

COMMUNITY LAYOUT PROTOTYPE  
NAKHON RATCHASIMA, THAILAND

by

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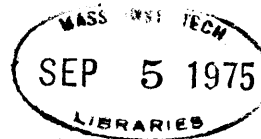
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## PREFACE

This study is intended as a guideline for urban residential developments with an emphasis on the community level, and an alternative set of design determinants for the planning of urbanization in Thailand. It is based on a field survey in Thailand by the author in the summer of 1974 and was elaborated during the fall semester of 1974 and spring semester of 1975 at the Massachusetts Institute of Technology. The approach to study analysis and community design is based on a methodology developed in the Urban Settlement Design Program, directed by Professor Horacio Caminos.

The guidance and advice of Professor Horacio Caminos, whose experience was invaluable in the preparation of this study is gratefully acknowledged. The personal advice and assistance of Reinhard Goethert is greatly appreciated, and also the comments from the members in the program of Urban Settlement Design in Developing Countries (class of 1974-1975; Al-Hussayen, Bazant, Millan, Patel, Shuaibi, Tokman, and Kobchai Ocharoen).

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## INTRODUCTION

The rapid growth of urban areas in Thailand and particularly in the capital city of Bangkok has resulted in severe problems for the majority of the urban inhabitants. The level of urbanization in Thailand increased from 9.9 percent in 1947 to 12.5 percent in 1960. According to the registry in 1960, urban residents constituted 13.1 percent of Thailand's population. By 1967 this level had risen to 14.4 percent. Between 1947 and 1960 the urban population had increased at an average annual rate of 5.0 percent compared to the rural population which grew by 3.0 percent each year. Between 1960 and 1967 registry account, this significant differential remained. The urban population grew at 4.8 percent annually and rural at 3.1 percent. In both periods, urban growth rates exceeded those of rural areas by over half. This increase is largely due to the exodus from the rural areas burdened with an excessive population growth.

The National Economic Development Board in 1974 has passed an urbanization policy encouraging development of northeastern secondary cities as part of the national planning policies. The emphasis is given to the development of secondary cities to accelerate industrial production and to absorb increasing agricultural unemployment in the lagging region, as well as to decentralize some of the industrial activities away from the Bangkok Metropolitan Area. It aims to promote industrial decentralization and check excessive population flows into already over concentrated urban areas of Bangkok. It hopes to alleviate the urban problems of Bangkok and to provide a regional balance in the development of the country. Nakhon Ratchasima is one of the four selected secondary cities, and is chosen for this study because of its importance to the northeast region. It has the most potential for development as a secondary city in the region as well as in the nation as a whole.

This study is a guideline for urban residential developments with an emphasis on the community level. It is based upon the survey-evaluation of existing urban layout and dwelling environments, which provide a basis for more realistic and effective community prototype developments.

The study is presented in sections as follows: Thailand National Context, Urbanization in Thailand, Nakhon Ratchasima Urban Context, Existing Urban Layout, Existing Dwelling/Land Types, and Proposed Community Layout Prototype. The following provides an overall view of the contents:

**THAILAND NATIONAL CONTEXT:** This brief section is a contextual reference for the major subject of the study. It will give the reader a quick overview focused on specific pertinent information.

**URBANIZATION IN THAILAND:** This section gives an overview of urbanization in Thailand at the national level, regional level, urban areas, and in Bangkok. This is intended to sketch out some of the issues that may influence the determinants at policy making stage.

**NAKHON RATCHASIMA URBAN CONTEXT:** This section contains brief statements of basic information. The statements are included to familiarize the reader with Nakhon Ratchasima, while at the same time, focusing on specific aspects.

**EXISTING URBAN LAYOUT:** This section discusses the urban tradition which provides a background on tradition development against which new changes can be measured. It also shows the progressive development of the city block. A process which responds to environmental and social needs of the growing community.

**EXISTING DWELLING/LAND TYPES:** The following dwelling/land types are covered:

**FARM HOUSE:** The indigenous housing approach developed with strong cultural determinant and folk architecture.

It provides housing needs for farmers and rural migrants. The migrants squat on unoccupied public land. The settlements may only be transitional or permanent according to the socio-economic indications of the residents.

ROW HOUSE: Because of the increase of the population and subsequent rise in land cost in the city center, row house was introduced to increase density of land use on land which has high commercial value.

DETACHED HOUSE: The most common housing type in Nakhon Ratchasima as well as other cities in the country. These detached houses can be found through out the city occupied by moderate low income to high income sector of the population. The size and condition of the houses vary according to the income of the residents.

PROPOSED COMMUNITY LAYOUT PROTOTYPE: This section contains a proposal for a prototype community which provides a model for dealing with the problems of community development and give a controlled urbanization pattern. It based upon the study and evaluation of existing urban layout and dwelling environments. It focuses on optimize land utilization with emphasis on maximizing private responsibility and minimizing public responsibility over the use and development of the community.

## THAILAND NATIONAL CONTEXT

Population: 37 million (1972 Est.)  
Capital: Bangkok

**GENERAL:** The Kingdom of Thailand, formerly known as Siam, is located in the heart of mainland Southeast Asia. It has an area of approximately 518,000 square kilometers - about the size of France. Thailand has common boundaries with Burma (west and north), Laos (north and east), Cambodia (southeast), and Malaysia (South). South of the main portion of the country and east of peninsular Thailand lies the Gulf of Thailand.

**GEOGRAPHY:** There are four main geographic regions central, north-east, north, and south:

The central region, dominated by Thailand's most important river, the Chao Phraya, is rich in alluvium and watered by an extensive network of canals and irrigation projects.

The northeastern region, a large plateau rising about 300 meters above the central plain, comprises roughly one-third of the country. A great deal of this land is poor and suffers from occasional droughts or floods depending on the season. The topography makes irrigation difficult, but the ongoing irrigation and flood control projects on the Mekong river have improved the region's agricultural potential.

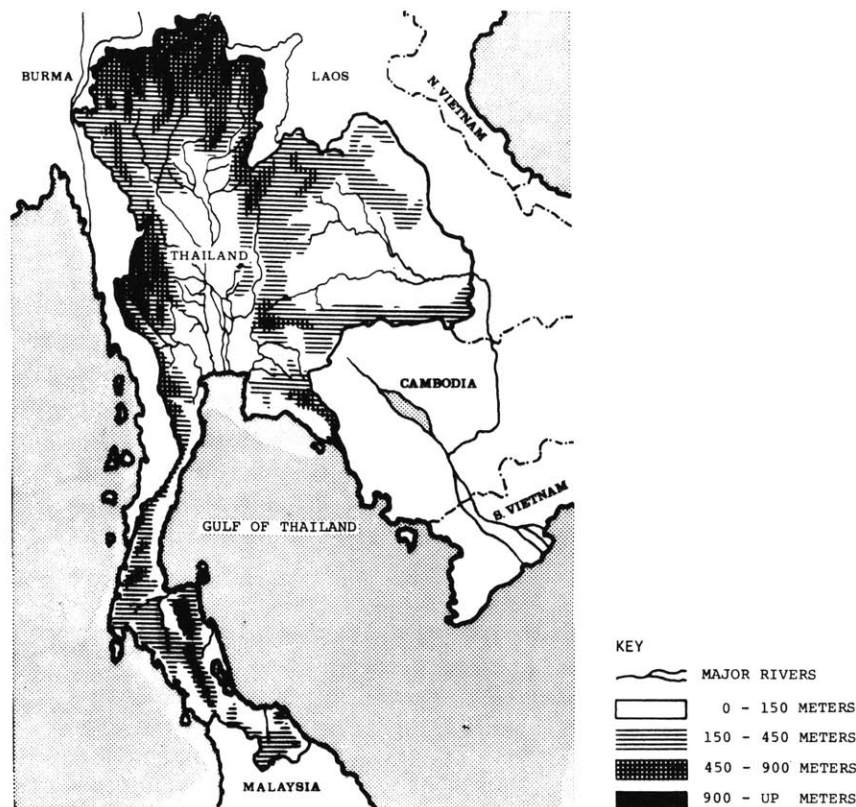
The northern region, primarily mountains and valleys, comprises about one-quarter of the nation. The mountains, running north and south are forested, and the valleys between them are narrow but fertile.

The southern region, a long sliver of land extending from central Thailand south to Malaysia, is covered in great part by a rain forest.

**CLIMATE:** Thailand is a tropical land, high in temperature and humidity. The climate of much of the country is dominated by monsoons. In most regions there are three seasons: rainy (June - October), cool (November - February), and hot (March - May). Rainfall varies but is generally heaviest in the south and lightest in the northeast.

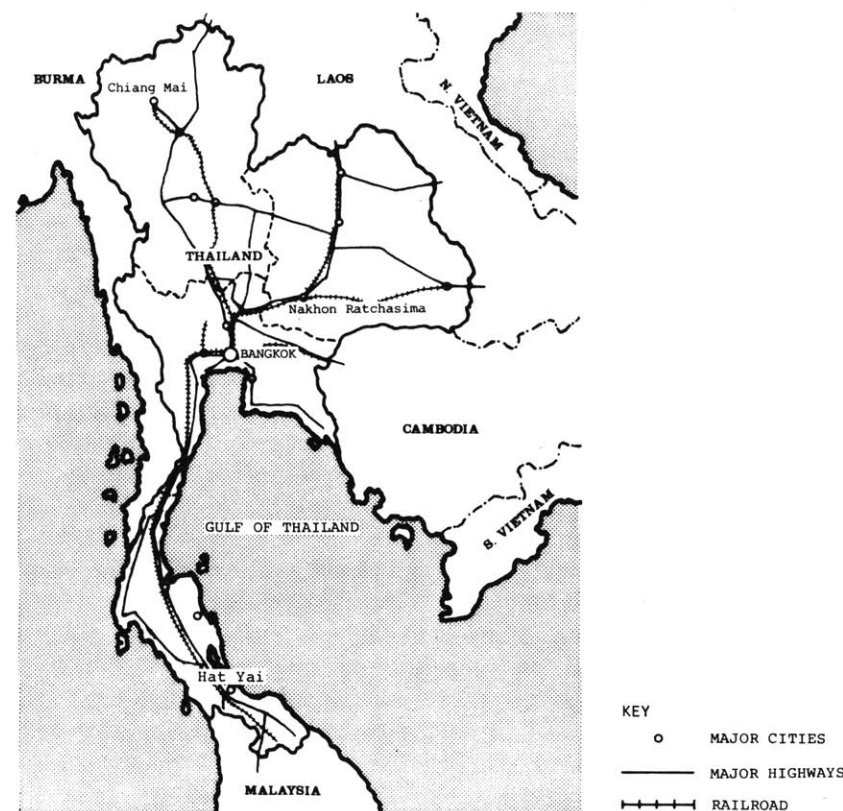
**HISTORY:** Recent archeological research suggests that a very early civilization existed in Thailand possibly as early as 4630 B.C. The first historical records indicate people of Thai stock ruling a kingdom in what is now Yunnan, China, who began migrating to Thailand about one thousand years ago. This process was greatly accelerated when southern China was overrun by the Mongols under Kub Lai Khan in the 13th century. During that century what was to become modern Thailand had its beginnings in a kingdom with its capital at Sukhothai in the north. In the 14th century the capital was transferred to Ayuthaya on the Chao Phraya river, a few miles north of Bangkok. Toward the end of the 18th century, Burmese armies overwhelmed the kingdom. Rama I, founder of the present ruling dynasty, was one of the leaders who eventually drove out the Burmese. He established the new capital at its present location, Bangkok, in 1782. During the last quarter of the 19th century, Rama V carried out a virtual revolution through modernization of the Thai Government. He combined diplomatic skill with modernization of the state structure, and thus made it possible for Thailand to survive as an independent state, the only country in South and Southeast Asia which was never colonized by an European power.

**ECONOMY:** The Thai economy is developing fast but stable. It has had a 8 percent average annual GNP growth rate since 1960. Thailand has shunned excessive deficit financing, built up comfortable foreign exchange reserves, and created a stable currency readily convertible at free market rates (about 21 baht = U.S. \$1.00). These conditions have facilitated development and attracted foreign investment.



**GEOGRAPHY**

Internally, the Thai economy continues to rely on agriculture, with rice the major crop. About 25 percent of the Gross Domestic Product of Thailand is derived from agricultural crops alone; the extractive industries as a group (agriculture, forestry, fishing and mining) provide about one-third of the total. Employment in agriculture accounts for 75 percent of the labor force. In 1964 Thailand was the largest rice exporter in the world and rice continues to be the major Thai export, with rubber, corn, and tin competing for second place. The 1960's saw a dramatic diversification of Thai agriculture, which has been reflected in the increasing importance of new exports, notably corn, tapioca, and kenaf. In 1971 Thai exports amounted to about U.S. \$870 million.



**TRANSPORTATION**

Imports into Thailand for 1971 amounted to U.S. \$1.3 billion. The major import items included machinery and transportation equipment, petroleum products, metal manufactures, chemicals, paper, and cotton.

The Thai economy is relatively free of controls and relies primarily on private rather than public enterprise. The Government encourages industrialization and is receptive to prospective private foreign investment. Despite the economic progress which Thailand has experienced in the last 10 years, per capita income is still only about \$180 per year. The benefit of the increase in GNP to \$6.5 billion in 1971 has been partially offset by the population growth.

**GOVERNMENT:** Government has been a constitutional monarchy since 1932. The present ruler, King Bhumibol, ascended to the throne in 1946. Three levels of government can be distinguished: central, provincial, and local. Power resides largely in the central government in Bangkok, led by an appointed Prime Minister and Cabinet. The Cabinet comprises 12 ministers and 16 deputy ministers. Each of the 71 provinces or changwads has a governor appointed by the Minister of Interior, plus a locally-elected Provincial Council. Locally, each of the 120 Municipal Areas has its own administrative and legislative leaders; communities too small to be designated as Municipal Areas may have their own government organization if they can qualify for pre-municipal or a Sanitary District.

A hierarchical system of administrative units has been in operation since 1448, with frequent re-structuring. The principal unit of territorial administration is the changwad (located at provincial capital), which is then subdivided into a number of amphoes or districts; each amphoe is divided into tambols or communes, which in turn are made up of mubans or villages. Each of these units has an elected or appointed leader, and the larger ones have sizeable staffs of government employees.

**DEMOGRAPHY:** Thailand's 1972 population of 37 million makes it the sixteenth largest nation in the world. A rapid growth rate of approximately 3.2 percent a year doubles the population in about 22 years. Bangkok, the capital, has about 3.0 million inhabitants (1970 est.). Thai society is predominately rural in nature with four-fifths of the population living in villages (the average village contains 500 to 1,000 persons), and is most heavily concentrated in the valleys and plains of the north, northeast, and central regions. The population density for the country as a whole is about 118 persons per kilometer.

**SOCIO-CULTURAL:** The majority of the population is composed primarily of people of Thai stock. The principal minority groups are an estimated 2 million ethnic Chinese located in the large urban areas (most of whom have been integrated into the Thai society); about 800,000 Malay-speaking Moslems in the southern provinces; the various hill tribes in the north, estimated at about 286,000; and 45,000 Vietnamese, mostly in the northeast.

The language is Thai, of which there are a number of regional dialects. English serves as the second language among the educated and official elements of society. Buddhism of the Theravada School is the religion of more than 90 percent of the Thai, but the Government permits religious freedom and a great number of other religions are represented throughout the country.

Theravada Buddhism is officially the state religion but, more accurately, a pervasive, non mystical, individualistic code of ethics, tend to encourage a "loosely structured" social system made up of independent and autonomous individuals whose reciprocal obligations and expectations are flexible rather than regimented. Among these common features are formalized superordinate-subordinate relationships: in principle, the young are subordinate to the old, women subordinate to men, and laymen subordinate to monks and the village headman. Actual behavior, however, may deviate considerably from these and other status distinctions. In general, status differences are small and even the small ones are respected only at the discretion of each individual.

**SOCIO-ECONOMIC:** In 1972 the annual per capita income of Thailand was estimated at U.S. \$180. Goods are still produced as frequently by home handicraft or cottage industry as by large scale manufacturing plants. Commercial activities too, are in transition from the predominant, family-operated, small shop to the large department stores, of which there are only a few in

Bangkok and almost none elsewhere in the nation. The main power sources are still man and water buffaloes.

HOUSING: Preliminary figures based upon the latest population and housing census conducted in April 1970 by the National Statistical Office indicate that there were approximately 5,804,000 households and a total population of 37 millions in Thailand. Of this number, the Bangkok Metropolitan has 3,051,000 inhabitants.

The high cost of land and the continuing rapid growth rate of metropolitan Bangkok are contributing greatly to overcrowding of existing housing stock. Due to the absence of land use control and effective land taxing has resulted in rampant speculation. New housing construction is restricted by the large proportion of financial resource required for land and development (up to 60% of total cost). Lower and moderate income families crowd into scarce rental units. Many families live with relatives to share costs or when other form of housing is not available. The emergence of large squatter communities show plainly that many lower income families can afford to build some sort of shelter if relieved from the burden of expensive land. Approximately 15% of the population or 45,000 people in Bangkok Metropolitan area are in the low income sectors. They do not have access to public/private housing and can only afford limited government subsidized housing. This facts accelerates the growth of housing demand, but the slow growth of housing stock results in a great deficit. The actual housing market in Bangkok is beyond the economic capacity of over 55% of the population.

The similar housing situation exist in the other major cities throughout the country. Eventhough the present scale of the condision is not as great as Bangkok's, it is increasing at a rapid rate in the same direction.

The National Economic Development Board has estimated that there is an existing need for 100,000 housing units in Bangkok Metropolitan area. The Department of Public Welfare is planning for the initial construction of

10.000 housing units for low-income families (families earning less than \$75 per month), and an additional 5,000 units annually over the next 10 years, and 4000 housing units in other major cities in the country. This amount of construction will only satisfy the present estimated housing need.

## URBANIZATION IN THAILAND

The rapid growth of urban areas in Thailand constitutes a problem second only to the high rate of population growth. Urban increase may largely be due to the large exodus from rural areas which are burdened with excessive population growth. Using municipal areas as the equivalent of urban population, the level of urbanization in Thailand increased from 9.9 percent in 1947 to 12.5 percent in 1960. According to the registry in 1960, urban residents constituted 13.1 percent of Thailand's population. By 1967 this level had risen to 14.4 percent. Between 1947 and 1960 the urban population had increased at an average annual rate of 5.0 percent compared to the rural population which grew by 3.0 percent each year. Between the 1960 and 1967 registry account, this significant differential remained. The urban population grew at 4.8 percent annually and the rural at 3.1 percent. In both periods, urban growth rates exceeded those of rural areas by over half, although the differential has narrowed slightly.

In 1967, as in 1947 and 1960, the position of Bangkok-Thon Buri as Thailand's primate city remain unchallenged. Greater Bangkok's 1947 population of 781,700 was 21 times greater than that of Chiang Mai, the next largest. By 1960, the capital's population had increased three-fold to 1,800,700 equal to 27 times the population of Chiang Mai. In 1967, the 2,614,400 persons living in Greater Bangkok out-numbered the residents of Chiang Mai 32:1. Bangkok has drawn away from all other cities in character as well as size.

## REGIONAL DIFFERENCES IN URBANIZATION

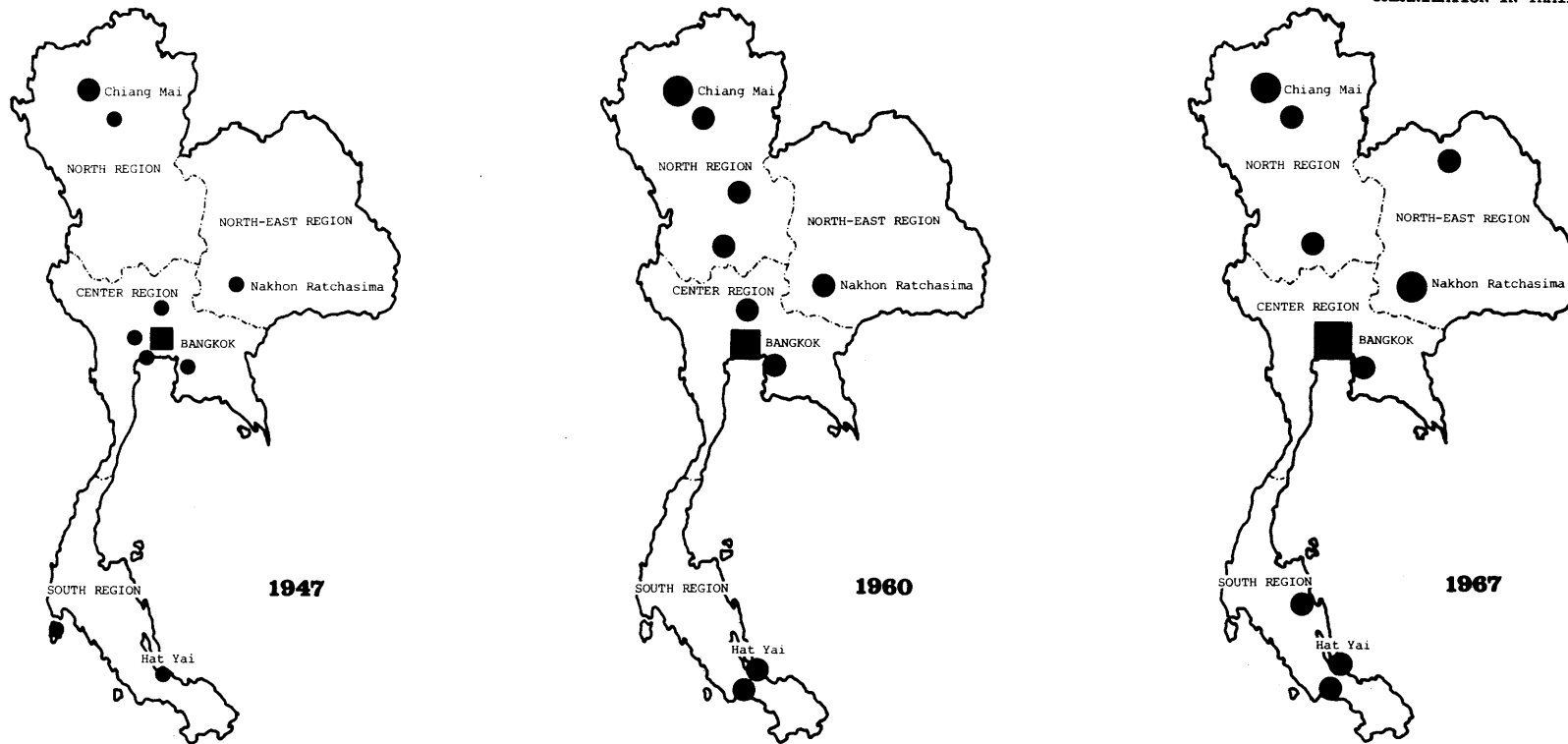
The very dominance of Greater Bangkok in Thailand's urban structure insures that the distribution of urban population does not follow an uniform pattern among the four major regions into which the country is subdivided.

The Central region covers approximately 101,000 square kilometers (22.9 percent of the country) and accounts for about 30 percent of Thailand's 1960 population. This area contains Thailand's four great rivers. Near the mouth of the Chao Phraya River, as it flows into the gulf of Thailand, stand Bangkok and Thon Buri, which comprise the capital city area.

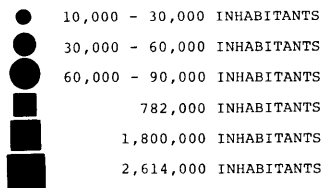
The largest region is the Northeast with 170,200 square kilometers (38.6 percent of the country) and 35 percent of the country's population. It is characterized by a unique geological plateau formation of red sandstone and has a relatively poor water supply, so that cultivation is heavily dependent on the monsoon. In recent years it has been the object of concerted development efforts to raise the low standard of living. Improved irrigation and widespread road construction have been major parts of a program to help the farming population.

The North ranks a very close second in area with 170,000 square kilometers (38.5 percent of the country) but it contains only one-fourth of the country's population. The region is mountainous and endowed with thick forests and fertile valleys. As a result, the production of rice, tobacco, timber, and cattle, as well as a variety of vegetables permits the population to maintain a better standard of living than in the Northeast, but not as high as that in the Central region or the South.

The South, the smallest geographic region with only about 70,000 square kilometers (15.9 percent of the country), is on a narrow peninsula joining with Malaysia. Its 3 million people constitute just over 10 percent of the country's total population. Due to the double monsoon which it experiences, rainfall and water are generally plentiful, permitting the farmers who cultivate the land along the East Coast to enjoy a high standard of living. In addition to its agricultural products, including tobacco, fruits, vegetables, and rubber, the South also relies on tin



**URBAN DISTRIBUTION PATTERN**



deposits and fish as sources of income.

Because Greater Bangkok represents the focal point of the Central region, this area is by far the most urbanized in Thailand. In 1967 almost one-third of its population lived in urban places compared with 11 percent or less in the other three regions. Because of Greater Bangkok, this region alone, which accounts for only 32 percent of Thailand's total population, contains 71.3 percent of the country's total urban population.

Next to the Central region, the South had the highest proportion of people living in urban areas, but this amounted to only 11.2 percent of its population. Urbanization levels in both the Northeast and the North were even lower, 6.3 and 4.0 percent respectively. Each of these other three regions contain only 9 to 10 percent of Thailand's total urban population.

These regional variations account for the fact that in the 20 years between 1947 and 1967 the Central region augmented its position as the most urbanized part of Thailand. In 1947 only 21 percent of the region's population was in urban areas and these accounted for 64 percent of Thailand's total urban population. By 1967 the corresponding values were 32 and 71 percent, respectively. In the same interval, both the Northeast and the South also increased their levels of urbanization; but because of the faster growth in the Central

region's urban population, the proportion of Thailand's urban population living in the South and the Northeast was less in 1964 than in 1947. In the North, because of the higher rate of rural growth after 1960, the percent living in urban places had declined by 1967 to about its 1947 level. Concomitantly, the North's share of the total Thai urban population declined.

## URBAN AREAS

In 1947 Bangkok-Thon Buri in the Central region was the only urban area in all of Thailand exceeding 40,000 persons. By 1967, there were nine such places, and seven were located outside the central region. Thus despite the decline in the proportion of Thailand's total urban population living outside the Central region, the other three regions did experience rising levels of urbanization if judged by the growing number of moderate-sized cities. In these 20 years, Chiang Mai in the North, which in 1967 ranked as Thailand's second city had grown from 38,200 persons to 81,600. Nakhon Ratchasima in the Northeast, Thailand's third largest city, numbered 73,000 in 1967; in 1947 it had only 22,300 persons. And Hat Yai in the South, the fourth largest city in 1967 with 49,300 persons had reported only 15,200 population in the 1947 census. Each serves as a regional center providing a potential core for greater urban decentralization.

## THE PRESENT SITUATION IN BANGKOK

Bangkok today reflects the impact of the rapid growth in population and wealth, and the introduction of the motor vehicle and other articles of modern technology on a city originally built for another age. The development of the city is encountering serious problems. The visible evidence is the traffic congestion, which already seriously affects mobility in the city. Not quite so visible are problems with supplying water to the increasing population, and the problem of disposing of waste and sewerage in a large city, which has no central sewerage system. A factor compounding the

problem of utilities and traffic is the uncontrolled nature of the city's growth. There are no land controls. The result has been development along the larger roads, pockets of under developed land throughout large parts of the city, and traffic generation and demands on utility services in a random fashion.

Housing problems also arise in the city. Land is expensive, and the concentration of population requires community action on water supply and sanitation. The cheapest subdivision building land is sold between \$1,500 to \$2,000 per minimum lot (160 square meters) with up to 15 years credit; the minimum standard dwelling costs approximately \$3,000. Up to fifty-five percent of the population cannot afford the commercially available houses in the Metropolitan area. As a result, a number of poorer city dwellers avoid the full cost of urban housing by erecting cheap dwellings on public land in locations accessible to employment. The largest single squatter community consists of 30,000 inhabitants at Klong Toey on property belonging to the Port of Bangkok. It has been estimated that there are 80,000 squatter families in Bangkok, approximately 15 percent of the city's population.

The rapid growth of urbanization in the Bangkok Metropolitan area is accelerated by the high rate of population growth. From 1.9 million in 1956 the population increased to more than 3 million in 1974, and the built up area increased from 90 square kilometers to 130 square kilometers. In the 1960's internal migration has contributed substantially to the growth of the Bangkok Metropolitan area; more than one-fourth of the households heads were not born in the city. There are a wide range of social, economic, ecological and other problems associated with Bangkok's rapid growth.

Encouraging developments throughout the other regions of the country may help to alleviate the problems of Bangkok and to give a better regional balance in the development of the country in the interests of long run growth and stability.

## URBANIZATION POLICY THROUGH DEVELOPMENT OF THE NORTHEASTERN SECONDARY CITIES

development as a secondary city in the region as well as in the nation as a whole.

The National Economic Development Board in 1974 has passed an urbanization policy encouraging development of northeastern secondary cities as part of the national planning policies. The emphasis is given to the development of secondary cities to accelerate industrial production and to absorb increasing agricultural unemployment in the lagging region, as well as to decentralize some of the industrial activities away from the Bangkok area. It aims to promote industrial decentralization and check excessive population flows into already over concentrated urban areas of Bangkok.

Four major northeast provincial capitals; Nakohn Ratchasima, Udonrntani, Ubonrajchatani, and Khon Khan, have been selected as the growth centers to play a key role in extending development across the entire region. The criteria for the selection of these growth centres were:

- A) Existing major urban areas
- B) Ability to attract investment
- C) Potential of diffusing investment benefits most widely throughout the region in the future.

These four urban centres have already been important marketing and distribution centres for Northeast Thailand. Initial efforts to implement the secondary cities development policies have started by the government. The World Bank has already approved loans for the improvement of the existing urban infrastructures.

Nakhon Ratchasima is chosen for this study because of its importance to the northeast region. Its population ranks third in the nation, highest in the region. Its Gross Domestic Product and annual per capita income are much higher than the other urban centres in the region. Nakhon Ratchasima has the most potential for

# NAKHON RATCHASIMA, THAILAND

## URBAN CONTEXT

**PRIMARY INFORMATION:** Nakhon Ratchasima Metropolitan area is located on a plateau approximately 255 kilometers northeast of Bangkok, latitude 13°45' North, longitude 102°07' East. It is the provincial capital of Nakhon Ratchasima region. The climate is tropical dominated by monsoon. There are three seasons: rainy (May - September), cool (November - February), and hot (March - April). The municipal district covers an area of 4.4 square kilometers with a population of 77,397 in 1972 with a density of 17,602 people per square kilometer.

**HISTORY:** Nakhon Ratchasima is considered as one of the historically important cities of Thailand. It was founded by Cambodians in the early 12th century. It remained a Cambodian city until 1337 during Aduttaya Dynasty when King Utong seized the city and established it as part of the Thai kingdom. In 1656 King Narai Maharaj moved the city to its present location for fortification purposes. Nakhon Ratchasima has served as a commercial and military center for the northeast region since the 17th century. In the year 1900 the first railroad service reached the city; increasing its growth and importance in the region.

**ECONOMY:** Nakhon Ratchasima is the major financial and commercial center of the northeast region, the principal industries consist of agriculture, textile and cattle. The labor force is estimated to be 56 percent of its total population, 98 percent of this group has permanent jobs in which 81 percent work for private enterprise and 19 percent work for public agencies. Small private industry and cottage industry are found throughout the city.

**GOVERNMENT:** Nakhon Ratchasima Metropolitan is the provincial capital and administration center under the authority of an appointed provincial governor. The province is divided into 18 Amphurs (districts) which is headed by a district officer who is directly responsible for district administration. Districts are also divided into 145 Tambols (communes) which is headed by a commune headman and responsible for performing both civil and crime repression duties in the commune.

**DEMOGRAPHY:** The present population in Nakhon Ratchasima is approximately 78,000 people with an annual growth rate of 3.2 percent. The projected population in the year 1992 is 248,000 people. At present, 68 percent of the population is under thirty years of age of which 51 percent are males.

**SOCIO-CULTURAL:** The majority of the population is of Thai ethnic origin and they are mainly Buddhist. The ratio of nuclear families to extended families is 70:30. Forty-seven percent of the population in the city are farmers.

**SOCIO-ECONOMIC:** In 1969 the annual per capita income of the metropolitan area was estimated as US.\$850 which is slightly above the national average; however, this ranks is the highest annual income in the northeast region. The majority of the middle income (approximately 30 percent of the population) concentrates in the commercial districts of the city located between the railroad station and the old city center. Upper income (approximately 20 percent of the population) sectors are dispersed throughout the outskirts of the city. The low income (approximately 38 percent of the population) sectors lives on the periphery and along the Friendship Highway, accommodating approximately 8 percent of the total population.

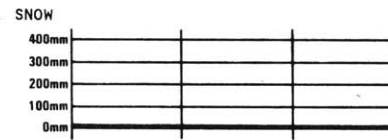
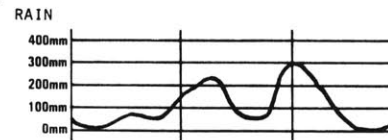
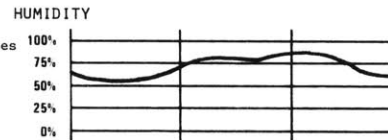
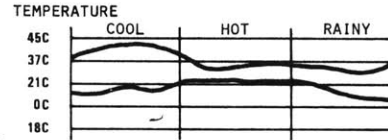
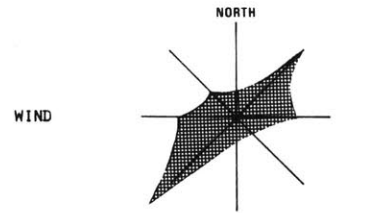
**UTILITIES, SERVICES, COMMUNITY FACILITIES:** Nakhon Ratchasima is the regional service center serving the community as well as the nearby provinces. 17.7 percent of the land in the city is used for educational facilities; students from other provinces come to Nakhon Ratchasima to continue their higher education. There are two hospitals and twenty one private clinics serving the community. Only 0.8 percent of the land is used for recreational purposes, however, there are thirty one temples which occupy 6.72 percent of the land which are used for social gathering places as well as religious ceremonies. The majority of the people use bicycles for transportation; there are few private cars and public buses connecting the city center to the nearby communes.

**HOUSING:** According to the 1974 report by the City Planning Division, Minister of Interior, 86% of the houses in Nakhon Ratchasima are made of wood, of which 18.9% are considered in bad condition and 59.6% in the fair condition. Sixty three percent of the dwelling are detached house type, and thirty six percent are row houses. Majority of the house has one story, the highest building in the city has 6 stories. There are some migrant squatters along the highway leading to the city; however, they are only a small number and have not yet developed into a community.

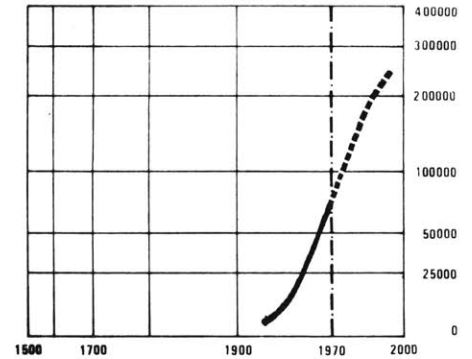
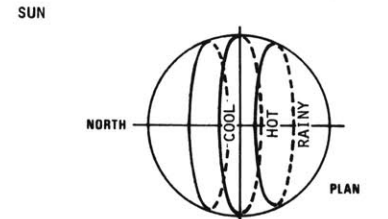
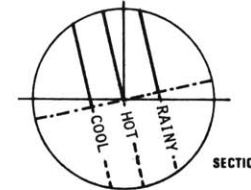
There are three main dwelling types: Farm house, Row house, and Detached house. Farm house is the product of self-help construction using the folk architecture and local building material satisfying the needs of low income sector of the population. Row houses locate in the city center along major commercial streets. They are built by small contractor out of wood or masonry/concrete. Middle income either rent or own these units. Detached houses locate throughout the city, made of wood, constructed by artisan or small contractor. Majority of the high income population of the city live in the detached houses, however some moderate low and middle income people also occupy this type of housing, the size and condition of the house vary according to the income of the residents. The Department of Public Welfare plans to construct 500 housing units for low income people in Nakhon Ratchasima in 1978, which will be the first government public housing project build in the city.

**OPPOSITE PAGE:**  
 (top left): Foreground of the picture shows a hotel with shops at the ground level. The highest building in the city is six stories high.  
 (bottom left): The picture show the contrast between the old and the new: wooden row houses and masonry/concrete row houses, the tricycle taxis and automobiles.  
 (top right): Public open space is shown on the right of the picture. Roof garden is used for laundry, and flower orchard on the masonry/concrete row houses.  
 (bottom right): A typical scene of the public market. There is no control over the use of the road, pedestrian is mixed with vehicles.

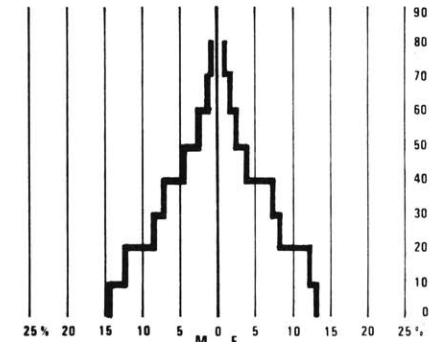
NAKHON RATCHASIMA 14° 58'N



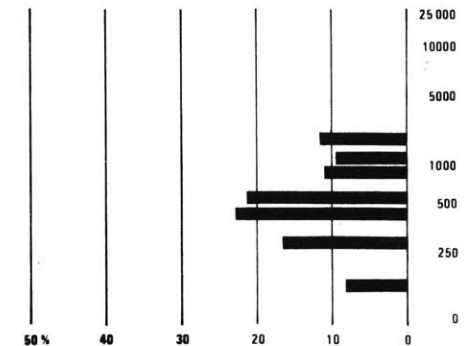
Source: 1969 Statistical Yearbook Thailand



URBAN POPULATION GROWTH  
horizontal: dates vertical: population  
Source: The Nakhon Ratchasima Development Board 1974

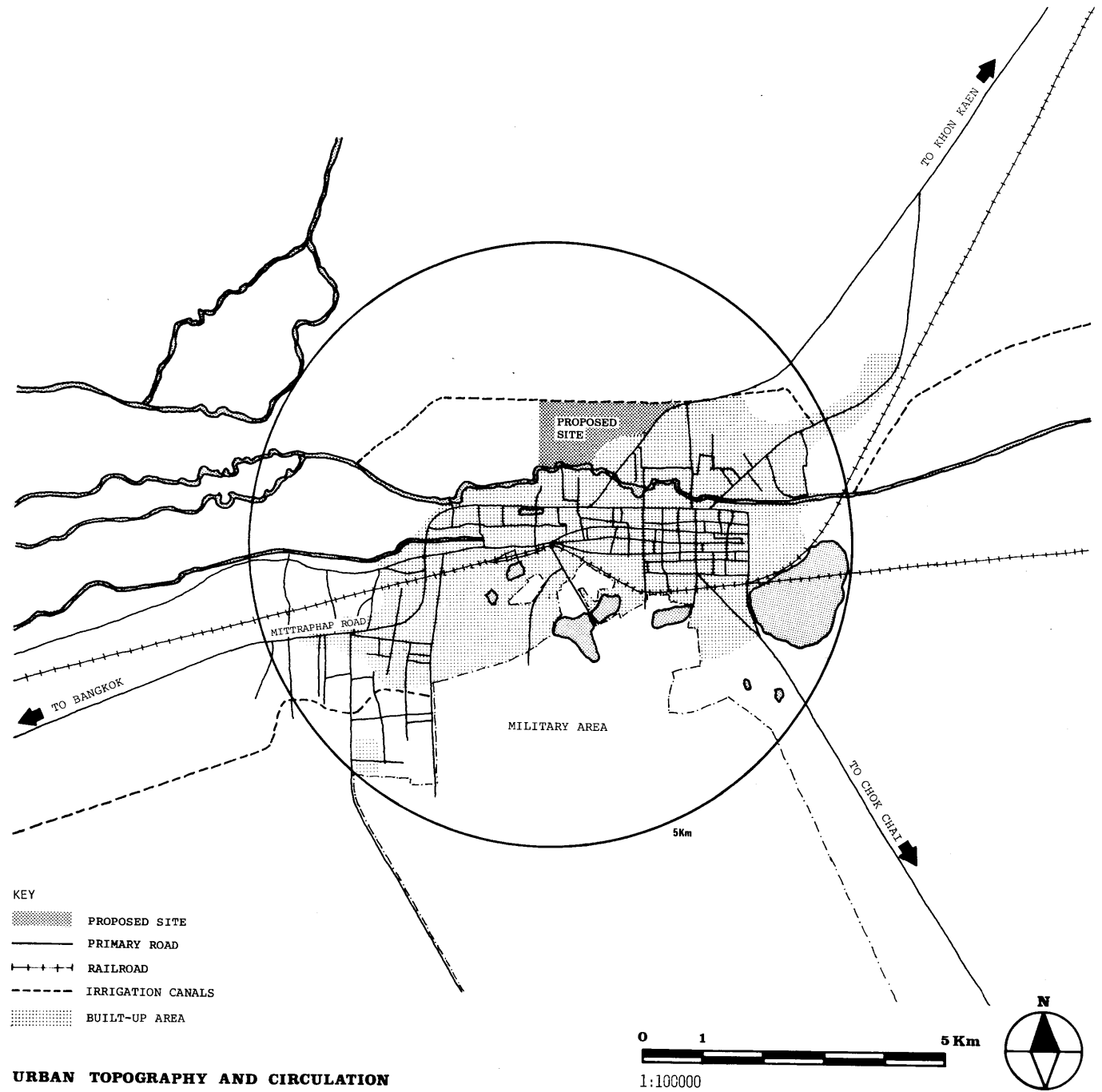


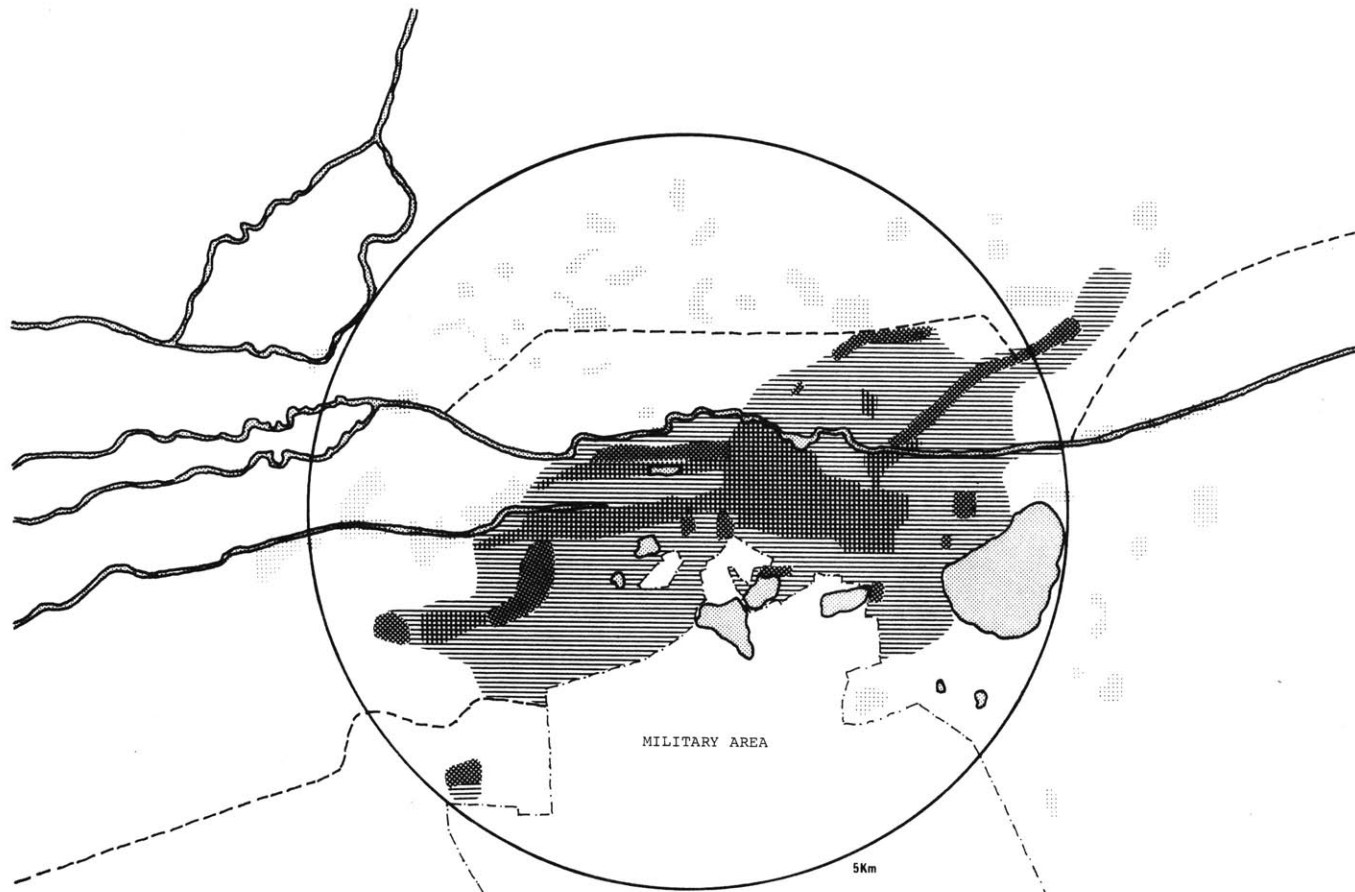
URBAN POPULATION DISTRIBUTION  
horizontal: percentages vertical: ages  
males: 51% females: 49%  
Source: The Nakhon Ratchasima Development Board  
Census, 1970; Population, 78,000



URBAN ANNUAL INCOME DISTRIBUTION  
horizontal: percentages vertical: dollars  
Source: The Nakhon Ratchasima Development Board 1974

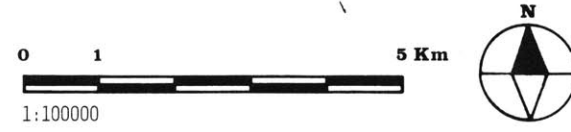






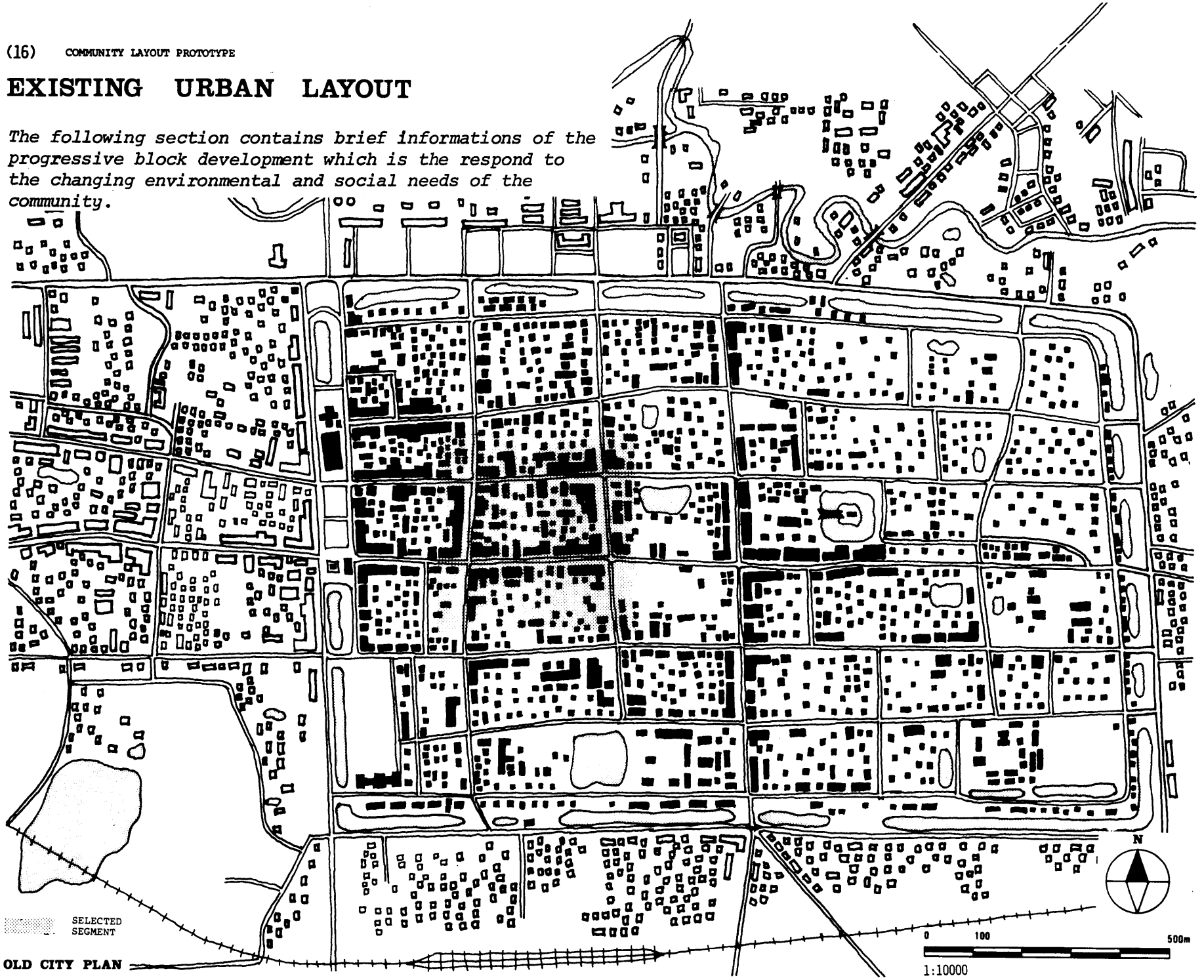
- AREAS
- RESIDENTIAL
  - COMMERCIAL
  - INDUSTRIAL
  - FARM VILLAGES

URBAN LAND USE PATTERN



# EXISTING URBAN LAYOUT

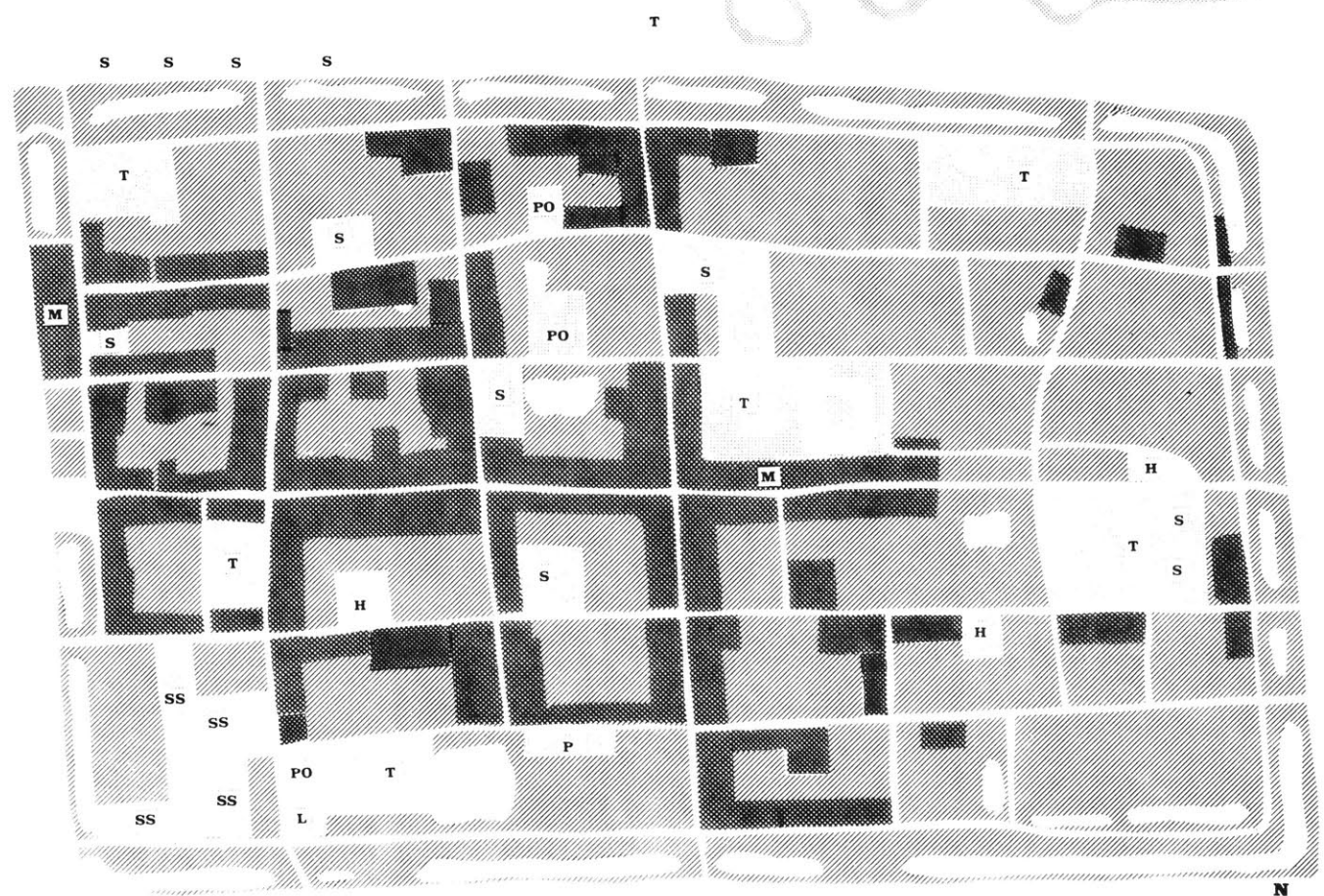
The following section contains brief informations of the progressive block development which is the respond to the changing environmental and social needs of the community.




SELECTED SEGMENT

OLD CITY PLAN

0 100 500m  
1:10000



- KEY
- P Police
  - S School
  - R Recreation
  - L Library
  - H Health
  - PO Post Office
  - SS Social Services
  - M Market

- AREAS
-  RESIDENTIAL
  -  COMMERCIAL
  -  INDUSTRIAL
  -  OPEN SPACES



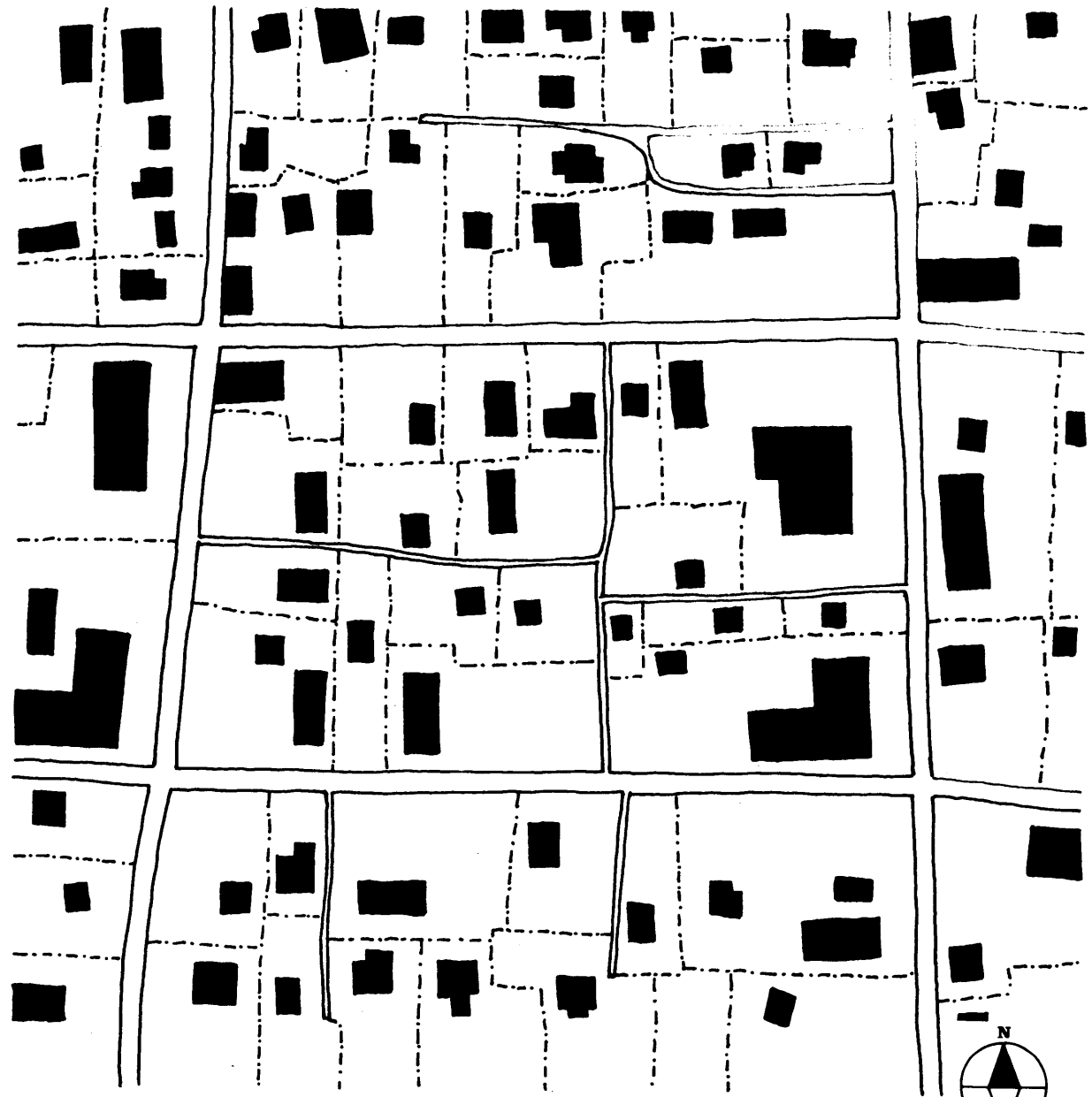
1:10000

OLD CITY LAND USE PATTERN

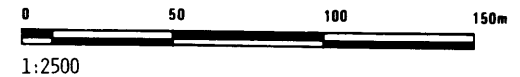
(18) COMMUNITY LAYOUT PROTOTYPE

Nakhon Ratchasima was founded in 1656 by King Narai Maharaj who move the city to its present location for fortification purposes. The layout of the old city is still remains and has been intergrated to the existing Nakhon Ratchasima. The old city area is distinguish from the rest of the city by fortification canals surrounded the area. Part of the old city wall is still remains. It covers an area of 18 Ha., supporting approximately 45,400 people or about 57% of the entire population of Nakhon Ratchasima. The layout of the old city can be characterised by its rectangular pattern, the block is approximately 180M. X 280M. in size.

In the old city area is the location of community facilities needed to support the population of the city. Schools, social service offices, temples, and markets scatter through out the area mixed with residential and commercial areas. A concentration of commercial activities occur along major streets connecting the old city center with railroad station which locates west of the area. Artisan shops and small industries can be found through out the area with no specific concentration in any particular section. Some open space along the fortification canals or ponds are used as recreation areas. Temples are used not only for performing religious ceremony, but also used by the residents as a place for relaxation and contemplation. The income of the population in the area ranges from moderate low to high income sector.



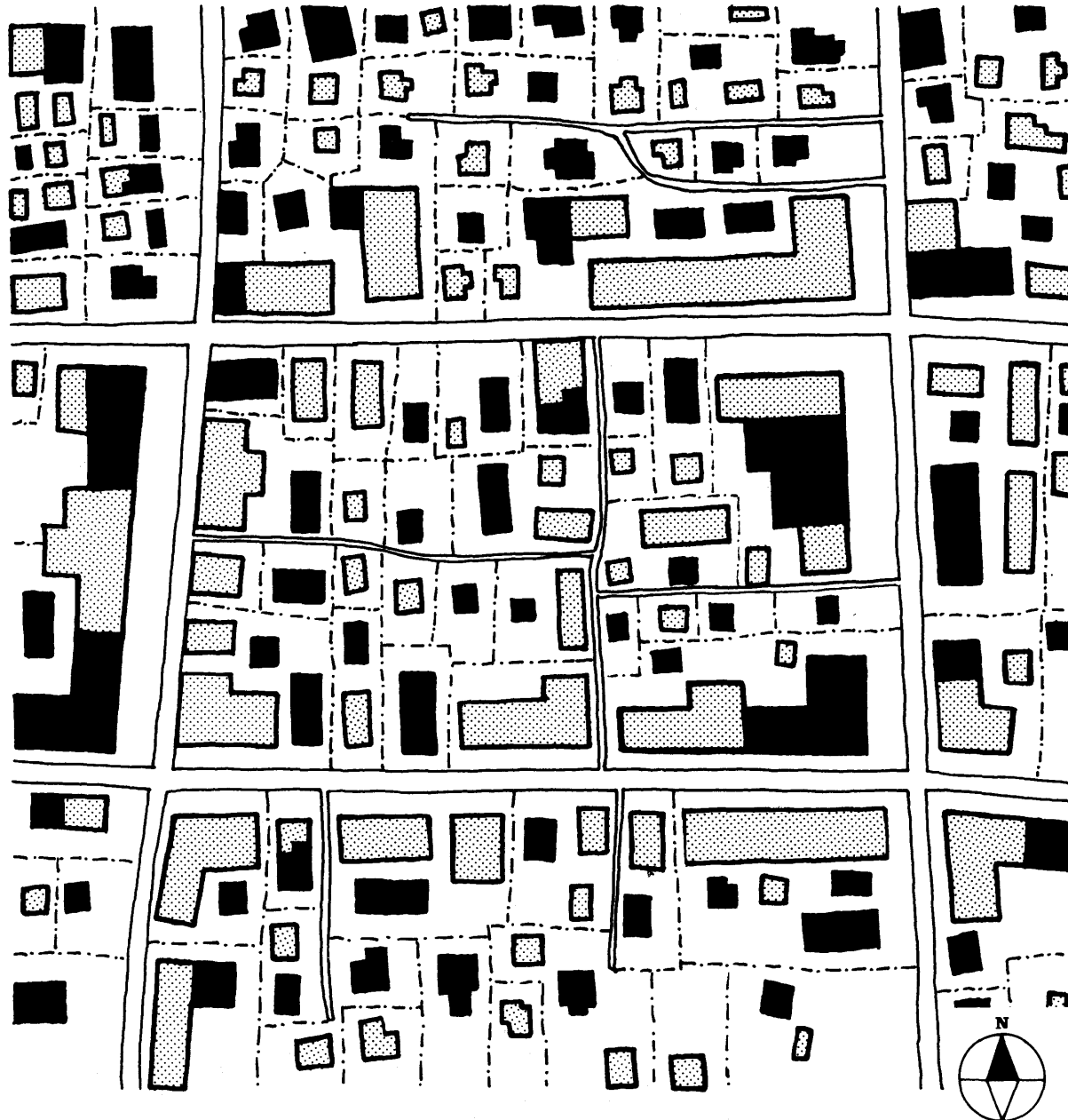
OLD BLOCK PLAN



The drawings of the selected segment of the old city plan show the changes and development of the land use and block layout from 1950's to 1970. The block's character changes according to the need of the land owner and the changing character of the community as time passed. The old block plan shows the land subdivision in the block at the initial stage. The buildings were mostly detached varied in size and configuration according to the location and the size of the lots. The land use in this was mainly residential with few commercial shops located at the street intersections, a similar character exists at present in the eastern section of the area (see detached house page 26). Access roads cut into the block to provide access for the lots which located within th block. These roads are pedestrian dominant with limited vehicular use. Most of these roads are not paved and recieves no public responsibilities.

The existing block plan drawing shows the change that occur to the block, new buildings are added, land are further subdivided. As the city expanded and population increase the land cost of the are is increased. Land owners subdivided their lots and sold to public. Families with increasing number and needs add on more area to their houses. Many land owners whose land are along major streets, built row houses for rent at the edge of their properties.

This progressive development of the block is the process which responds to the changing environmental and social needs of the community. However, this development put a great burden and demand on the existing public facilities which are not planned for such density and diversity of land uses. As a consequence, there are shortage of public facilities, traffic congestion and overcrowding in the area.



1:2500

KEY

- OLD BUILDINGS
- NEW BUILDINGS

EXISTING BLOCK PLAN

## EXISTING DWELLING/LAND TYPES

Three examples of residential settlements are presented in this study. They are samples of a diverse cross-section of housing situations in the city; it includes low to high income sectors, low to medium population densities, and private self-help to small contractor housings. These cases are: 1) Farm house, 2) Row house, 3) Detached house. The analysis of these dwelling types bring about the following conclusions:

-The majority of houses in low and high income sectors are built in wood, the traditional construction material locally available.

-Little financing opportunities have been available to families in helping them construct their houses. People always have had to rely on personal saving and family loans when they could, to finance their housing needs. The contribution of Construction and Mortgage Bank has been very small.

-Many of the large property owners subdivides the land into small lots, and sold to public or share among family, which increase the population density of the area.

-There is no control over the land use, owner may change/add the use of the land as needed which increases the demand on utilities lines/services of the area which was planned for residential use only.

-The city does not has sewage system and treatment plant. The residents depends on pit latrines or septic tanks.

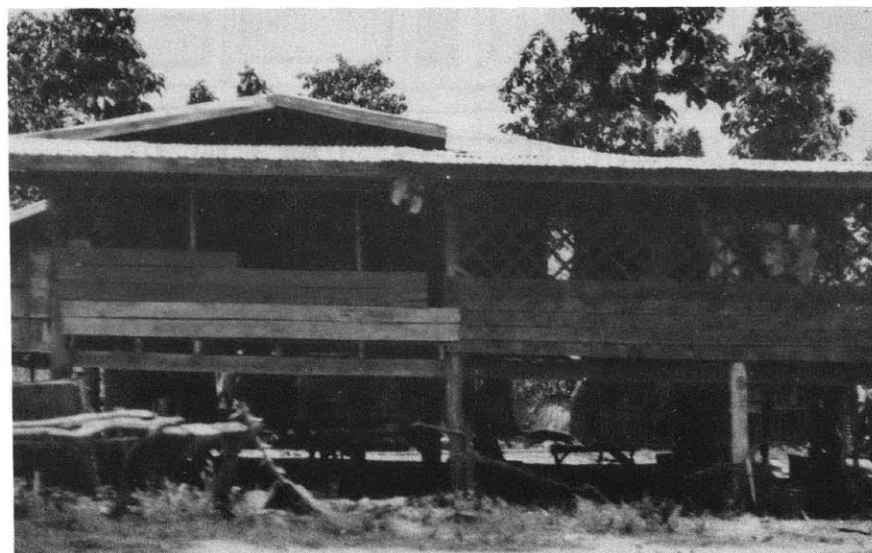
-Over 60% of the city's dwellings are in the form of detached house with the majority of structure being one or two stories high. The rest are row houses.

-80% of the dwellings are in bad or fair physical state.

### 1. Farm House

*(top): The residents expand their house according to the change of needs and economic situation.*

*(bottom): The house is built on stilts. Walls are left partially opened for cross ventilation.*



## 2. Row House

*(top): Wooden row houses are used for commercial as well as residential purpose.*

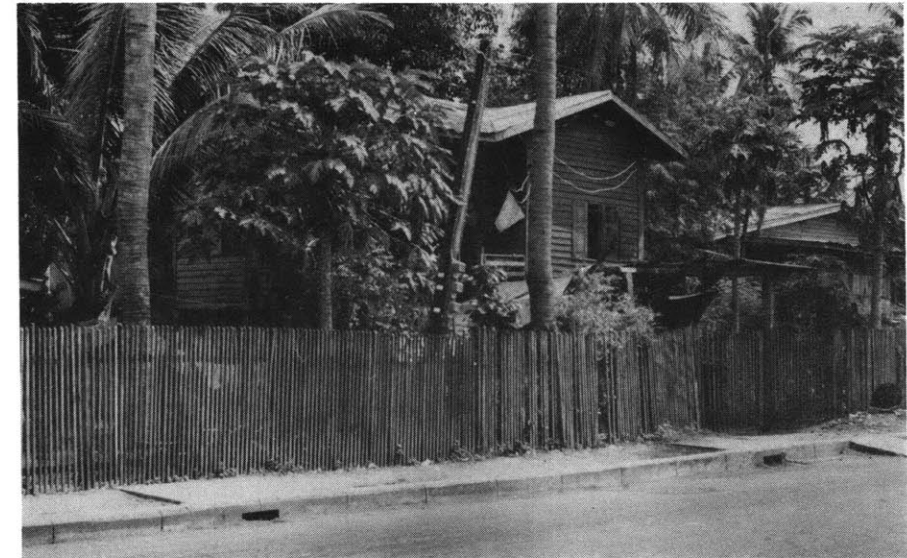
*(bottom): Four stories row houses are being built in place of the old using masonry/concrete construction.*



## 3. Detached House

*(top): road leading to the dwellings has pedestrian dominant character with limited vehicular uses.*

*(bottom): Private court is used for gardening and drying laundry. Trees provide shading as well as fruits.*



## 1. Farm House

**LOCATION AND ORIGIN:** The farm houses are located on the periphery area along the major roads leading to the city or grouped together to form a farming village. The settlement has rural character. The dwellings are built on stilts in the traditional fashion. Ground area is used for storage and raising animals. In some case the houses belong to the migratory workers who may stay only for one season after which they may move back to their farm; or else they may decide to stay longer and then will build more permanent shelters.

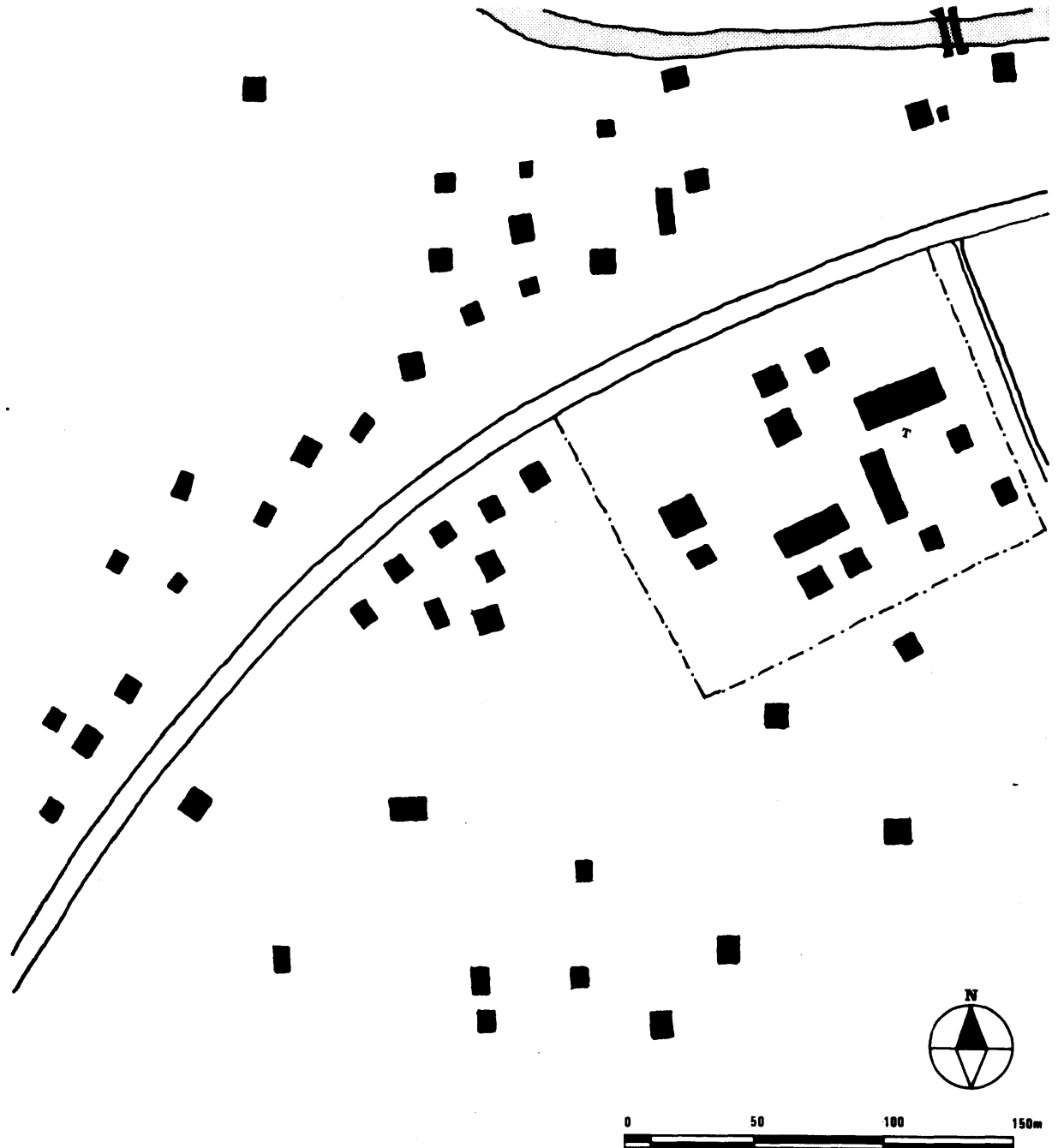
**LAYOUT:** The farm house is built on the land which the farmer is cultivating on either a privately own or rental land. In the case of the migrants land is picked on an unutilized land that may be privately owned or an unattended piece of public land. On this piece of land they build their dwelling near a major road for the ease of access to the city. This layout gives very low population density.

**LAND USE:** Land is used for rice paddy or plantation. Animals are domesticated for farm work and private consumption only. The residents has access to water supply through deep well dug next to the dwelling. They seldomly have electricity supply connect to the units. Latrines are used and located outside the house.

**CIRCULATION:** No organized system of circulation exists. Dwellings are reached only through pedestrian access along farm levees.

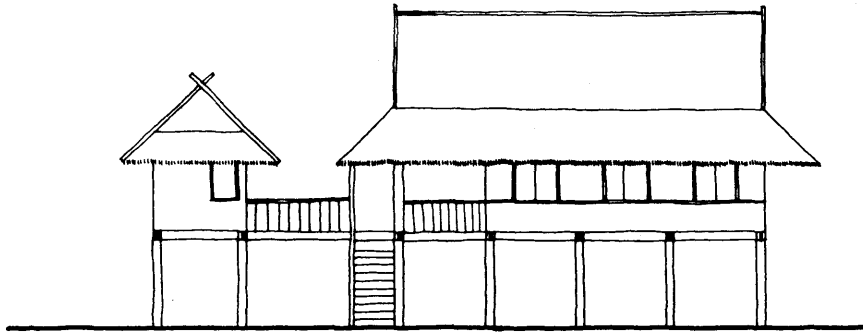
**POPULATION/INCOME:** The migrants originate in the north-east region. They move to the city as farming season changes. They may either stay on a temporary basis as laborers or else after finding some measure of economic security they may decide to live longer. The farmers and the migrants fall within the lowest income sector.

**CONSTRUCTION:** Houses are built from wood on stilts, raised above ground. Movable partitions or large louver are used on walls for cross ventilation. Thatch is used for roofing material. Units are built with self-help method, using the locally available material.

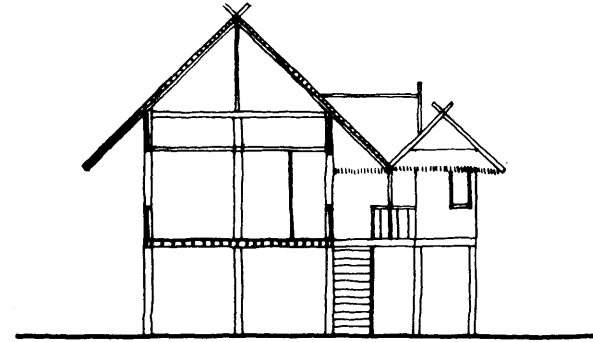


LOCALITY SEGMENT PLAN

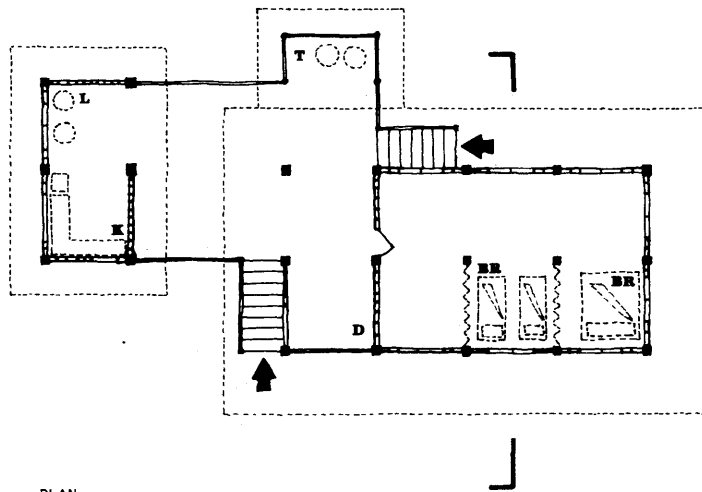
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1:2500



ELEVATION



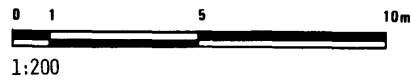
SECTION



PLAN

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)



## 2. Row House

**LOCATION AND ORIGIN:** The row houses are located in the city center along Pho Klang road and Suranari road which are the major commercial roads running from railroad station to the old city center. It was predominantly a residential area which changed its character to a commercial district as the city grew out to the western direction.

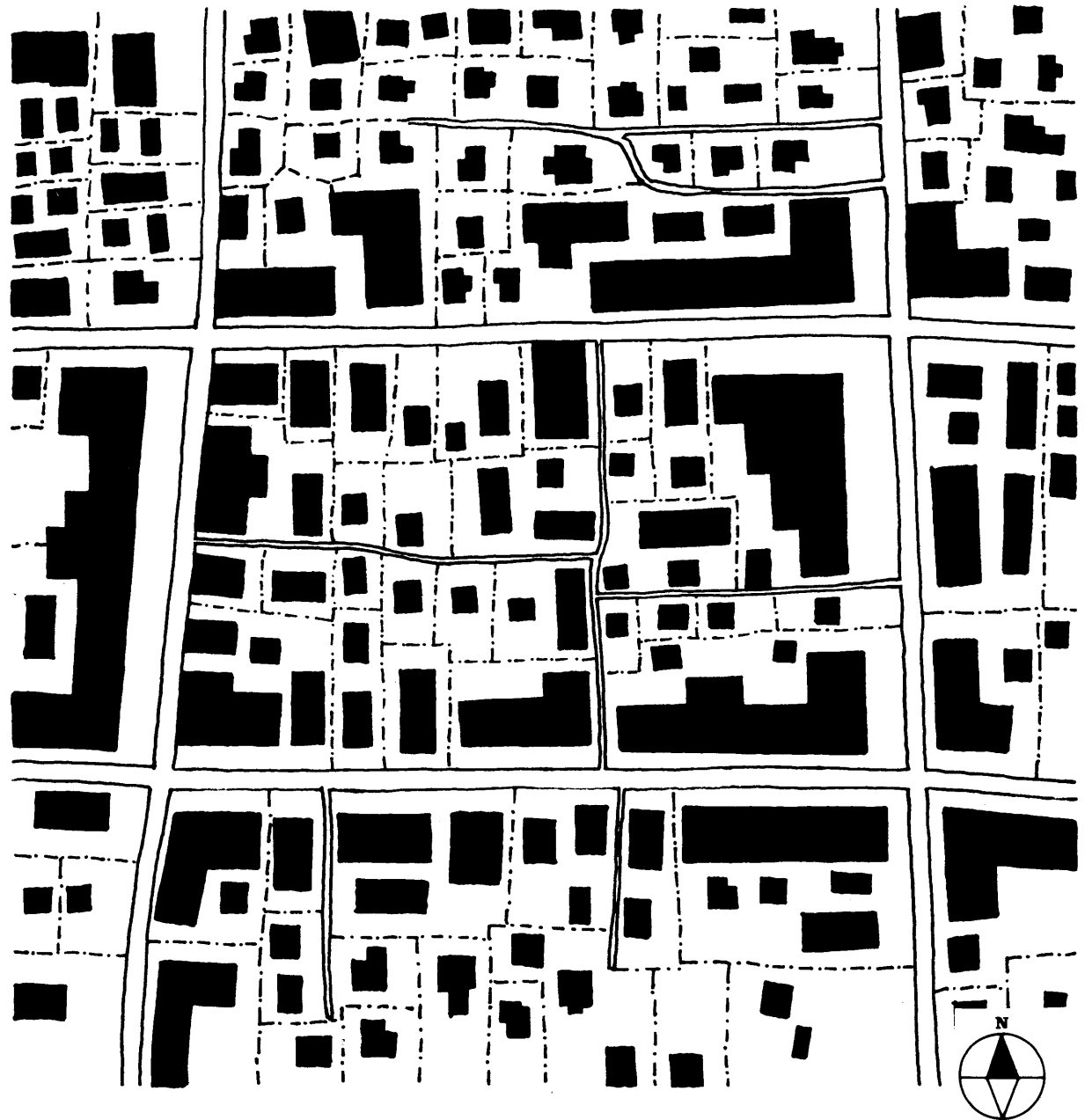
**LAYOUT:** The area is planned on an irregular and approximately rectangular pattern. Most of the home owners along commercial streets subdivided their land or built row houses for rent at the edge of their properties aligned to the streets. Economic use of land is a major constraint in the layout which gives medium to high population density.

**LAND USE:** The entire area is heavily built up and there is no room for residential expansion; a relatively high proportion of the area is developed into shop/store dwelling units, where the first level is used as shops and the rest as living quarter.

**CIRCULATION:** Vehicles movement dominate over pedestrian on roads around the block. Pedestrian roads with limited vehicles uses, provide access to the dwellings located in the block.

**POPULATION/INCOME:** Majority of the land owners have Thai ethnic origin, almost all the row houses are rented by the shop owners who are of Chinese ethnic origin. The inhabitants are in the middle income sector of the city.

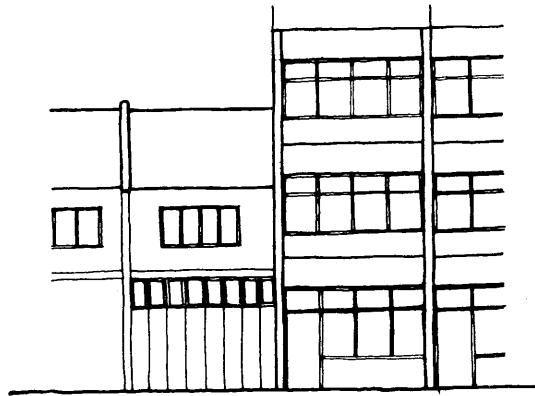
**CONSTRUCTION:** Majority of the row houses in the city are made of wood with galvanized steel roof. New row houses construction are being done by small contractors using masonry/concrete as construction materials.



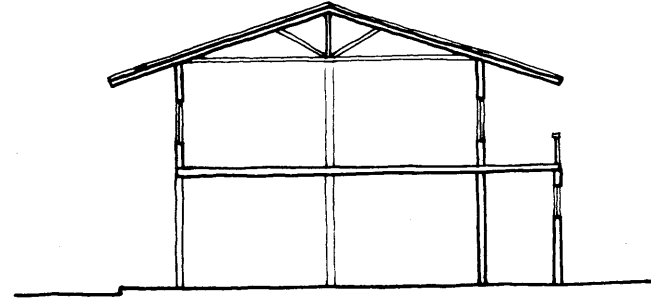
LOCALITY SEGMENT PLAN



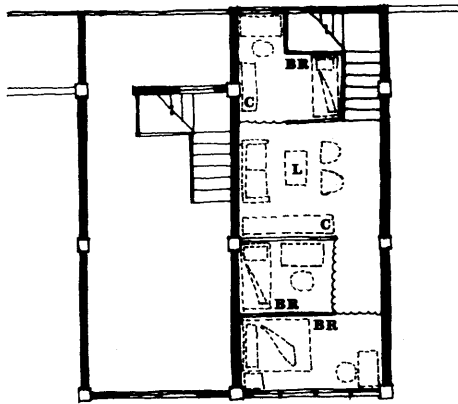
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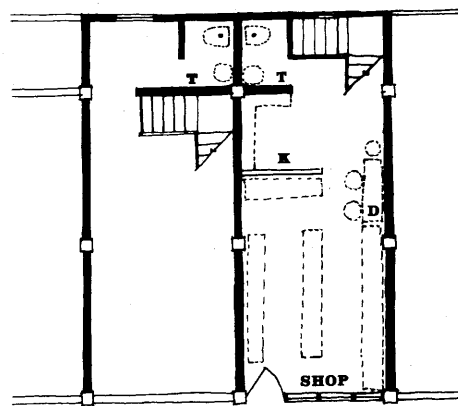
ELEVATION



SECTION



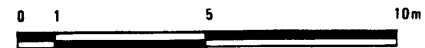
SECOND FLOOR PLAN



FIRST FLOOR PLAN

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)



1:200

TYPICAL DWELLING

### 3. Detached House

**LOCATION AND ORIGIN:** The detached houses are located at the edges of the city center. The model is an adaptation of the original Thai model with the international style, developed in 1930's.

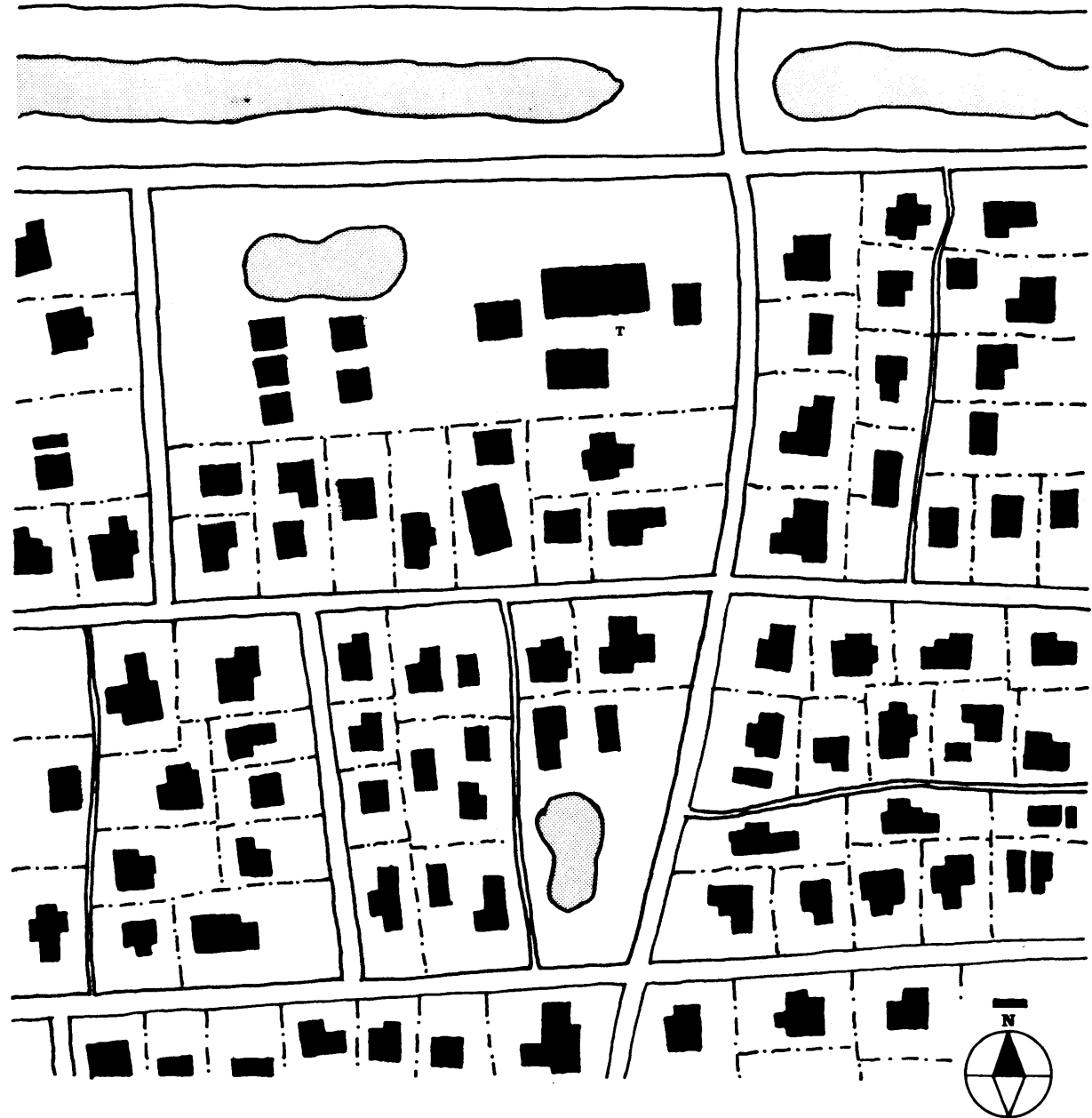
**LAYOUT:** The area is laid out on a rectangular pattern, with isolated individual lot. The sizes of the land are depend upon the different income groups. Many of the large properties were further subdivided into small lots, and sold to public or share among family. This layout gives low population density with wasteful circulation and utilities lines/services.

**LAND USE:** It is predominantly a residential area with commercial services and shops locate at streets intersections. Small cottage industries are also found throughout the area with no significant concentration in one particular segment.

**CIRCULATION:** The streets serve both for pedestrian and vehicular circulation in which pedestrian dominates since there are very little automobiles in the area.

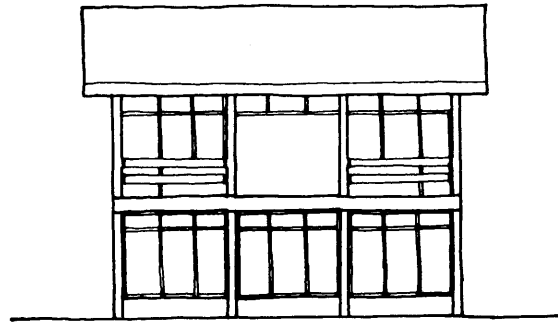
**POPULATION/INCOME:** Residents are mainly government civil servants, businessmen, office employee, whose income range from moderate low to high.

**CONSTRUCTION:** Majority of the dwelling are made of wood built by artisan. The sizes of the units vary according to the owner's income. New detached houses are made of masonry/concrete, constructed by small contractor.

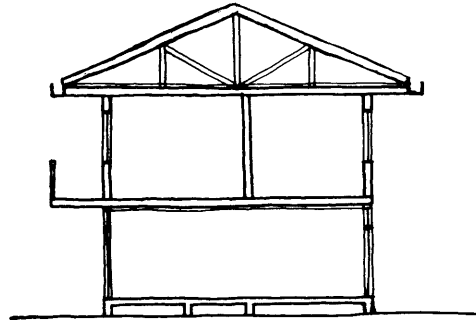


LOCALITY SEGMENT PLAN

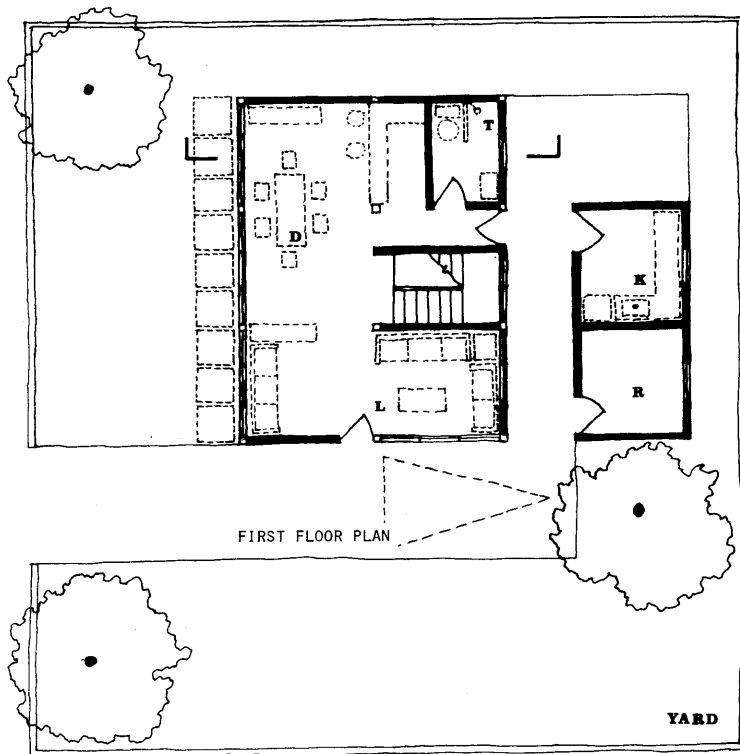




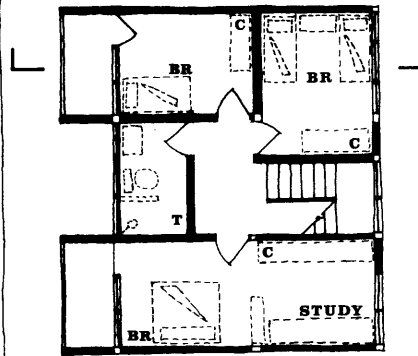
ELEVATION



SECTION



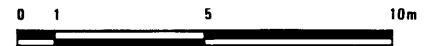
FIRST FLOOR PLAN



SECOND FLOOR PLAN

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)



1:200

## COMMUNITY LAYOUT PROTOTYPE

Nakhon Ratchasima's population is growing at a rate of 3 to 5% at the same time the ability of an increasing number of people to meet their housing need is diminishing. Rising values of urban land, rising cost of construction materials, non-existence of long term mortgage funds, and rising building standards are among the factors that are making the housing situation more and more difficult for the average person, particularly the poor.

All these necessitate a search for new solutions to the housing problem of the city, and provide a controlled urbanization process.

The size of the project is based on projections made by The City Planning division, office of Minister of Interior in a report for Planning of Nakhon Ratchasima 1993, and the National Economic and Social Development Board's report of the economic development plan for Nakhon Ratchasima. The reports project that the city's population considering 3.2% annual growth rate, will reach 181,000 by 1983. This in turn will lead to a rapid increase in the labor force of about 58,348 people by that same year. Provision of housing and jobs for this increase must be considered in the future economic development plan for the city. This would mean provision of about 12,000 housing units during 1973 to 1983.

## PLANNING CRITERIA

The proposed policies/goals provide a framework and a set of alternative guideline for approaching the basic problems related to the community.

### PRIMARY USE: RESIDENTIAL COMMUNITY

- The primary use of the site will be a residential community for 40,000 people at full development. It will also include commercial activities and artisan shops. The following supporting facilities are included:

- primary schools
- parks, playgrounds
- market
- light industrial areas
- public facilities

### TARGET INCOME GROUPS

-The development will aim at the very low to middle income sectors in Nakhon Ratchasima which will increase by approximately 40,000 at the year 1983.

### FORMS OF TENURE: PRIVATE OWNERSHIP, RENTAL

-The development will offer a variety of tenure options which will include, predominately, rental, private ownership and long term lease.

### INTENSITIES OF LAND USE: MEDIUM DENSITIES

-The densities planned for the site is 300 people per hectare.

### CIRCULATION: INTERNAL/EXTERNAL COORDINATION

-The circulation network will provide a basic framework for the development of the site.  
 -The internal network will be connected to the external network (Mittraphap road and proposed north-east highway) as follows:

- Primary roads running north-south between the Mittraphap road and proposed north-east highway which connect the site to the existing city center.
- Primary road running east-west from Mittraphap road on the east side providing service to the community through the light industry area locates on the east side of the site.

### UTILITIES: CONNECTORS TO EXISTING NETWORKS

- All utility systems will be interconnected into the existing/planned city networks:
- sewerage, storm drainage
  - water supply
  - electricity
  - refuse collection
  - public transportation
  - paved roads, walkways

### DEVELOPMENT MODES: INCREMENTAL

- The site will be developed incrementally  
 -The implementation will be staged, consisting of the following cycle: planning design, construction, allocation of lots, habitation, evaluation, and revision of policies.

This cycle will be repeated till saturation of the site is achieved.

### FINANCING GROUPS: PUBLIC AND PRIVATE

- Public financing is needed to carry out the overall site/planning development and the provision of public facilities layout and land subdivision.  
 -The completion of the housing scheme will be done by the residence through self-help and site and service modes.

## THE SITE

### LOCATION:

The site is approximately 1.2 kilometre north of Nakhon Ratchasima city center. It is on the rice field adjacent to a growing light industry area.

### AREA:

Gross area of site	260 Ha.
Occupied area	<u>16</u> Ha.
Available land for development	244 Ha.

### ACCESS:

Approaches and access to the site are through Mittraphap road from the south and east, and from the north through proposed future north-east highway.

### TRANSPORTATION:

Bus-route along Mittraphap road connected to the existing network serving the city center and nearby farm willages. The site is within walking and bicycling distances to the surrounding places of employment, community facilities and city center.

### AREA:

Gross area of site	260 Ha.
Built up area	<u>16</u> Ha.
Available and for development	244 Ha.

### BOUNDARIES:

Site is strongly defined by topography and man made features:

North: irrigation canal and future north-south highway  
East: Mittraphap road  
South: Lam Takhong River  
West: Private farm land

### TOPOGRAPHY/SOIL CONDITIONS:

The site is flat, 200 meters above sea level on a river basin. The area is on farm land suitable for residential development.

### LAND OWNERSHIP:

The land is now a rice field, privately owned and use for farming only once a year.

### ZONING:

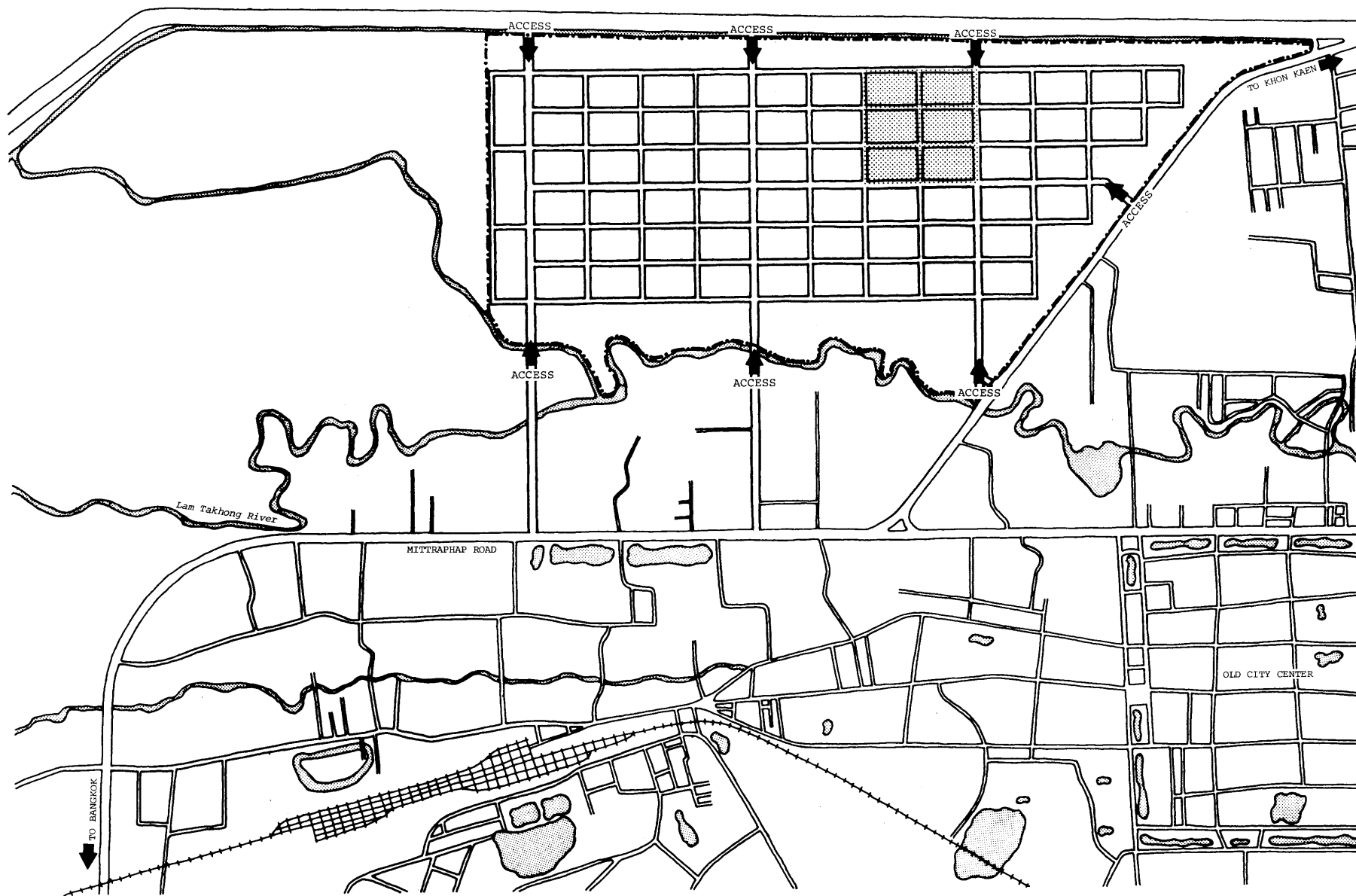
The zoning law for Nakhon Ratchasima has not been implemented. It is proposed that the site be developed into a residential community.

### UTILITIES:

Electric power line can be brought in directly from electric transformer station locate north of the site by Mittraphap road which is the main utility supply route to the city. The community will have its water system from either deep wells dug at the site or from the water supply from the dam north of the site.

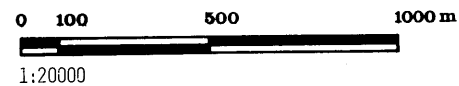
### RECOMMENDATION:

1. Soil condition should be thoroughly investigated and water table should be checked.
2. Well constructed drainage around the periphery of the site should be provided to prevent flooding of the settlement.



- SITE BOUNDARY
- SELECTED SEGMENT

**PROPOSED PLAN**



# LAND USE

	Ha.	%
Gross area within the boundaries of the site	260	
Occupied area	<u>16</u>	
Available land for development	244	100
 PUBLIC LAND - circulation	 29.7	 12.2
- schools, playgrounds, community, facilities, markets, parks, open areas	 54.3	 22.2
PRIVATE LAND- residential, commercial, light industries	160	65.6

The site will develop in stages according to existing and potential needs of the community.

The site has a potential population of 48,000 at a density of 300 P/Ha at the saturation stage.

The site development will be a small sized town and should be planned accordingly, not only in terms of community services but also in terms of the following options:

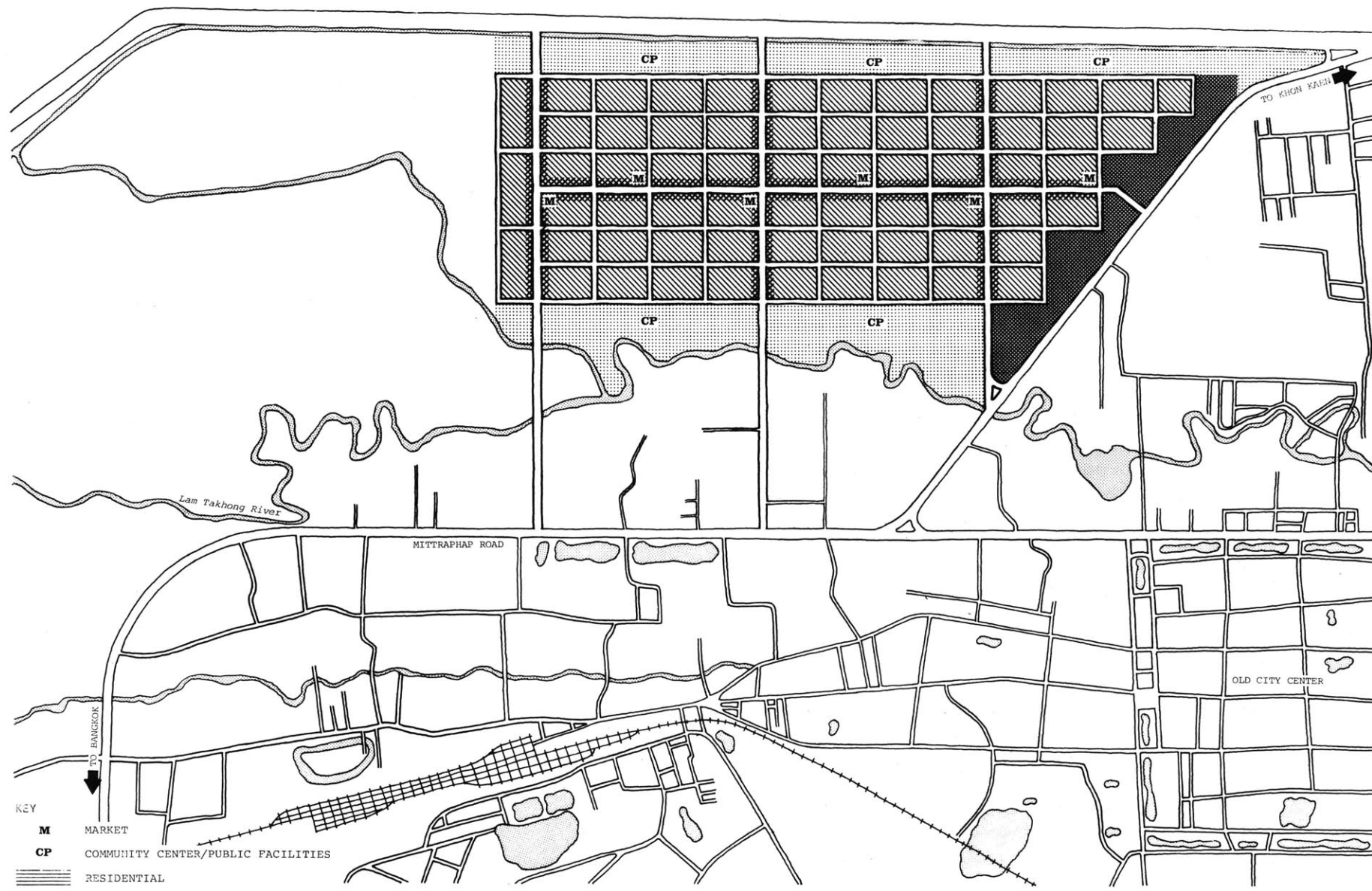
- DIFFERENT INCOME GROUPS
- DIVERSITY OF CHOICES IN LAND TENURE
- DIVERSITY IN HOUSING PROGRAMS
- PUBLIC AND PRIVATE DEVELOPERS AND FUNDING

## LAND USE CRITERIA

- The primary use of the site is for a residential community with supporting commercial and community services.
- The predominant commercial growth will develop along major circulation network (see: Proposed Circulation Plan Mode 3) and on land with higher land costs.
- The community facilities will be located within walking and/or bicycling distances of the residential areas served on land with the lower land costs.

The proposed land use plan (opposite page) shows:

- OPEN AREAS, PARKS: located at the south end of the site along Lam Takhong River and at the north end along irrigation canal where lands are far away from the main street with little commercial value but most suitable for recreation purposes.
- SCHOOLS: adjacent to open areas, parks
- PUBLIC FACILITIES AREA: located by schools and open areas.
- RESIDENTIAL AREA: located between the areas mentioned above as central spine of the community.
- MARKETS/COMMERCIAL AREA: located along major roads (Mode 3 in Proposed Circulation Plan) as a focus in the community.



- KEY**
- M** MARKET
  - CP** COMMUNITY CENTER/PUBLIC FACILITIES
  - RESIDENTIAL
  - COMMERCIAL
  - SMALL INDUSTRIES
  - PUBLIC FACILITIES, PARKS

**PROPOSED LAND USE PLAN**



## CIRCULATION

The circulation network provides a primary ordering framework around which the site is developed. As well as circulation function, the network provides the utility spine throughout the site. The land which is utilised by the circulation grid is considered to be under public ownership providing for paths of movement of both pedestrian and vehicular access.

### CIRCULATION CRITERIA:

- The circulation plan was developed to integrate the community with the existing urban networks by providing main connection spines running north-south between Mittraphap Road and proposed north-east highway, and from Mittraphap Road running east-west. These main spines serve as primary roads.
- Location of markets and commercial activities are along primary roads, where land values are anticipated to be highest.
- The secondary roads connect the primary roads and serve the residential and public facilities areas of the site.

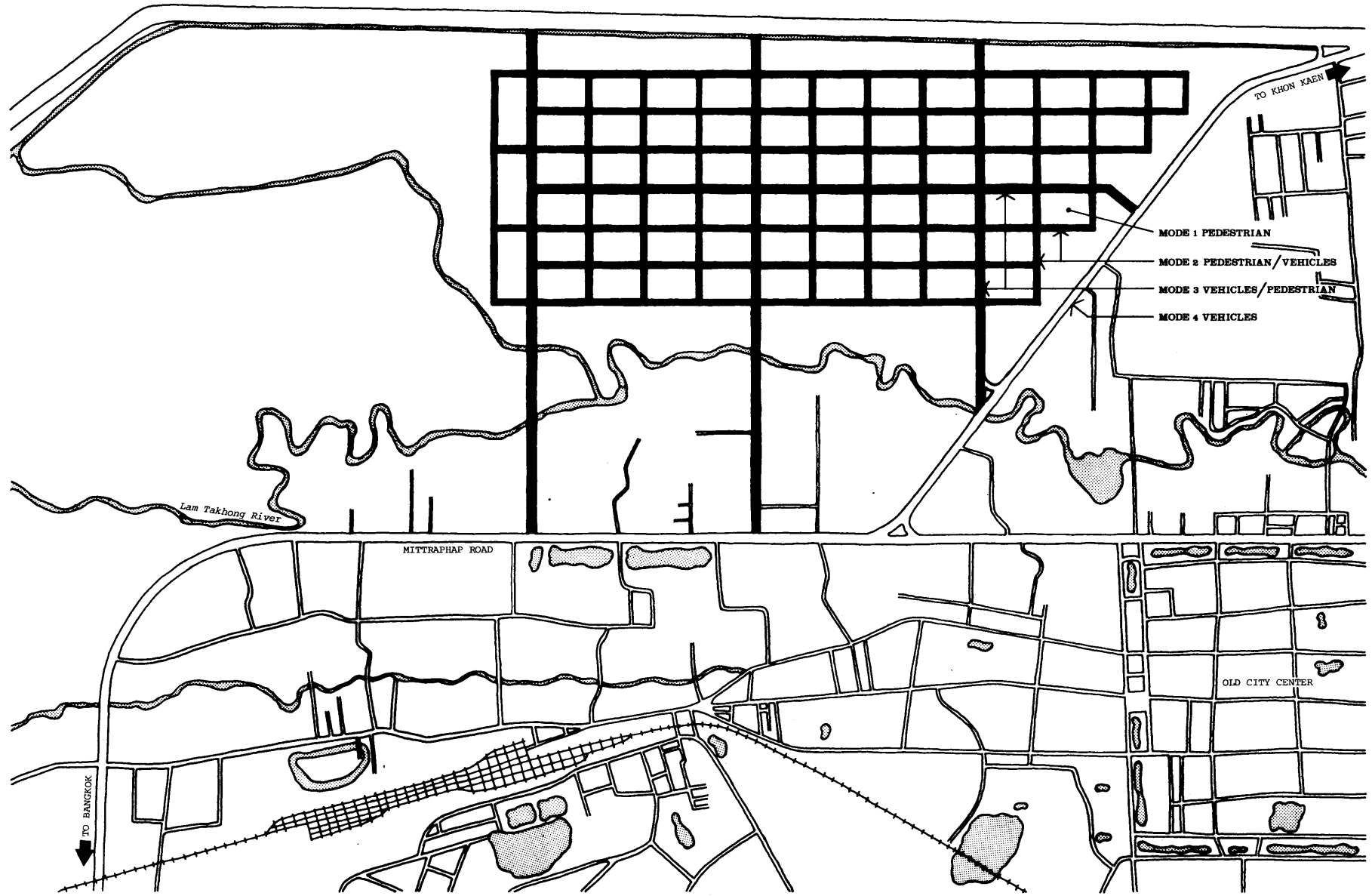
### CIRCULATION MODES:

The following circulation conditions are considered in the plan:

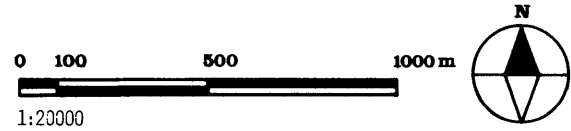
- MODE 1 PEDESTRIAN (3 meters right of way) exclusive use by pedestrian. Example: pedestrian walkways, cluster court.
- MODE 2 PEDESTRIAN/VEHICLES MIXED: (10 meters right of way) pedestrian dominate over vehicles; control of traffic frequency, character, and speed are mainly established by the street layout and use. Example: Second-ard roads in residential areas.

MODE 3 VEHICLES/PEDESTRIAN MIXED: (20 meters right of way) vehicles dominate but do not control circulation; controls are established for the protection of pedestrians: crosswalks, traffic lights. Example: main commercial street, primary roads.

MODE 4 VEHICLES ONLY: (30 meters right of way) exclusive use by vehicles; relatively high speed, with large volume of traffic flow. Example: limited access proposed north-east highway and Mittraphap Road.



PROPOSED CIRCULATION PLAN



## DEVELOPMENT MODE

The site has been developed in terms of stages, time, population to be settled (Detail social, economic, and physical studies, which are beyond the scope of this study, would be additionally required to propose the final development plan).

### DEVELOPMENT CRITERIA:

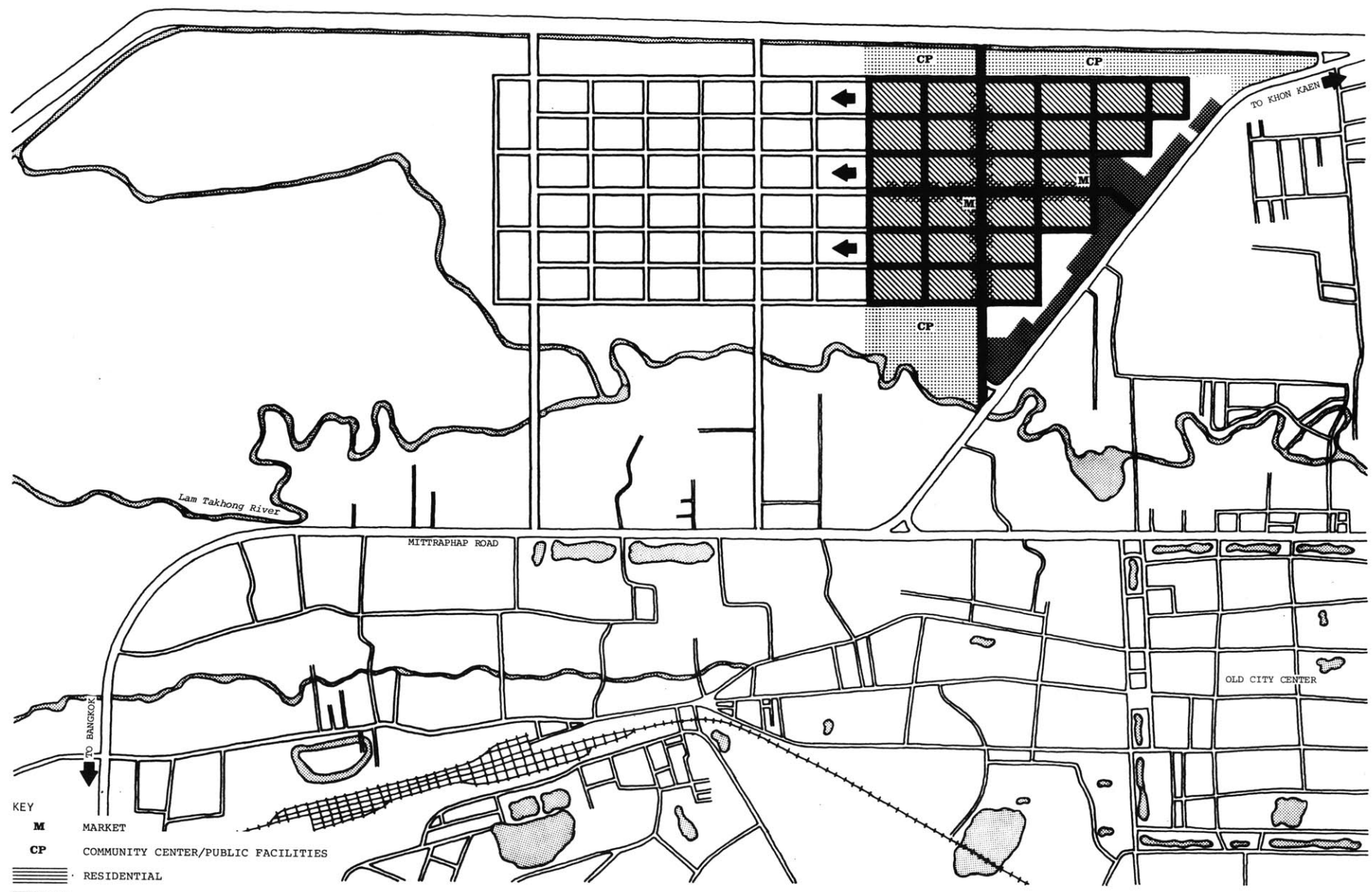
- The initial development will have supporting public and semi-public services and facilities.
- Easiest/direct access from the existing Mittraphap road south and east.
- Convenient pedestrian access to public transportation extension of public transportation.

### INITIAL DEVELOPMENT:

- The initial stage is proposed to start on the eastern side of the site and will basically expand westward as indicated by the arrows (see opposite page).
- It will include residential, commercial, schools, small scale industries, public facilities and open areas with basic circulation and infrastructure needed to the serve the community.
- In this stage emphasis should be upon instant government construction through instant process. This will help create an attractive environment and will encourage people to the project.
- Storm drainage should be constructed along primary roads leading to irrigation canal and Lam Takhong river to avoid flooding of the site.

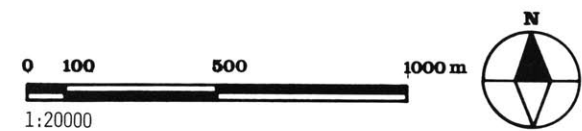
### SUBSEQUENT DEVELOPMENT:

The speed and magnitude of the growth of the site are difficult to forecast. Evaluation or revision of the plan is necessary at this point to improve and adjust the future development according to the needs of the community. However, the plan should enforces/facilitates a compact development instead of a scattered development, and maintain at any stage the consistency between land-use/densities/commercial potential and intensity of circulation/activities.



- KEY
- M** MARKET
  - CP** COMMUNITY CENTER/PUBLIC FACILITIES
  - RESIDENTIAL
  - COMMERCIAL
  - SMALL INDUSTRIES
  - PUBLIC FACILITIES, PARKS

**PROPOSED INITIAL DEVELOPMENT**



## SEGMENT LAND UTILIZATION

The proposed cluster blocks will create physical environments that provide a sense of community and facilitate incremental growth to take advantage of land values and to allow flexibility in development, and also to match services with residential requirements to avoid isolated developments without basic necessities.

Planning of the urban units is based on the following criteria:

- a) an urban unit is defined as being bordered by a main commercial street and transverse connector streets.
- b) the size is within the range of 3,000 to 4,800 people at saturation stage, large enough to have a primary school and markets.
- c) a maximum walking distance of 400 meters from the interior of the urban unit to through street border is required to allow access to public transportation.
- d) the urban unit will be a residential area with its required supporting facilities.

### COMPONENTS OF THE URBAN UNIT:

Residential areas: a combination of the five residential/commercial housing subsystems proposed, (see Housing Types).

Supporting facilities: elementary schools, parks, recreation areas, market.

Infrastructure: streets: layout promotes residential circulation; public bus route: follows main commercial street passing through center; pedestrian walkways: allows access to all sections of the urban unit; utility networks: water, sewer, storm drainage, and electricity follow local streets.

The proposed segment land utilization plan on the opposite page shows the concept of urban unit. The unit shown is 395 X 395 meters; based upon a 120 X 185 meters block.

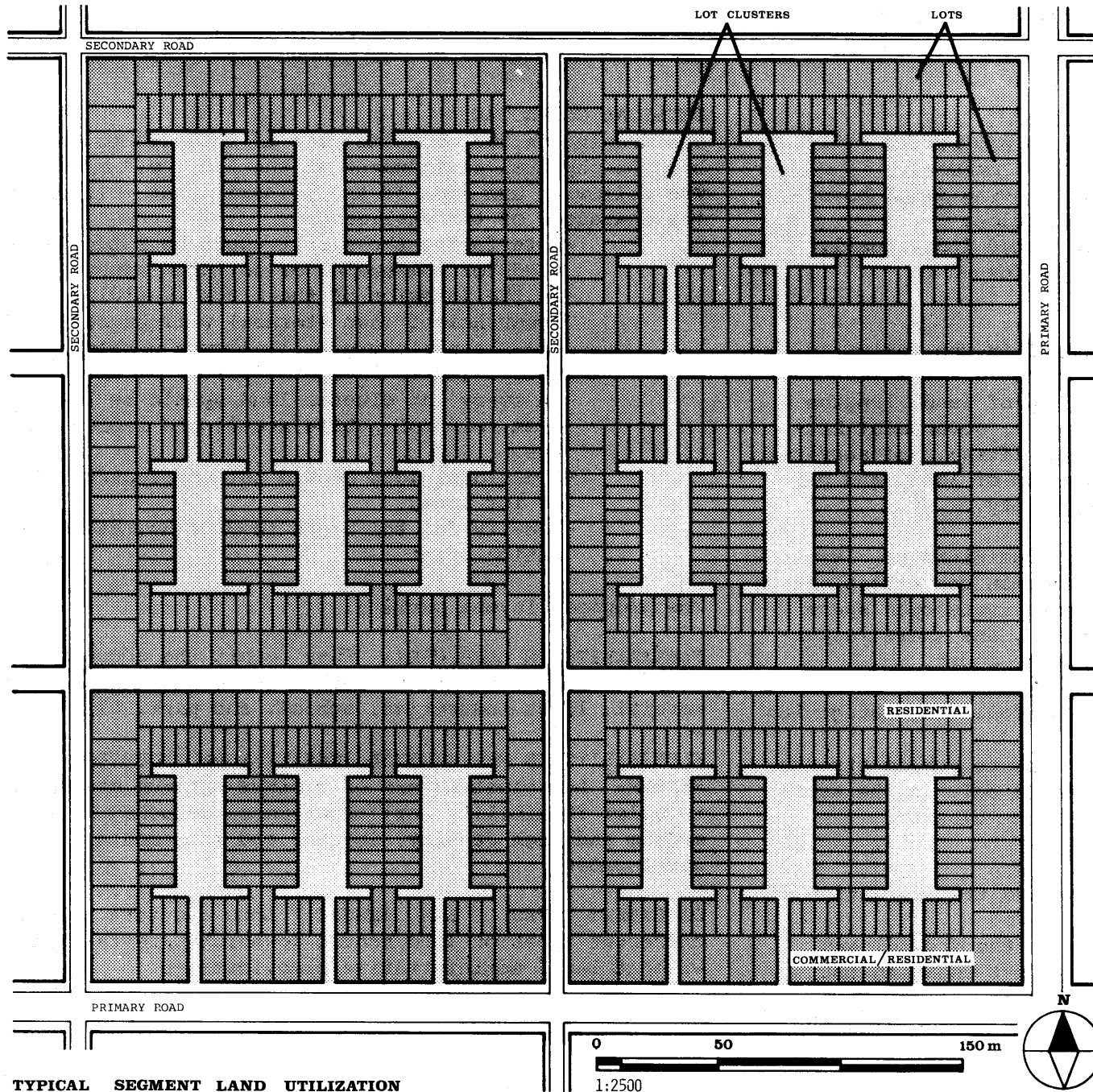
The top boundary of the plan is a local street which is adjacent to a park/open area and public facilities. The bottom boundary is the main commercial street, which is adjacent to other urban units. The side boundaries on the right is commercial street connecting the community to the city center and on the left is transverse streets, both streets are adjacent to other urban units.

### SEGMENT LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	954	15.6	61.2
DWELLING UNITS	954	15.6	61.2
PEOPLE	4770	15.6	306

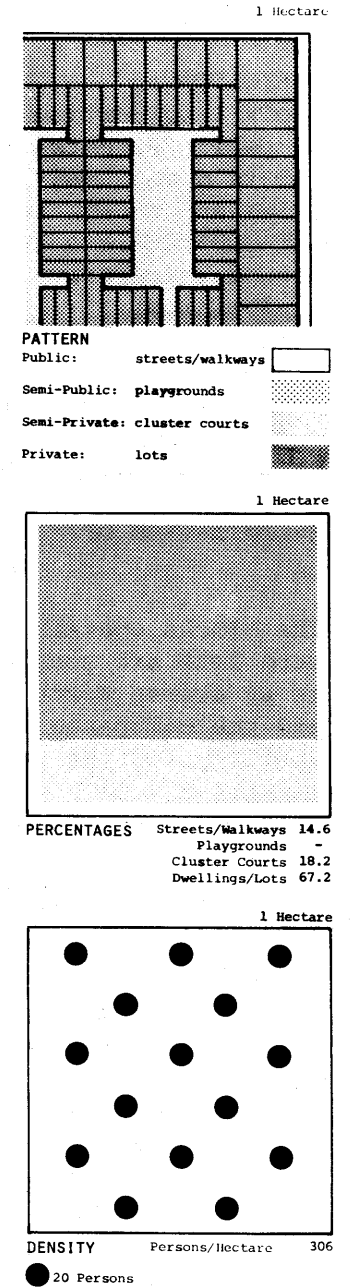
### AREAS

	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	2.3	14.6
SEMI-PUBLIC (open spaces, schools, community centers)	-	-
PRIVATE (dwellings, shops, factories, lots)	10.5	67.2
SEMI-PRIVATE (cluster courts)	2.8	18.2
TOTAL	15.6	100.0



TYPICAL SEGMENT LAND UTILIZATION

SEGMENT LAND UTILIZATION DIAGRAMS



## BLOCKS, LOT CLUSTERS, LOTS

### DEFINITION:

**BLOCK** is a portion of land bounded and served by lines of public streets (120 meters X 185 meters).

**LOT** is a measured parcel of land having fixed boundaries and access to public circulation.

**LOT CLUSTER** is a group of lots (owned individually) around a semiprivate common court (owned in condominium).

The block layout proposed is based in the following policy:

**MINIMIZATION OF:** public ownership of land; lengths of infrastructure; government burdens, responsibilities, and services.

**MAXIMIZATION OF:** private ownership of land, and private responsibility.

The blocks contain horizontal condominiums or clusters where lots are grouped around a common court that serves as an access space as well a semiprivate open space and the occupants share the use of, and share responsibility for the maintenance of the court.

Therefore, the blocks contain the following categories of lots:

**EXTERIOR LOTS:** Those having access to public streets.

**INTERIOR LOTS:** Those having access only to the semiprivate court of the cluster.

### EXPANSION OF HOUSING SYSTEMS:

Lot clusters facilitate expansion and transformation of buildings:

- Horizontal (addition on the ground) and vertical expansion without changing lot cluster configuration.
- Control of minimum spaces in lot cluster courts.

### PHYSICAL CHARACTER:

The drawing on the opposite page is intended to show how the physical environment at the end could occur. The following are some of the criteria that will shape the character of the environment:

- Lots facing the street could be intensively used for commercial or cottage industry.
- In the interior of the block, buildings of lower height (two stories) will be restricted; the periphery will allow a greater height (up to four stories).
- In every lot cluster land should be left open for semi-public access and recreational use.
- Individual lots should not cover over 70% of lot area.
- Density for the block is 300P/Ha. at saturation point.

The proposed layout permits:

**FLEXIBILITY IN LAND USES:** They permit the accommodation of different land uses that is residential, commercial, light industries, school, and park.

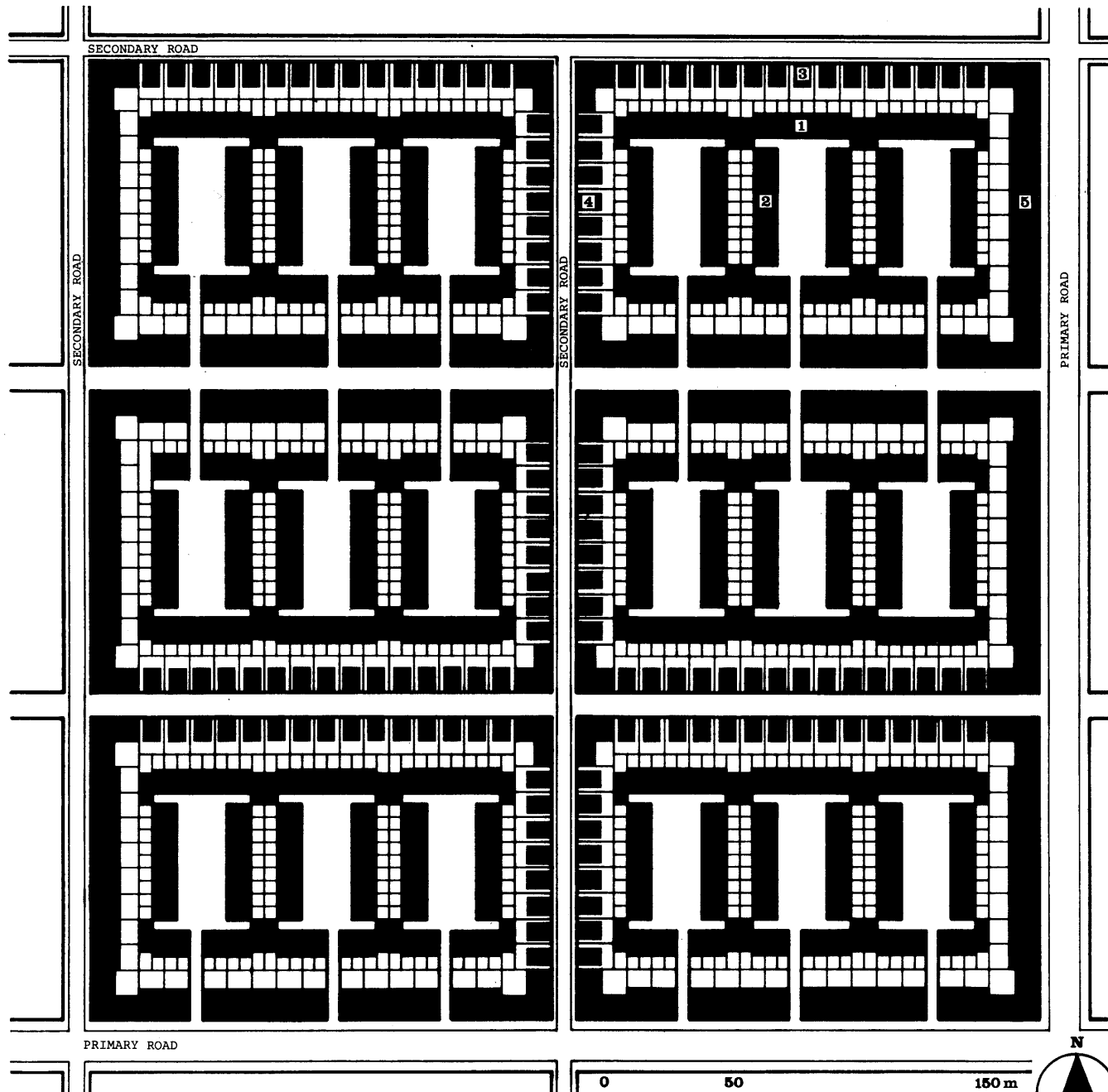
**FLEXIBILITY IN RESIDENTIAL DENSITIES AND HOUSING SYSTEM:** Lot clusters are of minimum optimum dimensions to allow flexibility for: rowhouses, detached houses; medium and high density, instand and incremental development.

**DIFFERENT TYPES OF LAND TENURE:** Lots clusters allow different types of land tenure (ownership/rental/lease) without legal administrative complications.

HOUSING OPTIONS KEY :

- 1 CORE/SHELL
- 2 ROW HOUSE
- 3 SERVICED LOT
- 4 INDIVIDUAL HOUSE
- 5 COMMERCIAL/RESIDENTIAL

for additional information and descriptions see HOUSING OPTIONS page 42.



TYPICAL SEGMENT LOTS SUBDIVISION/DEVELOPMENT



1:2500



## HOUSING OPTIONS

The following housing options are derived from studies of existing housing subsystems (see Case Studies) and demands (socio-economic characteristics of users, physical environment) in the city.

### 1 CORE/SHELL:

- CORE SHELL DWELLING UNITS will be grouped in LOT CLUSTERS, administered by the Nakhon Ratchasima City Council.
- Units include lot with toilet, shower, cooking, and one room minimum.
- Units offered to users for ownership/rental/lease. Users may expand/improve dwelling.
- Dwelling uses planned: a) family, b) family/commercial, small industries, c) family and subletting.

### 2 ROW HOUSE:

- TWO STORY ROW HOUSES will be grouped in LOT CLUSTERS, administered by the Nakhon Ratchasima City Council.
- Units include lot with rental rooms, services and facilities (toilet, shower, cooking).
- Units offered to users for rental/lease.
- Dwelling uses planned: a) family, b) multi-family, c) family/commercial.
- Dwelling will be developed by commercial companies.

### 3 SERVICED LOT:

- SERVICED LOT UNITS will be along secondary road which has pedestrian dominant use.
- Units include lot with services (water, sewage, electricity) to lot.
- Units offered to users for ownership/rental/lease. Users will develop/build dwelling.
- Dwelling uses planned: a) family, b) multi-family with shared facility, c) family/commercial, small industries.

### 4 INDIVIDUAL HOUSE:

- DWELLING UNITS will be along secondary road which has pedestrian dominant use.
- Units include lot with services, facilities and dwelling.
- Units offered to users for ownership/lease. Users may expand/improve dwelling.
- Dwelling uses planned: a) family, b) multi-family with shared facilities.
- Dwelling will be developed by private developers or commercial companies.

### 5 COMMERCIAL/SMALL INDUSTRIES WITH RESIDENTIAL FACILITIES:

- SHOP/STALL DWELLING UNITS will be along primary roads where land values are high and have commercial potential.
- Units include lot with facilities for shops, small industries and dwelling for occupants.
- Units offered to users for ownership/lease. Users may expand/improve dwelling.
- Shop uses planned: a) family/commercial, small industries, b) multi-family/commercial.

The chart on the opposite page shows the relationships between different housing types and the factors: income, tenure, lot/dwelling size, infrastructures, facilities, building process, and development.

ALTERNATIVE HOUSING OPTIONS		1	2	3	4	5
PROPOSED NO. OF	DWELLINGS PEOPLE (THOUSANDS)	± 25% 8-12	± 25% 8-12	± 20% 6-10	± 15% 5-7	± 15% 5-7
INCOME GROUP/ TENURE OPTION O=Ownership R=Rental, L=Lease	V. LOW: Baht up to 499/m LOW: Baht 500 to 699/m M. LOW: Baht 700 to 1499/m Middle: Baht 1000 to 2000/m	ORL ORL - -	RL RL - -	- ORL ORL ORL	- - OL OL	- - OL OL
SIZE m <sup>2</sup>	CLUSTER LOT DWELLING	1300 75-100 50-65	1300 75-100 50-65	- 150-300 -	- 150-300 70-200	- 200-400 125-300
INFRASTRUCTURE PROVIDED	WATER SEWAGE ELECTRICITY ACCESS TO SITE (lot)	YES YES YES YES	YES YES YES YES	YES YES YES YES	YES YES YES YES	YES YES YES YES
FACILITIES PROVIDED	TOILET SHOWER COOKING ROOMS	YES YES YES 1	YES YES YES 1-2	- - - -	YES YES YES 1-4	YES YES YES 1-4
BUILDING PROCESS IS=Instant IC=Incremental		IC	IS	IC	IS	IC
DEVELOPMENT PUB=Public PVT=Private	DEVELOPED BY MANAGED BY	PUB/PVT PUB	PUB PUB	PVT PVT	PUB/PVT PVT	PUB/PVT PVT

# GLOSSARY

Definitions of terms which are generally understood/accepted are essential to the presentation/understanding of the text are included in the GLOSSARY.

THE GLOSSARY IS TAKEN FROM THE URBAN SETTLEMENT DESIGN PROGRAM FILE, M.I.T..

**COMMUNITY:** the people living in a particular place or region and usually linked by common interests; the region itself, any population cluster.

**DEVELOPMENT:** gradual advance or growth through progressive changes; a developed tract of land.

**DWELLING:** The general, global designation of a building/shelter in which people live. A dwelling contains one or more 'dwelling units'.

**DWELLING BUILDER:** Four groups are considered: Self-Help Built: where the dwelling unit is directly built by the user or occupant.

**Artisan Built:** where the dwelling unit is totally or partially built by a skilled craftsman hired by the user or occupant; payments can be monetary or an exchange of services.

**Small Contractor Built:** where the dwelling unit is totally built by a small organization hired by the user, occupant, or developer; 'small' contractor is defined by the scale of operations, financially and materially; the scale being limited to the construction of single dwelling units or single complexes.

**Large Contractor Built:** where the dwelling unit is totally built by a large organization hired by a developer; 'large' contractor is defined by the scale of operations, financially and materially; the scale reflects a more comprehensive and larger size of operations encompassing the building of large quantities of similar units, or a singularly large complex.

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

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

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

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

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

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

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

**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).

**DWELLING DEVELOPER:** Three sectors are considered in the supply of dwellings:

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

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

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

**DWELLING FLOORS:** The following number 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.

**DWELLING GROUP:** The context of the dwelling in its immediate surroundings.

**DWELLING LOCATION:** Three sectors of the urban area considered:  
**City center:** the area located within a walking distance (2.5 km radius) of the commercial center of a city; relatively high residential densities.

**Inner ring:** the area located between the urban periphery and the city center (2.5 to 5 km radius); relatively lower residential densities.

**Periphery:** the area located between the rural areas and urban inner ring (5 or more km radius); relatively low residential densities.

**DWELLING PHYSICAL STATE:** A qualitative evaluation of the physical condition of the dwelling types: room, apartment, house; (the shanty unit is not evaluated).

**Bad:** generally poor state of structural stability, weather protection and maintenance.

**Fair:** generally acceptable state of structural stability, weather protection and maintenance with some deviation.

**Good:** generally acceptable state of structural stability, weather protection and maintenance without deviation.

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

**DWELLING UNIT AREA:** The dwelling unit area (m<sup>2</sup>) is the built-up, covered area of a dwelling unit.

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

**DWELLING 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).

**DWELLING TYPE:** The physical arrangement of the dwelling unit:  
**Detached:** individual dwelling unit, separated from others.

**Semi-Detached:** two dwelling units sharing a common wall (duplex).

**Row/Grouped:** dwelling units grouped together linearly or in clusters.

**Walk-Up:** dwelling units grouped in two to five stories with stairs for vertical circulation.

**High-Rise:** dwelling units grouped in five or more stories with stairs and lifts for vertical circulation.

**DWELLING UTILIZATION:** The utilization indicates the type of use with respect to the number of inhabitants/families.

**Single:** an individual or a family inhabiting a dwelling.

**Multiple:** a group of individuals or families inhabiting a dwelling.

**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.

**DWELLING DEVELOPMENT MODE:** Two modes are considered:

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

**Instant:** The formal development procedure in which all structures and services are completed before occupation.

**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.

**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.

**LAND TENURE:** The act, right, manner or term of holding land property. Types are categorized by how land is held and for what period of time. Legal definitions are established to determine the division of property among various owners, or the relationship between owner or occupier, or between creditor and owner; and between private owners and the public, and includes the assessment of taxes on private land rights and the regulation of land use through government control. There are TWO BASIC FORMS of land tenure:

**Land Ownership:** where the exclusive right of control and possession of a parcel of land is held in freehold.

**Land Tenancy:** where the temporary holding of mode or holding a parcel of land is of another.

**LAND UTILIZATION:** A qualification of the land around a dwelling in relation to user, physical controls, and responsibility.

**Public:** User: anyone/unlimited  
(streets, Physical controls: minimum  
walkways, Responsibility: public sector  
open spaces)

**Semi-Public:** User: limited group of people  
(open spaces, Physical controls: partial or  
playgrounds, complete  
schools) Responsibility: public sector and  
user

**Private:** User: owner or tenant or squatter  
(dwellings, Physical controls: complete  
lots) Responsibility: user

**Semi-Private:** User: group of owners and/or  
(cluster tenants  
courts) Physical controls: partial or  
complete  
Responsibility: users

**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.

**LAND UTILIZATION: RESPONSIBILITY:** The quality/state of being morally/legally responsible for the use and maintenance of land by the owners/users.

**METROPOLITAN AREA:** "an area in which economic and social life is predominantly influenced by a central city, to which it is linked by common interests though not often by common policies. The metropolitan area may have one city or more as well as outlying districts or satellite communities. No physical or legal boundaries mark its borders, but roughly speaking, these are the outer limits of commuting to or from the central city" (Abrams, 1971).

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

**PUBLIC TRANSPORTATION:** that segment of URBAN TRANSPORTATION which is available to the public without restriction. As public transport, it may also be regulated as to its operation, charges, and profits (Abrams, 1971).

**SETTLEMENT:** occupation by settlers to establish a residence or colony.

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

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

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). No cases of lease are shown in Typology.

**Ownership:** where the users hold in freehold 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. (Only one case is shown in the case studies.)

**URBAN AREA:** All developed land lying within the urban fringe (politically undefined development lying between the city and the country) including a central city and any of its satellite communities; it is not a political/governmental unit (Bartholomew, 1955).

**URBANIZATION:** the quality of state of being or becoming urbanized: to cause or take on urban characteristics.

**USER INCOME GROUPS:** Based upon the subsistence (minimum wage) income per year, five income groups are distinguished. (The subsistence income per 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 limited subsidized housing.

**Moderate Low** (4 x subsistence level)  
The income group that has access to public/private commercial housing (rental).

**Middle** (15 x subsistence level)  
The income group that has access to private commercial housing (ownership).

**High** (above 15 x subsistence level)  
The income group that represents the most economically mobile sector of the population.

**USUFRICT:** The right to profit from a parcel of land or control of a parcel of land without becoming the owner or formal lessee; legal possession by decree without charge.

## EQUIVALENTS

### METRIC SYSTEM EQUIVALENTS

#### Linear Measures

1 Centimeter = 0.3937 inches  
1 meter = 100 centimeters = 39.37 inches or 3.28 feet

1 kilometer = 1,000 meters = 3,280.83 feet or 0.62137 miles

1 inch = 2.54 centimeters  
1 foot = 0.3048 meters  
1 mile = 1.60935 kilometers  
1 Wa (Thai) = 2.0 meters

#### Square Measures

1 square meter = 1,550 square inches or 10.7639 square feet

1 hectare = 10,000 sq meters = 2.4711 acres  
1 square foot = 0.0929 square meters  
1 acre = 0.4087 hectares  
1 rai (Thai) = 1,600 square meters  
1 tarang wa (Thai) = 4 square meters

#### DOLLAR EQUIVALENTS

All income, cost, and rent/mortgage data have been expressed in terms of the U.S. equivalent;  
1 U.S. dollar = 20 bahts (Thai)

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