

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
NATIONAL HOUSING AUTHORITY (NHA)**

**THE STUDY
FOR
URBAN REDEVELOPMENT PLAN AND CASE STUDY
IN
THE BANGKOK METROPOLITAN AREA
IN THE KINGDOM OF THAILAND**

**FINAL REPORT
VOLUME I
SUMMARY REPORT**

MARCH 2002

**NIPPON KOEI CO., LTD.
URBAN DYNAMICS INSTITUTE, TAKAHA**

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PREFACE

In response to a request from the Government of the Kingdom of Thailand, the Government of Japan decided to conduct a “Study for Urban Redevelopment Plan and Case Study in the Bangkok Metropolitan Area in the Kingdom of Thailand” and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Shinya Osumi of Nippon Koei Co., Ltd. and consist of Urban Dynamics Institute, Takaha, to Thailand from November 2000 to March 2002.

In addition, JICA set up an Advisory Committee headed by Mr. Katsunori Otomaru of the Urban Development Corporation, which examined the Study from specialists and technical points of view.

The team held discussions with the officials concerned of the Government of Thailand and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Thailand for their close cooperation extended to the study.

March 2002



Takao Kawakami

President

Japan International Cooperation Agency

Mr. Takao Kawakami
President
Japan International Cooperation Agency
Tokyo, Japan

Subject: Letter of Transmittal

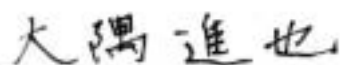
Dear Sir,

We are pleased to submit herewith the Final Report of the “Study for Urban Redevelopment Plan and Case Study in the Bangkok Metropolitan Area in the Kingdom of Thailand”. This study was conducted by Nippon Koei Co., Ltd., in association with Urban Dynamics Institute, TAKAHA, under a contract to JICA, during the period from November 2000 to March 2002. The report consists of Summary, Main Text and Appendix..

The report presents recommendations for the policy to improve living environment in the Bangkok Metropolitan Area, which reflect the results of preparation of the redevelopment master plan for public housings and implementation of a case study.

We would like to take this opportunity to express our sincere gratitude to your Agency, the Ministry of Foreign Affairs. We are also most grateful for the cooperation and assistance from the officials concerned in Thailand, the JICA Bangkok office, and the Embassy of Japan in Thailand. The Final Report is a fruit of excellent collaboration of all participants in this study.

Yours Faithfully,



Shinya OSUMI
Team Leader, JICA Study Team
The Study for Urban Redevelopment Plan and
Case Study in
the Bangkok Metropolitan Area in
the Kingdom of Thailand

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FINAL REPORT

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SUMMARY

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ABBREVIATIONS

| | |
|-----------|----------------------------------------------------|
| AC | Asbestos Cement |
| BCR | Building Coverage Ratio |
| BMA | Bangkok Metropolitan Administration |
| BMR | Bangkok Metropolitan Region |
| BOD | Biochemical Oxygen Demand |
| BTS | Bangkok Transit System |
| CAT | Communication Authority of Thailand |
| CBD | Central Business District |
| CI | Cast Iron |
| DCP | Department of Public Cleansing |
| DDS | Department of Drainage and Sewerage |
| DI | Ductile Iron |
| DMH Areas | Din Daeng, Makkasan, and Huai Khwang Areas |
| DO | Dissolved Oxygen |
| DOH | Department of Highway |
| DPC | Department of Public Cleansing |
| DS | Dry Solids |
| DSCV | Dry Solid Calorific Value |
| DTCP | Department of Town and Country Planning |
| DWF | Dry Water Flow |
| EGAT | Electricity Generation Authority of Thailand |
| EIA | Environmental Impact Assessment |
| ETA | Expressway and Rapid Transit Authority of Thailand |
| FAR | Floor Area Ratio |
| FY | Fiscal Year |
| GDP | Gross Domestic Product |
| GI | Galvanized Iron |
| GIS | Geographic Information System |
| GPP | Gross Provincial Product |
| IEE | Initial Environmental Examination |
| IMF | International Monetary Fund |
| JBIC | Japan Bank of International Cooperation |
| JICA | Japan International Cooperation Agency |
| LLC | Lowest Lower Class |
| LMC | Lowest Middle Class |
| M/M | Minutes of Meeting |

| | |
|-----------------|-------------------------------------------------------------|
| MEA | Metropolitan Electricity Authority |
| MLC | Medium Lower Class |
| MMC | Medium Middle Class |
| MOI | Ministry of Interior |
| MOSTE | Ministry of Science, Technology, and Energy |
| MOTC | Ministry of Transport and Communications |
| MRTA | Metropolitan Rapid Transit Authority |
| MSL | Mean Sea Level |
| MSW | Municipal Solid Waste |
| MSWM | Municipal Solid Waste Management |
| MWA | Metropolitan Water Supply Authority |
| NESDB | National Economic and Social Development Board (NESDB) |
| NHA | National Housing Authority |
| NIES | Newly Industrializing Economies |
| NSCD | Night Soil Control Division |
| NSTP | Night Soil Treatment Plant |
| OCMLT | Office of the Commission for the Management of Land Traffic |
| Pb | Plumbum |
| PB | Polybutylene |
| PC | Prestressed Concrete |
| PE | Polyethelene |
| PEA | Provincial Electricity Authority |
| PVC | Polyvinyl Chloride Pipe |
| RID | Royal Irrigation Department |
| S/W | Scope of Work |
| SO ₂ | Sulfur Dioxide |
| SP | Steel Pipe |
| SRT | State Railway of Thailand |
| SS | Suspended Solids |
| STS | Sewerage Treatment System |
| TOT | Telecommunication Organization of Thailand |
| TSP | Total Suspended Particles |
| UFW | Unaccounted-for water |
| ULC | Upper Lower Class |
| ULC | Upper Lower Class |
| UMC | Upper Middle Class |
| UTDM | Urban Transportation Distribution Model |
| VAT | Value Added Tax |
| WQMC | Water Quality Management Center |

| | |
|------|-----------------------------------|
| WQMD | Water Quality Management Division |
| WTP | Water Treatment Plant |
| WWTP | Wastewater Treatment Plant |

MEASUREMENT UNITS

Extent

cm² = Square-centimeters

m² = Square-meters

km² = Square-kilometers

ha. = Hectares (10,000 m²)

rai = 0.16 Hectares

Length

mm = Millimeters

cm = Centimeters (cm = 10 mm)

m = Meters (m = 100 cm)

km = Kilometers (km = 1,000 m)

wah = 2 Meter

Energy

kcal = Kilocalories

kW = Kilowatt

MW = Megawatt

kWh = Kilowatt-hour

MWh = Megawatt-hour

GWh = Gigawatt-hour

MVA = Mega Volt Ampere

V = Volt

kV = Kilovolt

Others

% = Percent

°C = Degree Celsius

MPN = Most Probable Number

dB = Decibel

pcu = Passenger Car Unit

l/c/d = Litter per Consumer per Day

Volume

cm³ = Cubic-centimeters

m³ = cu.m = Cubic-meters

l = Liter

Weight

g = Grams

kg = Kilograms

ton, t = Metric tonne

μg = Micrograma (= Millionths of a gram)

Time

sec, s = Seconds

min = Minutes

h, hr = Hour

d = Day

1. ISSUES IN URBAN STRUCTURE AND FUTURE PERSPECTIVE FOR BANGKOK METROPOLITAN AREA

1.1 Current Urban Features and Issues

(1) Socio-economic Characteristics

Bangkok is the capital city of the Kingdom of Thailand with registered population 5,662,000. Its per capita GDP marks twice as large as the national average, though the gap with other areas has been reduced. It has long been in the status of so-called “primacy”, but in recent years, the population concentration pressure has been diminished. The emigration of population from the inner city, on the other hand, has intensified as illustrated in Table 01 and figure 01.

Table 01: Primary Socio-economic Indexes

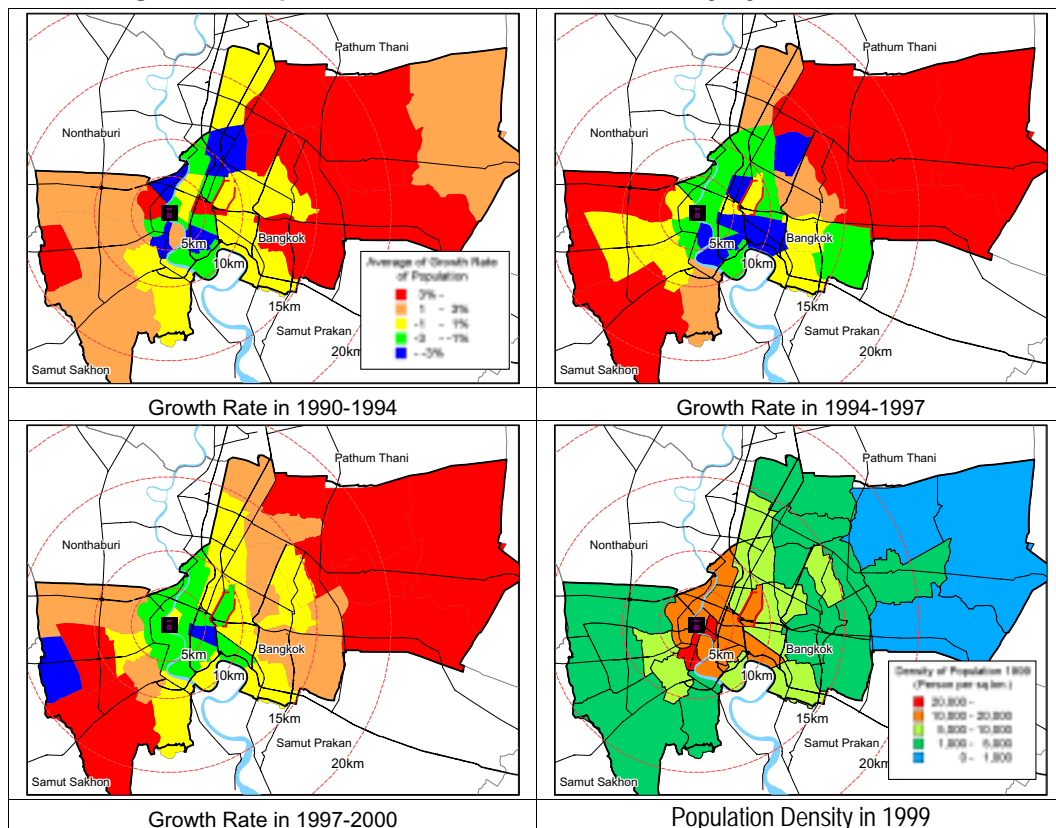
(Million Baht)

| | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998p |
|---------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Whole Kingdom | | | | | | | |
| G D P. | 2,830,916 | 3,170,258 | 3,634,498 | 4,185,632 | 4,608,490 | 4,727,307 | 4,635,926 |
| Population(1,000 persons) | 57,294 | 58,010 | 58,713 | 59,401 | 60,003 | 60,602 | 61,201 |
| Per capita GDP.(baht) | 49,410 | 54,650 | 61,903 | 70,464 | 76,804 | 78,006 | 75,749 |
| BMR | | | | | | | |
| G R P. | 1,476,237 | 1,695,196 | 1,907,844 | 2,160,672 | 2,352,470 | 2,389,715 | 2,244,388 |
| | 52.15% | 53.47% | 52.49% | 51.62% | 51.05% | 50.55% | 48.41% |
| Population(1,000 persons) | 9,511 | 9,743 | 9,973 | 10,201 | 10,429 | 10,660 | 10,894 |
| | 16.60% | 16.80% | 16.99% | 17.17% | 17.38% | 17.59% | 17.80% |
| Per capita GRP.(baht) | 155,214 | 173,991 | 191,301 | 211,810 | 225,570 | 224,176 | 206,021 |
| | 314.13% | 318.37% | 309.03% | 300.59% | 293.70% | 287.38% | 271.98% |
| BMA | | | | | | | |
| G P P. | 1,148,688 | 1,330,538 | 1,472,661 | 1,642,654 | 1,795,882 | 1,831,574 | 1,700,436 |
| | 40.58% | 41.97% | 40.52% | 39.25% | 38.97% | 38.74% | 36.68% |
| Population(1,000 persons) | 6,495 | 6,636 | 6,780 | 6,919 | 7,061 | 7,204 | 7,349 |
| | 11.34% | 11.44% | 11.55% | 11.65% | 11.77% | 11.89% | 12.01% |
| Per capita GPP.(baht) | 176,857 | 200,503 | 217,207 | 237,412 | 254,338 | 254,244 | 231,383 |
| | 357.94% | 366.89% | 350.88% | 336.93% | 331.15% | 325.93% | 305.46% |

Source: NESDB

Note: Percentages indicate shares in the whole kingdom.

Figure 01: Population Growth Rates and Density by District in BMA



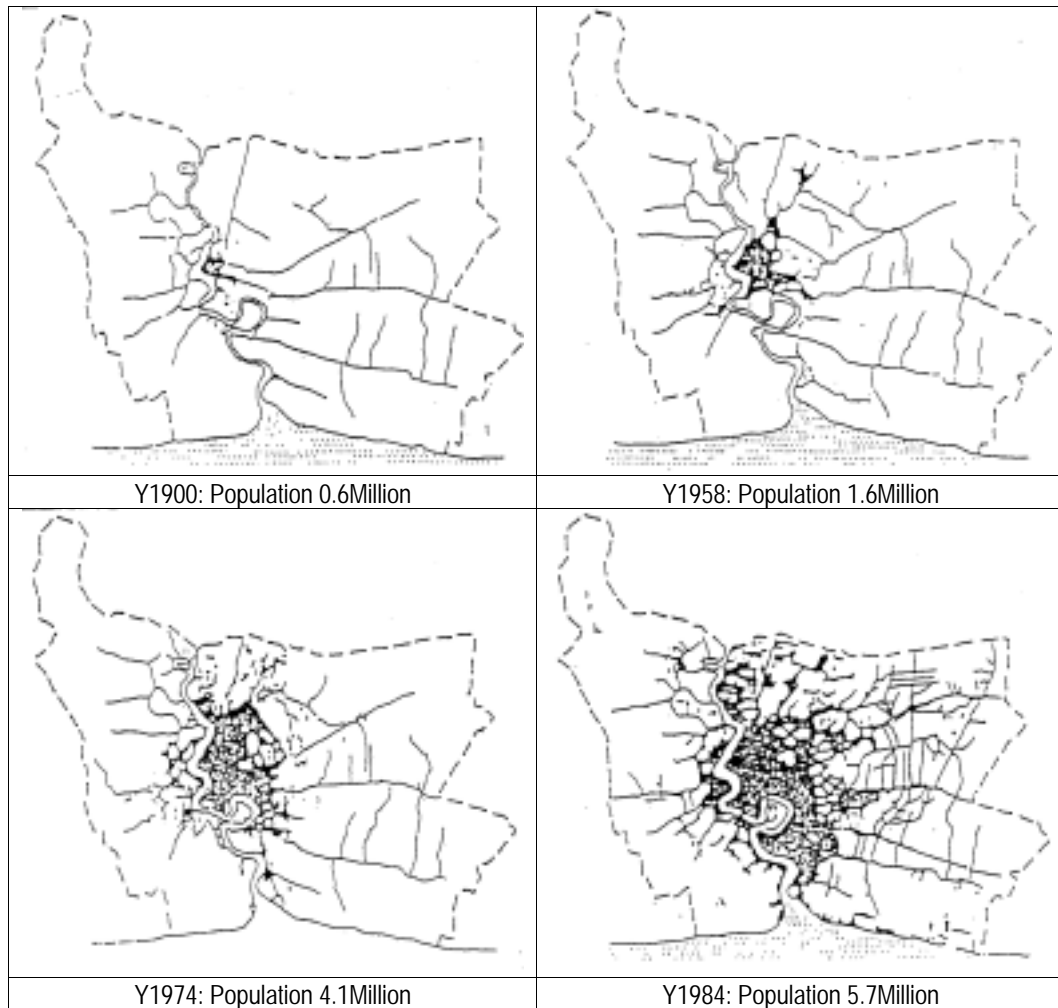
Note: Growth Rates based on the Registration Record
Source: Department of Local Administration, Ministry of Interior

(2) Trend of Urbanization

The city of Bangkok was first established in the area called Rattanakosin on the east bank of the Chao Phraya River as a result of capital relocation in the 17th Century. At the early stage, the city had been developed along Chao Phraya River within the area between newly constructed two canals. Roads have been developed in succeeding periods as shown in Figure 02.

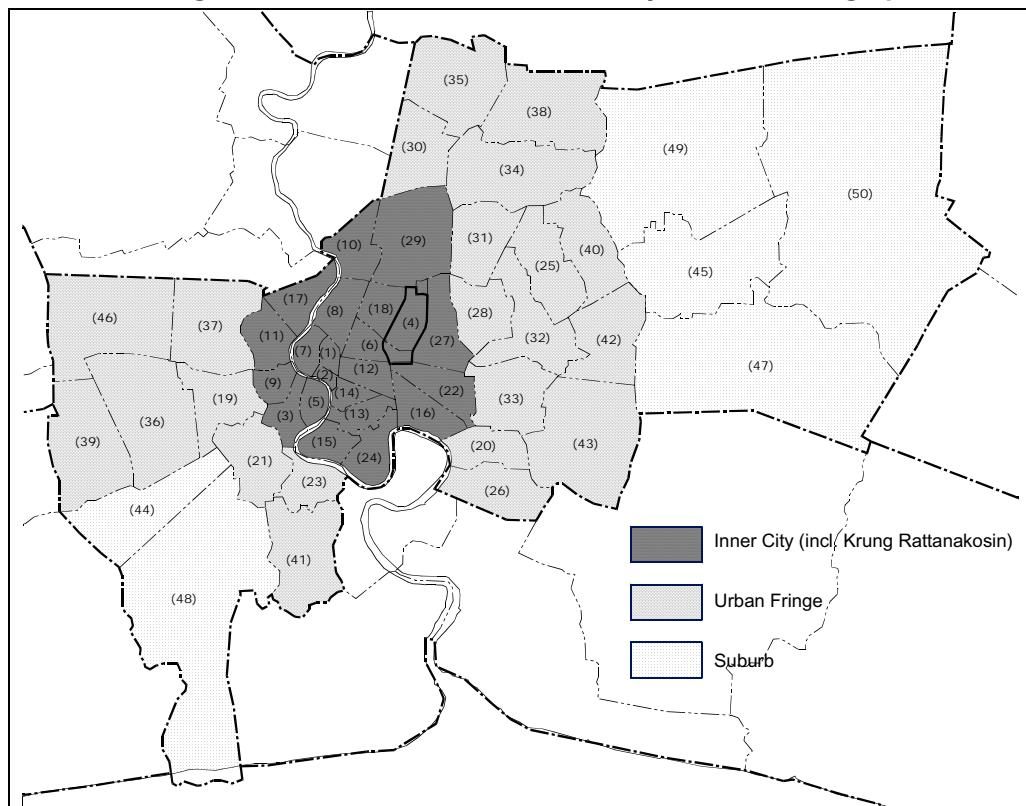
In the 1990s, the area within around 20 km radius from the old city center was rapidly developed largely due to the new-town development projects. According to the Department of City Planning, BMA, the built-up areas are classified into 1) the core of the city, 2) the inner city, 3) the suburb area, and 4) the urban fringe as shown in Figure 03.

Figure 02: Built-up Area: 1900-1984



Source: 1,2 From German Advisory Team, Bangkok Transportation Study
3 From Aerial Photography, 1974
4 From Aerial Photography, 1984

Figure 03: Classification of Districts by Urban Building-up



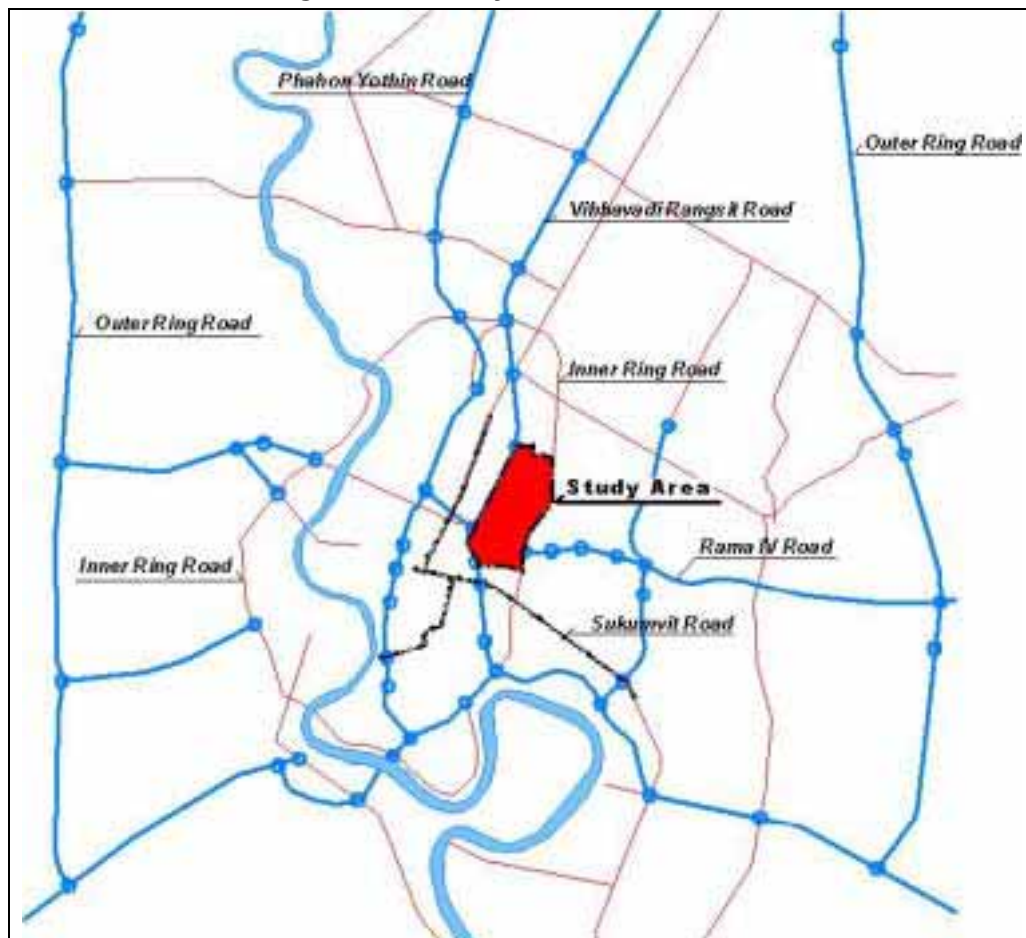
Source: City Planning Dept, BMA

Regarding the transport infrastructure sustaining the urban growth, it heavily depends on automobiles but massive efforts have been made in recent years to shift to mass transit systems by constructing Light Rail System (Bangkok Transit System, BTS) and a subway system (the Blue Line). On the other hand, the canal systems which used to be the primary mode of the surface transport in Bangkok has gradually faded out. These canals are not much expected to revive in the future transport network, except some trunk canals.

Trait of the trunk road network is the radial feature extending from the city center towards suburbs, which is concentrated on north-south direction (Dong Muang International Airport) and east-west direction (Nong Ngu Hao Airport, under construction) forming distinct two axes.

These trunk roads generally have very large capacities with 3-6 traffic lanes on one side, and the space above them are often used for the elevated express ways or BTS. Because of this feature, they tend to act as barriers for crossing.

Figure 04: Primary Road Network in BMA



Source: JICA Study Team

(3) Urban Pollution

Major items of urban pollution are the following:

Ground subsidence

The city experienced an extensive subsidence of ground on account of ground water retrieval for domestic consumption as well as for industrial use. The phenomenon has subsided recently thanks to restriction of ground water use, but the after-effect is still observed in poor drainage capability in areas near the river mouths.

Water pollution

Wastewater treatment systems had been developed behind the pace of the urban expansion. As a result, water in canals and watercourses have been heavily

polluted. Although massive efforts are being made to construct large wastewater treatment plants, it will be a long time before the situation gets turned around. Therefore, intermediate measures to counter the situation are being taken such as dredging of watercourses, installation of aeration equipment to purify water, etc.

Air pollution

Factories and electric powerhouses used to be the primary sources of air pollution, but weight of vehicle exhaust has become ever larger in recent years. O₃ and PM-10 values in residential districts are exceeding the regulation values, while NO₂, CO, O₃, PM-10 values are all exceeding the regulation limit along the main roads.

Noise

Similar to the air pollution, automobiles are the primary source of noise pollution.

(4) Problem Areas

Urban pollution is a serious issue in Bangkok, being the major cause for deteriorating the living environment. The pollution is more acutely felt in inner city areas and contributing to emigration of population from there. In view of the fact that the major source of the urban pollution is automobiles, rectification should now be attempted in spatial structure improvement; hierarchical constitution of road systems.

Trait of the current urban structure of Bangkok can be summarized as given below:

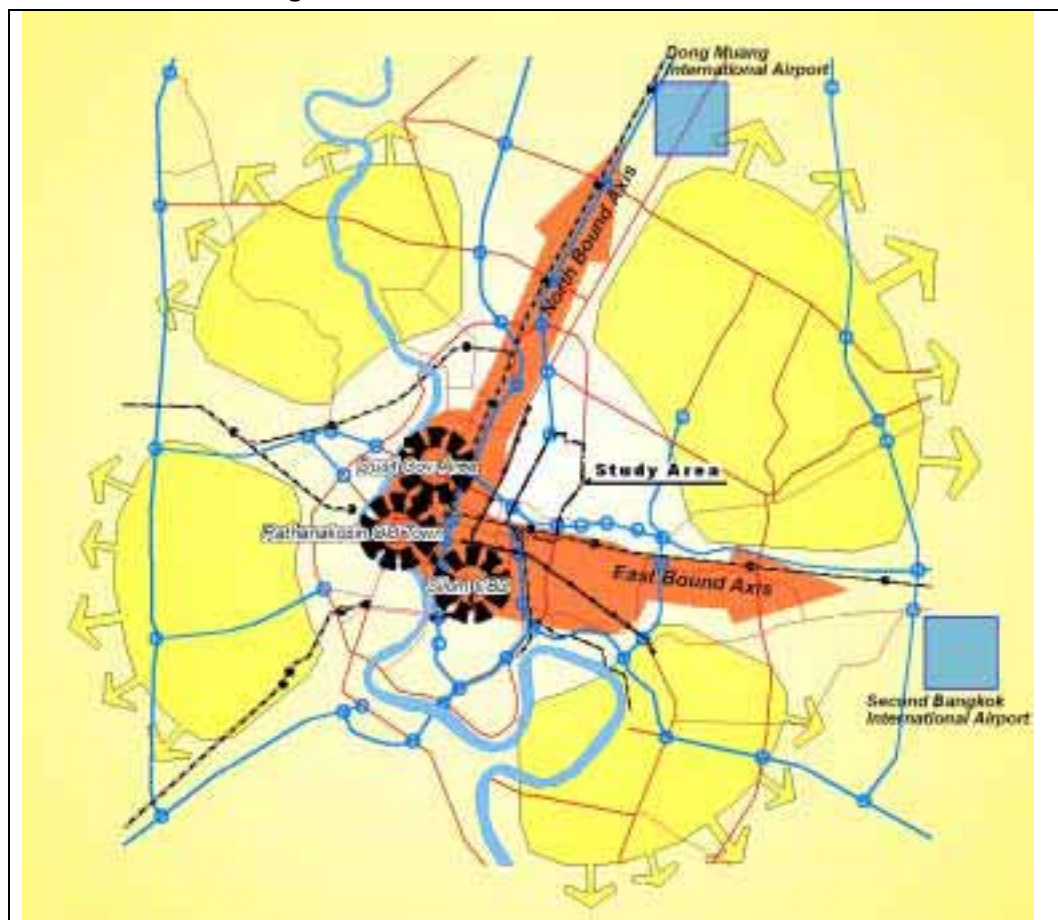
- Urban cores are those of 1) Rattanakosin old city center where major tourism resources and government office are located, 2) Silom business district, 3) Dusit area where public service facilities such as central administration offices, hospitals are located;
- Railways and trunk roads starting from these urban cores to north and east directions, forming radial transport axes, and supplemented with ring roads linking them. The radial trunk roads are wide and their upper spaces are often used for elevated express ways. These roads have obtained very large capacity but ironically now posing as physical barriers to cross over;
- Two urban axes have been formed as a result of ribbon type urbanization along the two radial transport axes drawing commercial and business development

along the way.

- Triggered by the said urban development along the major axes, residential development has taken place in the suburban areas, particularly in north-east region such as Bangkokpapi and Minburi absorbing the emigrating population.
- On the other hand, the infrastructures, especially the collector road networks, have not been properly developed in the inner city, owing to the intensive land use. This caused deterioration of living environment and accelerated emigration of population.

The current urban structure is conceptually illustrated in Figure 05 below.

Figure 05: Current Urban Structure of BMA



1.2 Future Perspective and Planning Implications

(1) Outline of Existing Development Plans

Decentralization policy has been promoted in Thailand since the Eighth National and Social Development Plan. The Ninth Plan has been put into practice since October 2001 where this policy is consistently pursued along with restructuring of the government offices to enhance efficiency.

A number of development plans have been worked out for future Bangkok, among which the followings are the ones largely related to the urban spatial structuring:

- The Regional Structure Plan (NESDB)
- The Urban Rail Transport Master Plan (OCMLT)
- The Second Bangkok General Plan (BMA)

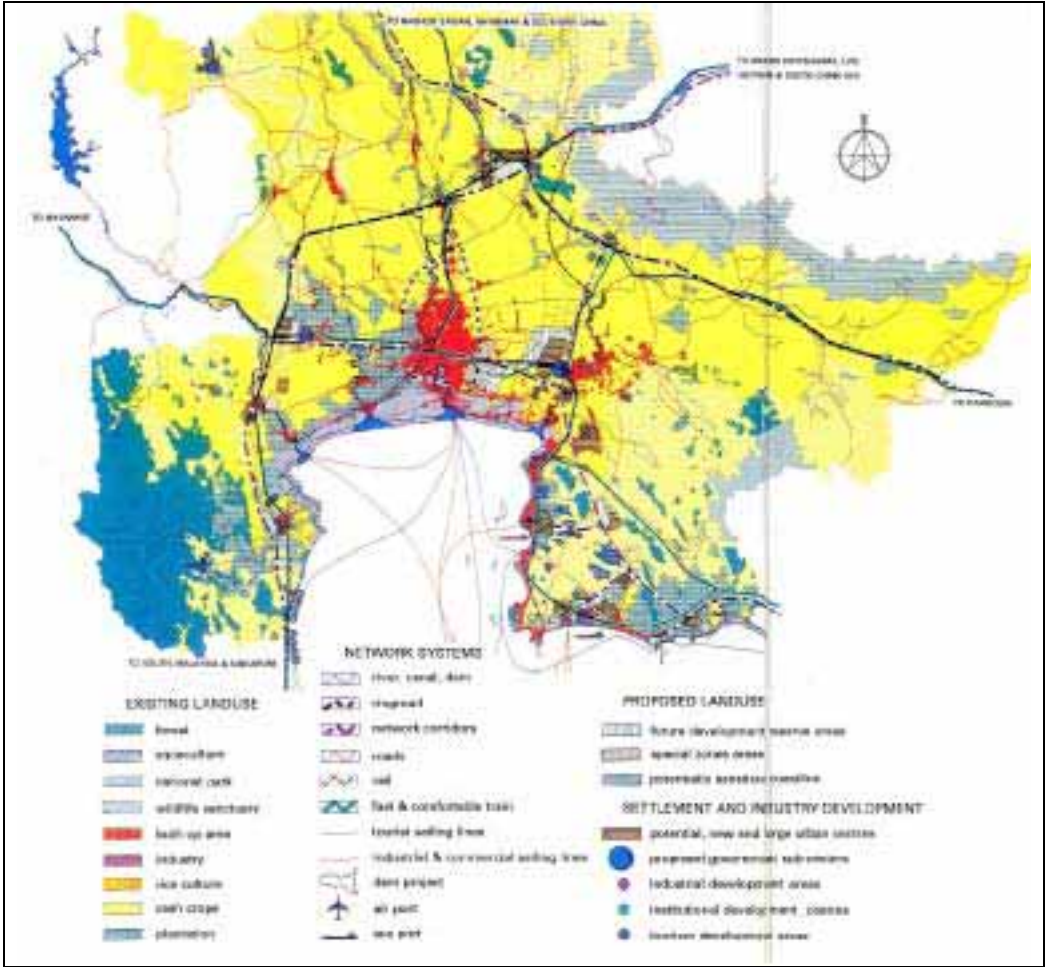
Characteristics of these plans are found in their direction towards polycentric urban structure linked by mass transit network.

On the other hand, there are number of giant urban development projects. Among others, those that have been well thought out and would give great impact to the urban structure of Bangkok are considered to be the following;

- The Rama III Special Development (Figure 06);
- The Pahon Yotin/Ban Sue Development (Figure 07);
- The Makkasan Marshalling Yard Development (Figure 08); and
- The New Bangkok City Hall Development.

Locations of these projects are shown in Figure 09.

Figure 06: Metropolitan Regional Structure Plan



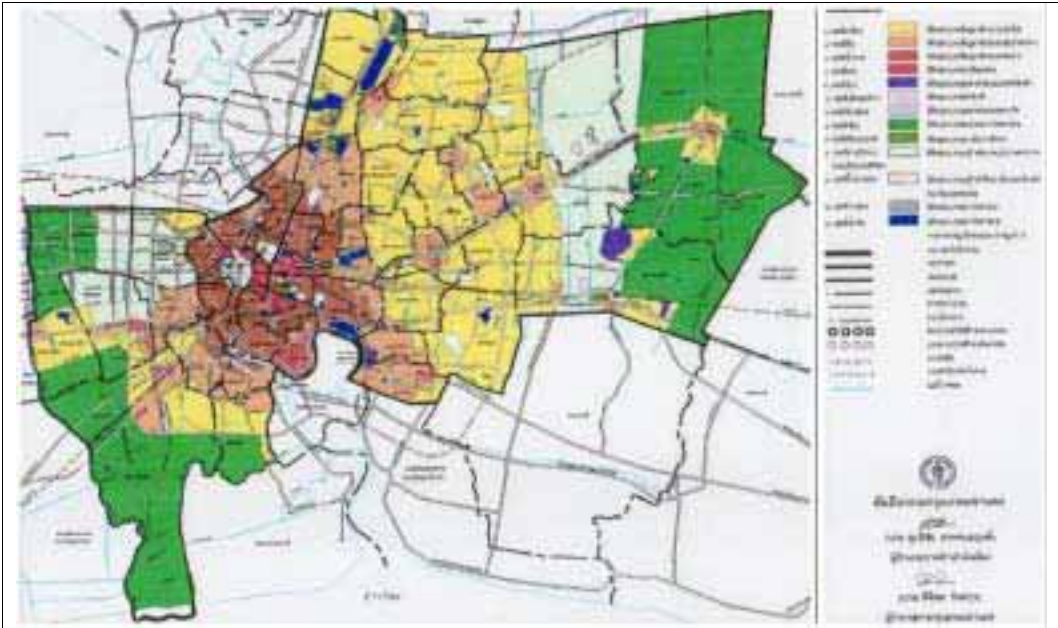
Source: The Bangkok Regional Structure Plan, NESDB, 1997

Figure 07: Proposed Rail Transit Master Plan by URMAP



Source: 2nd Draft Final Report, URMAP, OCMLT, May 2001

Figure 08: Second Bangkok General Plan



Source: The Second Bangkok General Plan, BMA, 1997

Figure 09: Locations of Major Urban Development Projects



Source: JICA Study Team

(2) Future Perspective

The recent population growth rate in Bangkok stays low at 2% or less, owing to the population growth control programs initiated at the time of the Second Social and Economic Development Plan. Further, the influx of rural population into Bangkok has gradually leveled off during the past ten years. The financial crisis in 1997 and ensuing economic stagnation accelerated this trend.

The population forecast performed by the Study based on the national census in 2000 revealed that the population would reach a peak in around 2015 and thereafter gradually diminish. Under these circumstances, it is no doubt endanger sustainable urban development to leave the current trend of suburbanization and inner city hollow-out phenomenon, as they would demand excessive investment for infrastructures, inflicting undue financial burden and cause inefficiency on urban activities.

Table 02: Population Forecast in BMA

| | 1970 | 1980 | 1990 | 2000 | 2005* | 2010* | 2015* | 2020* |
|----------------|---------|---------|---------|---------|---------|---------|---------|---------|
| Population | 3,908.2 | 5,965.3 | 7,470.7 | 8,026.6 | 8,202.6 | 8,289.5 | 8,319.9 | 8,302.7 |
| Household | 617.1 | 1,118.7 | 1,655.6 | 2,068.4 | 2,374.7 | 2,604.4 | 2,836.8 | 3,072.3 |
| Household size | 6.3 | 5.3 | 4.5 | 3.9 | 3.5 | 3.2 | 2.9 | 2.7 |

Source: JICA Study Team

Note: 1970~2000, result of multiplied Population and Housing Census, NSO by 1.27.

* Projection by the Study Team, based on Year 2000 Census results

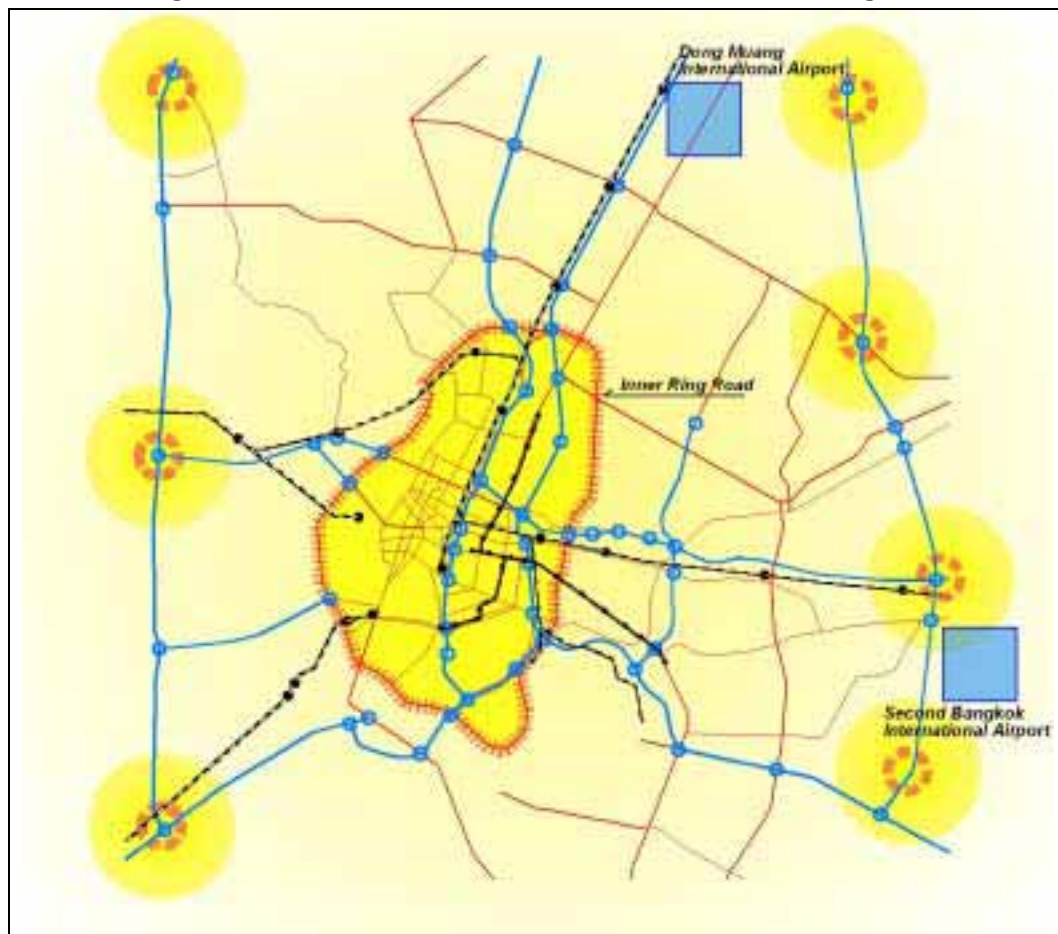
All the large-scale urban development projects discussed earlier are aiming at enhanced use of mass transit systems and formation of plural urban cores, in conformity with the envisaged ideal future urban spatial structure. However, it is a little too far-fetched and not necessarily realistic to curb the current trend of urban development of Bangkok, which is largely made by the private sector.

(3) Issues in Urban Districts

For a sustainable growth of Bangkok, it would be necessary to transform the current urban structure into polycentric urban structure envisaged in the foregoing development projects under the situation of low population growth. Specifically, the key is to curb the trend of ribbon type urban development along the two major axes absorbing the high order urban functions.

It would be of paramount importance to rejuvenate the inner city where hollowing-out is progressing by creating basis to draw the high order urban functions, for the sake of spatially balanced urban feature. This is especially true of the area enclosed by the Inner Ring Road where sub-main road networks are almost ready, and mass transit systems are in operation or expected to be opened soon.

Figure 10: Recommended Future Urban Structure in Bangkok



2. PRINCIPAL DIRECTIONS OF URBAN REDEVELOPMENT OF THE STUDY AREA (DMH AREA)

2.1 Outline and Development Issues of the Study Area

(1) Outline of the Study Area

Although the Study Area used to be a district a little off the core of Bangkok, it now become both the spatial center of the city's administrative area, and the gravity center of the city's population due to the recent population growth in the north-eastern part of the city. The urbanization of the Study Area was triggered by the public welfare housing complex projects to alleviating the slum problems. Currently private lands have been densely built-up and constituting one of the old residential districts in Bangkok.

(2) Socio-economic Characteristics

Population and households in the Study Area was 188,251 and 52,789 respectively in 1999. During the past 5 years, the former has been consistently dwindling while the latter is still slightly in rise.

Residents here are mostly of low-income population engaged in variety of urban services industries such as drivers in the public transport systems. These people are recognized to be an important constituent of the Bangkok society. On the other hand, there are so called "Dense Community" scattered in the Area represented by slums of which dwellers generally have more difficulty to engage in steady jobs than the rural immigrants due to the limited access to educational opportunities.

Table 03: Population and Household in the Study Area

| Items | Years | | | | | (%) |
|------------|---------|---------|---------|---------|---------|-------|
| | 1995 | 1996 | 1997 | 1998 | 1999 | |
| Population | | | | | | |
| Din Daeng | 177,685 | 173,672 | 171,062 | 168,552 | 166,187 | 1.66 |
| Makkasan | 23,748 | 23,473 | 22,680 | 22,317 | 22,064 | -1.82 |
| Total | 201,433 | 197,145 | 193,742 | 190,869 | 188,251 | -1.68 |
| Households | | | | | | |
| Din Daeng | 45,922 | 45,634 | 45,900 | 46,219 | 46,388 | 0.25 |
| Makkasan | 6,671 | 6,454 | 6,324 | 6,388 | 6,401 | -0.01 |
| Total | 52,593 | 52,088 | 52,224 | 52,607 | 52,789 | 0.01 |

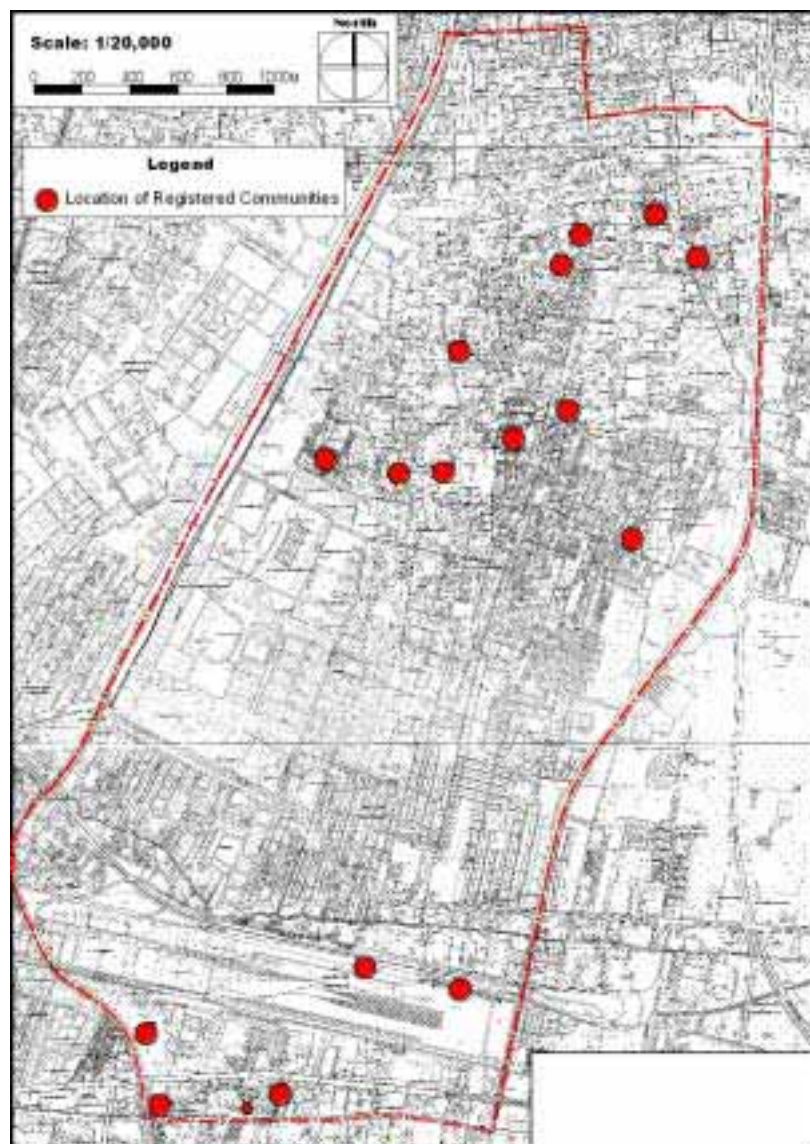
Source: Statistic of BMA 2000, Department of Policy and Planning, BMA.

Table 04: Distribution of Incomes

| Economic Class | Composition (%) | Family Income (Baht/month) |
|---------------------------|-----------------|----------------------------|
| Lowest Lower Class (LLC) | 8.9 | < 5,000 |
| Medium Lower Class (MLC) | 27.9 | 5,001 – 10,000 |
| Upper Lower Class (ULC) | 35.0 | 10,001 – 20,000 |
| Lowest Middle Class (LMC) | 14.7 | 20,001 – 30,000 |
| Medium Middle Class (MMC) | 9.2 | 30,001 – 50,000 |
| Upper Middle Class (UMC) | 4.3 | 50,001 – 80,000 |

Source: Social Survey, JICA Study Team, 2001

Figure 11: Locations of Dense Community



Source: City Planning Department, BMA

(3) Spatial Characteristics

One of the outstanding spatial characteristics of land use in the Area is that large public land lots are dispersed here and there among the finely divided private lands. The large public lands are those of Din Daeng Community Area (approx. 100ha, BMA, NHA, etc.), Makkasan Marshalling Yard (approx. 57ha, SRT), Huai Khwang Housing Complex etc.

Distribution of land use of the Area can be outlined as given below:

- Northern part is primarily occupied by detached residences;
- Southern part is densely built-up and predominantly occupied by shop houses;
- Along the eastern boundary formed by Ratchada Phisek Road, large commercial development has taken place in recent years; and
- Along the west boundary formed by Vibhavadi Rangsit Road, large public land blocks are located for government offices and administrative service facilities.

The transport in the Area is mainly made by automobiles. Characteristics of the road system are as summarized below:

- Intrusion of passing traffic into the residential areas is conspicuous;
- Density of urban secondary trunk roads with several traffic lanes is sparse and the linear configuration of roads has a lot of clanks;
- Hierarchical road network have not been developed and there are number of cul-de-sacs at the junction with watercourses;
- The front space of commercial lots are often illegally used for loading and unloading activities hindering the traffic flow; and
- Pedestrian sidewalks are narrow along crowded roads, and safety facilities such as over-bridges are rare. Traffic control facilities such as signals are not adequately provided.

Figure 12: Existing Road Network in the Study Area

