, public utilities, roads, parking lots, and playgrounds are expected to be recovered from: selling the housing units; shops and market units; land for commercial development; tax on housing units sold at the open market; and utilities payments.

CIRCULATION NETWORK: BUS SYSTEM AND PEDESTRIAN

ACCESS. A bus system is suggested that will circulate to the central area and serve the upper section. This circulation road is 20m wide in the residential area and 12m wide in other parts with no side-walks. The through road connecting to the central city will be widened to 15m. Pedestrian walkways connect to different areas and within the entrance floor of buildings.

DEVELOPMENT MODE: INSTANT

The instant development of this project to reduce shortages of low-income housing units is contained in the annual housing goals of the city government. Time and budget are limited therefore new construction methods and management are need to be studied.



It is original a preservation area of agriculture and woods. Four meters wide existing road connects with Mucha town and the distance to its commercial area is 1.5 km. The distance to central commercial area of Taipei city is 6 km that means 30 minutes bus trip.




Total area of the site: 54 Has.
 Existing population: 219 people.
 Topography: deep sloping, two thirds slope are more than 40%. The lowest point is 20 m above sea level high, the highest point is 140 m above sea level high.

Geological condition: Most part are loess alluvium, mud and sand. Some part are loess lava bed. A mining pit at the other side of the major southern road but no direct effects. The condition of soil conservation is good and no land slide but water supply and gas system do not exist.

AREAS

-  RESIDENTIAL
-  COMMERCIAL

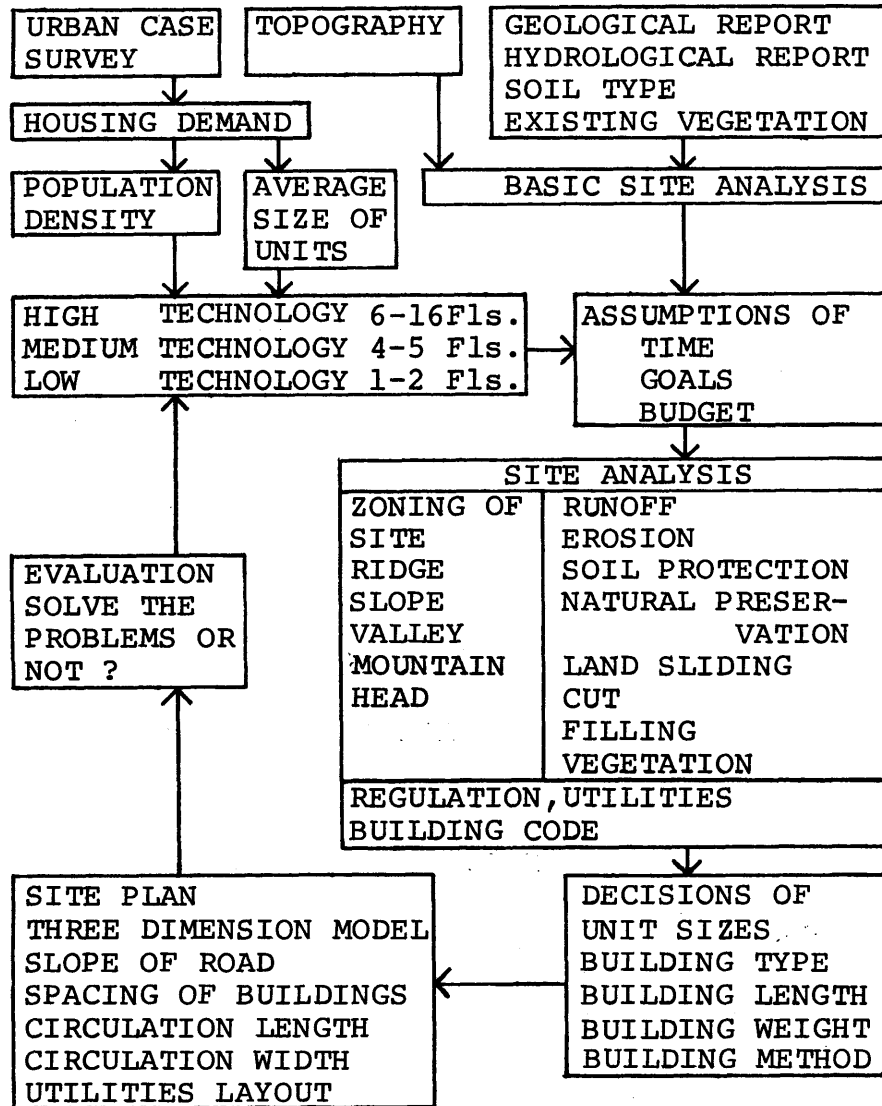
KEY

- Pk** Parking
- P** Police
- F** Fire Department
- S** School
- Ch** Church
- R** Recreation
- L** Library
- U** University
- H** Health
- PO** Post Office
- SS** Social Services
- M** Market
- C** Cemetery
-  HIGHWAY
-  EXISTING BUS ROUTE
-  TO BE WIDENED AS BUS ROUTES



CHINGMEI-MUCHA LOCALITY LAND USE PATTERN

APPROACH







GENERAL REGULATIONS

Decisions on site engineering works are based on goals of land use, dwelling density and population density controls. Public housing should emphasize safety first, then cost saving. Government's general regulations about sloping site developments are as follows:

- 1) Slope of building site should be less than 30%. Building on greater slopes (over 30%) should have good protection facilities like retaining wall and drainage system, and then should be no geological fault, mining, records of land sliding and possibilities of land movement.
- 2) Building land coverage should be less than 40%. Volume ratio should be less than 160%. Building on filled land should have good foundation design. Building near slope of cutting or filling should keep minimum distance with its base or head.
- 3) 3 year storm rain records should be used in design of storm drainage and its system covering the whole site should connect with neighboring system.
- 4) Soil conservation like terracing, intercept ditch and retaining wall are necessary; suitable planting is necessary on natural slope.
- 5) 15% max. slope be used in road design and 15m minimum radius in horizontal curve.

SITE ANALYSIS

NAME	DEFINITION	DESCRIPTION	AVERAGE SLOPE (%)	AVERAGE WIDTH (M)	TOTAL LENGTH (M)
RIDGE	Width: Sum of 5 contour lines interval of each side down the central ridge line. Length: The total ridge length.		51	37.5	1340
SLOPE	Width: Length of middle level contour line. Length: From the border of ridge or mountain head to the border of valley or flat land.		45	81	3900
SMALL MOUNTAIN HEAD	Width: 5 contour lines interval down the mountain head. Length: Length of middle level contour line.		44.5	23.4	695
VALLEY	Width: Sum of 5 contour lines interval of each side up the central valley line. Length: The total valley length.		6	43	1070

The 4 groupings of site topography are for the purpose of evaluation. All the figures are used to compare the commanding site characteristics and to support land use decisions. Contour interval is 2 meters. Average slope = $100 \times I \times L / A$. I=Contour interval; L=Total length of contour lines within the parcel; A=Area in Ha.

RUN OFF, EROSION CONTROL AND VEGETATION
When a slope is covered with an impervious surface, runoff increases dramatically thereby increasing the potential for erosion. The rate of runoff is dependent on the intensity of rainfall, the density of natural vegetation and topography. To control the release rate of storm-water runoff, it is sometimes necessary to build storm drainage systems, channelized water courses, dams and reservoirs. In designing a channel network, the natural drainage system can be used and has the advantage of less soil dewatering affecting plant life and lower development costs.

Erosion is the result of drag forces acting on the surface particles of a slope like water runoff. Control of erosion can be effected by reducing the drag forces on a slope and increasing the resistance of the slope to erosion. Three ways exist of control erosion: a) Reduction of the amount of discharge of flow over a slope. This is achieved by a ditch-and-dike interceptor channel at the top of the slope. b) Dispersion of water on slope. c) Channel design.

Many methods of increasing resistance to erosion forces can be used like: groundcover of jute, wooden grids, slag, stone, etc; mulching; wattling; contour trenching; tamping and grid rolling; and vegetative coverage. In all cases, provision must be made to prevent runoff down the slope face, by constructing berms at the top and channeling water from benches to drainage areas. Planting of deep-rooted shrubs and trees on the higher slopes can be used for soil-stabilization. Vegetation shall be removed only when absolutely necessary, e.g. for building, filled areas, roads. Every effort shall be made to conserve top soil which is removed during construction for later use on areas requiring vegetation or landscaping e.g. cut and fill slopes. Vegetation sufficient to stabilize the soil shall be established on all disturbed areas as each stage of grading is completed. Vegetation also makes a positive contribution to the open space in residential areas. It is desirable wherever vegetative slope coverage is appropriate the expert advice be secured for species of vegetation.

In sloping site development, for the purpose of reducing possibilities of soil instability, increased erosion and runoff, detailed plans in site analysis and design ordinances should guide layout decision including grading, excavation, runoff, erosion, road, parking, vegetation and density control. To find out the domain in which changing of natural slope can be handled, a lot of information gathering are necessary in addition to understanding the characters of slopes of different kinds. Instability still may occur on natural slope as the result of natural action like rainfall, erosion, temperature change, weathering and earth-quakes. Man-made excavation into natural slope reduces the stability of the newly created up-hill slope by removing the toe or lateral support. But the removal of weight by excavation in creases the stability of a natural slope down hill conversely. Special drainage, buttress-

ing, flattening or installation of retaining structure are always needed at an unstable cut slope. A simultaneous excavation and filling decrease the stability of the downhill slope because of the added weight imposed, blocked subsurface seepage, or weak underlying soil or rock. So, soil type, geologic hazards and hydrologic data as following are important to work out safe slope ratio for specific cut and fill.

- Steepness and height of slope to be cut or filled.
- Width of bench to be created by cut and fill.
- Soil types in slopes both above and below cut or fill. This includes shear strength, particle size distribution, Atterberg limits, homogeneity or stratification, water table profile and seasonal changes, existence of faults, cracks, fissures and stress-strain history.

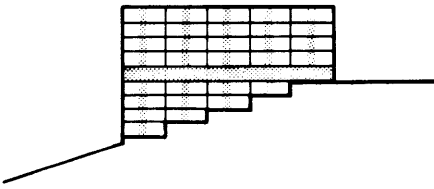

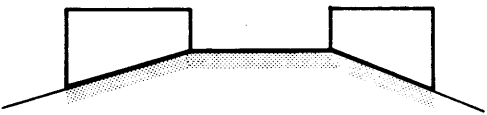
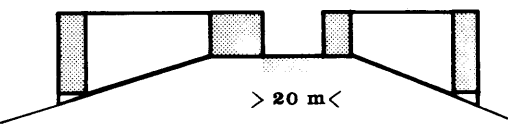
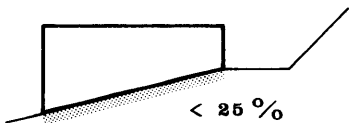

- Water content fluctuations of in-situ soil.
- Optimum water content and density for compaction of each type of soil to be used in fill.
- Existence and flow pattern of seepage.
- Presence of individual sewage disposal system.
- Surface water flow and drainage pattern of area.
- Existence of loads on slope including dead weight of soil mass.

These considerations and interrelationships between them expose the complexity of deep slope development not only technical treatment but also mass land saved to protective facilities. A qualified professional with experience should be entrusted. The most extreme alteration of a slope site is to level it. This and similar radical changes of a slope site can have far-reaching consequences including rapid erosion,

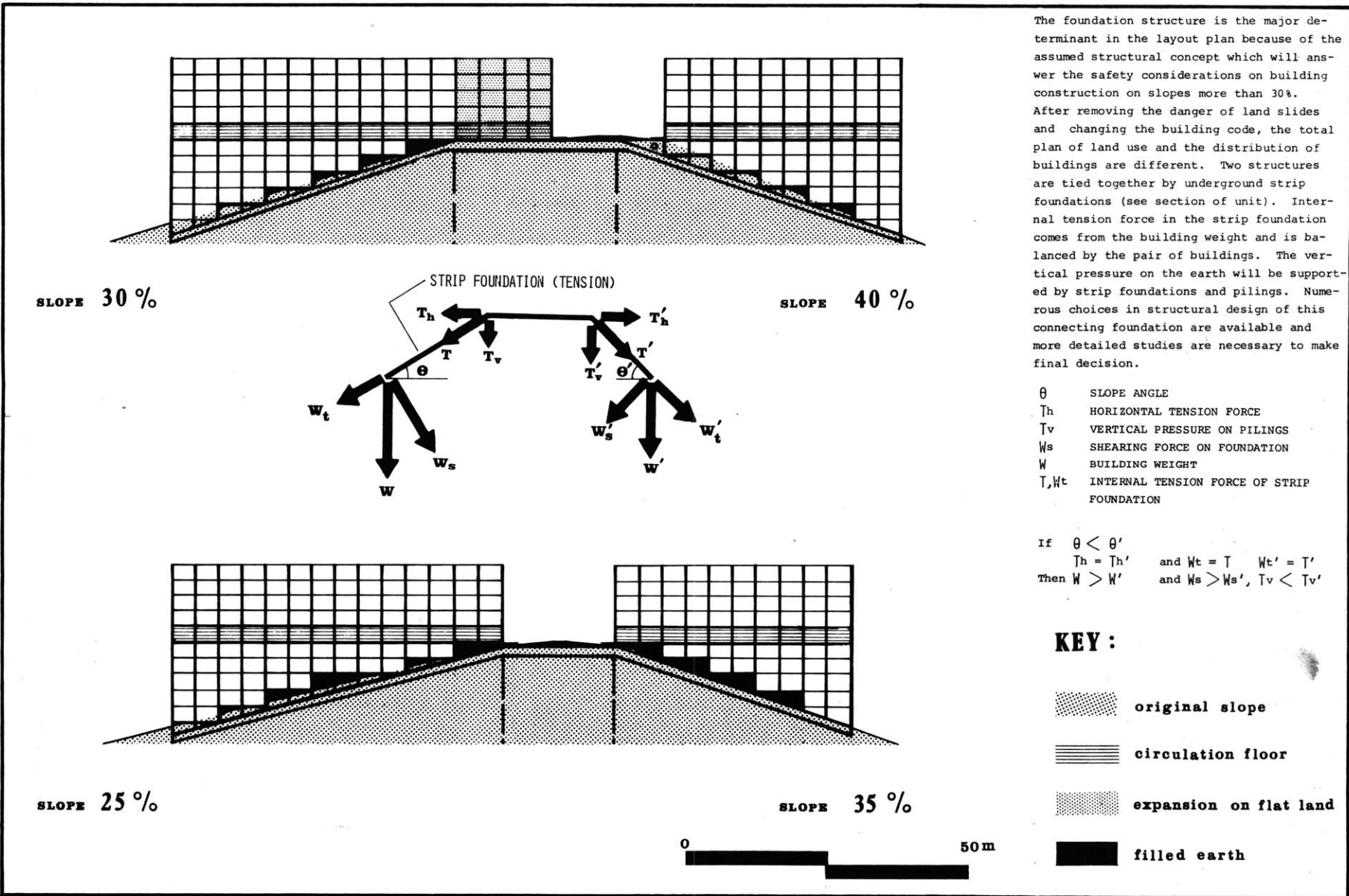
disturbance of groundwater hydrology and alteration in stream flow and drainage pattern.

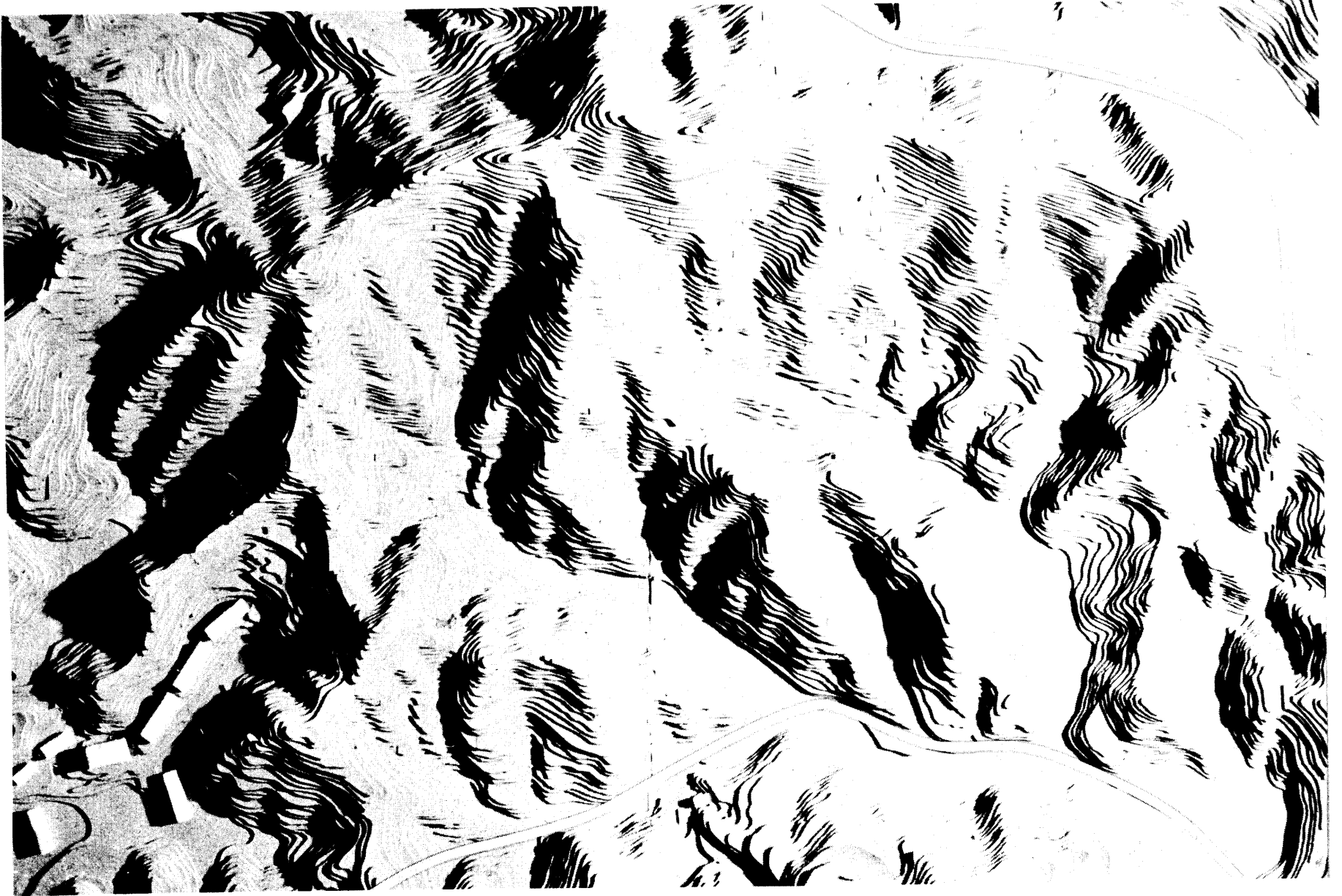
In the preliminary site reconnaissance of this 140 high-land site, there is no evidence or likelihood of slope failure from visual inspection, no high earthquakes activity history, no spring or seepage and any existing septic tank on the slope. But a few adequate drainages are already available on the slope to protect against erosion deep parts and are actually as the water source for family and agricultural usages. To minimize changing of topography, new building type on deep slope and preservation of existing drainage are basic considerations in decision making of earth moving work. Following pages are explanation of guidances and regulations of major individual control factors of grading, excavation, runoff, erosion, road and parking, slope and density.

DESIGN PRINCIPLES and ASSUMPTIONS

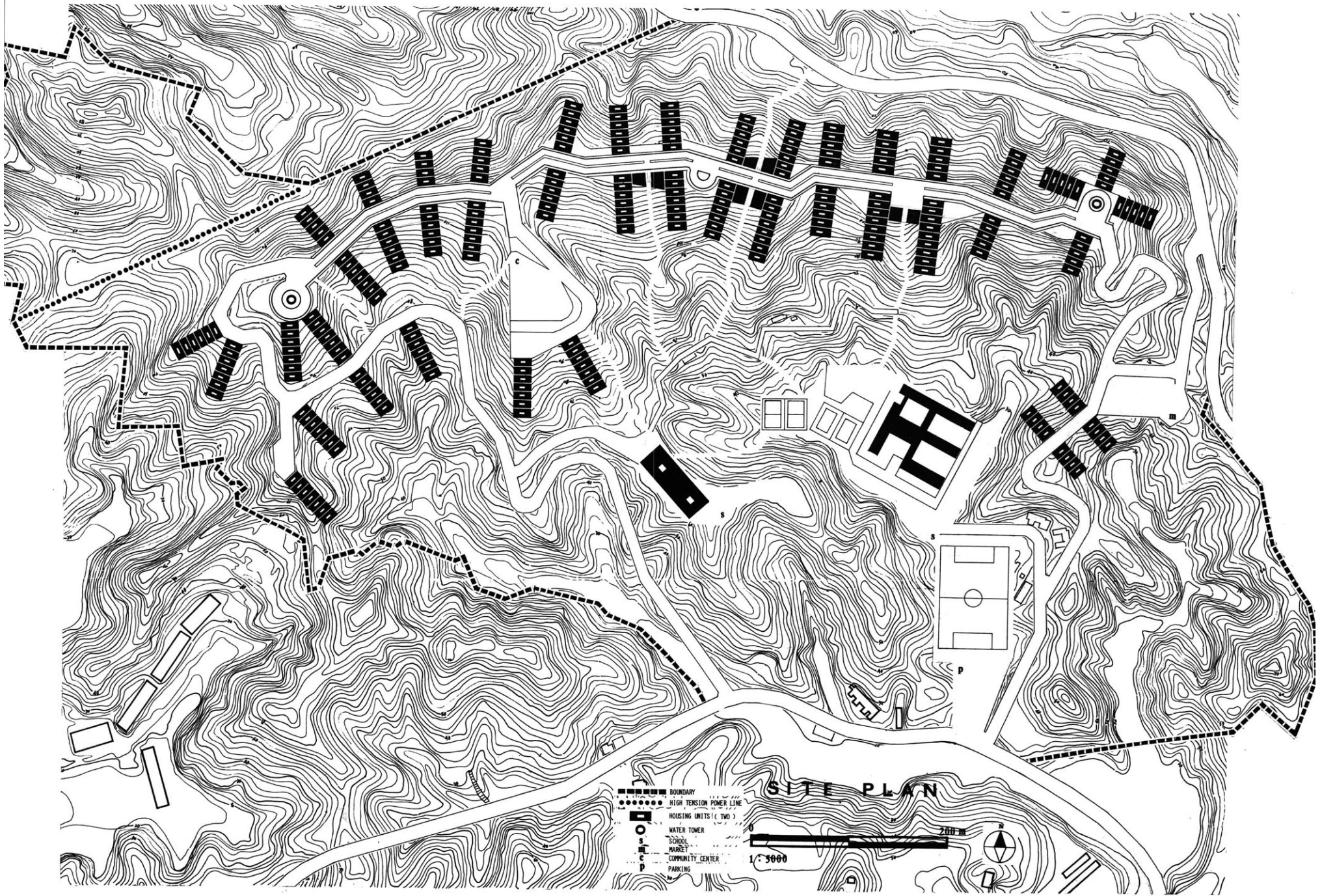
Principles and Assumptions		Descriptions
1	<p>All building types are walk-up apartments with stairs shared by two units per floor. The ground floor of the entrance is used as a walk-way for stair exits and shop functions for the upper and lower units. The design has four floors up from the entrance floor and a maximum of four floors down from the entrance floor, limited by the walking distance considerations of the building code. The unit design features include: a) A unit width using a minimum frontage of 4.2m. The advantage is the maximum horizontal integration of units in a fixed building length. b) All units have balconies with multi-purpose function and enough size that is useful for low-income families. c) Inside room division can supply through ventilation that is very important for housing in semi-tropical areas. The major facade's orientation is in a east-west direction. d) A 30cm duct space for utilities can supply the necessary vertical ventilation for kitch and bathroom. The duct is designed for self-suction without mechanical ventilators.</p>	
2	<p>Because of the limitation of maximum four floors up and down from the entrance floor and the same unit frontage width, the maximum building length is controlled solely by the slope. Due to the building height limitation of the units, the slope site is separated into four groups of slopes that are recognized as economically useful: 25%, 30%, 35%, 40%. Less than 25% slope is very rare in this site and not used in the stratege of unit concentration. More than a 40% slope affects the building length and makes it too short for reasonable use.</p>	<p style="text-align: center;">slope</p>  <p style="text-align: center;">% 25% 30% 35% 40%</p>
3	<p>The building code prohibits construction on slopes of more than 30% due to the danger of land slides. The intent of the proposed design takes the opposite viewpoint. If the landslide problem is overcome and building has a high safety ratio, a slope of more than 30% can technically be used as a building site. The strategy is to balance weights on the opposite sides of a ridge by connecting frondations to keep the building from the danger of sliding. So in the proposed design, buildings on slopes of greater than 30% all have an opposite buildings to balance the forces and use a reverse V shaped strip foundation to prevent sliding and settlement.</p>	
4	<p>The space between buildings along their common axis provides for roads. The road is 20m in width with side-walks on two sides throughout the major residential areas. If the space is larger than 20m the buildings can expand inward and the building length may be increased. Expansion outward may also be easily accomplished by special column foundations to support additional units. The space between two buildings is a minimum of 25m, determined by building height.</p>	
5	<p>In buildings on slopes of 25% or less, it is assumed that the balancing opposite building is not necessary in landslide consideration. This type of building will be supported by a special design of a piling foundation. Other aspects in the design of this type of building are the same.</p>	
6	<p>All roads are designed with slopes up to 15% maximum but most are in the range of 10% to 12%. Prime consideration is given the most direct route between destinations. In major residential areas, the slope of the road is 10% maximum.</p>	<p style="text-align: center;">< 12 %</p> 

STRUCTURAL ASSUMPTIONS & DESIGN CONSTRAINTS





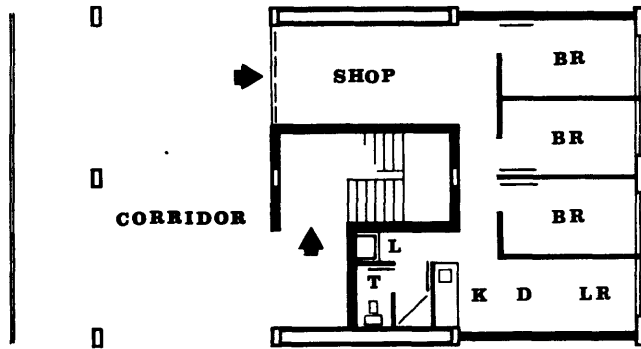
SITE TOPOGRAPHY



- BOUNDARY
- HIGH TENSION POWER LINE
- HOUSING UNITS (TWO)
- WATER TOWER
- SCHOOL
- MARKET
- COMMUNITY CENTER
- PARKING

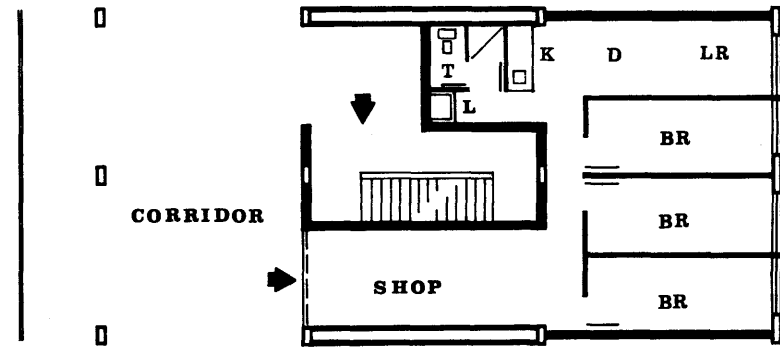
SITE PLAN



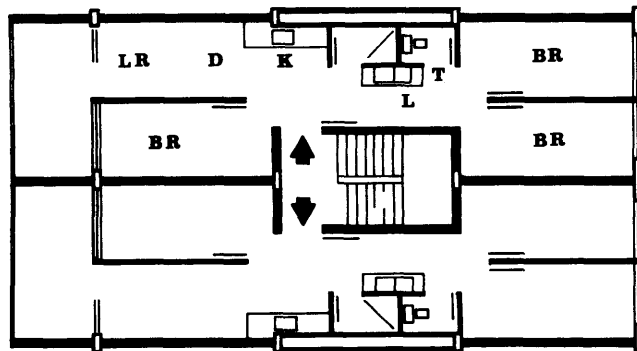
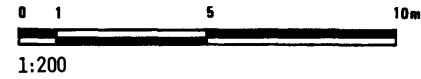


ENTRANCE FLOOR

- 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)

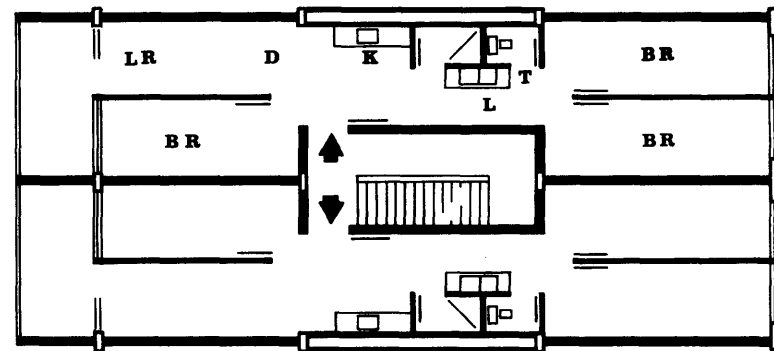


ENTRANCE FLOOR



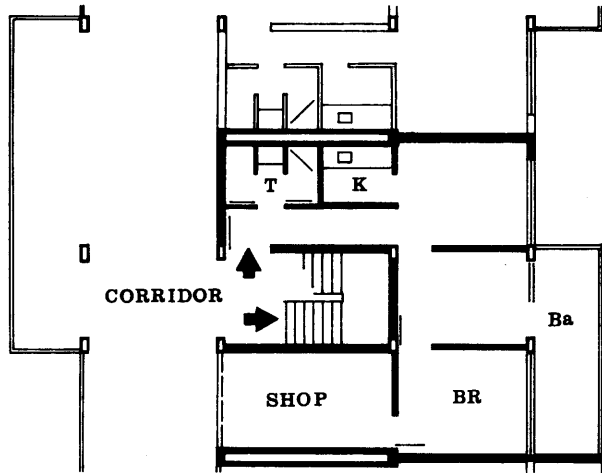
TYPICAL FLOOR

DWELLING UNIT, 66 m² 3 BEDROOMS

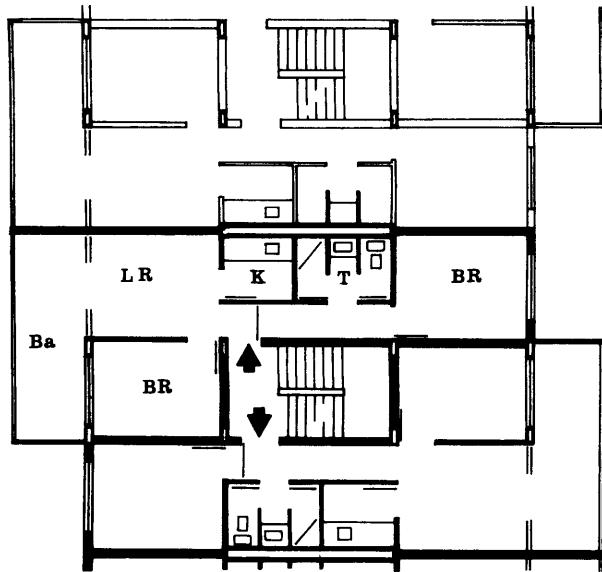


TYPICAL FLOOR

DWELLING UNIT, 80 m² 3 BEDROOMS



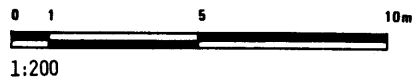
ENTRANCE FLOOR



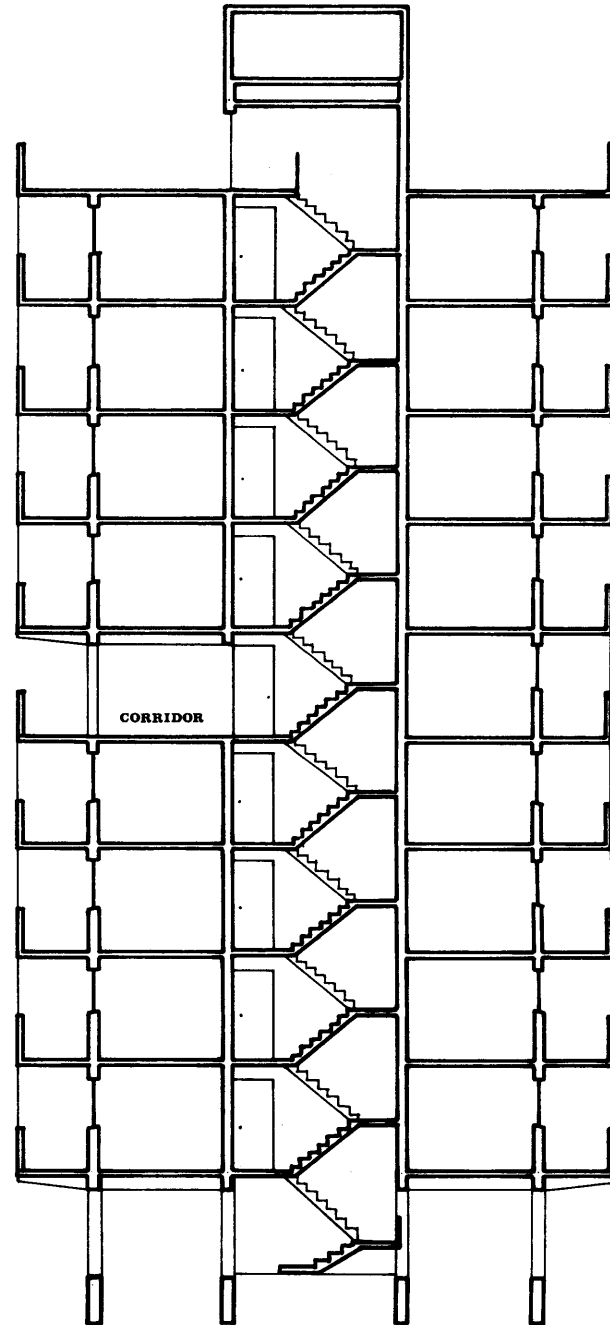
TYPICAL FLOOR

- 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)

ENTRANCE FLOOR





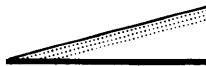
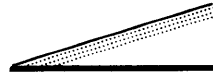
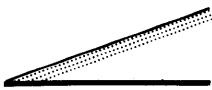
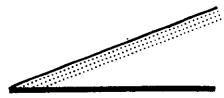

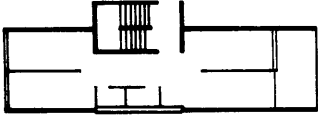



DWELLING UNIT, 56 m², 2 BEDROOMS



SECTION

HOUSING OPTIONS, SLOPS and BUILDING LENGTH

TOTAL UNITS of ONE BUILDING		97 units	84 units	65 units	75 units	SUBTOTAL UNIT	
BUILDING SECTION on slope parts							
BUILDING LENGTH		59 m	51 m	42 m	42 m		
SLOPE							
BUILDING UNITS		25 %	30 %	35 %	40 %		
1	 SIZE 56 m ² 4.2 × 13.3	on slope	466 UNITS	168 UNITS	455 UNITS	—	1089
		expansion	—	—	45 UNITS	—	45
2	 SIZE 66 m ² 4.2 × 15.7	on slope	562 UNITS	336 UNITS	166 UNITS	657 UNITS	1741
		expansion	—	9 UNITS	45 UNITS	45 UNITS	99
3	 SIZE 80 m ² 4.2 × 19	on slope	—	168 UNITS	195 UNITS	207 UNITS	570
		expansion	—	27 UNITS	—	45 UNITS	72
SUBTOTAL			1048 UNITS	708 UNITS	906 UNITS	954 UNITS	3616

REVIEW

As mentioned before, alternatives of lowering construction costs for low-income housing built on steep sloping mountain sites is the principle goals of this design. There are numerous existing cases which may serve as references but appropriate solutions must be determined for each problem. The many past failures of mass housing show us the complexity of the problem, especially in social and economic aspects. "Cheap" is not the only determinant in housing supply. However, many "cheaper" ways to build housing units are also useful, for example, the "site and services" method. Even a one or two floors development can result in a more economic and more appropriately organized neighborhood. It is clear however that in the scheme proposed here there are several advantages: natural preservation, more reserved land for future development, an economic utilities provision and with only limited high-rise building. The buildings also consider savings in construction cost and building maintenance. For detailed economic comparisons, further study is required.

The social and economic aspects of the proposed design and the problems for organization and maintenance of the neighborhoods require additional inputs from specialists.

GLOSSARY

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

-FIRST PREFERENCE: definitions from "Webster's Third New International Dictionary", Merriam-Webster, 1971.

-SECOND PREFERENCE: definitions from technical dictionaries, text books, or reference manuals.

-THIRD PREFERENCE: definitions from the Urban Settlement Design Program (U.S.D.P.) Files. They are used when existing sources were not quite appropriate/satisfactory.

Words included for specificity and to focus on a particular context are indicated in parenthesis.

Sources of definitions are indicated in parenthesis. (See also: REFERENCES).

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

COMMUNITY. The people living in a particular place or region and usually linked by common interests: the

region itself; any population cluster. (U.S.D.P.)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

DRAINAGE. Interception and removal of ground water or surface water, by artificial or natural means. (De Pina, 1972)

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

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

DWELLING BUILDER. Four groups are considered: *SELF-HELP BUILT*: where the dwelling unit is directly built by the user or occupant; *ARTISAN BUILT*: where the dwelling unit is totally or partially built by a skilled craftsman hired by the user or occupant; payments can be monetary or an exchange of services; *SMALL CONTRACTOR BUILT*: where the dwelling unit is totally built by a small organization hired by the user, occupant, or developer; 'small' contractor 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. (U.S.D.P.)

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

DWELLING DEVELOPER. Three sectors are considered in the supply of dwellings: *POPULAR SECTOR*: the marginal sector with limited or no access to the formal financial, administrative, legal, technical institutions involved in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the Popular Sector generally for 'self use' and sometimes for profit. *PUBLIC SEC-*

TOR: the government or non-profit organizations involved in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the Public Sector for service (non-profit or subsidized housing). **PRIVATE SECTOR:** the individuals, groups or societies, who have access to the formal financial, administrative, legal, technical institutions in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the Private Sector for profit. (U.S.D.P.)

DWELLING DEVELOPMENT MODE. Two modes are considered: **PROGRESSIVE:** the construction of the dwelling and the development of the local infrastructure to modern standards by stages, often starting with provisional structures and 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. (U.S.D.P.)

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

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

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

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

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

DWELLING TYPE. The physical arrangement of the dwelling unit: **DETACHED:** individual dwelling unit, separated from others. **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. (U.S.D.P.)

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

DWELLING UNIT AREA. The dwelling unit area (m²) is the built-up, covered area of a dwelling unit. (U.S.D.P.)

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

DWELLING UNIT TYPE. Four types of dwelling units are considered: **ROOM:** A SINGLE SPACE usually bounded by

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

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

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

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

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

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

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

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

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

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

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

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

ELECTRIC PHASE. May be either a single-phase circuit (for small electrical devices) or a three-phase circuit (for heavy equipment, large electrical devices). In single-phase only one current is flowing through

the circuit with the voltage dropping to zero twice in each cycle. In three-phase currents flow through the circuit with the power never dropping to zero. (U.S.D.P.)

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

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

ELECTRICITY. Electrification: the process (network) for supplying (the site) with electric power. (Merriam-Webster, 1971)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

INFRASTRUCTURE. The underlying foundation or basic framework for utilities and services: streets; sewage, water network; storm drainage; electrical network;

gas network; telephone network, public transportation; police and fire protection; refuse collection, health, schools, playgrounds, parks, open spaces. (U.S.D.P.)

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

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

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

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

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

LAND COST. Price: the amount of money given or set as the amount to be given as a consideration for the sale of a specific thing (the site). (Merriam-Webster, 1971)

LAND DEVELOPMENT COSTS. The costs of making raw land ready for development through the provision of utilities, services, accesses, etc. (U.S.D.P.)

LAND LEASE. The renting of land for a term of years for an agreed sum; leases of land may run as long as 99 years. (U.S.D.P.)

LAND-MARKET VALUE. Refers to: 1) the present monetary equivalent to replace the land; 2) the present tax based value of the land; or 3) the present commercial market value of the land. (U.S.D.P.)

LAND OWNERSHIP. The exclusive right of control and possession of a parcel of land. (U.S.D.P.)

LAND SUBDIVISION. The division of the land in blocks, lots and laying out streets. (U.S.D.P.)

LAND TENANCY. The temporary holding or mode of holding a parcel of land of another. (U.S.D.P.)

LAND UTILIZATION. A qualification of the land around a dwelling in relation to user, physical controls and responsibility. PUBLIC (streets, walkways, open spaces): user - anyone/unlimited; physical controls - minimum; responsibility - public sector. SEMIPUBLIC (open spaces, playgrounds, schools): user - limited group of people; physical controls - partial or complete; responsibility - public sector and user. PRIVATE (dwellings, lots): user - owner or tenant or squatter; physical controls - complete; responsibility - user. SEMI-PRIVATE (cluster courts): user - group of owners and/or tenants; physical controls - partial or complete; responsibility - user. (U.S.D.P.)

LAND UTILIZATION: PHYSICAL CONTROLS. The physical/legal means or methods of directing, regulating, and coordinating the use and maintenance of land by the owners/users. (U.S.D.P.)

LAND UTILIZATION: RESPONSIBILITY. The quality/state of being morally/legally responsible for the use and maintenance of land by the owners/users. (U.S.D.P.)

LATERAL SEWER. A collector pipe receiving sewage from building connection only. (U.S.D.P.)

LATRINE. A receptacle (as a pit in the earth or a water closet) for use in defecation and urination, or

a room (as in a barracks or hospital) or enclosure (as in a camp) containing such a receptacle. (Merriam-Webster, 1971)

LAYOUT. The plan or design or arrangement of something that is laid out. (Merriam-Webster, 1971)

LEVELS OF SERVICES. Two levels are considered: MINIMUM, are admissible or possible levels below the standard; STANDARD, are levels set up and established by authority, custom of general consent, as a model, example or rule for the measure of quantity, weight extent, value or quality. (U.S.D.P.)

LIFT PUMP. A collection system component that forces sewage to a higher elevation to avoid deep pipe networks. (U.S.D.P.)

LOCALITY. A relatively self-contained residential area/community/neighborhood/settlement within an urban area which may contain one or more dwelling/land systems. (U.S.D.P.)

LOCALITY SEGMENT. A 400m x 400m area taken from and representing the residential character and layout of a locality. (U.S.D.P.)

LOCATION. Situation: the way in which something (the site) is placed in relation to its surroundings (the urban context). (Merriam-Webster, 1971)

LOT. A measured parcel of land having fixed boundaries and access to public circulation. (U.S.D.P.)

LOT CLUSTER. A group of lots (owned individually) around a semipublic common court (owned in condominium). (U.S.D.P.)

LOT COVERAGE. The ratio of building area to the total lot area. (U.S.D.P.)

LOT PROPORTION. The ratio of lot width to lot depth. (U.S.D.P.)

LUMINAIRE. In highway lighting, a complete lighting device consisting of a light source, plus a globe, reflector, refractor, housing and such support as is integral with the housing. (DePina, 1972)

MANHOLE. An access hole sized for a man to enter, particularly in sewer and storm drainage pipe systems for cleaning, maintenance and inspection. (U.S.D.P.)

MATRIX (OF BASIC REFERENCE MODELS). A set of models of urban layouts arranged in rows and columns. (U.S.D.P.)

MASTER PLAN. A comprehensive, long range plan intended to guide the growth and development of a city, town or region, expressing official contemplations on the course its transportation, housing and community facilities should take, and making proposals for industrial settlement, commerce, population distribution and other aspects of growth and development. (Abrams, 1972).

MEDIAN BARRIER. A double-faced guard rail in the median or island dividing two adjacent roadways. (DePina, 1972)

MESHING BOUNDARIES. Characterized by continuing, homogeneous land uses or topography, expressed as: LINES: property lines, political or municipal divisions, main streets, etc.; AREAS: similar residential uses, compatible uses (as parks with residential). (U.S.D.P.)

MICROCLIMATE. The local climate of a given site or habitat varying in size from a tiny crevice to a large land area, but being usually characterized by considerable uniformity of climate. (Merriam-Webster, 1971)

MODE OF TRAVEL. Manner of moving from one place (the

site) to another (other parts of the urban context). (U.S.D.P.)

MODEL (OF URBAN LAYOUT). A representation of an urban residential area illustrating circulation, land utilization, land subdivision, and utility network of a specific layout and lot. (U.S.D.P.)

MUTUAL OWNERSHIP. Private land ownership shared by two or more persons and their heir under mutual agreement. (U.S.D.P.)

NATURAL FEATURES. Prominent objects in or produced by nature. (U.S.D.P.)

NATURAL UNDISTURBED SOIL. Soils that have not been disturbed by artificial process. Although natural, they depend greatly on local conditions, environment, and past geological history of the formations. (U.S.D.P.)

NEIGHBORHOOD. A section lived in by neighbors and having distinguishing characteristics. (U.S.D.P.)

NETWORK EFFICIENCY (LAYOUT EFFICIENCY). The ratio of the length of the network to the area(s) contained within; or tangent to it. (U.S.D.P.)

NEUTRAL WIRE. Wire carrying no voltage between itself and a ground. (ROTC ST 45-7, 1953)

NOISE. Any sound (affecting the site) that is undesired (such as that produced by: traffic, airports, industry, etc.) (Merriam-Webster, 1971)

ODOR. A quality of something that affects the sense of smell. (Merriam-Webster, 1971)

OHMS (electrical). The unit of resistance to the flow electricity. The higher the number of ohms, the greater the resistance. When resistance is constant, amperage (and wattage) are in direct proportion to voltage. Resistance varies inversely with the cross-sectional area of the wire. Ohms = volts/amperes. $R = E/I$. The practical mks unit of electrical resistance that is equal to the resistance of a circuit in which a potential difference of one volt produces a current of one ampere or to the resistance in which one watt of power is dissipated when one ampere flows through it and that is taken as standard in the U.S. (U.S.D.P.; ROTC ST 45-7, 1953; Merriam-Webster, 1971)

OPTIMIZE/OPTIMIZE. To bring to a peak of economic efficiency, specially by the use of precise analytical methods. (Merriam-Webster, 1971)

ORGANIC SOILS. Soils composed mostly of plant material. (U.S.D.P.)

OXIDATION POND (LAGOON). A method of sewage treatment using action of bacteria and algae to digest/decompose wastes. (U.S.D.P.)

PERCENT RENT/MORTGAGE. The fraction of income allocated for dwelling rental or dwelling mortgage payments; expressed as a percentage of total family income. (U.S.D.P.)

PIT PRIVY/LATRINE. A simple hole in the ground, usually hand dug, covered with slab and protective superstructure; for disposal of human excreta. (U.S.D.P.)

PLANNING. The establishment of goals, policies, and procedures for a social or economic unit, i.e. city. (U.S.D.P.)

PLOT/LOT. A measured parcel of land having fixed boundaries and access to public circulation. (U.S.D.P.)

POLICE PROTECTION. Police force: a body of trained men and women entrusted by a government with the maintenance of public peace and order, enforcement of laws, prevention and detection of crime. (Merriam-

Webster, 1971)

POPULATION DENSITY. It is the ratio between the population of a given area and the area. It is expressed in people per hectare. It can be: GROSS DENSITY: includes any kind of land utilization, residential, circulation, public facilities, etc. NET DENSITY: includes only the residential land and does not include land for other uses. (U.S.D.P.)

POSITION. The point or area in space actually occupied by a physical object (the site). (Merriam-Webster, 1971)

PRIMER. A small introductory book on a specific subject. (U.S.D.P.)

PRIVATE LAND OWNERSHIP. The absolute tenure of land to a person and his heirs without restriction of time. (U.S.D.P.)

PRIVY. A small, often detached building having a bench with one or more round or oval holes through which the user may defecate or urinate (as into a pit or tub) and ordinarily lacking any means of automatic discharge of the matter deposited. (Merriam-Webster, 1971)

PROJECT. A plan undertaken; a specific plan or design. (U.S.D.P.)

PUBLIC CIRCULATION. The circulation network which is owned, controlled, and maintained by public agencies and is accessible to all members of a community. (U.S.D.P.)

PUBLIC FACILITIES. Facilities such as schools, playgrounds, parks, other facilities accessible to all members of a community which are owned, controlled, and maintained by public agencies. (U.S.D.P.)

PUBLIC SERVICES AND COMMUNITY FACILITIES. Includes: public transportation, police protection, fire protection, refuse collection, health, schools, and playgrounds, recreation and open spaces, other community facilities, business, commercial, small industries, markets. (U.S.D.P.)

PUBLIC SYSTEM (general). A system which is owned and operated by a local governmental authority or by an established public utility company which is controlled and regulated by a governmental authority. (HUD/AID, Minimum Standards, 1966)

PUBLIC UTILITIES. Includes: water supply, sanitary sewerage, storm drainage, electricity, street lighting, telephone, circulation networks. (U.S.D.P.)

PUMP. A device or machine that raises, transfers, or compresses fluids or that attenuates gases especially by suction or pressure or both. (Merriam-Webster, 1971)

REFUSE COLLECTION. The service for collection and disposal of all the solid wastes from a community. (U.S.D.P.)

RESERVOIR. Large-scale storage of water; also functions to control fluctuations in supply and pressure. (U.S.D.P.)

RESIDENTIAL AREA. An area containing the basic needs/requirements for daily life activities: housing, education, recreation, shopping, work. (U.S.D.P.)

RESISTANCE. The opposition to electrical flow. (Resistance increases as the length of wires is increased and decreases as the cross-sectional area of wires is increased). (ROTC ST 45-7, 1953)

RIGHT-OF-WAY. A legal right of passage over another person's ground (land), the area or way over which a right-of-way exists such as: a path or thoroughfare which one may lawfully use, the strip of land devoted to or over which is built a public road, the land

occupied by a railroad, the land used by a public utility. Rights-of-way may be shared (as streets, pedestrians and automobiles) or exclusive (as rapid transit routes; subways, railroads, etc.) (Merriam-Webster, 1971; U.S.D.P.)

ROADWAY (HIGHWAY). Portion of the highway included between the outside lines of gutter or side ditches, including all slopes, ditches, channels, and appurtenances necessary to proper drainage, protection, and use. (DePina, 1972)

ROW/GROUPED HOUSING. Dwelling units grouped together linearly or in clusters. (U.S.D.P.)

RUNOFF. That part of precipitation carried off from the area upon which it falls. (DePina, 1972)

RUNOFF-RAINFALL RATIO. The percentage (ratio) of stormwater runoff that is not reduced by evaporation, depression storage, surface wetting, and percolation; with increased rainfall duration, runoff-rainfall ratios rise increasing runoff flow. (U.S.D.P.)

SAND. Loose, distinguishable grains of quartz/feldspar, mica (ranging from 2mm to 0.02mm in diameter). (U.S.D.P.)

SANITARY SEWERAGE. The system of artificial usually subterranean conduits to carry off sewage composed of: *excreta*: waste matter eliminated from the human body; *domestic wastes*: used water from a home/community containing 0.1% total solids; and some *industrial wastes*, but not water from ground, surface, or storm. (U.S.D.P.)

SEMI-DETACHED DWELLING. Two dwelling units sharing a common wall (duplex). (U.S.D.P.)

SEPTIC TANK. A tank in which the organic solid matter of continuously flowing sewage is deposited and retained until it has been disintegrated by anaerobic bacteria. (Merriam-Webster, 1971)

SERIES CIRCUIT. Fixtures connected in a circuit by a single wire. When one fixture is out, the circuit is broken. Fixtures with different amperages cannot be used efficiently in the same circuit. (ROTC ST 45-7, 1953)

SETTLEMENT. Occupation by settlers to establish a residence or colony. (U.S.D.P.)

SEWAGE. The effluent in a sewer network. (U.S.D.P.)

SEWER. The conduit in a subterranean network used to carry off water and waste matter. (U.S.D.P.)

SEWER BUILDING CONNECTION. The pipe connecting the dwelling with the sewer network. (U.S.D.P.)

SEWERAGE. Sewerage system: the system of sewers in a city, town or locality. (Merriam-Webster, 1971)

SHAPE. Form/configuration of the site surface as defined by its perimeter/boundaries. (U.S.D.P.)

SHOPPING. (Facilities for) searching for, inspecting, or buying available goods or services. (U.S.D.P.)

SILT. Loose, unconsolidated sedimentary rock particles (ranging from 0.02mm to 0.002mm in diameter). (U.S.D.P.)

SITE. Land (that could be) made suitable for building purposes by dividing into lots, laying out streets and providing facilities. (Merriam-Webster, 1971)

SITE AREAS. Two types are considered: *GROSS AREA*: includes the whole site or the bounded piece of ground. *USABLE AREA*: includes only the portion of the site that can be fully utilized for buildings, streets, playgrounds, recreation facilities, gardens, or other structures. (U.S.D.P.)

SITE AND SERVICES. The subdivision of urban land and the provision of services for residential use and complementary commercial use. Site and services projects are aimed to improve the housing conditions for the low income groups of the population by providing: *a) SITE*: the access to a piece of land where people can build their own dwellings; *b) SERVICES*: the opportunity of access to employment, utilities, services and community facilities, financing and communications. (U.S.D.P.)

SIZE. Physical magnitude or extent (of the site), relative or proportionate dimensions (of the site). (Merriam-Webster, 1971)

SLOPE. Degree or extent of deviation (of the land surface) from the horizontal. (Merriam-Webster, 1971)

SMOKE. The gaseous products of burning carbonaceous materials made visible by the presence of carbon particles. (Merriam-Webster, 1971)

SOIL. Soil structure: the arrangement of soil particles in various aggregates differing in shape, size, stability, and degree of adhesion to one another. (Merriam-Webster, 1971)

SOIL INVESTIGATION. It is the process to find the soil structure and other characteristics. It may include the following stages: initial soil survey, exploratory boring, construction boring. (U.S.D.P.)

SOIL PIPE. The pipe in a dwelling which carries the pipe discharge from water closets. (U.S.D.P.)

SOIL SURVEY (INITIAL). An on-site examination of surface soil conditions and reference to a GENERAL SOIL MAP. It is used to reveal obvious limitations/restrictions/hazards for early planning consideration. (U.S.D.P.)

STACK. The vertical pipe in a dwelling of the soil-, waste-, or vent-pipe systems. (ROTC ST 45-7, 1953)

STANDARD. 1) Something that is established by authority, custom or general consent as a model or example to be followed. 2) Something that is set up and established by authority as a rule for the measure of quantity, weight, extent, value or quality. (Merriam-Webster, 1971)

STANDPIPE. A pipe riser with tap used as a source of water for domestic purposes. (HUD/AID, Minimum Standards, 1966)

STORM DRAINAGE. Storm sewer: a sewer (system) designed to carry water wastes except sewage (exclusively storm water, surface runoff, or street wash). (Merriam-Webster, 1971)

STREET LIGHTING. Illumination to improve vision at night for security and for the extension of activities. (U.S.D.P.)

SUBDIVISION REGULATIONS. Regulations governing the development of raw land for residential or other purposes. (Abrams, 1972)

SUBGRADE. The layer of natural soil or fill (compacted soil) upon which the pavement structure including curbs is constructed. (DePina, 1972)

SUBMAIN or BRANCH SEWER. A collector pipe receiving sewage from lateral sewer only. (U.S.D.P.)

SUBSISTENCE INCOME. The minimum amount of money required for the purchase of food and fuel for an average family to survive. (U.S.D.P.)

SULLAGE. Drainage or refuse especially from a house, farmyard, or street. (Merriam-Webster, 1971)

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

TAX EXEMPTION. A grant by a government of immunity from taxes; (a ten-year tax exemption on new housing in New York stimulated new construction in the 1920's; to ease its housing shortage, Turkey granted a ten-year tax exemption on new buildings). (Abrams, 1966)

TAX INCENTIVE. Favorable tax treatment to induce the beneficiary to do something he would not otherwise be likely to do. (U.S.D.P.)

TAX STRUCTURE - TAXATION. The method by which a nation (state, municipality) implements decisions to transfer resources from the private sector to the public sector. (U.S.D.P.)

TELEPHONE. An electrical voice communication network interconnecting all subscribing individuals and transmitting over wires. (U.S.D.P.)

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. Four types of tenure are considered: *RENTAL*: where the users pay a fee (daily, weekly, monthly) for the use of the dwelling unit and/or the lot/land; *LEASE*: where the users pay a fee for long-term use (generally for a year) for a dwelling unit and/or the lot/land from the owner (an individual, a public agency, or a private organization); *OWNERSHIP*: where the users hold in freehold the dwelling unit and/or the lot/land which the unit occupies; *EMPLOYER-PROVIDED*: where the users are provided a dwelling unit by an employer in exchange for services, i.e. domestic live-in servant. (U.S.D.P.)

TITLE. The instrument (as a deed) that constitutes a legally just cause of exclusive possession (of land, dwellings, or both). (Merriam-Webster, 1971)

TOILET. A fixture for defecation and urination, esp. water closet. (7th Collegiate Webster, 1963)

TOPOGRAPHY. The configuration of a (land) surface including its relief and the position of its natural and man-made features. (Merriam-Webster, 1971)

TRANSPORTATION. Means of conveyance or travel from one place (the site) to another (other parts of the urban context). (Merriam-Webster, 1971)

TRAP. A fitting that provides a water seal to prevent sewer gases and odors being discharged through fixtures. (ROTC ST 45-7, 1953)

TREATMENT WORKS. Filtration plant, reservoirs, and all other construction required for the treatment of a water supply. (ROTC ST 45-7, 1953)

UNIT. A determinate quantity adopted as a standard of measurement for other quantities of the same kind. (Merriam-Webster, 1971)

URBAN TRANSPORTATION. Means of conveyance of passengers or goods from one place to another along ways, routes of circulation in a metropolitan context. (U.S.D.P.)

URBANIZATION. The quality or state of being or becoming urbanized; to cause to take on urban characteristics. (U.S.D.P.)

USE TAX. The tax on land aimed primarily at enforcing its use or improvement. (U.S.D.P.)

USER INCOME GROUPS. Based upon the subsistence (minimum wage) income per year, five income groups are distinguished: *VERY LOW (below subsistence level)*: the income group with no household income available for housing, services, or transportation; *LOW (1 x subsistence level)*: the income group that can afford no or very limited subsidized housing; *MODERATE (3 x subsistence level)*: the income group that can afford limited housing and rent only with government assistance; *HIGH (5 x subsistence level)*: the income

group that can afford housing without subsidy, by cash purchase, through mortgage payments, or by rent; *VERY HIGH (10 x subsistence level)*: the income group that represents the most economically mobile sector of the population. (U.S.D.P.)

USUFRUCT. The right to profit from a parcel of land or control of a parcel of land without becoming the owner or formal leasee; legal possession by decree without charge. (U.S.D.P.)

UTILITIES. Include: water supply, sanitary sewerage, storm drainage, electricity, street lighting, gas, telephone. (U.S.D.P.)

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

VALVE. A water supply distribution component which interrupts the supply for maintenance purposes. (U.S.D.P.)

VENT. A pipe opening to the atmosphere, which provides ventilation for a drainage system and prevents trap siphonage or back pressure. (ROTC ST 45-7, 1953)

VIBRATION. A quivering or trembling motion (such as that produced by: heavy traffic, industry, aircraft, etc.). (Merriam-Webster, 1971)

VIEWS. That which is revealed to the vision or can be seen (from the site). (Merriam-Webster, 1971)

WALK-UP. Dwelling units grouped in two to five stories with stairs for vertical circulation. (U.S.D.P.)

WASTE PIPE. A pipe (in a dwelling) which carries water from wash basins, sinks, and similar fixtures. (ROTC ST 45-7, 1953)

WATER SUPPLY. Source, means, or process of supplying water, (as for a community) usually involving reservoirs, pipelines, and often the watershed from which the water is ultimately drawn. (Merriam-Webster, 1971)

WATERSHED. The catchment area or drainage basin from which the waters of a stream or stream system are drawn. (Merriam-Webster, 1971)

WATERWORKS. The whole system of reservoirs, channels, mains, and pumping and purifying equipment by which a water supply is obtained and distributed to consumers. (Merriam-Webster, 1971)

WATT. Watts (w) measure the power of the flow of energy through a circuit. Wattage is the product of volts times amperes. Both watts and horsepower denote the rate of work being done. 746w = 1hp. (ROTC ST 45-7, 1953)

ZONING ORDINANCE. The demarcation of a city by ordinance into zones (areas/districts) and the establishment of regulations to govern the use of land and the location, bulk, height, shape, use, population density, and coverage of structures within each zone. (U.S.D.P.)

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