

Part III.
Land Readjustment Project Planning

Volume I.
Purpose and Methodology

Volume I. Purpose of Methodology

1. Study Purpose

The L/R project implementation requires establishment of an L/R implementation system as shown in the preceding volume, and that secondly, an implementation plan for the L/R project be formulated.

The purpose of the study in this volume is to formulate the L/R implementation plan as well as show the methodology of the L/R study.

2. Methodology of L/R Study

The L/R study consists of a series of studies and the planning is as unique as the L/R system proposed. It is a technical process of planning as well as a social coordination process. On the other hand, it is a scientific and technical process where development visions and concepts of the project area are mapped out, and engineering/designing are made for the physical development plan. Simultaneously, it is a social coordination process where consensus among the people concerned regarding urban development are sought out in such a manner that their ideas are adopted into the development plan and project. In other words, the L/R system is a process for facilitating the compromises among the persons concerned in order to reach a consensus. Uniqueness of L/R projects rests in this methodology of the L/R study and planning.

It can be safely said that the L/R study is an important part of the L/R project implementation process in the community.

In the course of the L/R study coordination for achieving the consensus among the people concerned is made and the consensus is reflected in the L/R implementation plan. Then, the L/R project is implemented along with the implementation plan agreed upon. In this respect, the L/R study is an integral part of project implementation.

Consequently, any plan/design of the L/R project can't be made without the social coordination process for reaching a consensus of the people.

2.1 Technical Planning Process

The studies involved in the L/R project are classified by character and stage of planning as follows.

(1) Character of Study

The L/R studies are categorized into three groups of study: the Master Plan study mainly for specifying the L/R project area; the project study for examining the feasibility of the specified L/R project; and the implementation study for the L/R project implementation.

1) Master Plan Study

First, an urban development plan covering a relatively wider range of area is to

be drawn with the L/R planning area being specified in the urban development area.

Secondly, a general L/R master plan in the planning area is set up and a priority project area for the L/R is selected.

2) Project Study

Feasibility study on the L/R in the priority project area is to be made.

3) Implementation Plan

Based on the results of the studies made as stated above, the implementation plan is finally compiled.

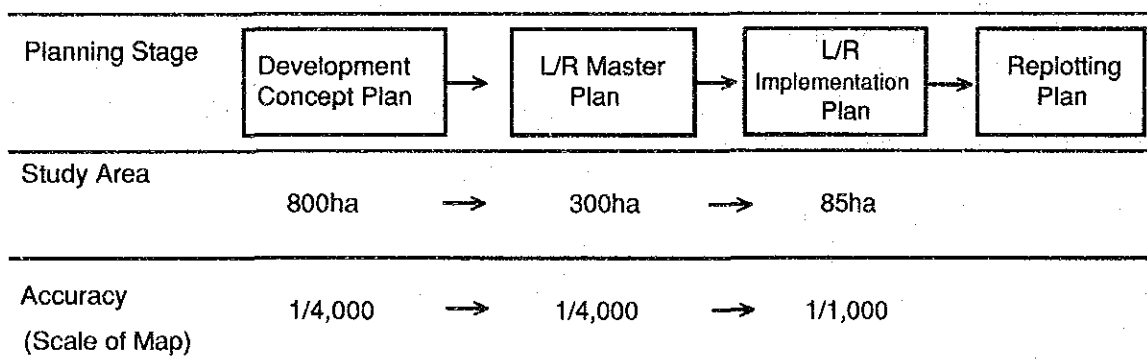
At this stage of the L/R planning, all the conditions for project implementation including those of agreement with the agencies concerned, budgetary arrangement, the agreement with the landowners concerned, must be resolved.

(2) Technical Stage of Planning

Planning is to follow the hierarchical stages such as those from the wider planning area to the smaller area, general and conceptual planning to specific and actual, and low degree of accuracy to high degree of accuracy.

The following technical stages of planing must be taken in the L/R study.

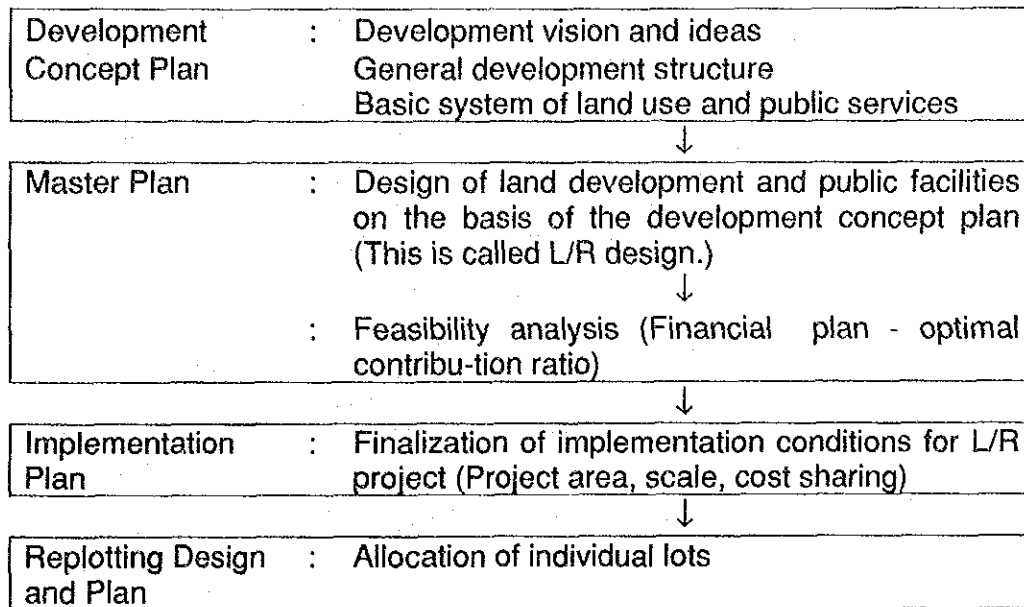
Figure 3.1.1-Technical Stages of Planning



The study items for each stage of planning are listed in **Figure 3.1.2**. It shows that through the stages of planning, development, and concept are to be embodied into a physical development plan and eventually a site plan of individual lots.

The Technical Items at Planning Stages.

Figure 3.1.2-Technical Items at Planning Stages



2.2 Social Coordination Process of Planning (Process for reaching consensus)

Urban development through an L/R is not strictly designed in the scientific and technical planning process.

Unlike the land subdivision project which is developed in the area of a single landowner, the L/R project development plan is subject to consensus among the people concerned (landowners) and government agencies concerned.

Consensus or agreement on the project must be reached among those concerned in such a manner that their interests are adjusted through mutual compromises in the course of persuasion, negotiation, and consultation.

The results of the agreements made are to be incorporated into the development plan. Thus, the L/R plan is formulated so that the L/R planning process is viewed as a social coordination process.

It is another important aspect of the L/R system that agreement among the persons concerned about the L/R project are made by phase, that is, the phases of the concept plan, master plan, implementation plan, and the replotting plan.

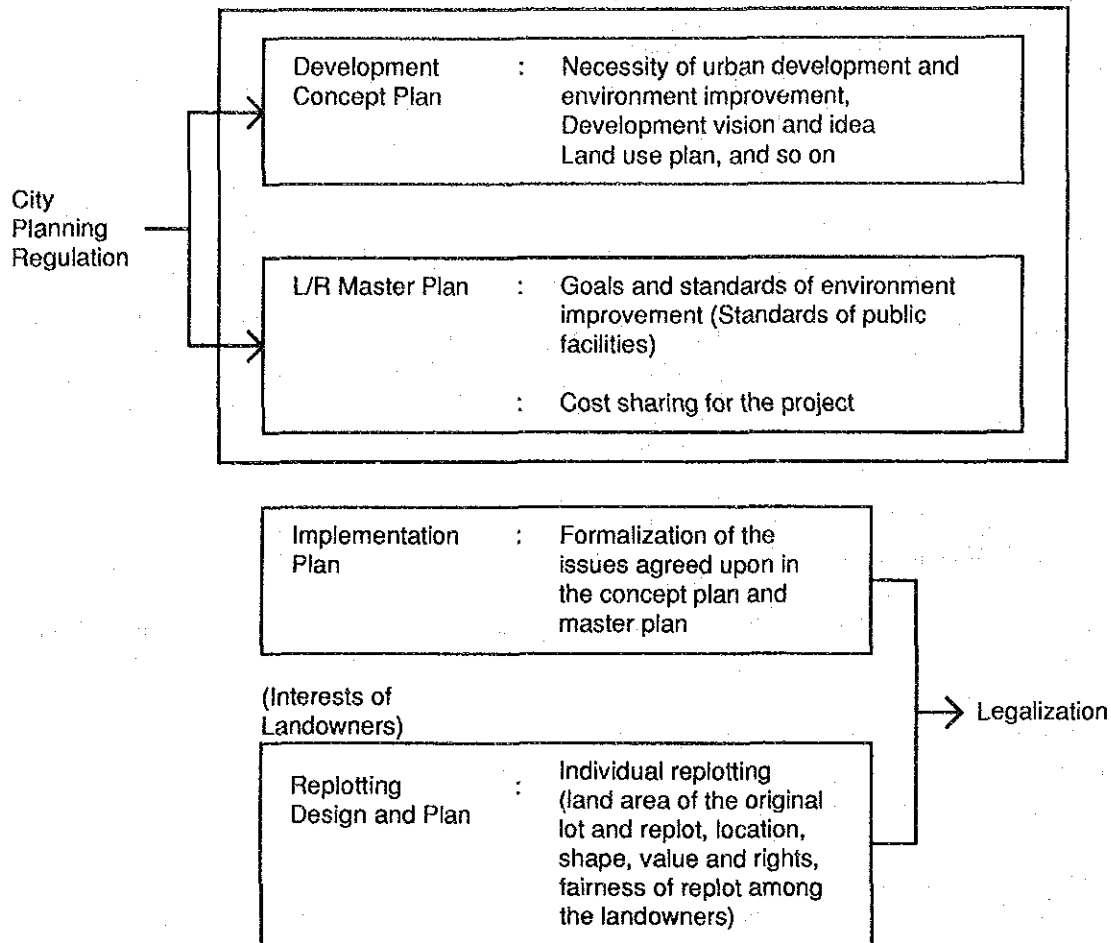
The agreement of the concerned parties is pursued for the duration of the L/R plan.

The L/R plan is to be elaborated in the course of consultation and negotiation with concerned parties, reaching agreement on the project's implementation.

In other words, consultation with landowners must remain a constant throughout all the stages of the L/R planning and implementation. The main issues of consultation to be agreed upon at each stage are summarized in **Figure 3.1.3**.

Main issues of consultation to be agreed upon among concerned persons related to the L/R project.

Figure 3.1.3-Main Issue of Consultation



It is not uncommon that the opponents against the project are likely to become the proponents in the course of the project implementation due to continuous consultations in the social coordination system of the L/R project.

Among other urban development systems, the L/R is a unique system where the consensus reaching process keeps on a parallel with the project implementation.

The following three (3) points are necessary in the process of reaching consensus:

- (1) Consensus must be reached first on urban development as an interest of all landowners in the project area, and secondly, on the replotting as an interest of the individual landowners.
 - 1) At the concept and master plan stages, agreement must be reached among the landowners on issues such as general development of the project area; including development concept, land use, public facilities and others.

As replotting and land contribution are in the interests of individual landowners, the basic policy and average contribution ration all over the project area alone should be agreed upon at this stage of planning.

- 2) Individual replotting and contributions are to be agreed upon by each landowner at the stages of the replotting design (provisional replotting) and the replotting plan.

(2) Consensus and Authorization by the Government

The L/R plans with the consensus of the persons concerned are to be authorized by the government agency in charge in order to legalize and sustain the established consensus during the period of project implementation.

Among the L/R plans, the only plan authorized by the government is the implementation plan.

In the process of the L/R project preparation, the conceptual and master plan are to change in response to consultations with landowners, government agencies, and others. The L/R system and planning are flexible enough to reflect the opinions of the people concerned during the course of implementation.

It is not a good idea to fix the concept and master plan through their authorization.

All the consultation with the people concerned through plan formulation of the concept plan and the L/R master plan shall be finalized and all the items agreed upon through consultations are to be incorporated into the implementation plan.

Consequently, the implementation plan alone must be fixed through government authorization before the start of the L/R project implementation.

(3) Review and Revision of the L/R Plan

As stated before, preparatory works for the L/R implementation, including consultation with the people concerned are to keep pace with the step-by-step plan formulation, principally the concept plan, master plan, and implementation plan.

It happens that it takes a long time to move to the following step of planning due to prolonged consultations with the landowners.

Accordingly, the concept plan must be reviewed and revised at the master plan formulation stage, if necessary to update the data and incorporate the results of consultation into the master plan.

Eventually, review and revision of the preceding plans will be finalized at the formulation of the implementation plan.

3. Study Methodology

This study followed the method of the L/R study as stated above.

In spite of the fact that the L/R plan formulation must keep pace with the preparatory works of the L/R project implementation, including consultations with concerned parties in the project area, this L/R study followed only the technical/engineering process of planning, skipping the social coordination process due to the limitations of the JICA study.

(However, an opinion poll survey was conducted to incorporate the landowners ideas into the L/R plan formulation.)

Accordingly, any modification resulting from the consultation with the landowners has not been made throughout the L/R planning process that consisted of the concept plan, the master plan and the implementation plan.

The above mentioned plans are to be separately compiled because of the different times when they are formulated in the procedure of the L/R project implementation.

The items of studies and plan formulation made in this study are listed in **Figure 3.1.4** and **Figure 3.1.5**.

The outline of the studies are shown as follows.

I. Master Plan Study

The main purpose of this study is to identify the areas which should be developed by the L/R system and more specifically the L/R priority projects which should urgently be implemented.

First, the general concept plan study was carried out to set up an urban development plan in the relatively broader study area, and also the planning area which is to be developed through the L/R system was identified in the study area.

Secondly, a general L/R master plan study in the planning area was executed with the L/R priority project and area being selected.

1-1 General Concept Plan Study in the Study Area

The site survey was carried out to identify the existing conditions of the 800ha of the study area. Urban development concept plan was mapped out indicating the general L/R master plan area (Planning area).

1-2 General L/R Master Plan Study in the Planning Area

General L/R master plan was set forth, indicating the L/R priority project and area on the map with a scale of 1/4,000.

Figure 3.1.4-Study Flow Chart

STUDY FLOW CHART

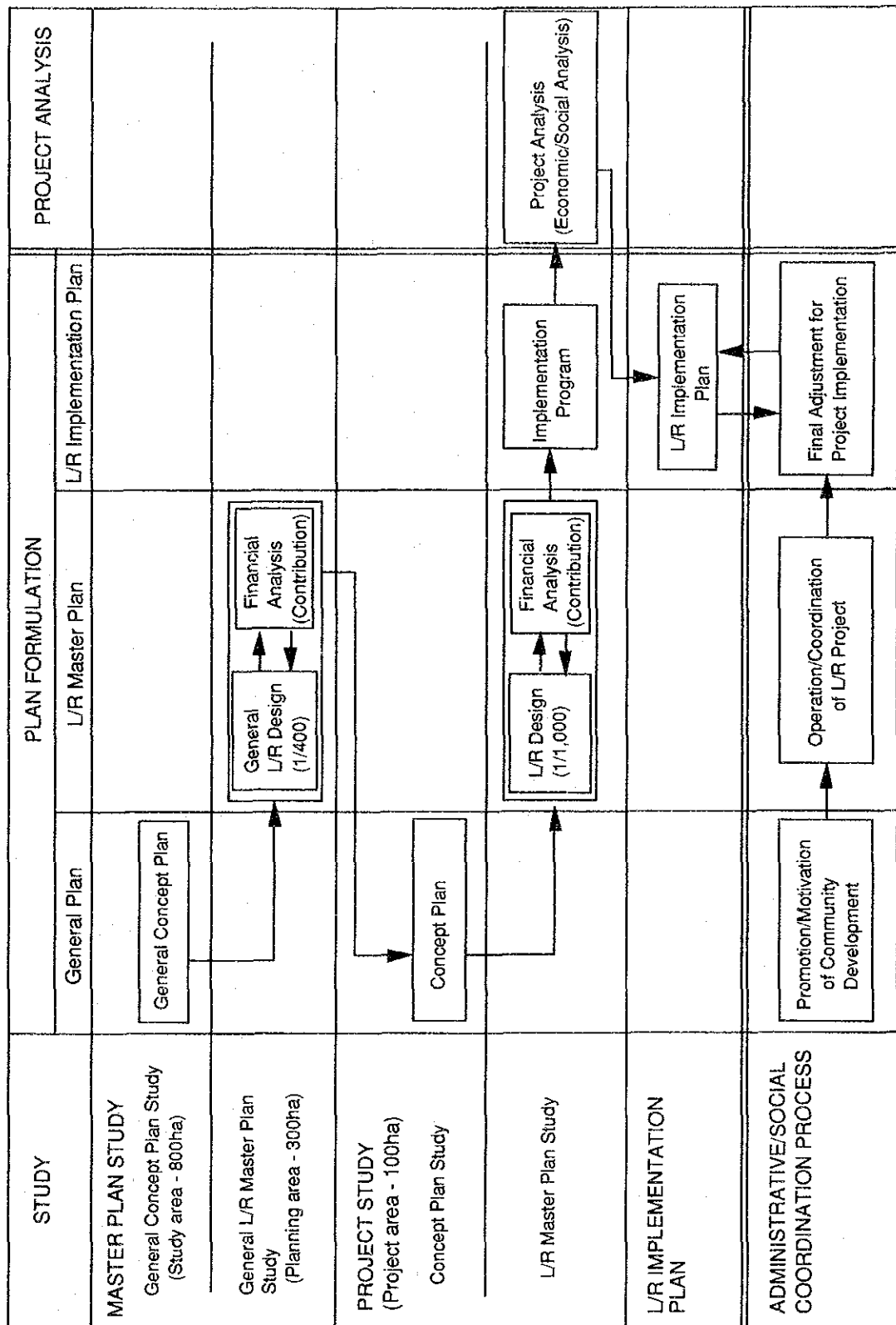


Figure 3.1.5-Study Survey and Plan Formulation

STUDY SURVEY AND PLAN FORMULATION

		Study Area	Survey	Scale	Plan Formulation	Remarks
MASTER PLAN STUDY	General Concept Plan Study	Study area (800ha)	- 1st site survey	1/4,000	General concept plan	
	General L/R Master Plan Study	Planning area (300ha)	- 2nd site survey - Opinion poll survey	1/4,000	General L/R master plan	
PROJECT STUDY	Concept Plan Study	Project area (100ha)	- 3rd site survey - Topo survey	1/1,000	Project concept plan	Study reports to be separately compiled due to time difference in the course of real project implementation
	L/R Master Plan Study	Project area (100ha)			L/R master plan	
IMPLEMENTATION PLAN STUDY		Project area (100ha)			L/R implementation plan	

II. Project Study

The Project study is to be made in order to promote and facilitate the L/R project implementation.

The following three (3) kinds of plans covering the project area are elaborated in accordance with preparedness of the project implementation.

1. Concept Plan
2. L/R Master Plan
3. L/R Implementation Plan

Part III.
Land Readjustment Project Planning

Volume II.
General Concept Plan Study

Volume II: General Concept Plan Study

1. Introduction

Accompanying the rapid economic growth Bangkok, there has been rapid development of urban centers. It is obvious that Bangkok has developed with only one Central Business District (CBD) and several supporting sub-centers. To support the future development of Bangkok, a second CBD is needed.

The objectives of the development of the Second Bangkok Central Business District (New CBD) are:

- to develop an urban area for serving the expected future demand by taking into account the appropriate concepts of land use and transport. The new CBD and existing sub-centers will create a more balanced and unified city structure through the improvement of the transport network linking various centers; and
- to utilize the land readjustment (L/R) process for the implementation of the New CBD.

2. Basic Concept of City Planning through Land Readjustment

Urban development in Bangkok has been so far derived from market forces with the encouragement of the road network. This type of development is referred to as "*ribbon development*". This development has caused various problems such as poor accessibility to major roads and a poor drainage system. The JICA study team realized this problem due to the uncontrolled/unplanned growth and intends to introduce an appropriate development plan by the utilization of the L/R.

For the present study, the application of the L/R in the study area can be summarized into two points:

- In such an area as the study area where urban sprawl type development has taken place, the L/R is the only possible approach for urban development by means of promoting cooperative efforts among land owners, not resorting to outright land-purchase either by the private or public sector.
- It has been said that where there is no city planning, there is no L/R. This implies that the L/R is a tool for implementing city planning. The L/R should be utilized to develop the study area which will be beneficial not only to the study area but more importantly, to Bangkok as a whole.

3. Regional/Urban Context in Bangkok Metropolitan Area

The Bangkok Metropolitan Area (BMA), located in a low-lying area of about 1.5 meters above mean sea level, covers an area of approximately 1,500 km². The BMA, as a capital city, has played an important role in economic, social, cultural and educational activities. The expansion of the service and industrial sectors of the BMA has attracted migration from rural areas and

from provinces throughout Thailand.

During the Sixth Plan (1986-1991), the BMA has expanded rapidly due to economic growth in both Thailand and overseas. The rapid economic growth of the BMA has resulted in various land development projects such as housing estates, industrial estates, apartments, condominiums, hotels, department stores, and golf courses. These projects have an impact to land use patterns and the urban structure of the BMA.

The following sub-sections focus on the socioeconomic condition, land use and urban structure, major urban infrastructure, and urban development policy.

3.1 Socioeconomic Condition of BMA

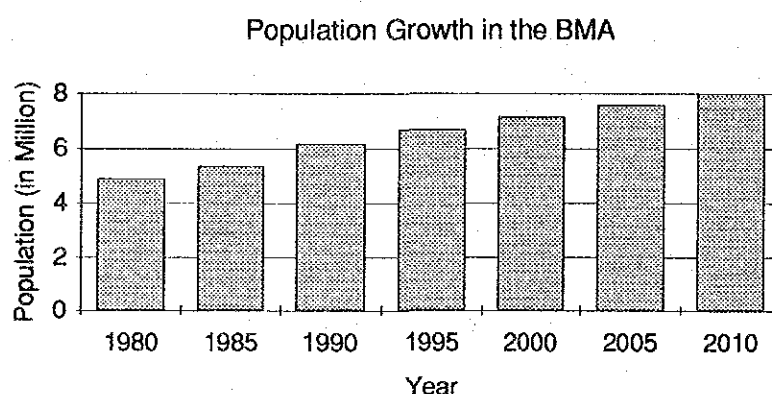
3.1.1 Population

Based on the geographical condition, the population in the BMA is considered an urban population. The population of the BMA is projected to increase from 6.16 million in 1990 to 7.15 million in 2000, and to 7.58 million by 2005, with an annual growth rate of 1.5% to 2000 and 1.17%, thereafter. These figures indicate the slightly increasing share of the BMA from 11.0% in 1990 to 11.2% in 2005, of the total population in Thailand. The national urban population is expected to grow more rapidly than that of the BMA so that the capital's primacy will decrease.

In terms of population, the BMA was about 26 times greater than that of Nonthaburi in 1988, the next largest urban city. In 1975, in terms of urban population, as high as 42.8% of the country's urban population lived in the BMA. This proportion decreased to 35.3% in 1988. These figures indicate the primacy of the BMA in the kingdom's urban system.

The population growth of the BMA over the years 1980 to 2010 is shown in **Figure 3.2.1**.

Figure 3.2.1-Population Growth in the BMA



Source: NESDB

3.1.2 Employment

The number of employed persons in the BMA is estimated to be 3.18 million in 1990 and was

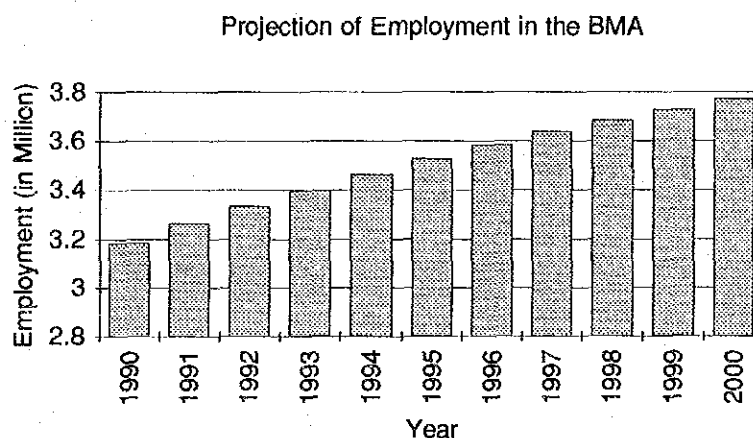
forecast to be 3.77 million in 2000, with an average annual growth rate of 1.72%.

The employment growth rate within the BMA is projected to be relatively stable ranging from 1.7% to 2.2%, which is lower than that of the surrounding provinces, i.e., between 3.2 and 3.7% and slightly higher than that of the whole kingdom.

Employment in the agricultural sector in the BMA has been declining considerably from 7.8% in 1980 to 2.7% in 1988, indicating that a part of the farm land was converted to urban land. In the manufacturing sector, employment declined slightly from 34.3% to 32.7% over the years 1980 to 1988. This can be explained by the fact that the government has a policy in relocating/developing industrial estates into the surrounding provinces of the BMA. The service sector has the highest number of employees which increased from 57.9% to 64.7% over the same period.

Changes in the employment figures in the BMA for the period 1990 to 2000 are depicted in Figure 3.2.2.

Figure 3.2.2-Projection of Employment in the BMA



Source: NESDB

3.1.3 Gross Regional Product

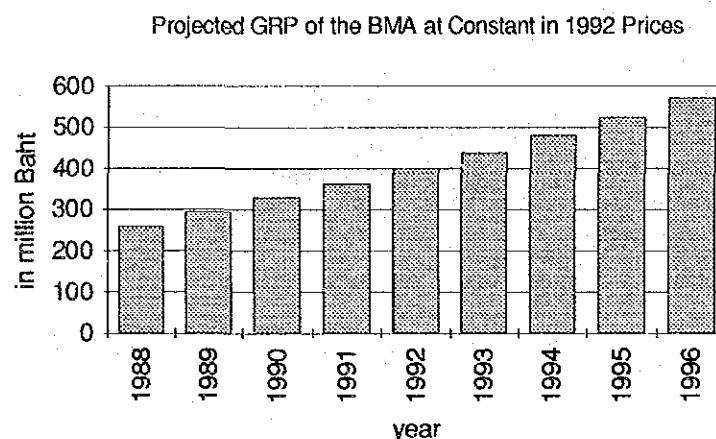
The economic growth of the country is forecast to be approximately 8.2% over the period of the Seventh Plan (1991-1996), whereas that of the BMA and vicinity is projected to be 9.5%. The BMA and vicinity is usually referred to as the Bangkok Metropolitan Region (BMR) which includes Bangkok, and the five provinces of Nonthaburi, Samut Prakan, Pathum Thani, Nakhon Pathom, and Samut Sakhon.

The growth rate of real Gross Regional Product (GRP) within the BMR will be 9.5% at the end of the Seventh Plan (down slightly from 9.6% in 1992), while the contribution of the BMR to national GDP will increase to 55.9% in 1996, up from 53.4% in 1992. The largest portion of the BMR's contribution comes from the service sector; the contribution of services to GDP will fall from 51.3% in 1992 to 51.8% in 1996. The industrial sector is predicted to contribute more than 6.7% to GRP in 1996 while the agricultural sector will continue to diminish in importance in this region. The contribution of agriculture is projected to drop from 1.87 % in 1992 to 1.46% in 1996. These projections indicate that the BMR will continue to play a

prominent role in national development as the primary center for trade, business, services and industry.

Growth in the GRP of BMR during 1988 and 1996 is illustrated in **Figure 3.2.3**.

Figure 3.2.3-Projected GRP of the BMA at Constant 1992 Prices



3.1.4 Income

Income per capita in the BMR significantly increased between 1986 and 1988, from 21,944 Baht per capita to 28,098 Baht per capita. These figures are considered to be much higher than those of the whole country which was 10,133 Baht and 12,766 Baht in the years 1986 and 1988, respectively. The annual growth rate of income over 1986 and 1988 was 13.16% for the BMA, and 12.24% for the whole kingdom.

In 1975, the average national income was approximately 58% of that of the BMR, by 1988 this figure fell to 45%. These figures indicate that a bigger gap in income between the BMR and the whole kingdom occurred over the aforementioned period. In the northeast, the situation is more severe. In 1988, the average income per capita in the northeast was only 28% of that of the BMR, down from 42% in 1975.

3.2 Land Use and Urban Structure

3.2.1 Land Use Classification of the BMA

Based on the consideration of land usages and existing land use patterns in the BMA, land uses in the BMA can be classified into four categories.

- **Priority Location Type**

Land uses in this category are large-scale industries, universities, religious institutes, large-scale parks and public utilities. These land uses are constrained by locational factors. They are considered the policy-option type in which their locations depend on the government's policies of land development.

- **Optional Location Type**

Residential areas and business centers including non-basic industries are classified into this category. These activities locate themselves freely by taking into account, for example, potential for development and accessibility to major infrastructure.

- **Subsequent Location Type**

These land uses are located by necessity in order to serve the demands of the first and second types. Neighborhood stores, primary schools and clinics are examples of this category. The amount is determined in proportion to the amount of land allocated to those two types.

- **Passive Location Type**

Land use in this category is agricultural which is considered a source of new sites for urban land uses or they will remain as agricultural areas. A part of the present study area is categorized into this type of land use.

3.2.2 Current Land Use Patterns of the BMA

Analysis by the Department of Town and Country Planning (DTCP) in 1986 indicated that 79.6% of the utilized land area within the BMA was for residential uses, while 12.5% and 7.8% were occupied by industrial and commercial entities, respectively.

Major land uses in the core area of the BMA are shophouses, temples or historic places, government and educational institutes. Recently, high-rise buildings have been constructed to serve the rapid growth of the Thai economy.

Inner city districts are densely-populated and available land is very limited. Intensive development of land in these districts is dominated by the construction of high-rise buildings for office and residential uses. Though this type of development can make effective use of limited available land, it has caused traffic congestion problems since more traffic is generated to/from high-rise buildings. Due to the limited supply of land, land prices in this area have increased dramatically.

In the outer areas, economic centers such as department stores, super markets and government offices have been developed. These centers, which play an important role in serving local demand, can be considered as sub-centers of the present CBD. In the eastern suburbs of the BMA, rice fields can be found whereas orchard, orchid-rearing and vegetable gardening are located in the western suburbs.

It should be noted that, as a factor in relieving traffic congestion, several government offices have been relocated to the suburbs especially in the northern area of the BMA, such as along the Chaeng Wattana Road.

The main indicator of land development patterns in the BMA is the number of construction permits issued by the BMA in a given district. In 1989, approximately one-half of the total 7.8

million square meters of floor area constructed legally is for residential purposes, while the rest is planned for commercial uses.

The supply of buildings in central Bangkok has increased remarkably over the past few years. A well-known international property consultant has forecast that by 1992 the vacancy rate for prime office space in central Bangkok would be 11.5% rising to 22% by 1993. The vacancy rate for prime residential apartments would increase to 11.1% in 1992. Most new office space is gathered along Viphavadi Rangsit Highway, Phahonyothin Highway and Ratchadaphisek Road while prime condominiums are located along Sukhumvit Road. The supply and demand of buildings for office and residential uses including their vacancy rates are illustrated in Figures 3.2.4 and 3.2.5 respectively.

Figure 3.2.4-Prime Office Supply and Demand, Central Bangkok

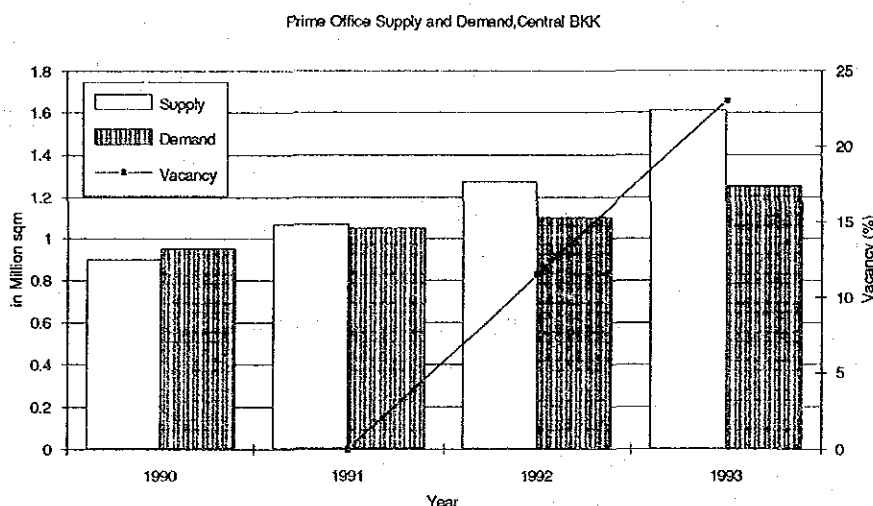
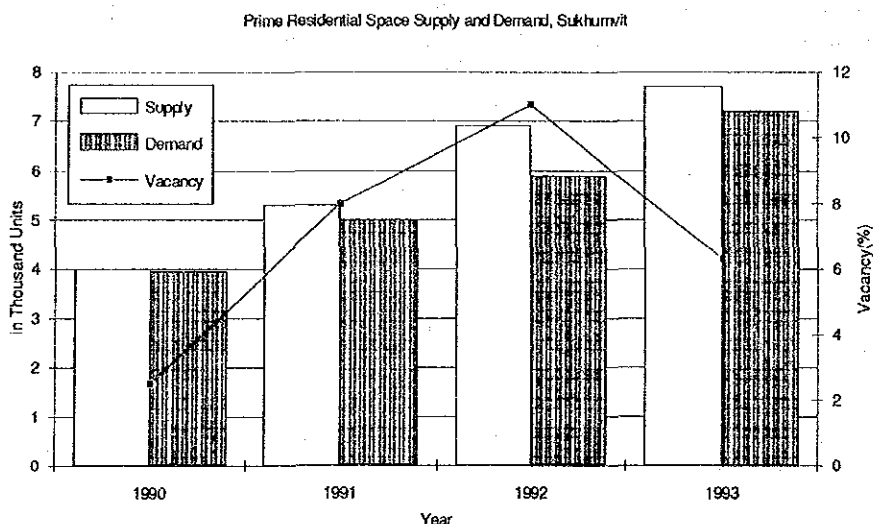


Figure 3.2.5-Prime Residential Space Supply & Demand, Sukhumvit



(1) Patterns of BMA Enlargement

Individual locations for land use development are determined by building control regulations,

land prices, suitability for commercial/trade center purposes, and the availability of vacant land. The expansion patterns of the BMA are discussed below.

- **Growth Within the Controlled Zone of Rattanakosin City**

Land in Rattanakosin has been used mainly for building temples (historic places), government offices, educational establishments, and for two and four stories row houses for combined commercial and residential purposes. Construction of high-rise buildings in this area is prohibited. Due to the very limited vacant land, land development in this area has remained unchanged.

- **Growth in the Inner City Districts**

Inner city districts are defined as densely-populated areas with little or no available land, where the land has already been developed for commercial purposes, as living quarters, government offices, educational establishments, temples and so forth. Therefore, the major land development has been distinguished mainly by the construction of high-rise offices and residential buildings, rather than traditional horizontal development of row houses for retail-cum-residential purposes only.

- **Growth in the Outer City District**

Land in the outer city has been utilized mainly for agricultural purposes such as rice growing in the eastern suburbs and orchid-rearing, vegetable and fruit gardening the western suburbs of the BMA. A portion of this area has been allocated as a preserved green-belt zone for agricultural purposes. Recently, some housing estates have been developed in the outer city to meet the need of low-income groups.

(2) Horizontal Enlargement of the BMA

The construction of bridges across the Chao Phraya River linking Bangkok and Thonburi and the construction of new roads are the main determinants of urban development. This is evidenced by an analysis of the expansion of the BMA over the last decade by utilizing satellite-relayed pictures.

It can be seen that the completion of Ratchadaphisek Road linking Khlong Toei to Asoke, the expressway linking Khlong Toei to Thonburi Pak Tho, and Rama IX Bridge linking both sides of the Metropolis, have strengthened the urbanization mechanism in the western area of the BMA which had previously been used for agricultural purposes. Completion of the eastern outer ring road will also be instrumental in converting land which had been reserved solely for agricultural uses, to agriculture-cum-residence usage. The Rama III Bridge has had similar effects on land use in Nonthaburi Province. These developments have benefitted the middle-level income earners.

(3) Vertical Enlargement of the BMA

The supply of available land within the BMA has become increasingly scarce, especially in the

core area. This has led to incredible increases in land price. As a result, the development form of the BMA has been changed to vertical enlargement. Construction of high-rise buildings, rather than row shophouses, has taken place to keep pace with the increasing demand for office space resulting from the rapid economic expansion, increase in inflow of foreign investment, export-oriented trade expansion, and growth in the service industry.

Though high-rise buildings can be applied to make the best use of very limited urban land, these have also created heavy traffic congestion in an already-populated area causing various problems to Bangkok residents.

3.2.3 Future Land Use Patterns of the BMA

Over the Seventh Plan (1991-1996), the future spatial development potentials in the BMA analyzed for the study on the National Urban Development Policy Framework by the Thailand Development Research Institute (TDRI) are summarized below:

- Rattanakosin City will be preserved as a historic district.
- The existing Central Business District (CBD) will receive benefits from the implementation of Mass Rapid Transit (MRT) system and the Second Stage Expressway System (SES) which will result in a good potential for development. Most shophouses in this area will be replaced by high-rise buildings to make the best use of the very limited available land. It will maintain its CBD status to serve as the BMA's main wholesale and retail trading center, though new CBDs would be developed.
- Khlong Toei Area has the potential of being a new CBD since various transport mega-projects have been planned. Urban expansion in this area will be mainly in the form of high-rise buildings.
- The growth of districts located between the old and new CBDs, such as Pathumwan, Sathon, Ratchathewi and Phayathai, will be strongly influenced by the formation of a new CBD.
- It is anticipated that the land use pattern in Bangkok's original business center, the area between Bang Lum Phu Canal and Padung Krung Kasem Canal which has most buildings in the form of row-shophouses, will not change much. This is because there are numerous land owners with small land allotments causing a problem in building large-scale projects.
- Secondary business centers are expected to be developed in the areas of Sathon, Ratchathewi, Khlong San, and Thonburi. Major development patterns will be in the form of row-shophouses or of row-shophouses intertwined with high-rise buildings.
- Chatuchak district will become a trading center mixed with medium-density residential developments.

- Housing estates will be developed mainly in the districts of Dusit, Bangsue, Thonburi, Bangphlat and Bangkok Noi.
- Districts of Yannawa, Phrakhanong, Don Muang, Bangkok, Phasicharoen and Chomthong will serve as medium-density residential areas.
- Low-density residential areas will be served by the districts of Prayet, Lat Phrao, Bangkok, Bangkok, and other outlying districts.
- Industrial estates will be developed in a part of Latkrabang, Ratburana, Nongkhaem and Bangkhunthian. The rest of these districts will be preserved as green areas.

Land use development patterns over the Seventh Plan as discussed above are depicted in **Figure 3.2.6.**

Expansion of the BMA in the future, based on the planned highways and mass transit, would follow the existing pattern as shown in **Figure 3.2.7.** Future developments would concentrate mainly along the existing corridors, for example, toward the north (along the Viphavadi Rangsit Highway, the northeast (Ramindra-Suwintawong), the southeast (along the Bang Na - Trat Highway), the southwest (along the Thonburi-Pak Tho Highway), and the west (along Thonburi - Nakhon Chaisi Highway).

3.2.4 Problems and Constraints Encountered in the Development Process

In developing the BMA, there are several problems and constraints which result in economic losses, delay in economic growth, and a declining quality of life. These problems are discussed below.

(1) Traffic Congestion

Growth of the population and the economy has led to an increase in the number of vehicles over the existing capacity of the BMA's existing transport network. Heavy traffic has resulted in emissions of carbon monoxide, lead, smoke and other toxic substances which pose a risk to public health in certain districts.

The principal reason for traffic congestion is a shortage of roads, the results of inadequate supply of public transport modes, and inappropriate city planning due to the city's founding more than 200 years ago.

It appears reasonable that better traffic conditions in the BMA will, in turn, result in more efficient economic growth as a portion of travel time will be utilized for various productive purposes.

(2) Inundation and Land Subsidence

The current increasing severity of inundation resulted from the following factors:

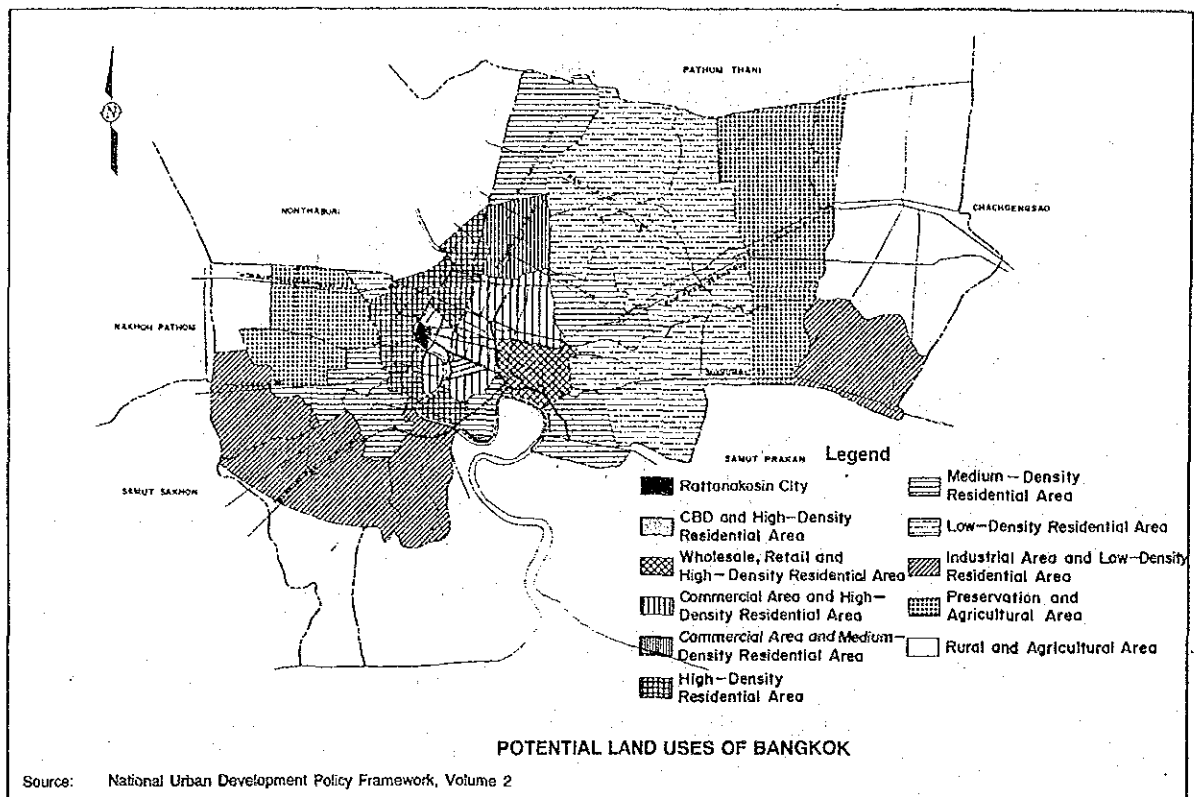


Figure 3.2.6-Potential Land Uses of Bangkok

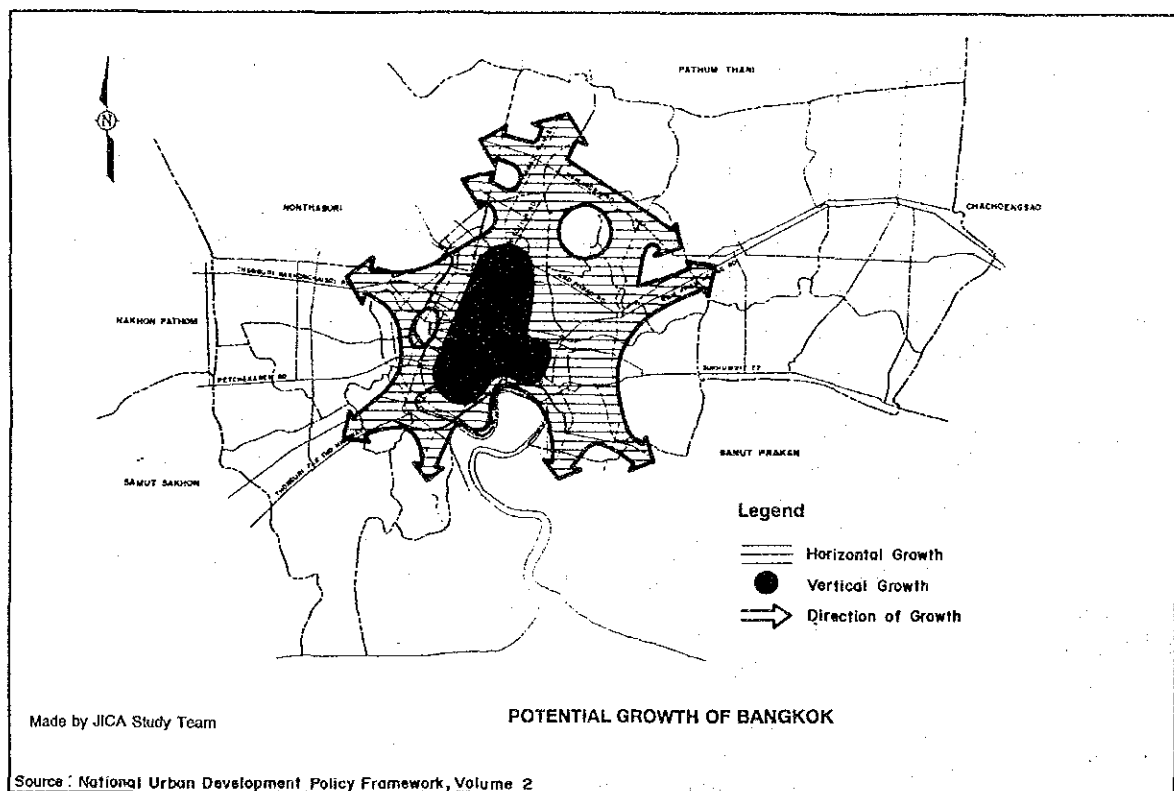


Figure 3.2.7-Potential Growth of Bangkok

- The construction of roads and buildings has blocked the natural outflow of water. Small, inadequate irrigating pipes have been installed to compensate.
- The development and existence of residential housing estates and industrial estates in the outer city districts has led to the consumption of a large volume of underground water since these districts are not served by the water works. Heavy and continuous usage of underground water has resulted in severe land subsidence. Consequently, land subsidence also increases the severity and duration of any inundation.

(3) Residential Problems

Two main residential problems are:

- Overcrowded and unhygienic accommodations as a result of low-income earners building their living-quarters on vacant plots of land to achieve inexpensive accommodations, proximity to work, and access to the city center where transport facilities are well provided.
- Due to increasingly expensive land prices in recent years, the preferred types of house have become smaller in size and tend to be located far away from the city resulting in greater commuting time.

(4) Land Utilization Problems

As a result of being the economic, social, culture, educational, communications and government administrative center of the country, the BMA has become a destination of migration from the rural areas for better job opportunities. This has led to vertical growth in the form of high-rise buildings and horizontal growth expanding through the city outskirts to the city boundaries.

Urbanization of the BMA has created the following difficulties.

- Urbanization has expanded well into the suburbs of the BMA where infrastructure had been provided for agricultural purposes only; inadequate for other uses.
- Environmental pollution has occurred as a result of population overcrowding and inappropriate utilization of land, for instance, as industrial sites.

3.3 Major Urban Infrastructure

Over the past five years, the rush implementation of infrastructure was clearly observed to keep pace with Thailand's much higher-than expected economic growth rate. The notable economic growth rate of almost twice of the original infrastructure plan targets has caused a problem in inadequate supply of infrastructure facilities.

Major infrastructures in the BMA have been planned or are being constructed mainly for the transport sector in order to relieve severe traffic congestion problems. These transport projects

include both road and rail networks such as:

- Don Muang Tollway;
- Second Stage Expressway System (SES);
- Ramindra - At Narong Expressway (RAE);
- Fourth Stage Expressway System (FSES);
- Skytrain of Expressway and Rapid Transit Authority of Thailand (Lavalin);
- SRT Mass Rapid Transit (Hopewell);
- BMA Mass Rapid Transit (Tanayong); and
- Second Bangkok International Airport (SBIA);

The planned expressway and MRT networks are depicted in **Figures 3.2.8 and 3.2.9** respectively.

3.3.1 Don Muang Tollway

With a total length of about 20 km, it is an entirely elevated six-lane expressway, connecting the northern end of the First Stage Expressway System (FES) with the Bangkok International Airport (BIA). This project will provide a direct route to the airport which would reduce the existing heavy traffic burden on Viphavadi Rangsit Highway; the only highway linking central Bangkok with the BIA.

3.3.2 Second Stage Expressway System (SES)

The SES is 39 km. in length and consists of two sections: one section runs in the north-south corridor between north of Rama IX Bridge (at Bang Kho) and Chaeng Wattana Road; the other runs east-west from a junction with the north-south section near the Sam Sen Waterworks Pumping Station to a terminal at Si Nakharin Road. The construction of the east-west section and the north part of the north-south section is being undertaken.

3.3.3 Ramindra - At Narong Expressway (RAE)

Nineteen km. of the RAE runs in the north-south direction of the eastern area of the BMA between a junction of FES in the area of Khlong Toei Port (At Narong Road) and Ramindra Road.

The RAE will be an expressway playing a substantial role in relieving traffic burdens on the Viphavadi Rangsit Highway. It will play a similar function with the north-south section of the SES.

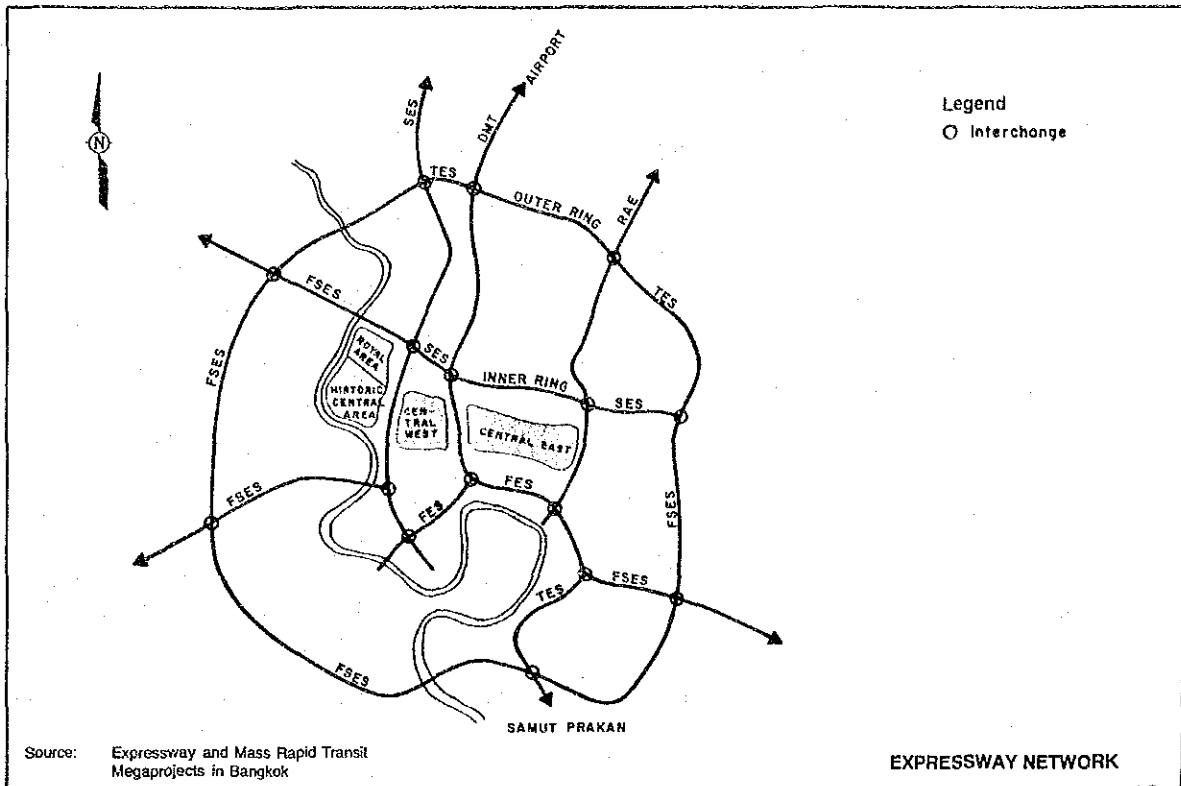


Figure 3.2.8-Expressway Network

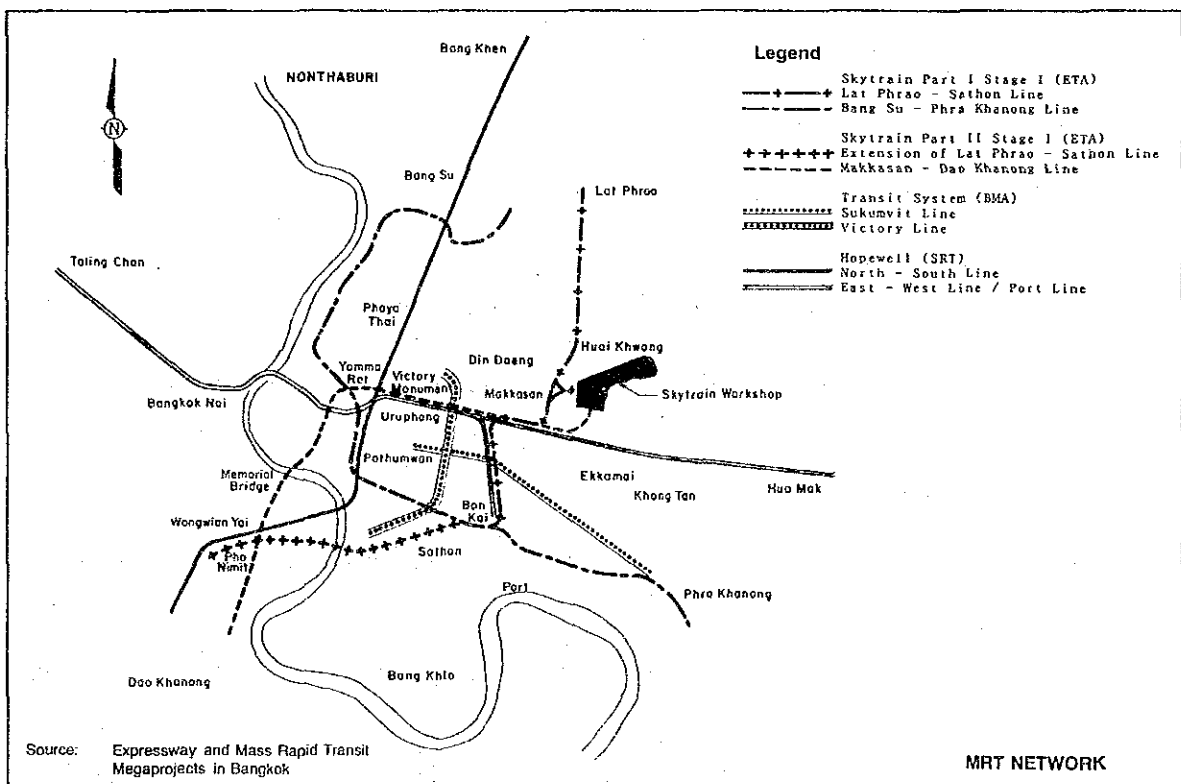


Figure 3.2.9-MRT Network

The ETA, the responsible agency, is currently selecting a qualified group of consulting firms to take charge in the construction supervision of this project.

3.3.4 Fourth Stage Expressway System (FSES)

The FSES which is being planned will cover a massive area of the BMR. It consists of an urban expressway and an inter-city expressway. The urban expressway of FSES consists of radial and ring expressways. It will serve traffic demand in the inner city, urban areas and suburban areas. The ring expressway will play a substantial role in allocating economic activities with the result that more economic/community centers will be developed. With the implementation of FSES, more residential areas will be developed in the remote areas due to better accessibility and relative lower land prices.

3.3.5 ETA Skytrain

The system of 34 km consisting of three lines in the first phase is expected to be a major part of the transport infrastructure in improving traffic flows. These three lines are:

- **Rama Line:** serve public transport demand between the Northern Bus Terminal and Phra Khanong;
- **Sathon Line:** begins at Thonburi, cross the Chao Phraya River on the Tak Sin Bridge, and ends at Bangkapi; and
- **Memorial Line:** runs from Rat Burana, crosses the Chao Phraya River on the Memorial Bridge, and ends at Huai Khwang.

3.3.6 BMA Mass Transit System

This system consists of two sections:

- **Sukhumvit Line:** is approximately 8.5 km in length, and runs from Rama I Road at Pathum Wan Intersection to Khlong Tan at Sukhumvit Road; and
- **Victory Line:** is approximately 6 km in length, and runs from Surasak Road on Silom and ends at the Victory Monument.

3.3.7 Hopewell System

The Hopewell System consists of three transport modes: expressway, community train (MRT), and the State Railway of Thailand (SRT). The system has two sections:

- **North-South:** a section that is 37 km. in length, and runs from Rangsit to Pho Nimit.
- **East-West Section:** runs for 23 km. from Hua Mark to Taling Chan.

The three modes are generally placed such that the two rail modes are two levels above existing ground (a level is approximately 7 meters) and the expressway is one level above that.

All three MRT projects will be implemented in the already built-up areas with large populations. Business/commercial centers will be constructed around the MRT stations and more residential areas will be developed along the MRT lines, even small distances away from MRT lines.

The above transport infrastructures, if they are realized, will definitely change the patterns of land uses and more sub-centers would be created.

All these schemes are aimed at relieving the congestion of the city's heavy traffic while giving commuters a quicker, more convenient choice of transport.

3.3.8 Second Bangkok International Airport (SBIA)

The SBIA will be a major node of transport and will create community/business/commercial centers around the airport. Between the SBIA and the city center, roads and rail transit will be planned to serve both air and road traffic demands that will result in changing land uses along these transport corridors.

This project is being planned/studied and the construction is anticipated to be completed within the next 10 years.

3.4 Urban Development Policy

To reduce/prevent various problems associated with the expansion of the BMA and to facilitate the growth of the BMA in the appropriate direction, the government has introduced policies, plans and measures affecting the growth of the BMA in the following areas.

- **Urbanization Control Area**

The areas designed to be controlled by land usage, height, frontage access area, floor space allocations, etc., consist of:

- The Preservation Area of Rattanakosin City
- The Green-Belt Area

In this context, the green-belt area requires local zoning of lands to govern usage. The objective of this policy is to keep those areas conducive to agriculture from being diverted to other uses that are harmful to agriculture. The BMA has about 140,000 rai of green-belt area land situated in the eastern and western areas.

Any urban development occurring in the green belt should be subject to construction and building controls. For urban development outside the green belt, the characteristics of a satellite or new town in order to avoid the ribbon development effect should be taken into account.

- **Government-Promoted Urban Growth Areas**

These areas are the targets of government policies in generating economic growth in a specific location. Some of the important government projects include:

The Government Agencies' Center Project

This project was designed to centralize all government agencies located in the Rattanakosin City and relocate them to outside the Metropolis, which will result in preserving the inner city area of Rattanakosin as an important historic place.

Residential Area Development Project

It is the responsibility of the National Housing Authority (NHA) to build and develop new residences to replace the presently crowded slum dwellings. Two projects are being undertaken:

- (i) The project to replace densely-populated areas by building flats in the city center and the suburbs of the BMA. This will furnish the requirements of the low to middle-level income groups.
- (ii) The special project to utilize lands according to highest present values thereby fulfilling market requirements and yielding market rates of return on the project. This will involve residential construction catering to the requirements of the upper-middle income group.

Industrial Estate Project

The government has offered special advantages for the investors inside the industrial estates, such as tax rate reductions or tax exemptions, the right to apply for promotional privileges from the Board of Investment (BOI), privileges regarding export of goods, and the granting of work permits to foreign nationals working within these compounds. Examples of industrial estates being developed/operated are:

(i) Eastern Seaboard Development Program

The Eastern Seaboard Development is an integrated program designed to encourage and assist private-sector investors to capitalize on Thailand's natural resources, skilled labor and market potential. The program covers Laem Chabang, Map Ta Phut, and related area, including U-Taphao Airport, Pattaya, and Sattahip.

(ii) Southern Seaboard Development Program

This program has been established to promote the development of peninsular Thailand, located in the provinces surrounding Krabi on the Andaman Sea and Khanom District of Nakhon Si Thammarat of the Gulf of Thailand.

(iii) Northern Industrial Estate

The Northern Industrial Estate is located in an area of 3 km² in the province of

Lamphun, 27 kms from Chiang Mai International Airport, and 6 kms from Lamphun.

- Improve the road network by providing more primary and secondary roads in areas which were previously derelict pieces of land and blind-spots.
- Accelerate the construction of the MRT. Give priority to the MRT over the expressway system. Arrange coordination of the MRT projects being carried out by various government agencies such as the ETA, the Bangkok Metropolitan Administration (BMA), and the State Railway of Thailand (SRT).
- Improve the bus routes of the Bangkok Mass Transit Authority (BMTA) in order to provide more effective routes.
- Construct a non-electric trolley system within Rattanakosin City and the old inner city area to reduce the volume of vehicles in these areas.
- Control the parking of vehicles along the roads. Encourage the construction of off-street parking around the MRT stations.
- Accelerate the construction of truck terminals and cargo depots to reduce the number of trucks travelling in the inner city.
- Lobbying for a rapid enforcement of the city plans of Bangkok, Nonthaburi and Samut Prakan to lessen land use conflicts, to reduce the extent of environmental pollution occurring within the city area, and to make convenient provision of infrastructure systems adequate and more efficient.
- Accelerate the announcement of ministerial orders regulating and controlling the height and the size of large-scale and high-rise buildings.
- Prepare legislation aimed at revitalizing the city (urban redevelopment act), new community, and new town development (new community and new town act).
- Lobby for the implementation of Property Tax which redresses the balances between those who have benefitted from government investments (for example, the establishment of new roads flood protection system) and those who have suffered disadvantages as a result of identical government investments (for instance, living within the area designated as a green belt). This tax will raise sufficient public revenue which will be used to improve the intensive infrastructure systems within the city that require investments.
- Improve the drainage and flood protection systems by utilizing existing canals and water storing ponds including expanding the width of major canals to increase the effectiveness of water drainage.
- Expand the water supply area. Increase fees for the use of under ground water to the rate close to the fee for piped water service to lessen the use of under

ground water which causes land subsidence.

- Promote the establishment of industrial estates and parks to reduce environmental pollution generated by factories.

4. Existing Condition of the Study Area

4.1 Socioeconomic Conditions

The study area covers the major part of Khwaeng Bang Kapi of Huai Khwang District and small portions of Khwaeng Sam Sen Nok and Khwaeng Huai Khwang of Huai Khwang District and Khwaeng Thong Lang of Bang Kapi District. (Figure 3.2.10)

Table 3.2.1-Population of Khwaeng (Sub-district) Covered by Study Area

Khet (district)	Khwaeng (Sub-district)	Population	Study Area's (1990)	Share
Huai Khwang	Bang Kapi	19,343	70 % - 80 %	
	Huai Khwang	98,381	<5 %	
	Sam Sen Nok	41,607	<5 %	
Bang Kapi	Thong Lang	93,125	<5 %	

Source: Bangkok Metropolitan Administration
JICA Study Team

The present population of the study area is estimated approximately at 17,000 - 18,000 based on the distribution of residential areas.

The average household size of Khwaeng Bang Kapi was 3.9 persons in 1989. The total number of households in the study area is estimated approximately at 4,500. (Table 3.2.2)

Major economic activities in the study area are commercial and business sectors along the arterial roads.

There are few agricultural fields and fishing ponds and their shares in the study area's economy are marginal.

Three factories identified in the study area are small scale light manufacturers.

4.2 Land and Building Uses

Land and building uses in the study area are shown in Figure 3.2.11.

Along Petchaburi Road and Asoke Din Daeng Road, commercial and business uses mixed with residential uses are dominant.

Along Ratchada Pisek Road, not like the west side, the east side has low density of buildings. There are scattered commercial facilities with open spaces.

Figure 3.2.10-Administrative Boundaries

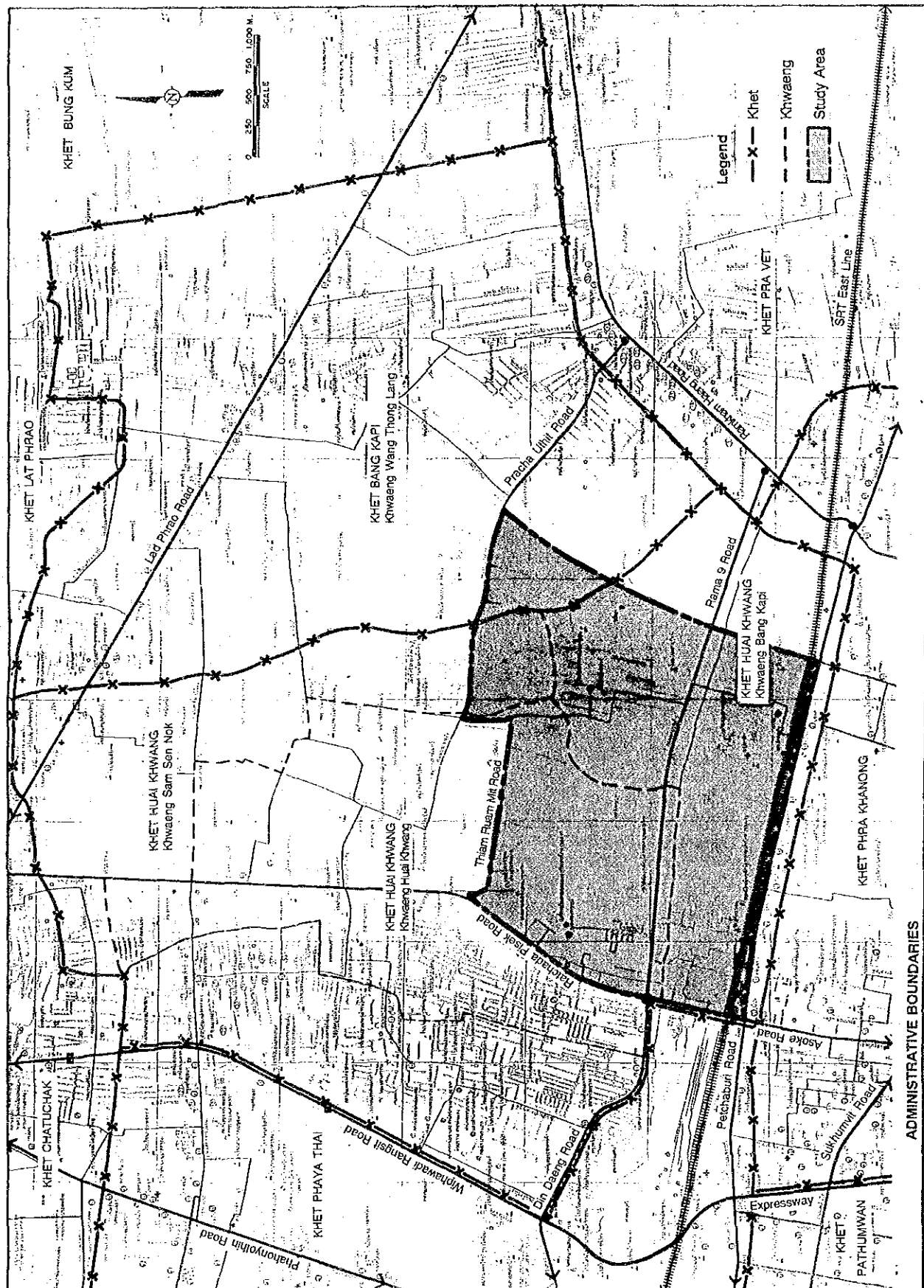


Figure 3.2.11-Existing Land and Building Uses

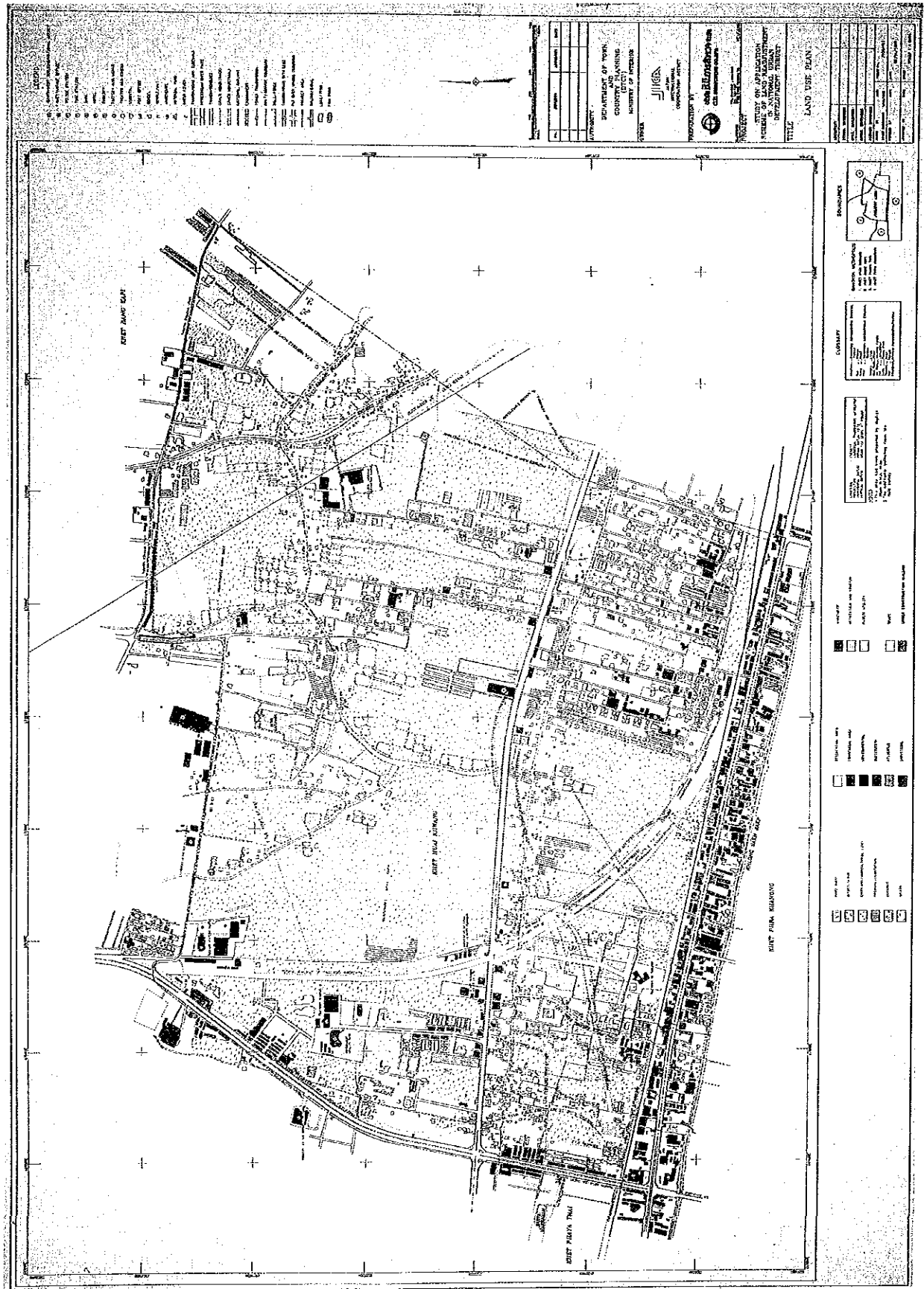


Table 3.2.2-Population and Number of Households

District: Bang Kapi

Year	Khwaeng Wang Thong Lang						Total	
	Population	Household	Population	Household	Population	Household	Population	Household
1981	65,477	13,874					65,477	13,874
1982	69,005	14,628					69,005	14,628
1983	71,395	15,334					71,395	15,334
1984	74,227	16,226					74,227	16,226
1985	Year 1985 & 1986 the data collected by district (not divide in to Khwaeng)							
1986								
1987	80,702	18,812					80,702	18,812
1988	85,143						85,143	
1989	88,550	20,884					88,550	20,884
1990	93,125						93,125	
1991								

District 'Huai Khwang

Year	Khwaeng Sam Sen Nok		Khwaeng Huai Khwang		Khwaeng Bang Kapi		Total	
	Population	Household	Population	Household	Population	Household	Population	Household
1981	21,169	4,684	90,802	15,236	24,220	3,454	136,191	23,374
1982	24,350	5,118	99,135	15,741	27,056	3,497	150,541	24,356
1983	25,091	5,448	101,375	16,367	27,026	3,620	153,492	25,435
1984	25,896	6,124	103,754	17,108	27,118	3,883	156,768	27,115
1985	Year 1985 & 1986 the data collected by district (Not divided into Khwaeng)							
1986								
1987	36,068	8,352	100,445	15,378	17,222	4,496	153,735	28,226
1988	39,066		100,151		18,045		157,262	
1989	42,612	9,850	100,579	16,073	19,142	4,958	162,333	30,881
1990	41,607		98,381		19,343		159,331	
1991								

Source: Town Planning Section, BMA

Along newly constructed Rama IX Road and currently improving Thiam Ruam Mit Road and Pracha Uthit Road, shops, offices and leisure places for customers by private cars are scattered and being constructed.

The inner areas of those arterial roads are roughly grouped into six parts. The area around TV Channel 9 Soi is a relatively new residential area with business and commercial buildings along the soi.

The inner area west of Khlong Bang Kapi is an old style residential and commercial area largely evacuated for construction of the Second Stage Expressway.

The area between Thiam Ruam Mit Road and Rama IX Road is an open area with grass and ponds.

The area between Khlong Bang Kapi and Soonvijai Area is also open grass land with a new arch-shaped commercial and business mall called Royal City Avenue.

The inner area between Pracha Uthit Road and Rama IX Road is a low density residential area mixed with scattered other uses surrounded by open grass areas with bodies of water.

Soonvijai Area is a medium density residential area mixed with other scattered uses.

Major features of each sub-area are presented in **Figure 3.2.12**.

4.3 Infrastructure

4.3.1 Existing Road Network

The existing road network is shown in **Figure 3.2.13**.

Ratchada Pisek Road (8 lanes partially 6 lanes), Asoke Din Daeng Road (6 lanes), Phetchaburi Road (6 lanes), Rama IX Road (6 lanes partially 8 lanes), Thiam Ruam Mit Road (temporarily 2 lanes to be 4 lanes), and Pracha Uthit Road (temporarily 2 lanes to be 4 lanes) form the skeleton of the study area's road network.

Most of the other roads in the study area are two lane roads including Soi Soonvijai and Soi through Mu Ban Wichit Chai, which connect Phetchaburi Road, Rama IX Road and Thiam Ruam Mit Road.

Most roads in the study area are paved.

4.3.2 Existing Public Transport Network

Buses operated by the Bangkok Mass Transit Authority are the dominant public transport. They operate along major roads except Thiam Ruam Mit Road and Pracha Uthit Road, which are currently being upgraded. Phetchaburi Road has 10 routes, Ratchada Pisek Road has six routes, Rama nine Road has three routes and Asoke Din Daeng Road has two routes. Feeder service along soi is provided by motorcycles. Complementary to these are the railway services (eight services for each direction) of the State Railway of Thailand. Along Khlong Saen Saep, there are public boat services. (**Figure 3.2.14**) Taxis and Tuk Tuk are also operating in the study area.

During peak hours, buses are full as well as trains and boats.

4.3.3 Traffic Volume on Major Roads

Results of a traffic counting survey at 10 locations on major roads are summarized in **Table 3.2.3** and depicted in **Figure 3.2.15**.

The following passenger car units (PCU) for various types of vehicles are used here according to the Feasibility Study and Environmental Impact Assessment of Fourth Stage Expressway System Report (February 1992).

Figure 3.2.12-Site Survey Notes

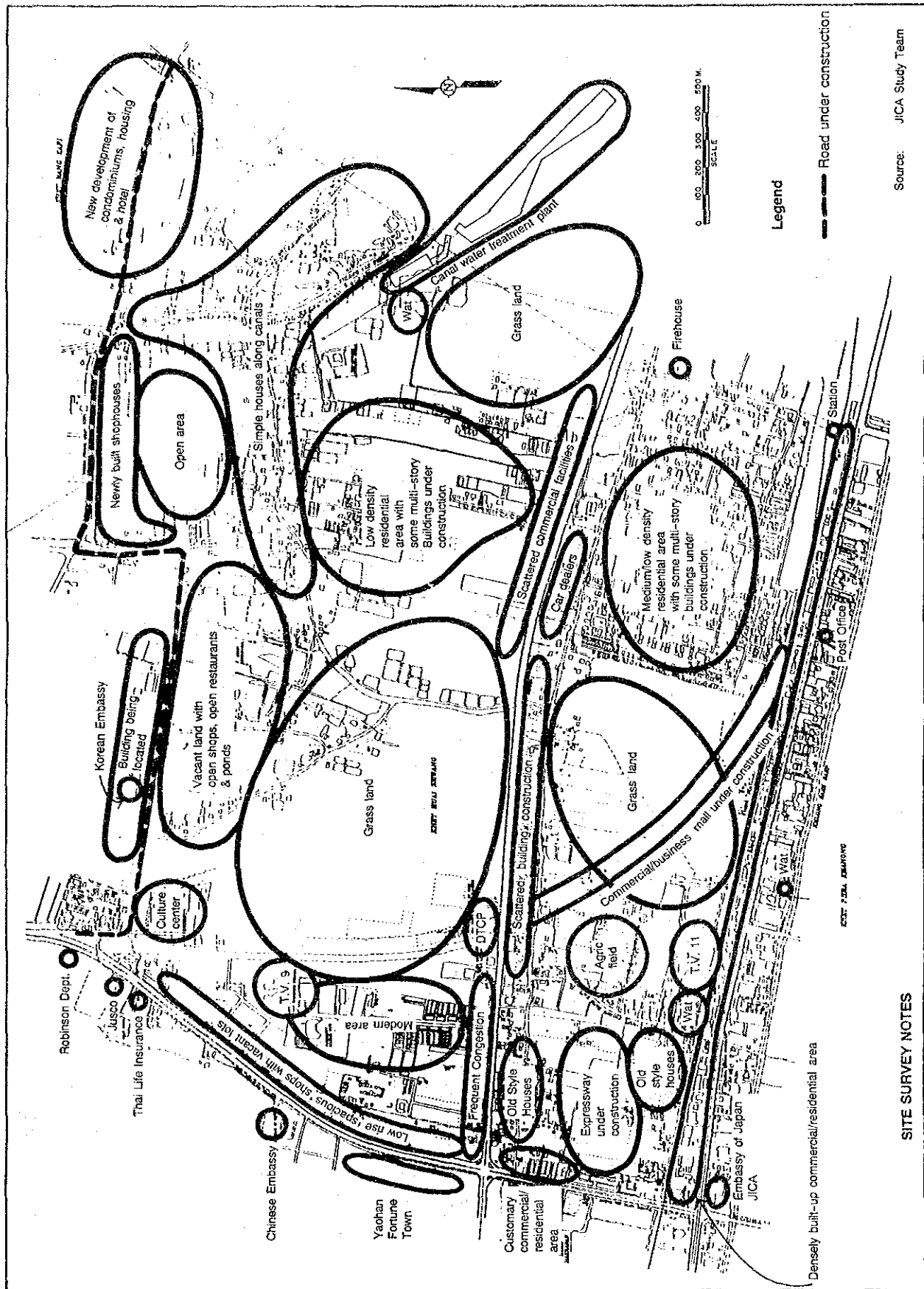
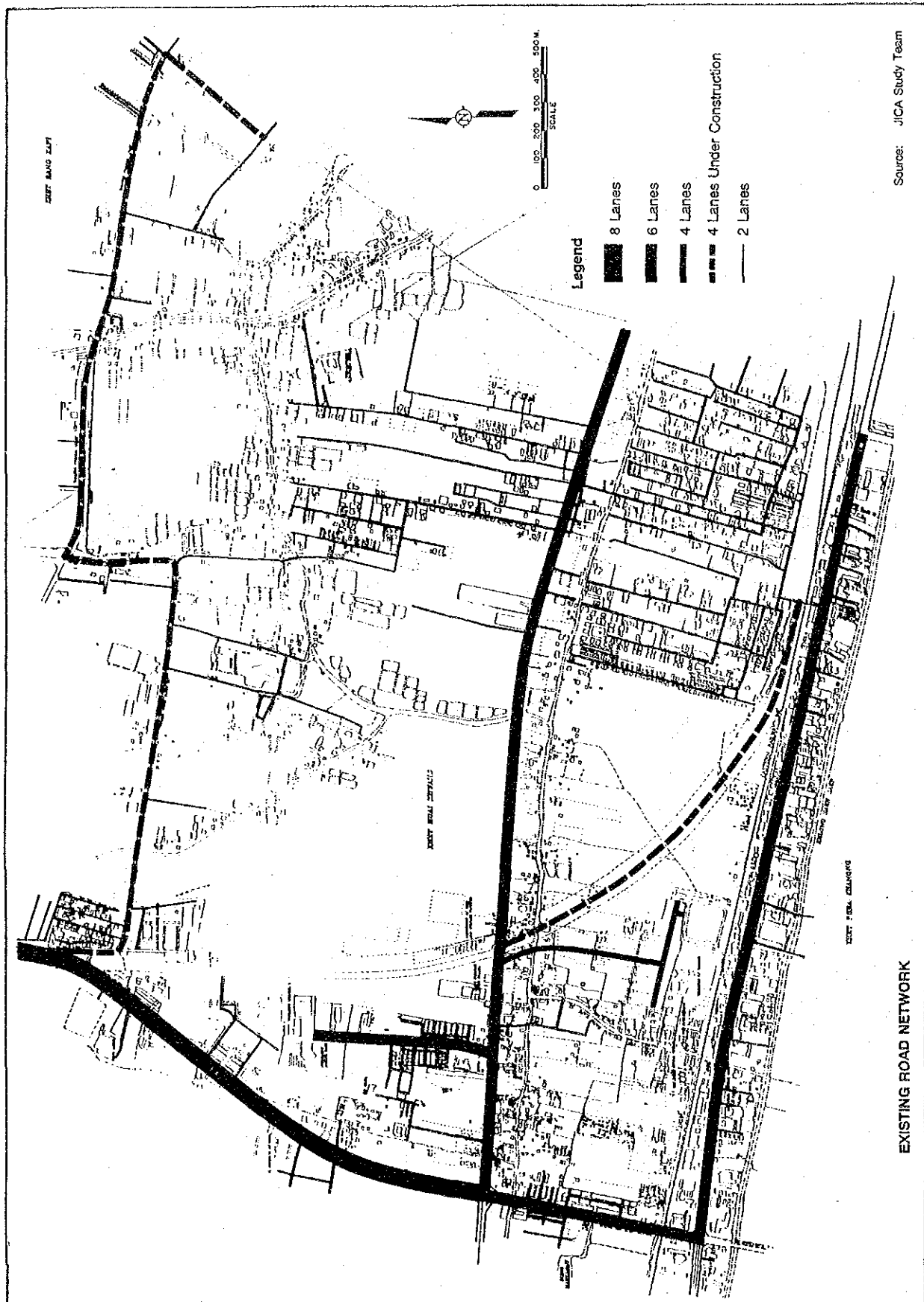


Figure 3.2.13-Existing Road Network



Source: JICA Study Team

Table 3.2.3-Summary of Traffic Counting Results

For Bangkok Center toward South or West Direction

Road Section	Number of Lanes	Number of cars	Number of Motorcycle	Total Vehicles	Total PCU	PCU/ Lane	Peak from	Hour to	PCU in Peak Hour	PCU/ Lane in Peak	Peak Ratio(%)
1 Asoke Din Daeng	3	26,923	29,694	56,617	39,850	13,283	7	8	3,991	1,330	10.0
2 Ratchada Pisek	4	34,646	24,000	58,646	47,241	11,810	7	8	725	931	7.9
3 Phetchaburi East	3	29,020	14,984	44,004	38,749	12,916	7	8	3,741	1,247	9.7
4 Phetchaburi West	3	27,336	11,087	38,423	35,372	11,791	7	8	4,337	1,446	12.3
5 Rama IX East	3	31,332	16,737	48,069	42,029	14,010	7	8	3,659	1,220	8.7
6 Rama IX West	3	27,522	16,715	44,237	38,002	12,667	7	8	3,239	1,080	8.5
7 Pracha Uthit	1	7,905	3,015	10,920	10,880	10,880	7	8	954	954	8.8
8 Tiam Ruam Mit	1	3,109	1,888	4,997	4,601	4,601	7	8	373	373	8.1
9 Soonvijai South	1	6,548	2,573	9,121	8,451	8,451	9	10	762	762	9.0
10 Soonvijai North	1	5,475	1,435	6,910	7,313	7,313	8	9	794	794	10.9

For Outside Bangkok toward North or East Direction

Road Section	Number of Lanes	Number of cars	Number of Motorcycle	Total Vehicles	Total PCU	PCU/ Lane	Peak from	Hour to	PCU in Peak Hour	PCU/ Lane in Peak	Peak Ratio(%)
1 Asoke Din Daeng	3	40,770	32,461	73,231	56,138	18,713	16	17	4,087	1,362	7.3
2 Ratchada Pisek	4	36,353	24,048	60,401	48,491	12,123	18	19	3,956	989	8.2
3 Phetchaburi East	3	36,153	15,521	51,674	46,974	15,658	16	17	3,867	1,289	8.2
4 Phetchaburi West	3	35,052	18,531	53,583	45,953	15,318	17	18	3,698	1,233	8
5 Rama IX East	3	29,329	16,357	45,686	39,600	13,200	14	15	2,865	955	7.2
6 Rama IX West	3	24,992	15,407	40,399	34,125	11,375	17	18	2,616	872	7.7
7 Pracha Uthit	1	9,663	2,611	12,274	12,983	12,983	18	19	1,229	1,229	9.5
8 Tiam Ruam Mit	1	3,545	1,758	5,303	5,018	5,018	17	18	450	450	9
9 Soonvijai South	1	7,543	2,636	10,179	9,894	9,894	15	16	826	826	8.3
10 Soonvijai North	1	5,155	1,725	6,880	7,103	7,103	17	18	653	653	9.2

To Both Directions

Road Section	Number of Lanes	Number of cars	Number of Motorcycle	Total Vehicles	Total PCU	PCU/ Lane
1 Asoke Din Daeng	6	67,693	62,155	129,848	95,988	15,998
2 Ratchada Pisek	8	70,999	48,048	119,047	95,732	11,967
3 Phetchaburi East	6	65,173	30,505	95,678	85,723	14,287
4 Phetchaburi West	6	62,388	29,618	92,006	81,325	13,554
5 Rama IX East	6	60,661	33,094	93,755	81,629	13,605
6 Rama IX West	6	52,514	32,122	84,636	72,127	12,021
7 Pracha Uthit	2	17,568	5,626	23,194	23,863	11,932
8 Thiam Ruam Mit	2	6,654	3,646	10,300	9,619	4,810
9 Soonvijai South	2	14,091	5,209	19,300	18,345	9,173
10 Soonvijai North	2	10,630	3,160	13,790	14,416	7,208

Figure 3.2.14-Existing Public Transport Networks

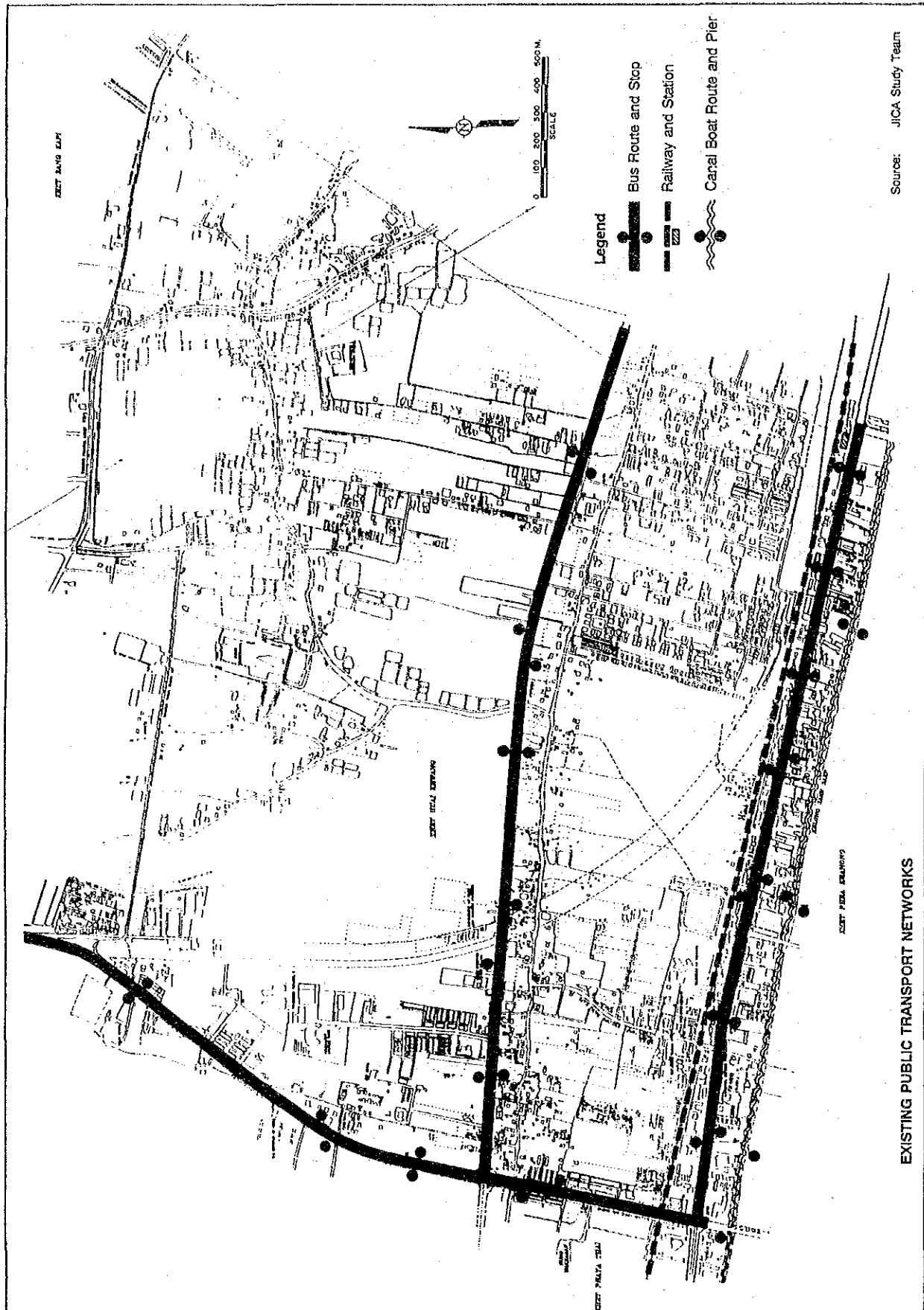
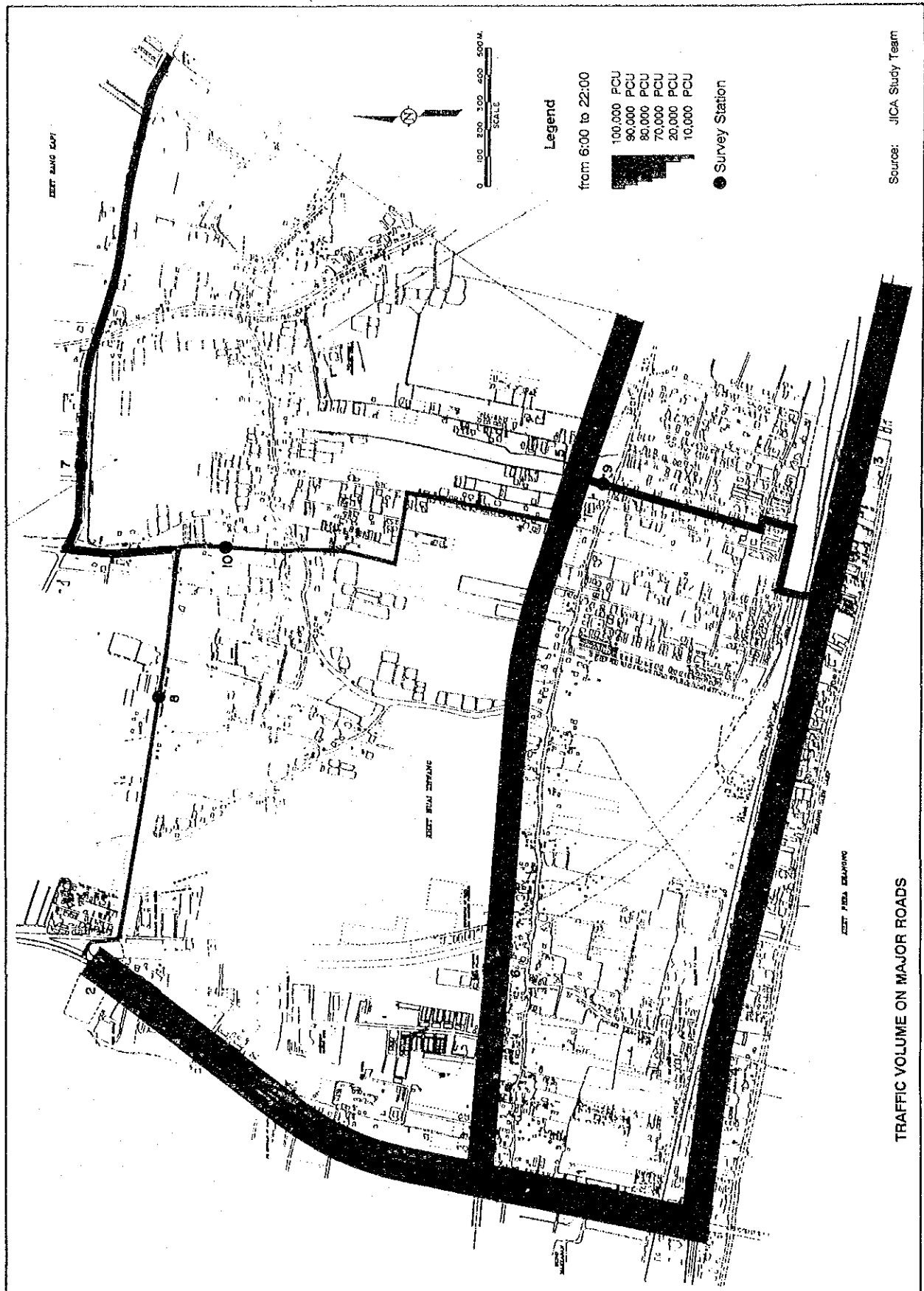


Figure 3.2.15-Traffic Volume on Major Roads



Passenger car	=	1.00
Tuk tuk	=	0.75
Mini bus	=	1.25
Light medium bus	=	1.50
Bus	=	2.00
Pick-up	=	1.75
Heavy truck	=	2.00
Motorcycle	=	0.25

Asoke Din Daeng Road, Ratchada Pisek Road, Petchaburi Road, and Rama IX Road have heavy traffic. The daily two-way traffic of these roads range from 72,000 passenger car units to 96,000 passenger car units. The PCU per lane of these roads is not less than 12,000. It is thought that these roads do not have extra capacity so that any urban development in the study area needs corresponding development of the transport system.

The daily traffic volume of the other roads is far smaller. However, the PCU per lane of the 2 soi is rather high for district roads. Besides the current up-grading of Thiam Ruam Mit Road and

The Pracha Uthit Road, improvement of the district road network is necessary, in particular, in districts where new developments are taking place.

4.3.4 Khlongs and Drainage

The study area is located in the Huai Khwang drainage area, and is in the older system of eastern suburban-Bangkok as shown in **Figure 3.2.16**. The rain water of the study area is transferred to Khlong Sean Saep by passing through Khlong Lat Phrao and Khlong Khamen, then, it is discharged into the Chao Phraya River downstream via drain pumps.

There are 10.6 km. long khlongs in the study area. Khlongs are utilized as rain water and sewage transfer channels. The three khlong branches which run through the middle-study area from the north to the Khlong Khamen bring the northern area rain water to the study area.

Figure 3.2.17 shows the khlongs and the flood-prone area in/around the study area. None of the khlongs in the study area are utilized as public transportation at present.

The northeast and along the khlong branches of the study area is low ground, flood-prone areas. The eastern railway, located along the southern boundary of the study area, functions as a dike for the core district of Bangkok.

4.3.5 Public Facilities

1) Sewerage

There is not a public sewerage system in the study area. A septic-tank is utilized at an ordinal house. Large-scale condominium and commercial buildings are equipped with sewerage treatment facilities individually. The treated water is discharged into khlongs through pipes.

Figure 3.2.16-Concept of Flood Protection/Drainage System

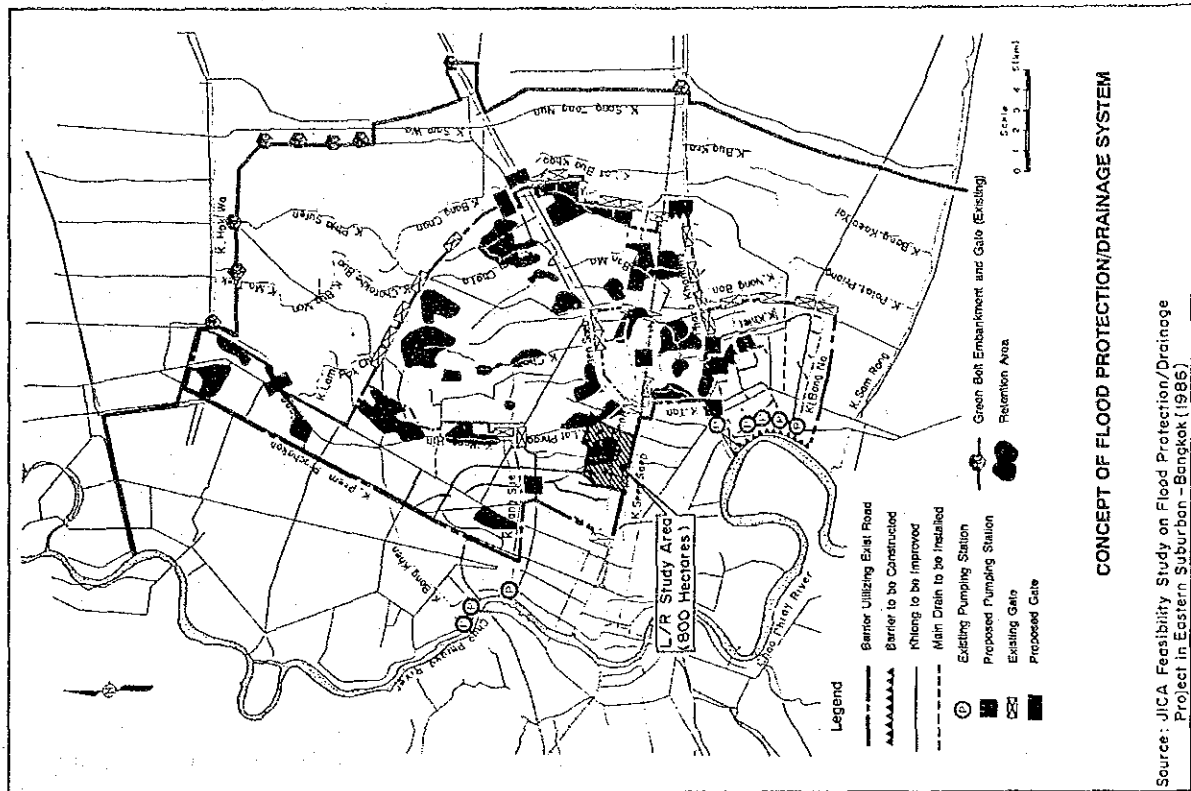
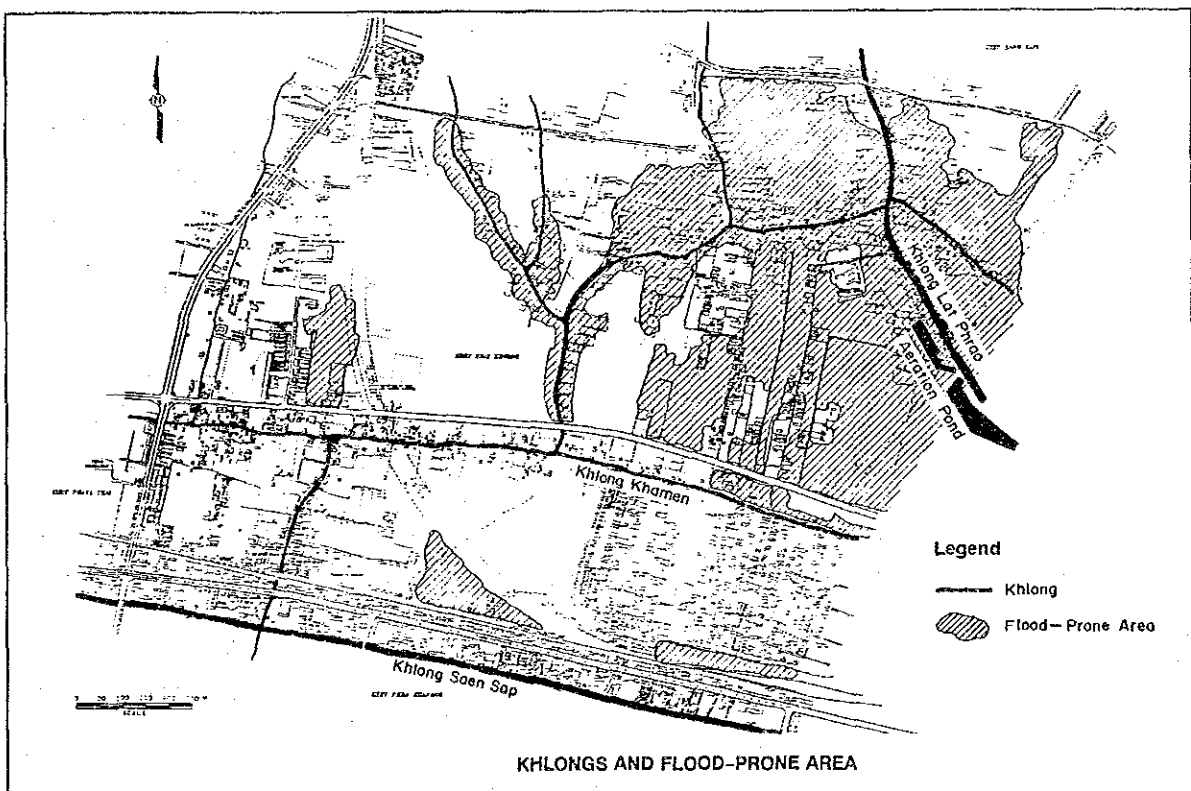


Figure 3.2.17-Khlongs and Flood - Prone Area



Houses along the khlongs and all informal housing in the study area discharge sewage directly into khlongs or water pools without treatment. The water quality of khlongs in the study area is quite bad.

An aeration pond for treatment of khlong water is located at the east side of the study area along Khlong Lat Phrao.

2) Water Supply

The MWA's (Metropolitan Waterworks Authority) water supply distribution pipeline is completed in/around the study area. All houses in the study area that can afford to pay water charges utilize the MWA's piped water.

The MWA's water transmission pipe of dia. 2.3 m. has been installed under the route of SRT Royal City Avenue, and the distribution pipe of dia. 0.3 m. has been installed at the both side of Rama IX street for water supply services.

It is expected that ground water will not be drawn from the study area because of the completed MWA pipeline and there are few industries.

3) Electricity and Telephone

The MEA (Metropolitan Electricity Authority) and TOT (Telephone Organization of Thailand) are supplying electricity and telephone services. At almost all streets in the study area electrical wiring and telephone cable installations have been completed. Every house in the study area can obtain electricity and telephone services at present.

4) Garbage Collection Services

The study area is located within the coverage of the BMA provided garbage collection services. However, waste materials from the construction sites are disposed of along Rama IX Street and at the open spaces along small streets in the study area, polluting the environment of the study area.

5) Gas Supply

There is not a piped gas supply system in Bangkok.

4.4 Public Urban Facilities

4.4.1 School

In the study area, there are four schools i.e., a public primary school, two private primary/secondary schools, a private vocational school in Khwaeng Bang Kapi, and the Thai Japanese Association School. Among these, three schools are in the existing community of Soonvijai.

4.4.2 Park

There is not a public park nor recreational facility in the study area.

4.4.3 Temple

There are two Buddhist temples. Wat Utai Tharam along Khlong Bang Kapi which provides open space for citizens.

Table 3.2.4-Schools in the Study Area

Kind of school	Uthai Tharam	Chalermst	Cham Wit	Don Witthaya
	Primary	Vocational	Primary + Secondary	Primary + Secondary
Public/Private	Public	Private	Private	Private
Site Area	7,320	3,200	6,600	8,800
No. of Stories	3	2	4	4
No. of Class	24	14	12	48
No. of Students	900	300	200	1,700
No. of Teachers	40	20	25	70
No. of grades	6	3	9	9
Location	1	2	3	4

Table 3.2.5-Temples in the Study Area

	Site Area (sq.m.)	Building Area (sq.m.)
Wat Khok	3,200	400
Wat Uthai Tharam	8,000	3,000

Table 3.2.6-Hospitals in the Study Area

Name	Private/Public	Site Area (m ²)
Bangkok General Hospital	Private	6,400 existing
Rama IX Hospital	Private	6,000 under construction
Imperial Piyarate Hospital	Private	6,000 under construction

4.4.4 Health Care

Bangkok General Hospital, is a large private hospital.

Two hospitals, the Rama IX Hospital and the Imperial Piyarate Hospital, are uner construction.

4.4.5 Cultural

The Thailand Culture Center is at the northwest corner of the study area, which is a national facility, and not for community use.

4.4.6 Institutional

The Makkasan Police Station is at the entrance of Soi Soonvijai.

A fire station of about 1,500 m² with 8 fire engines is at the end of a soi in the Soonvijai Area on the boundary of the study area.

The Petchburi Post & Telegram Office is on New Petchburi Road just outside of the study area.

Administrative branch offices are distributed in the 'Khet' level, and the Khet Huai Khwang Office is located outside the study area.

4.5 Official Land Prices and Land Ownership

The official land prices are available at the Office of the National Valuation Authority of Department of Lands.

The office revises the land prices every four years.

The typical range of official land prices of road side areas and other areas is as follows. (Figure 3.2.18).

Table 3.2.7-Range of Official Land Prices

Area	Range of Land Prices (Baht per wa)
Ratchadapisek & Petchaburi	>140,000
Rama IX	100,000-140,000 partly >140,000
Asoke Din Daeng	100,000-140,000
TV 9 Soi	80,000-140,000
Thiam Ruam Mit Road	40,000-100,000
Pracha Uthit Road west of khlong Lat Phrao	40,000- 80,000
Soonvijai area	30,000- 60,000
Mu Ban Wichit Chai area	20,000- 40,000 partly <80,000
Other areas not adjacent to roads and soi	10,000- 20,000
Area east of khlong Lat Phrao	<10,000

Most land in the study area is owned by private individuals or companies. Public sector held land marginal.

Within the study area, Rama IX Road is the only publicly owned road. The others appear to be privately owned roads, though some may have been transferred under the management of the Bangkok Metropolitan Administration (BMA). How to effectively handle these private roads is an important issue for land readjustment.

4.6 Major On-Going Projects

A number of projects are on-going or planned in the study area. (Figures 3.2.19 and 3.2.20)

Figure 3.2.18-Official Land Prices

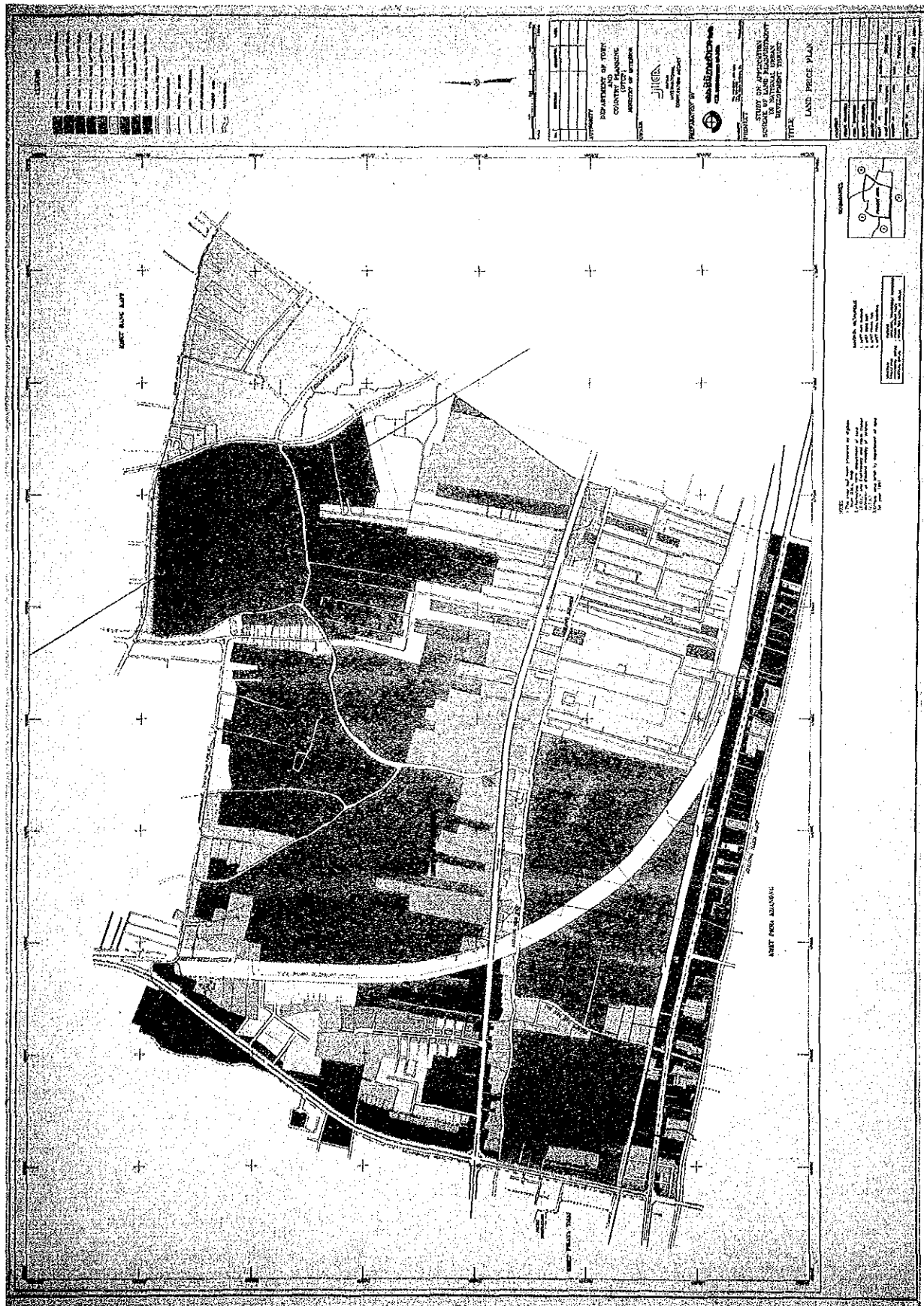


Figure 3.2.19-Major Transport Projects

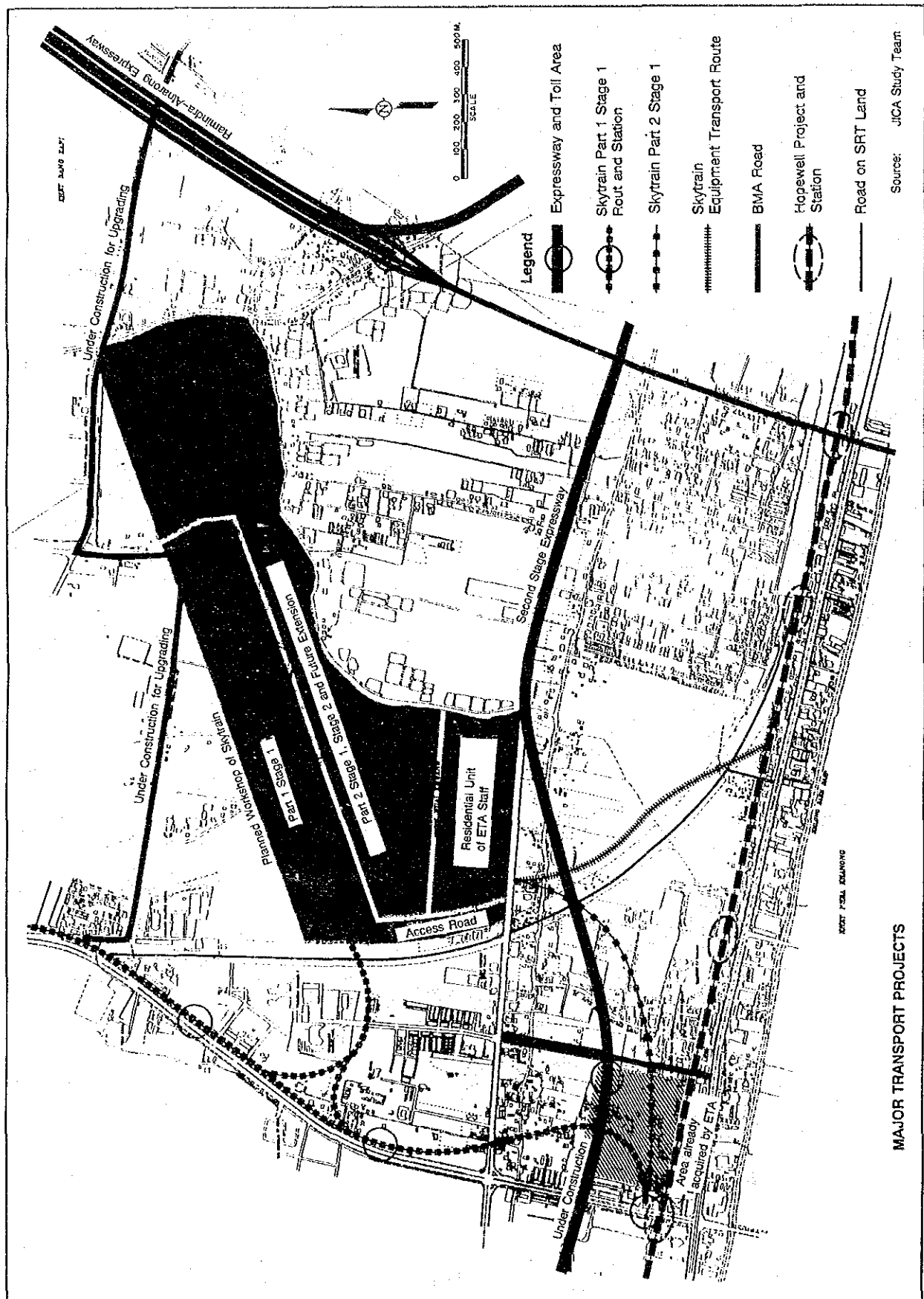
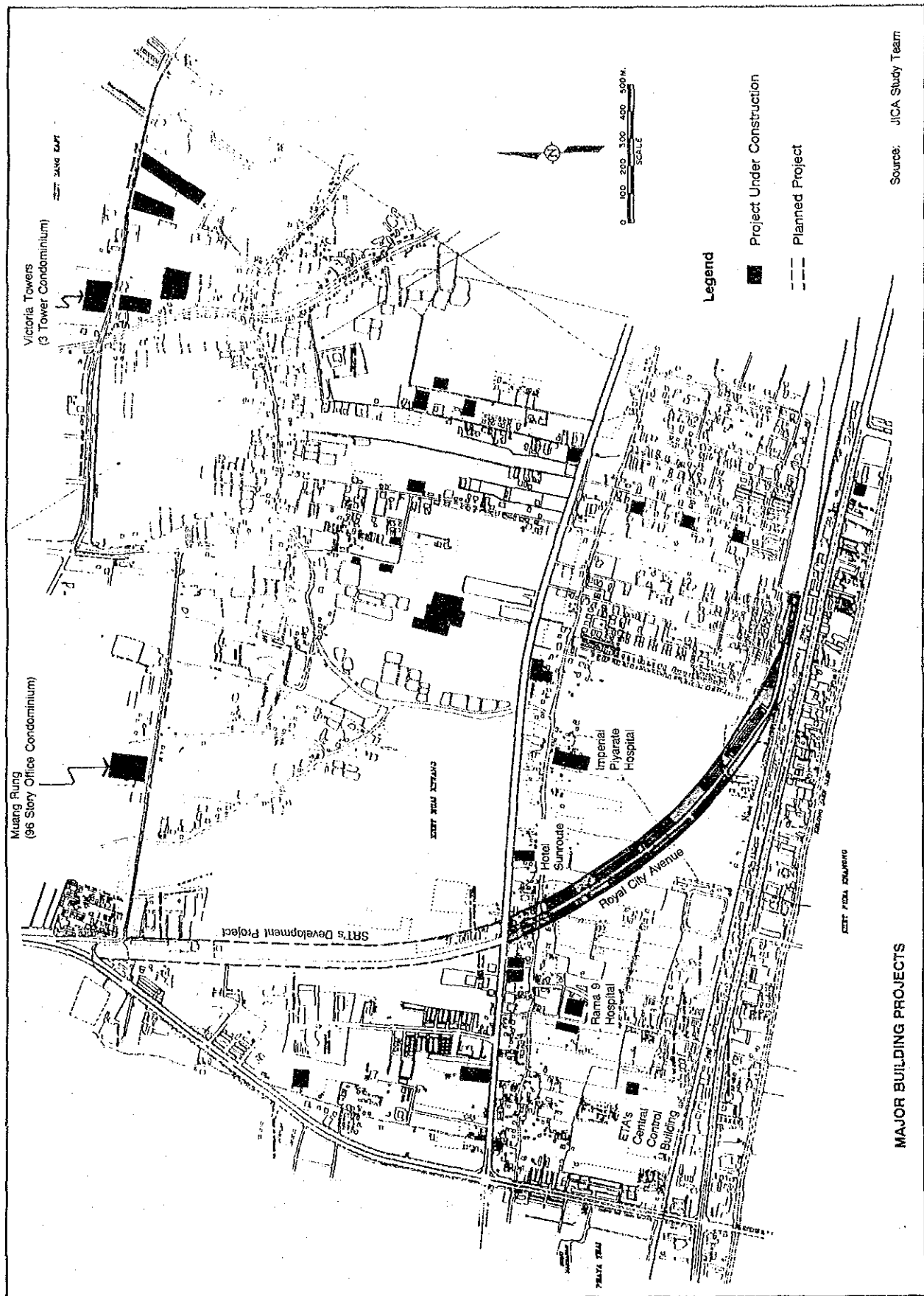


Figure 3.2.20-Major Building Projects



1) Skytrain Project

The Expressway and Rapid Transit Authority of Thailand (ETA) is initiating the Mass Rapid Transit System Part 1 Stage 1. The workshop of 160 ha is planned to be constructed on an open area between Thiam Ruam Mit Road/Pracha Uthit Road and Rama IX Road. The Lad Phrao and Sathorn Line is planned to pass along Ratchada Phisek Road.

The sidetracks connecting the line and the workshop are planned to pass south of television station, Channel 9

The Mass Rapid Transit System Part 2 Stage 1 is also planned to have a sidetrack to the workshop.

The workshop and the east line of the State Railway of Thailand are planned to be connected by a route for equipment transport for the project.

Stations are planned opposite to Robinson Department Store, north of the intersection of Ratchada Pisek Road and Rama IX Road, and at the intersection of Ratchada Pisek Road and Petchaburi Road.

2) Hopewell Project

The project of the State Railway of Thailand (SRT) is to upgrade the existing railways in the urban area. The east line section in the study area is part of the project. The typical future structure along the route will be such that the third level is for an expressway, the second level is for the SRT urban and regional railways, and the first level is for shops and roads.

New stations for urban services will probably be located at the intersection of Ratchada Phisek Road and Petchaburi Road, near the television station, Channel 11 or Wat Uthai Tharam, Soonvijai and/or Ekkamai Station.

3) The Second Stage Expressway System Project

ETA is constructing the Second Stage Expressway System. In the study area, the section west of the television broadcasting station, Channel 11 with an entrance/exit in front of TV Channel 9 soi at Rama IX Road will be completed in 1993. Construction for an extension toward the east along Rama IX Road will begin within a couple of years, and will have a ramp on the east side of the study area's boundary. The expressway is an elevated system.

4) Ramindra-Atnarong Expressway Project

ETA plans to construct an expressway connecting Ramindra, Ekkamai and Atnarong. The eastern boundary of the study area coincides with the alignment. The branch to Ekkamai is connected to Soi 63 of Sukhumvit Road at Khlong Tan Railway Station. A toll plaza is planned at Khlong Lat Phrao. In the eastern side of the boundary, a large scale interchange of the expressway and the Second Stage Expressway is planned.

5) Major Road Projects of the Bangkok Metropolitan Administration

- a. Current upgrading of Thiam Ruam Mit Road and Pracha Uthit Road
- b. Khlong Bang Kapi Road Project
- c. Road plan under Ramindra-Atnarong Expressway

6) Major Building Projects

Projects currently under construction :

- a. The Royal City Avenue with approximately 14 ha stretching along a 1.7 km street
- b. Rama IX Hospital
- c. Imperial Piyarat Hospital
- d. Sunroute Hotel with 408 rooms
- e. Other commercial, business and residential buildings

In addition to the above, a 96 story intelligent office condominium with an international convention hall/exhibition hall, a five star hotel and a shopping center is under construction next to the Republic of Korea's Embassy. Three towers of condominiums named the Victoria Towers are also to be constructed on the north side of Pracha Uthit Road.

Planned projects:

- 1. A development project on the land of SRT between Thiam Ruam Mit Road and Rama IX Road

Besides this project, a number of building permits have been approved by the BMA in the study area. Most are located along Thiam Ruam Mit Road, Rama IX Road, Petchaburi Road, Ratchada Pisek Road, in Soonvijai area and along the Japanese School Soi.

5. Site Evaluation

5.1 Identification of Elements to be Conserved

Elements to be conserved are shown in **Figure 3.2.22.**

1) Canals

Some canals and areas along the canals preserve the traditional scenery of Bangkok. These are environmental assets and also act as a flood prevention. The canal water should be protected from pollution for the revival of the canals.

Figure 3.2.21-Schedules of Major Projects

Projects	Year						
	1992	1993	1994	1995	1996	1997	1998
Skytrain Part 1 Stage 1	DDDDDD AAAAAA (1st line) (2nd line)	D D D A CCCCC	D D D CCCCC	D D D CCCCC	CCC CCC	CCCCC	CCC
Hopewell Project (in Study Area)	DDDDD C	CCCCC	CCCCC	CCCCC	CCCCC		
Second Stage Expressway up to TV11	CCCCC	CC					
Second Stage Expressway extension	AAAAA CCCCC	CCCCC	CCCCC	CCCCC			
Ramindra - Atnarong Expressway	AAAAA	AAA CCC	CCCCC	CCCCC		CCCCC	
Thiam Ruam Mit Road & Pracha Uthit Road Upgrading	CCCCC						
Khlong Bang Kapi Road (Rama IX Road - Phetchaburi Road)	AAAAA TTTTT	AAAAA CCCCC	CCCCC				
Ekkamai-Ramindra Road (along Ramindra - Atnarong Expressway)	TTT	CCCCC	CCCCC	CCCCC		CCCCC	
Royal City Avenue	CCC						
SRT Project Similar to RCA	T						

D = Design

A = Right of way acquisition

T = Tender

C = Construction

Source: Seventh Plan Urban and Regional Transport
Expressway and Rapid Transit Authority of Thailand
State Railway of Thailand
Bangkok Metropolitan Administration

2) Natural Assets

In addition to canals, some ponds should be maintained for flood protection.

Some of the grass and vegetation can be conserved for use in the parks.

3) Wat

There are two temples in the study area, Wat Uthai Tharam and Wat Kok. The temples are religious assets and also serve as community centers and provide valuable open space.

4) Community Environments

Soonvijai area, part of Mu Ban Wichit Chai and TV Channel 9 Soi area provide a good community atmosphere. Development of these areas should be in harmony with the residential environments. Development of commercial and business buildings and high rise condominiums should be guided and regulated from this view point.

5.2 Identification of Hazardous Elements

Hazardous and negative elements are shown in **Figure 3.2.23**.

1) Natural Disasters

The study area is a flood prone area. It is necessary to take flood protection measures by providing sufficient structure and facilities and controlling development in some flood prone areas.

The area has also experienced land subsidence. Use of underground water should be controlled.

2) Traffic Accidents

There are certain locations on arterial roads where safety facilities for pedestrians are not available, although many pedestrians cross these roads and thus promote unsafe conditions. Examples of this are in front of the DTCP and in front of Yaohan.

Along arterial roads, especially the Rama IX Road, traffic speeds are generally much higher than the legal speed limit. There are only two throughway in the study area. They are Soi Soonvijai and Soi through Mu Ban Wichit Chai. The traffic volume in these soi exceed the capacity and there is considerable traffic dangers along these soi.

3) Air Pollution

Vehicles are a major source of a air pollution.

4) Noise

In addition to vehicles, trains produce hazardous noise levels along the railways.

5) Poor Residential Conditions

There are some locations where houses with poor conditions are seen. Such as temporary houses for construction workers. Others include locations along the railways, canals, among the grasslands and the west side of Wat Uthai Tharam. Some of these housing areas have poor access, and garbage is not collected properly, and is left scattered among the houses.

Figure 3.2.22-Elements to be Conserved

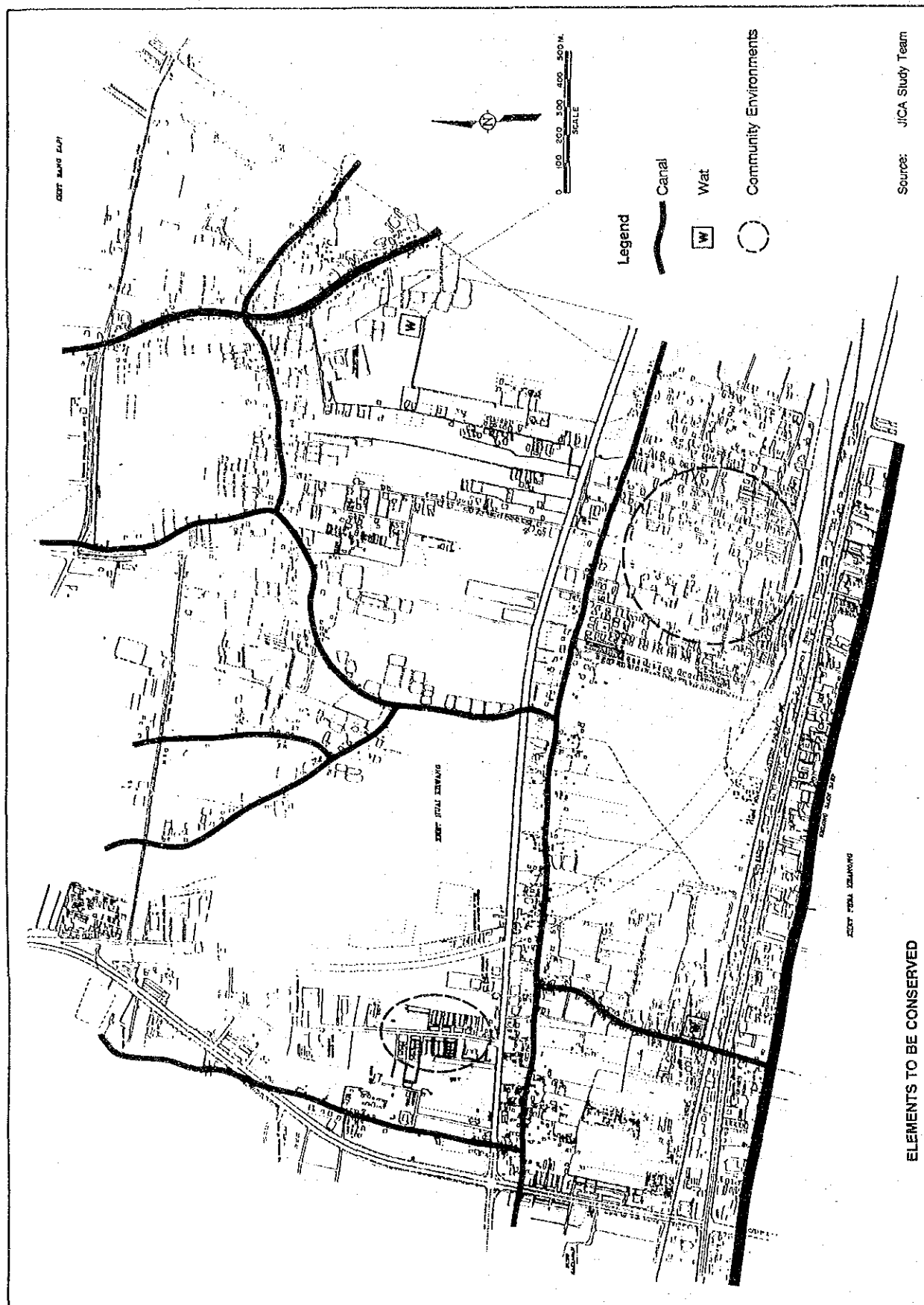
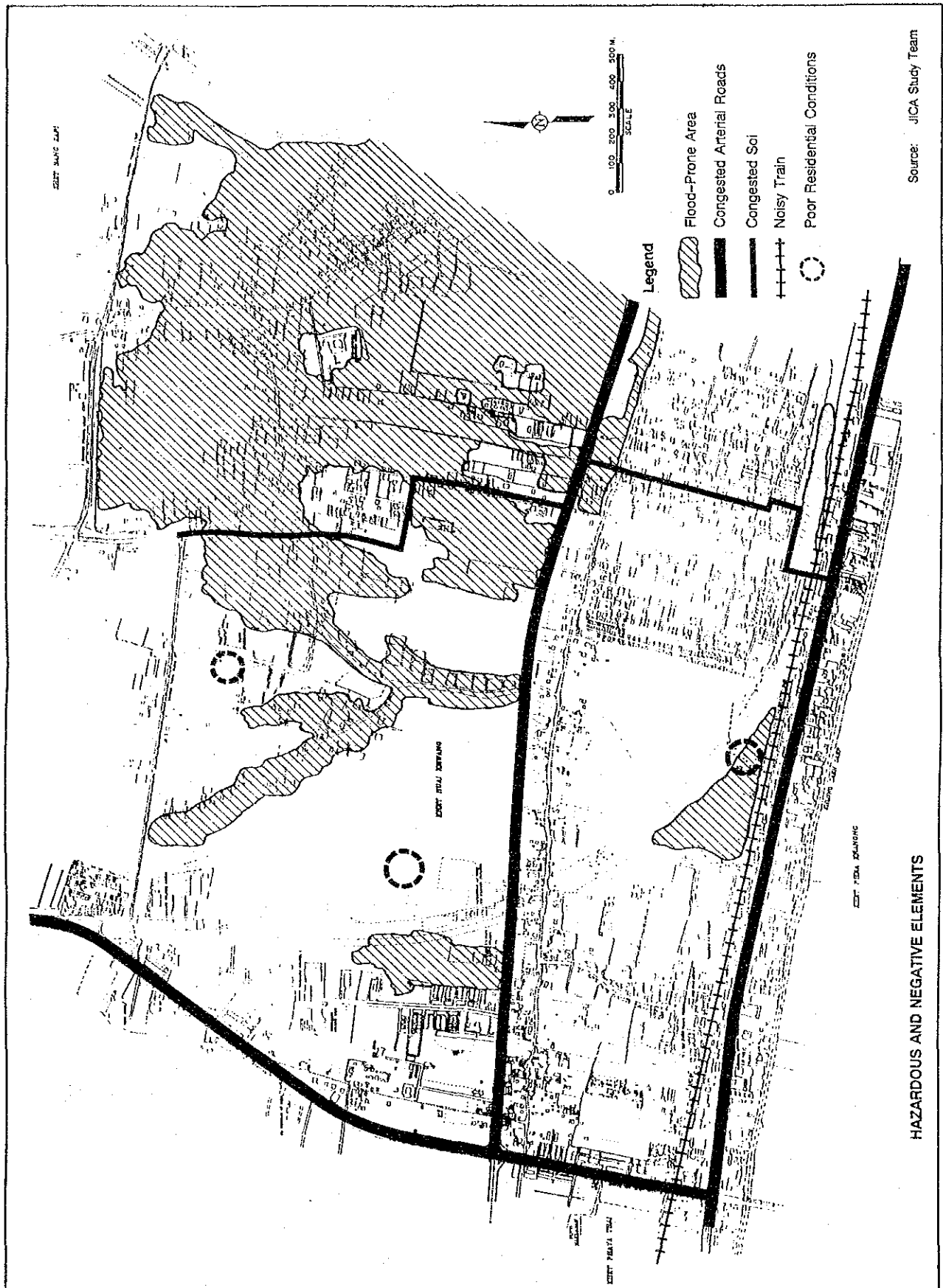


Figure 3.2.23-Hazardous and Negative Elements



5.3 Identification of Lacking Elements

Lacking Elements are shown in **Figure 3.2.24**.

1) Road Network

There is a set of roads connecting Thiam Ruam Mit Road/Pracha Uthit Road, Rama IX Road and Petchaburi Road within the study area that stretches approximately 3 km from an east-west direction. These roads have traffic in excess of capacity.

Most north-south soi are not well connected by east-west roads, and dead end at the canals.

2) Public Transport

Major roads are served by buses and soi are served by motorcycle taxis. However at the moment Thiam Ruam Mit Road and Pracha Uthit Road have no bus service due to construction.

The number of passengers of the Khlong Tan Station of the SRT's is limited because the SRT east line also has limited commuter services.

3) Parks and Other Community Facilities

There is not a park in the study area and there are not any special community facilities for the residents.

5.4 Integrated Site Evaluation and Development Issues

Integrated site evaluation and development issues for each sub-area are as follows. (**Figure 3.2.25**)

1) Ratchada Pisek Road and TV Channel 9 Soi Area

This area has immediate development potential in spite of costly land prices. Development of the area needs environmental consideration along the Skytrain routes. Another key issue is to alleviate the already apparent traffic congestion along the two arterial roads. Access to Ratchada Phisek Road from within the areas is also necessary.

2) Future SRT Project Area

Development of the area needs planning coordination and integration with surrounding areas. The traffic at both ends of the area needs managing to maintain a smooth flow of traffic.

3) Thiam Ruam Mit Road Area

This area has significant potential as a future urban center combined with the high rise development on the north side of the road. The Thailand Culture Center and the canals

Figure 3.2.24-Lacking Elements

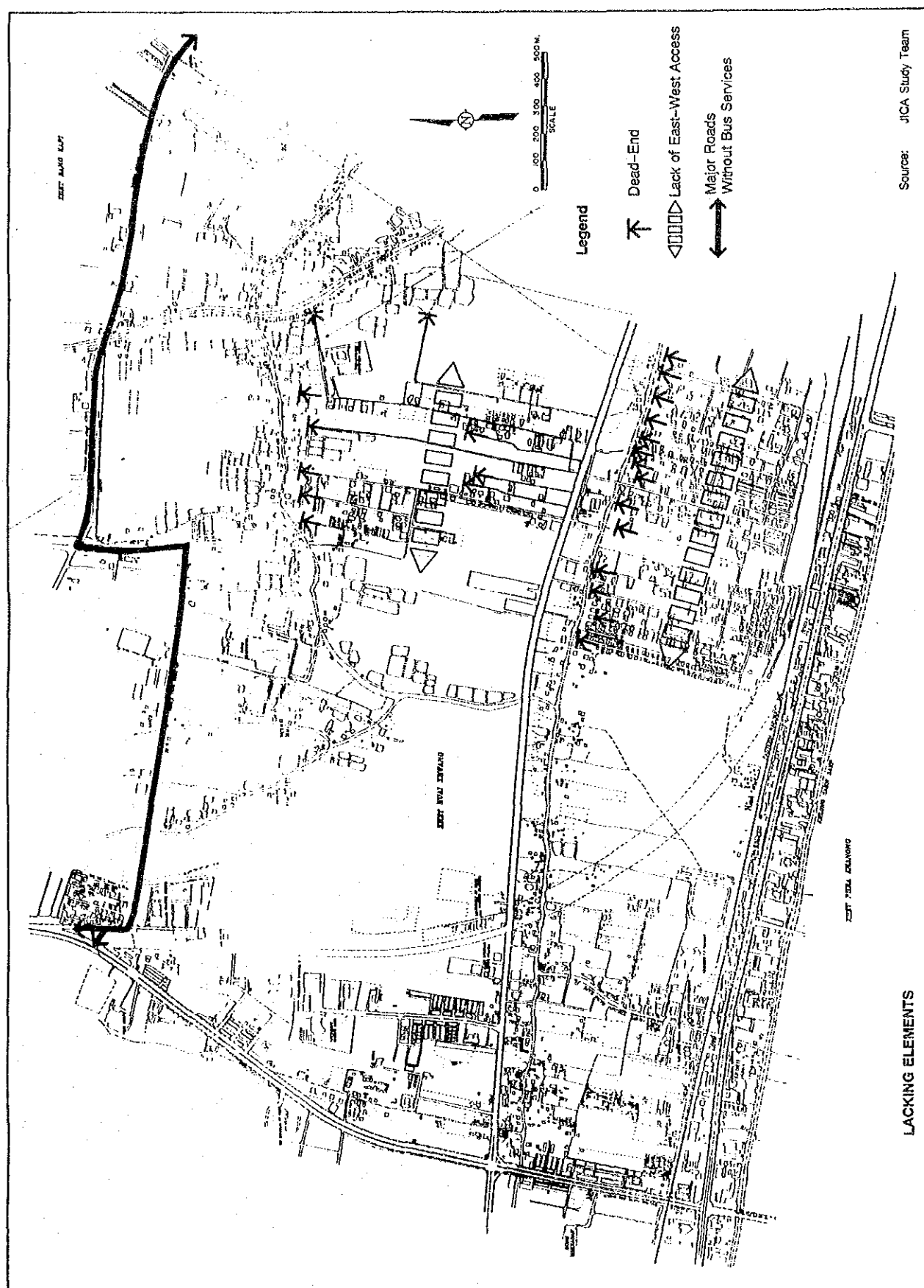
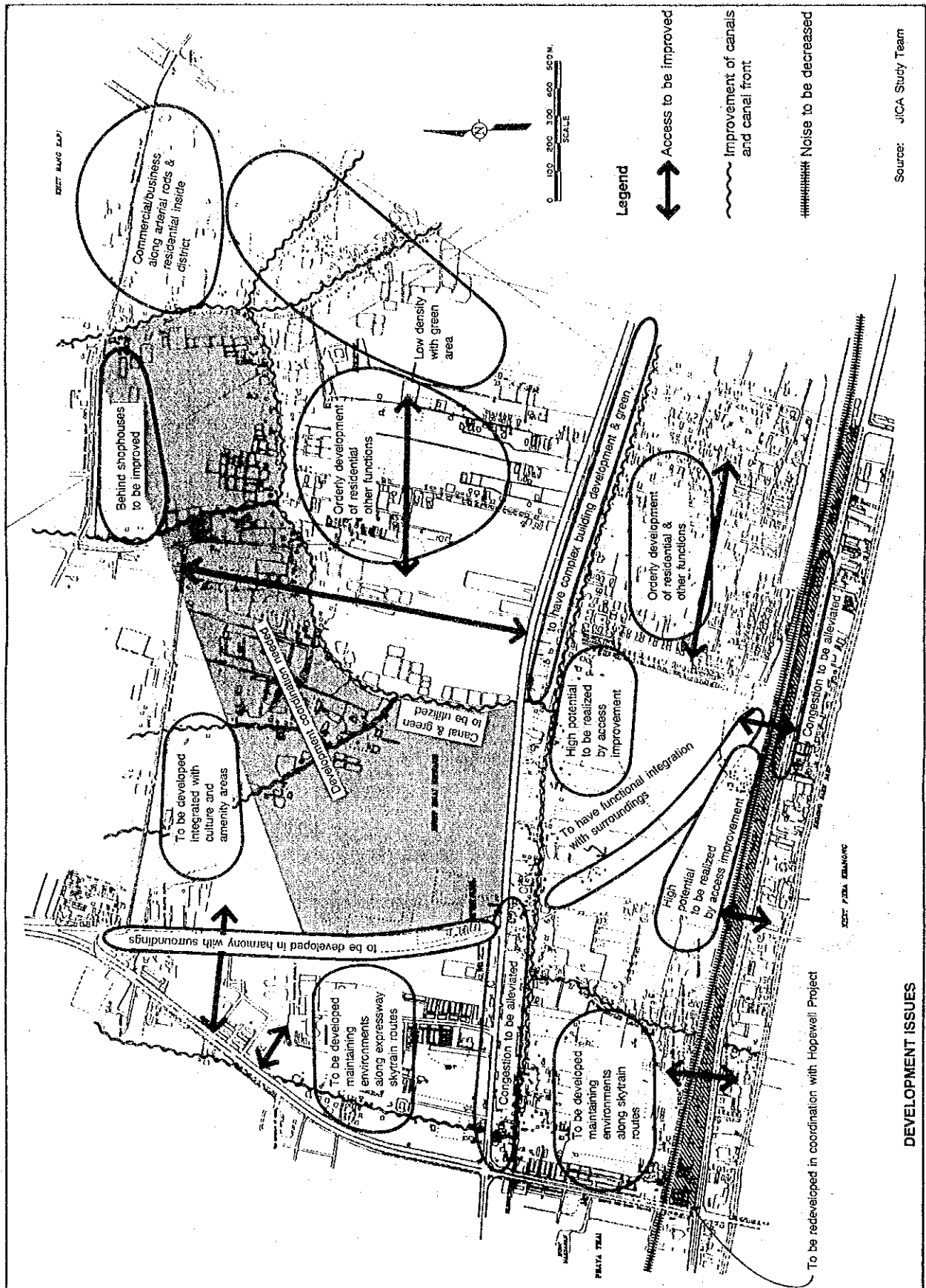


Figure 3.2.25-Development Issues



and the green belt can form an integrated urban forest, which should be integrated with the buildings to be developed.

Access to the skytrain stations area is needed. Another access to Ratchada Road in addition to Thiam Ruam Mit Road will be needed for the urban complex. Access to Rama IX Road should be kept with both the SRT project area and a new route passing at the middle of the study area.

4) ETA's Workshop Plan Area

The area should be provided with a road for through traffic and buffer belts on the peripheries of the workshop to maintain a good environment for the neighboring areas. Necessary measures must be taken for the generated traffic from the area.

It should be noted that the area would be an ideal area for large scale new urban development.

5) Pracha Uthit Road West Area

Combined with newly built shophouses, residential environments should be improved. Courtyards or pocket parks can be introduced in the area.

6) Khlong Khuatyai South Area

This is an open area except for a leisure and hotel complex at Rama IX Road and a 98 unit housing project north of the complex. A road connecting Pracha Uthit Road/Thiam Ruam Mit Road and Rama IX Road may well pass through the area. In this low area, green space along the canal should be selectively established.

7) Mu Ban Wichit Chai Area

This area should be improved as a medium density residential area mixed with schools and offices that will not affect the residential environment. Development of high rise buildings or office buildings should be regulated to avoid sprawl or disordered development. To maintain sufficient pedestrian movement and smooth traffic flow, east-west access should be improved and a district road network should be completed.

8) Huai Khwang East Area

Density of this area should be low. Green areas along the canal should be kept not only for amenities, but also for flood protection and as buffers of the Ramindra-Atnarong Expressway and the new road located beneath. Limited areas along arterial roads can be developed as commercial zones by utilizing the roads.

9) Khlong Plappla and Khlong Ladprao Area

Utilizing the two canals and considering that the ground level is low, green areas should be developed for amenities, flood protection, and as a buffer for the two new roads and intersections.

10) Pracha Uthit Road East Area

Along Pracha Uthit Road, Ramindra-Atnarong Expressway and the new road located

beneath, commercial/business functions can be developed utilizing the roads. However, the inside areas should be low density residential areas.

11) Rama IX Road Area

Along Rama IX Road, there will be building complex development to be accompanied with development of green areas. The traffic to and from the connected roads should be managed by networking and traffic control.

12) Asoke Din Daeng Road and Khlong Bang Kapi Area

This area has immediate build-up potential in spite of costly land prices. This area needs environmental consideration along the Second Stage Expressway and the Skytrain routes. Another key issue is to alleviate the already apparent traffic congestion along the three arterial roads.

Access to Petchaburi Road should be improved. The environment of Wat Uthai Tharam and the canal should also be improved.

13) Southwest of Royal City Avenue Area

This area has significant development potential that can be realized by establishing access to arterial roads and functional integration with Royal City Avenue.

14) Royal City Avenue Area

This area is expected to provide functional integration with surrounding development. The traffic at both ends should be well managed.

15) Northeast of Royal City Avenue Area

This area has high development potential that can be realized by establishing access to arterial roads and functional integration with Royal City Avenue. Pedestrian networks to Soonvijai and areas north of Rama IX Road are also important.

16) Soonvijai Area

This area should be improved as a medium density residential area mixed with other buildings such as offices do not affect the residential environment. Development of high rise buildings or office buildings should be regulated to avoid sprawl or disordered development of these buildings. To maintain sufficient pedestrian movement and smooth traffic flow, east-west access should be improved and a district road network should be completed. The Khlong Sam Sen can contribute to improve the area if the water front is open to the public.

17) Between Railway and Petchaburi Area

The area has re-development potential in coordination with the Hopewell project to have buildings, green and crossings of the railway. Reduction of the railway's noise is an issue.

6. Concept Plan

6.1 Goals of City Planning and Development

6.1.1 Urban Restructuring of Bangkok

It is recognized that the Bangkok Metropolitan Area is reaching a turning point where urban restructuring must take into consideration the following urban development trends.

1) Impact of Large-Scale Urban Transportation Projects

Several large-scale urban transportation improvement projects including expressways, the MRT, and the Second Bangkok International Airport (SBIA) have been planned and partially implemented in order not only to relieve the present severe traffic problems, but also to meet the future traffic demand expected to increase drastically following the rapid economic growth.

Of these large-scale projects, the MRT system would play a substantial role in future land uses and urban development patterns of Bangkok that have depended mainly on road networks. This will be a factor in the enhancing of urban restructuring in Bangkok.

2) Urban Growth

It is obvious that new urban development in Bangkok has been predominated by the recent construction boom of office buildings, hotels, condominiums in/around the CBD.

Geographically, buildings are sporadically located based on the past urban structure and no longer follow the general locational rules. The locational change of urban growth indicates that a new urban structure or urban restructuring is needed for Bangkok.

Taking the future urban growth of Bangkok into consideration, the urban restructuring will be necessitated so as to accommodate the future demand of important urban functions in preparation for the 21st century era. The multi-urban center system shall be included in the urban restructuring.

6.1.2 Necessity of the New CBD

In line with the urban restructuring as stated above, the development of a new CBD should be taken into account to meet the following needs in city planning and the development of Bangkok.

1) Function of New CBD

Bangkok needs to collectively accommodate the dispersing urban central functions and industries to create a more efficient and functional CBD.

As mentioned above, urban industries and facilities which can be categorized as urban central functions have been located in/around the existing CBD of Bangkok that will result in formation of an inefficient/unfunctional Bangkok CBD in the future.

This may impede the continuous development and growth of Bangkok. In this regard, a

New CBD with better efficiency and functionality should be developed to collectively accommodate the dispersing of urban functions and industries in strategic locations close to the existing CBD.

2) CBD Responsive to the Future Growth of Thailand

Due to the rapid socio-economic growth in recent years, Thailand could increase its standing among the NIEs countries and become a regional center for the Indo-China countries.

To serve the international activities of Thailand, it is apparent that quality improvement, functional advancement, and internationalization will be required in developing the new CBD.

This development must be in line with the implementation of the national urban development policy to enhance the international role of the BMR as stated before.

Correspondingly the New CBD must be improved and strengthened. Further growth and internationalization of Thailand in the coming 20 years will bring about location of new advanced urban industries and functions. It is expected that the existing CBD and dispersed locations being developed are not sufficient in terms of quality and quantity for accommodating expected future demand.

Based on the two planning issues stated above, it could be concluded that a new CBD of great efficiency and functionality, supplementing the existing CBD should be created to collectively accommodate the dispersing urban functions and provide for the future growth of Bangkok's CBD, and promote Bangkok as an attractive international capital.

6.1.3 Development Advantages of the Study Area

As a part of Bangkok's restructuring, the development of a new CBD should be taken into account. The study area is considered the best location to be developed as a new CBD based on the following advantages.

1) Strategic Location Close to the Existing CBD

This advantage implies that the new CBD to be constructed within the study area could be unified with and/or could supplement the existing CBD.

- Direct access to the innovative urban transportation system

The study area will be a major transportation node for the expressway and the mass rapid transit mega-projects which include:

- Second Stage Expressway System (SES);
- Ramindra - At Narong Expressway (RAE);
- Khlong Saen Saeb Elevated Toll Road;

- Hopewell Mass Rapid Transit; and
- ETA Mass Rapid Transit (Lavalin)

2) Land Resources

A considerable amount of land in the study area will remain open which can be utilized as an area wise development to facilitate the new CBD.

With the exception of the study area, there are not any other areas in/around the central area of Bangkok where development in terms of area for a CBD with locational advantages is possible. In other words, the study area provides the last opportunity for city planning and development of Bangkok's new CBD, whether by expansion of the existing one, or by developing a new CBD.

6.1.4 Development Goals

The study area is a valuable and scarce land resource in Bangkok. This implies that the best use of the study area would be for improving, upgrading and reinforcing Bangkok's city planning and development.

Consequently, development goals are set to develop a new innovative business district. More specifically as follow

1) Innovative CBD with Increased Efficiency for the 21st Century

A new CBD is planned to accommodate currently dispersed urban facilities (such as hotels and offices), to prevent an inefficient/unfunctional CBD with scattered urban facilities.

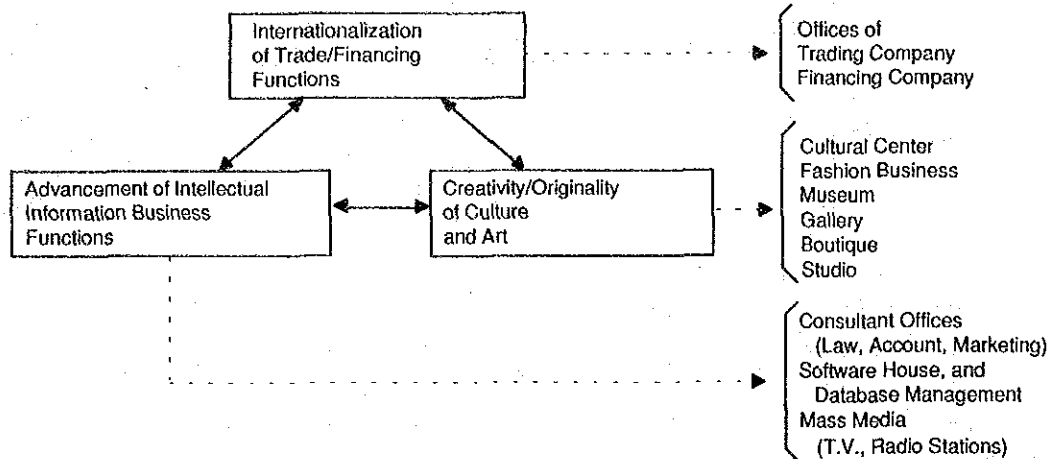
Moreover, additional advanced urban functions will be required to locate in Bangkok to serve the further growth of Thailand until the country becomes an NIE or further developed country, and Bangkok is considered an international city.

Indeed, Bangkok is in need of developing an urban system to accommodate incoming upgraded and highly advanced urban business facilities.

With the further international development of Thailand, the following business functions, illustrated in **Figure 3.2.26**, must be comprehensively developed in the new CBD to strengthen Bangkok as an international city.

- International Trade/Finance;
- Intellectual/Information Industries; and
- Sophisticated Culture and Art Industries.

Figure 3.2.26-Basic Components of New CBD



The basic components of the news CBD are aimed at yielding higher values for the Thai economy and industries. The components will be mutually dependent during the course of development. This type of development is an example that in order to enhance the international trade of Thai products, it is necessary to:

- strengthen information systems providing, for instance, global market information
- to increase cultural and artistic creativity/originality of Thai products.

2) Innovative Urban Area Development (Land Readjustment)

In cases such as the study area where urban sprawl development has begun, an L/R is the best possible approach for area-wise development of the CBD by promoting cooperative efforts among land owners, resorting to outright land-purchases by the private or public sector. In other words, the implementation of a new CBD will not be realized without the utilization of an L/R.

3) Innovative Mass Rapid Transit Based Urban Development

MRT systems have played an important role in land use and dense, compact urban areas and/or urban centers are created around stations and along the system lines. This will be the first attempt for Bangkok to create an urban center with the reinforcement of a mass rapid transit system. The relocation of the population and employment to the station areas or to the areas along the MRT lines, will ease accessibility to the MRT system. This is a desirable shift in transport mode as traffic flow volume will change from road traffic to rail transport and thus alleviate traffic congestion.

6.2 Basic Policy

The basic development policies of the new CBD are summarized below.