

3.5 METROPOLITAN ROAD STREET NETWORK PLANNING

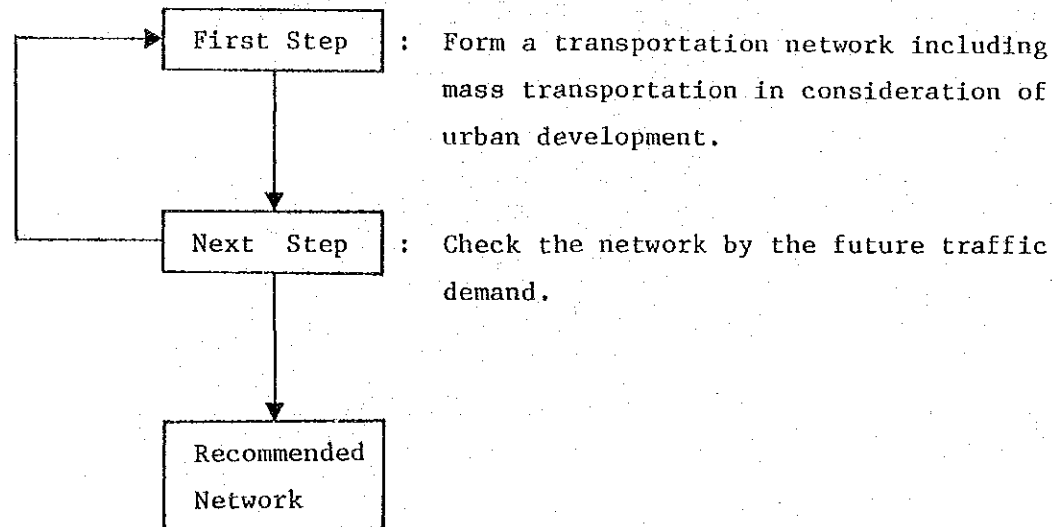
3.5.1 METHODOLOGY

Generally, five criteria are used to form an arterial road and street network; namely, to:

- minimize congestion;
- satisfy trip desires;
- facilitate access to land;
- provide system continuity; and,
- optimize facility spacing.

However, arterial roads and streets are one of the major elements of urban structure. Since the urban structure of the Jakarta Metropolitan Area needs to be changed in the future, the most important aspect of arterial road and street planning in this case is "how to induce the preferred urban development".

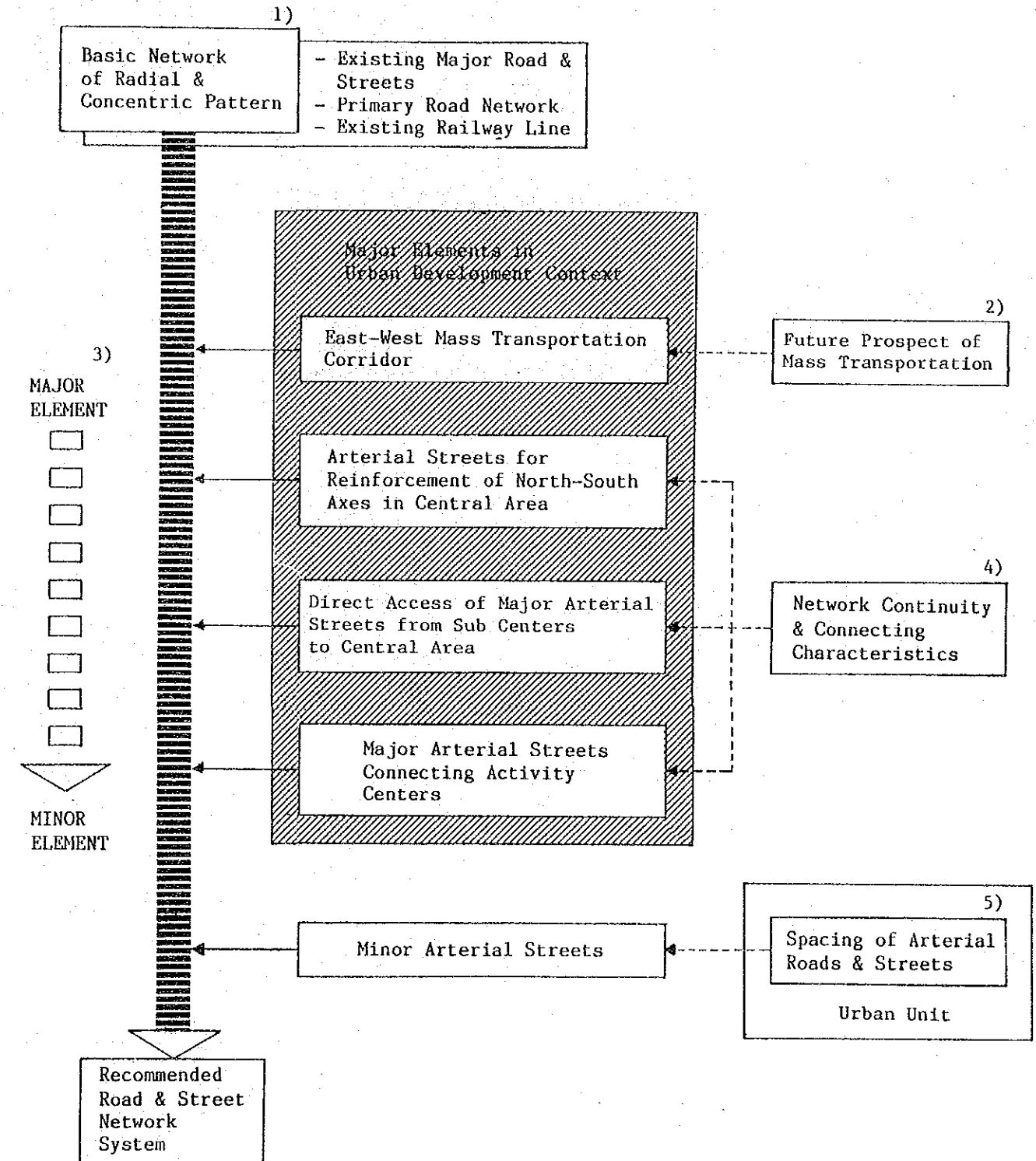
Therefore, in this study the following procedure was adopted to establish the recommended road and street network:



In the first step, the following principles were used in the procedure of forming the network:

- 1) Preserve basic features such as the radial and circumferential pattern of the existing road and street network
- 2) Decide on the location of medium/mass transportation required for the future urban development
- 3) First decide on the location of major elements of the road and street network and then decide on those of the minor elements
- 4) Attach importance to straight continuity and the connecting characteristics from a traffic engineering point of view, so as to achieve high speed movement
- 5) Decide on the location of minor arterial streets according to the guideline of spacing based on the urban unit

The flow chart shown in Fig. 3.5.1 shows the relationship between key elements of the network and the principles described above and the order of deciding on the network location.



Note : Number with parentheses denote principles for forming the network

Fig. 3.5.1 PROCEDURE OF FORMING THE ROAD AND STREET NETWORK

3.5.2 FUTURE PROSPECT OF MEDIUM/MASS TRANSPORTATION

As described in the general transportation development policy in Sec. 2.5.1, the major role of medium/mass transportation is expected to be established. Therefore, medium/mass transportation should be considered first, prior to the arterial road and street planning. In the DKI Structure Plan, the modernized existing railway system and the conventional bus system are considered to function as a medium/mass transportation system in 2005. In this section, these will be examined from an urban planning point of view.

REVIEW OF THE REHABILITATION AND MODERNIZATION PROGRAM OF THE EXISTING RAILWAY FACILITIES AND SYSTEM

Even when the on-going rehabilitation and the expected modernization programs are completed, the existing railway lines will not have enough geographical coverage over the major development areas in the Jakarta Metropolitan Area as shown in Fig. 3.5.2.

The railway lines will have to carry the following four kinds of trains which use facilities in different ways. This implies that the carrying capacity of commuter trains will be limited by this mixed operation.

- Long distance train
- Medium distance train
- Cargo train
- Commuter train

Since the existing railway facilities were constructed for regional and goods transportation and not for urban and suburban railway services, the urban structure has been established independently of the railway alignment. Therefore the on-going rehabilitation program of the existing railway facilities alone cannot induce enough demand to fill the capacity supplied by the investment without changing landuse along the railway line.

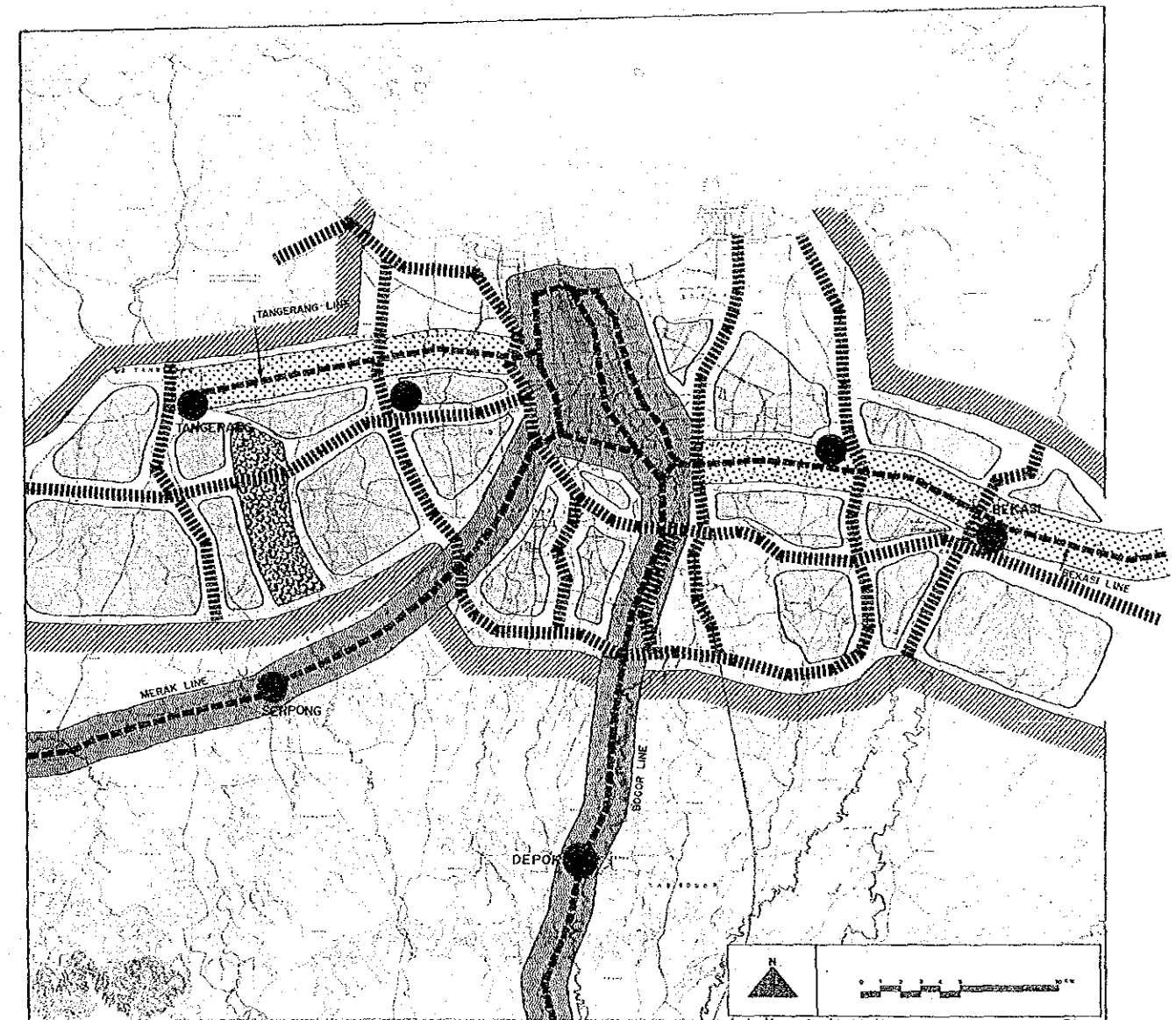
The cost of implementing the rehabilitation and modernization program is huge compared to the benefits of its expected role. This huge cost is one of the reasons for the delay in implementation of the program.

In consideration of above aspects, the railway system improved by the on-going rehabilitation and the expected modernization program is considered to play a full role in the distant future at least beyond the next twenty years. Because the potential of improving the existing facilities and systems are limited in coverage and passenger transportation capacity, the railway network system should be integrated with other new additional mass transportation modes.

ADDITIONAL MEDIUM/MASS TRANSPORTATION REQUIRED

As shown in Fig. 3.5.2, there are many areas which are not covered by the improved railway system in the major development areas of the Jakarta Metropolitan Area. These areas will need additional medium/mass transportation.

Moreover, the Bekasi Line's transportation capacity for commuters will be limited by the mix operation of long/middle distance trains, cargo trains and commuter trains. The Tangerang Line does not have a large enough hinterland to attract enough passengers to cover the minimum transportation capacity provided by the improvement. Therefore, the areas near the Bekasi and Tangerang Lines will also need additional medium/mass transportation.



LEGEND

- | | |
|---|------------------------------------|
| EXISTING RAILWAY SYSTEM TO BE IMPROVED | LIMITED DEVELOPMENT ZONE |
| COVERAGE OF RAILWAY SYSTEM WITH HIGH COMMUTER TRANSPORT CAPACITY | SUB CENTER |
| COVERAGE OF RAILWAY SYSTEM WITH LIMITED COMMUTER TRANSPORT CAPACITY | GREEN PRESERVATION/RECREATION ZONE |
| AREA WITHOUT RAILWAY SERVICE | |

Fig. 3.5.2 COVERAGE OF THE EXISTING RAILWAY SYSTEM

3.5.3 FORMATION OF THE EAST-WEST DEVELOPMENT AXIS AND REQUIRED TRANSPORTATION

In the previous section, the formation of the East-West Development Axis was recommended as the major strategy to establish the Jakarta Metropolitan System. The concrete measures to form the East-West Development Axis and its location are examined and recommended in this section.

EXPECTED ROLES OF EAST-WEST DEVELOPMENT AXIS

By directly connecting the Central Area to the suburban areas with the Multi Corridor System, the following results are expected:

- The central commercial and business functions will have opportunities to expand their hinterlands, increase their accumulation and up-grade their functions
- An enormous amount of land in the suburban area will have opportunities to be supplied for urban use. Urban work places will be able to be created through activity center development in the suburban areas
- The land prices within the Outer Ring Road will be reduced and efficient land use will be formed. Consequently, uncontrolled urban sprawl will be stopped

Moreover, by connecting the Central Area to the East and West Centers, the following can be also expected:

- The East and West Centers will have incentives to be the location for high level functions, because business trips between centers can be warranted by public transportation
- The commuter traffic pattern will proportionately change to the east-west direction from the present north-south direction

CRITERIA FOR FORMATION OF THE EAST-WEST DEVELOPMENT AXIS

Having considered the expected roles of the axis above, the following criteria were adopted for deciding the location and function of the East-West Development Axis:

- To restrict continuous urbanization from Jakarta to the Jakarta Metropolitan boundaries
- To encourage housing development in the suburban areas
- To foster Sub Centers
- To promote utilization of east-west medium/mass transportation

REQUIRED TRANSPORTATION FOR THE EAST-WEST DEVELOPMENT AXIS

In the growing areas, such as the eastern and western suburban areas, provision of arterial streets is essential for guiding urban growth. The Multi Corridor System of arterial streets, including direct access to the Central Area, is advantageous to foster activity centers and to encourage efficient land use in the suburban areas, and this Multi Corridor System is required to install medium/mass transportation in the east-west direction. In this sense, the Circuit Medium/Mass Transportation Corridor in the Multi Corridor System is recommended.

In consideration of the development potentials, conditions and criteria, the location as shown in Fig. 3.5.3 is recommended for the Circuit Medium/Mass Transportation Corridor. The alternative locations are shown in Fig. 3.5.4. The Circuit Medium/Mass Transportation Corridor is as follows:

- 1) The Circuit Medium/Mass Transportation Corridor should have a mass transit mode on a separated right-of-way
- 2) The separated right-of-way for a medium/mass transportation mode should be at first used for a rapid bus system operation and then, according to the demand, it should be later converted to a guideway transit mode with higher capacity
- 3) The Circuit Medium/Mass Transportation Corridor should have a joint right-of-way for medium/mass transit and arterial streets to secure accessibility to activity centers and ribbon development along the corridor. The parallel arterial street would not carry trips with long length
- 4) The individual transportation corridors, which private vehicular trips with long length use, should be provided parallel with the Circuit Medium/Mass Transportation Corridor. This secures dual access for both medium/mass and individual transportation to the Central Area

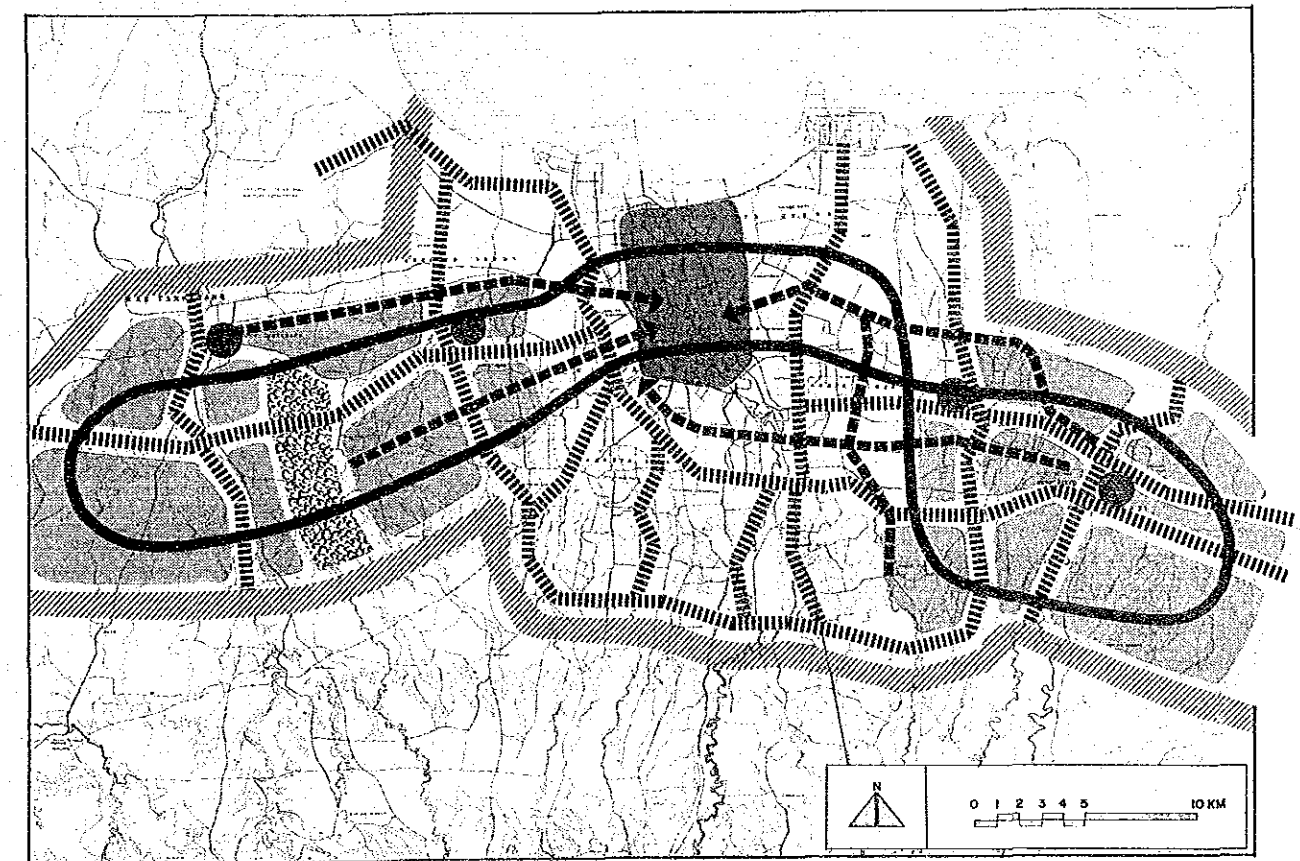


Fig. 3.5.3 RECOMMENDED LOCATION OF CIRCUIT MASS TRANSPORTATION CORRIDOR

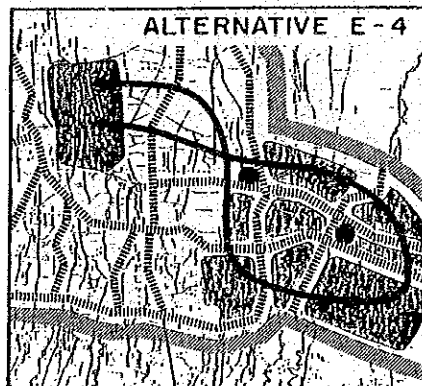
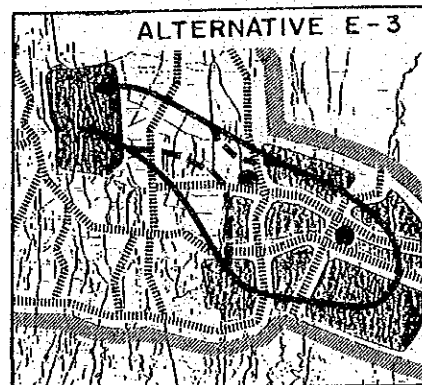
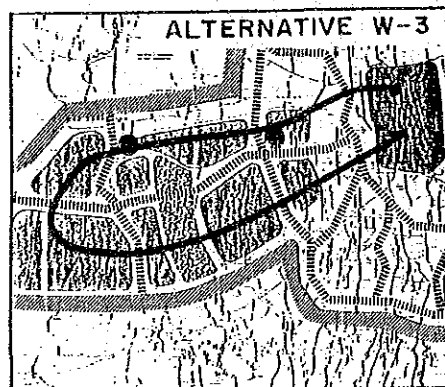
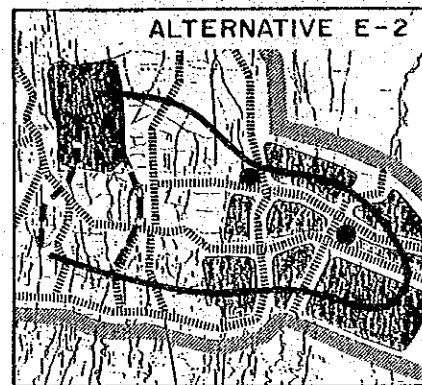
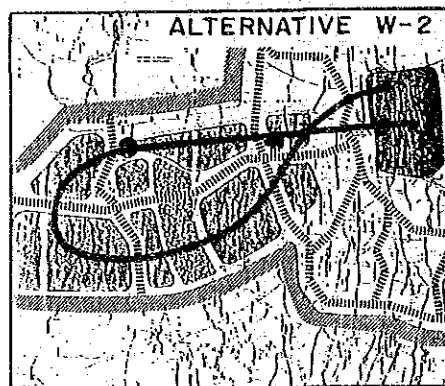
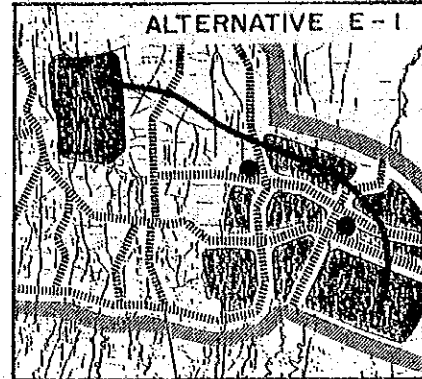
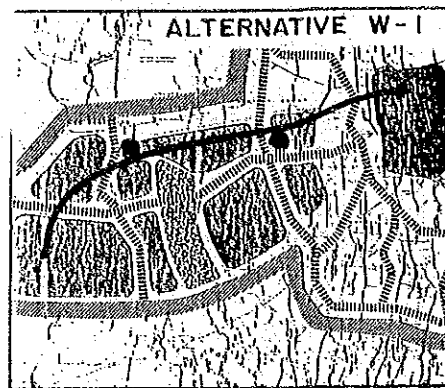


Fig. 3.5.4
ALTERNATIVE LOCATIONS OF
MASS TRANSPORTATION CORRIDOR

3.5.4 REGIONAL CORRIDORS

INDUSTRY IN REGIONAL CORRIDOR

The location of industry has been closely related to the accumulation of commerce and business in Kota and the terminal function of international and domestic cargo in Tanjung Priok. Industrial development in the future is considered to occur along the east and west regional corridors extending from these two areas. On the other hand, the Bogor regional corridor in the south, which has some industrial activities, has limited future industrial development potential.

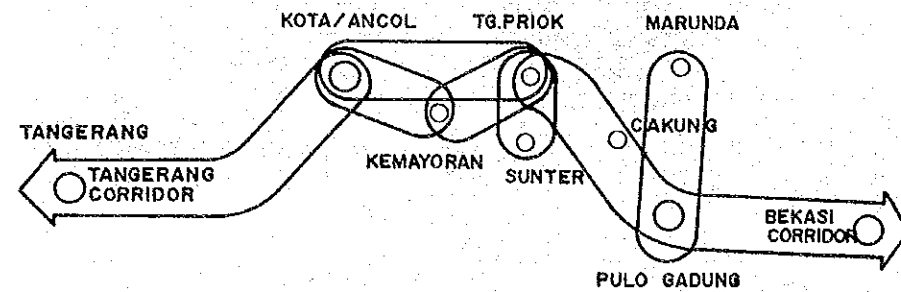


Fig. 3.5.5 SPATIAL DISTRIBUTION OF INDUSTRY

EAST-WEST REGIONAL CORRIDOR

The existing cities of Tangerang and Bekasi are located in the east-west regional corridor with industrial areas. To the north of the industrial zone lies the agricultural preservation area in the coastal plain, and the south residential areas are expected to spread in the future. In this sense, high attention should be given to the conflict between regional/goods and metropolitan-wide person transportation in the east-west regional corridors, and corridor separation between regional/goods and metropolitan-wide person transportation is recommended.

According to the future traffic demand forecast, in 2005 the Tangerang and Bekasi centers will suffer from through traffic of 5,100 trucks per day and 12,200 trucks per day respectively. This will have a serious negative effect on the development of these activity centers.

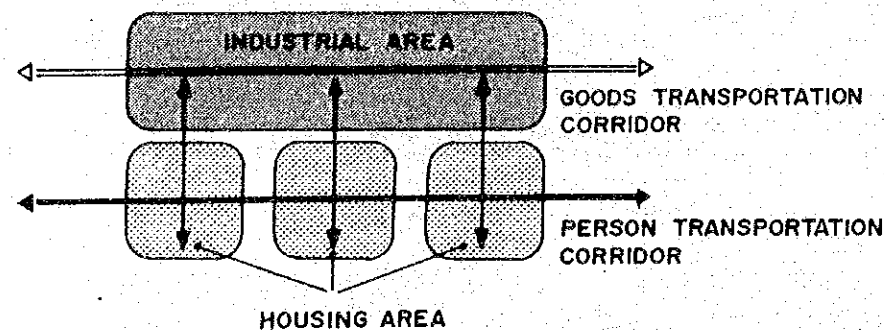


Fig. 3.5.6 SYSTEM SEPARATION BY CORRIDOR (GOODS-PERSON TRANSPORTATION)

BOGOR REGIONAL CORRIDOR

Although further industrial development in this corridor is not expected to occur, the conflict between regional/goods and metropolitan-wide person transportation will become serious. Moreover, the present traffic demand cannot be managed with an adequate level of service. The transportation capacity of the Bogor regional corridor is recommended to be upgraded by separating corridors for regional/goods transportation and metropolitan-wide person transportation.

BY-PASS ROADS FOR CORRIDOR SEPARATION BETWEEN REGIONAL/GOODS AND TRANSPORTATION AND METROPOLITAN-WIDE PERSON TRANSPORTATION

To attain the corridor separation, the following by-pass roads are newly required (See Fig. 3.5.7). In the context of the Multi Corridor System, the person transportation corridors should be also the arterial streets running parallel to the regional corridors used mainly for goods transportation.

- Tangerang By-pass Road passing the Tangerang town along the northern boundary of the major development zone
- Bekasi By-pass Road passing the Bekasi town along the northern boundary of the major development zone
- Kota By-pass Road connecting Jl. Daan Mogot to Jl. Cilincing Raya will avoid goods passing through the Kota Center
- Cililitan By-pass Road connecting Jl. Raya Bogor to Jl. Let. Jen. MT. Haryono passing through Cililitan

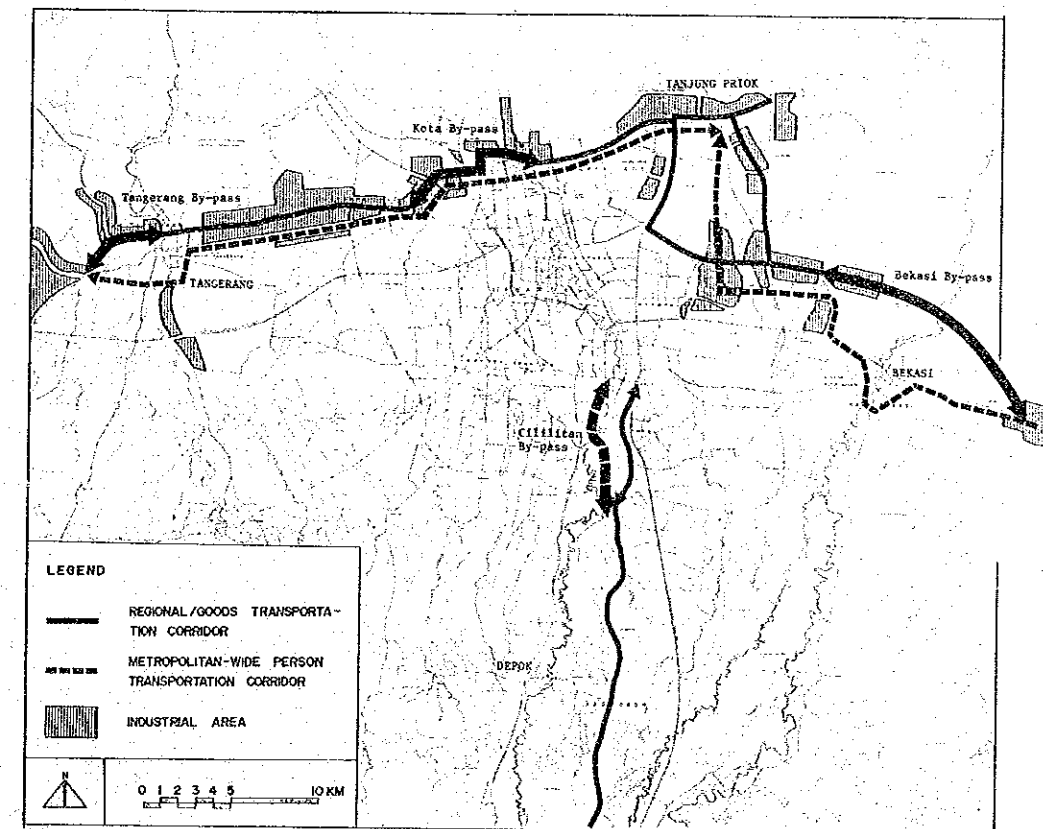


Fig. 3.5.7 REGIONAL CORRIDORS AND RECOMMENDED BY-PASS ROAD

3.5.5 URBAN DEVELOPMENT AND TRANSPORTATION DEVELOPMENT IN THE CENTRAL AREA

Based on the overview of the current developments and transportation problems in the Central Area described in Chapter 1, the desirable structure of the Central Area will be examined and recommended in this section. Furthermore, a transportation network is recommended to establish the structure of the Central Area.

RECOMMENDED URBAN DEVELOPMENT POLICY

The coexistence of both individual and medium/mass transportation is given first attention, and the recommendation on the urban development policy to achieve maximum utilization of medium/mass transportation is as follows:

- 1) Decentralize the existing functions of the Central Area to suburban activity centers:
 - By establishing direct access from the suburban areas to the Central Area through corridors with medium/mass transportation modes (Medium/Mass Transportation Corridor)
 - By providing arterial streets with straight continuity of traffic, not only in the north-south direction, but also in the east-west direction, to ensure mobility of trips from the direct access corridors described above

As the result of these transportation provisions, the hinterland of the commerce and business functions accumulated in the Central Area will be expanded and the Central Area may obtain a higher level of function.
- 2) Encourage commerce and business activities to locate around the stations of the loop railway line in a concentrated form, but not in a scattered form:
 - By redeveloping the areas around the railway stations
 - By providing arterial streets to distribute feeder transport services for rail transportation services
 - To encourage intra-urban trips and urban-suburban trips to use the railway system that will be improved by the railway modernization program
- 3) Establish nuclei by activity center development where urban functions concentrate to:
 - Make it convenient for medium/mass transportation users to fulfill any purpose, such as business, shopping and other private matters, within walking distance
- 4) Utilize the development potential of nuclei at points where the loop railway line intersects with the Medium/Mass Transportation Corridor recommended above

ACTIVITY CENTER DEVELOPMENT AROUND RAILWAY STATION

In order to create enough railway passengers for the transportation capacity provided by the railway system modernization program, activity center development is inevitable around stations of the railway line, which is recommended to be operated in a loop shape. The following potential areas are designated as follow:

- 1) The following existing activity centers around stations of the loop railway line have potential for redevelopment:
 - Kota
 - Senen
 - Tanah Abang
 - Jatinegara
 - Manggarai
- 2) Potential activity center areas at intersections between the loop railway line and Circuit Medium/Mass Transportation Corridor are:
 - Kemayoran
 - Duri
 - Kramat
- 3) Potential activity center areas at intersections between the loop railway line and major arterial streets are:
 - Pisang Batu
 - Angke
 - Kemayoran
 - Petojo
 - Salemba
 - Karet

TRANSPORTATION DEVELOPMENT FOR THE CENTRAL AREA

Based on the maximum utilization of medium/mass transportation, the transportation developments recommended in this section are required for achieving the urban development policy recommended for the Central Area.

TWO MAJOR EAST-WEST CORRIDORS

The two major east-west corridors are required for the following reasons:

- To assure direct access by medium/mass transportation modes to the Central Area from the east and west suburban areas
- To connect activity centers, such as the East Center, West Center, Tangerang Center, Bekasi Center and the Kemayoran ex-airport, and to encourage development of these activity centers
- To create employment and to induce housing development in the east and west suburban areas

The recommended locations of the two major east-west corridors are as follows:

- 1) Northern Major Corridor
Located between Kota's trade and service center area and Monas's administrative center area; that is, between Jl. Raya Mangga Besar and Jl. Sukarjo Wiryopranoto - Jl. H. Samanhudi
- 2) Southern Major Corridor
The proposed location corresponds to the present Jl. K.H. Wahid Hasyim

ARTERIAL STREETS FOR REINFORCEMENT OF NORTH-SOUTH AXES

Three additional arterial streets in the north-south direction are required to distribute the traffic entering from outside the Central Area, not only from the south, but also from the east and west suburban areas. The recommended locations of these three arterial streets in the north-south direction are as follows:

- 3) The straight route from Jl. Dr. Sahardjo to the end of Jl. Lodan, through Manggarai, Jl. Cikini Raya, Jl. Medan Merdeka Timur, and the new road along the Central Railway Line
- 4) The route to insure the directness and the continuity of the traffic of Jl. K.H. Mass Mansyur connecting through Tanah Abang to the west part of Kota. This street is proposed by the DKI Structure Plan
- 5) The route crossing the Intra Urban Tollway at the north part of Slipi and connecting with Ancol through the Kemayoran ex-airport by passing on the existing streets of Jl. Sutan Syahrir and Jl. Prof. Moh. Yamin SH. This street is proposed by the Local Plan (RBWK)

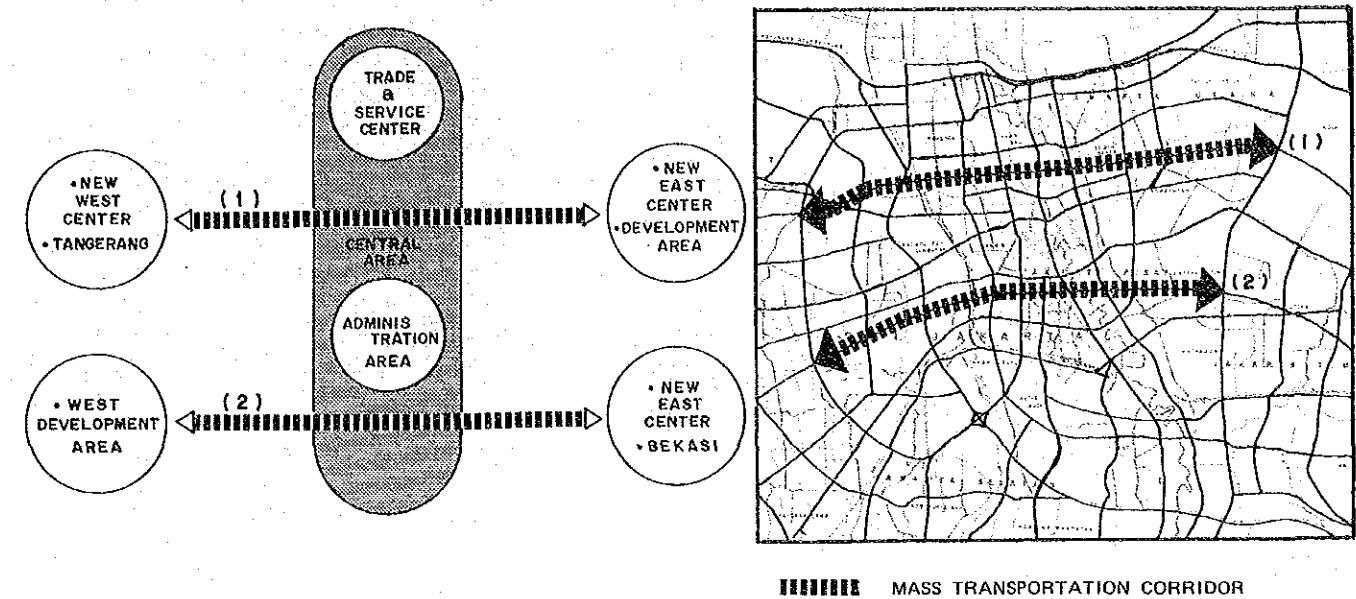


Fig. 3.5.8 MAJOR EAST - WEST CORRIDORS

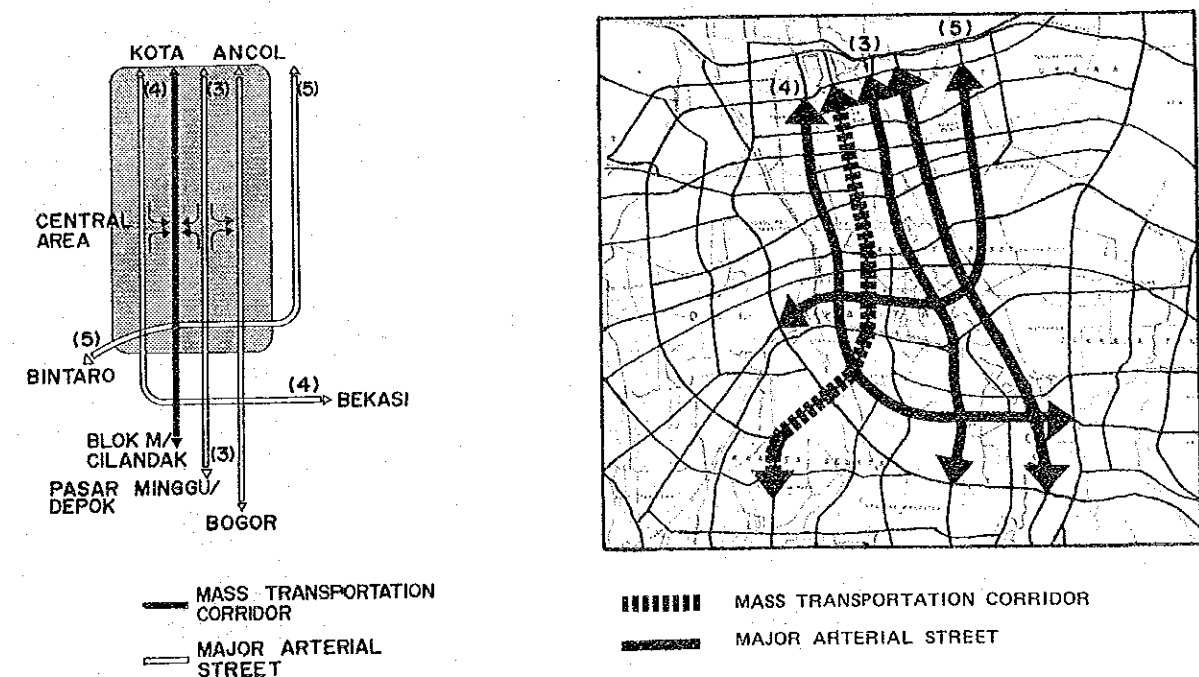


Fig. 3.5.9 REINFORCEMENT OF NORTH - SOUTH AXES

ARTERIAL STREETS IN EAST-WEST DIRECTION

As many arterial streets as possible crossing the five north-south arterial streets are required so as to diversify the access routes to the Central Area and to enable the existing north-south traffic movement to access to the Central Area in an east-west traffic pattern. The following six arterial streets in the east-west direction are recommended for utilizing effectively the existing streets:

- 6) The route connecting Tanjung Priok and Jl. Tubagus Angke, running parallel to Jl. Martadinata and passing the new Kota Station on Jl. Mangga Dua. The provision of this route can separate the goods movement on Jl. Martadinata from/to the Tanjung Priok Port from person movement
- 7) The route from Jembatan Besi passing on the existing Jl. Mangga Besar and passing through the Kemayoran ex-airport and connecting to Jl. Prof. Dr. Latumenten
- 8) The route from Duri to Kemayoran, being composed of the existing roads of Jl. Kompa, Jl. Sukarjo Wiryopranoto, Jl. H. Samanhudi and Jl. Angkasa
- 9) The route from Tomang to the north part of Cempaka Putih, connecting such existing streets as Jl. Tomang Raya, Jl. Suryo Pranoto, Jl. Veteran/Jl. Juanda, Jl. Dr. Sutomo, Jl. Garuda and extending to the east, over Jl. Yos Sudarso
- 10) The route crossing the Intra Urban Tollway at the south part of Tomang, extending to the east to pass Tanah Abang and running on the existing road of Jl. Kebon Sirih, Jl. Karet, Jl. Jend. Suprpto to Cempaka Putih
- 11) The route running from Pejompongan along the Kalimalang waterway, passing through Manggarai and entering into Jl. Pramuka

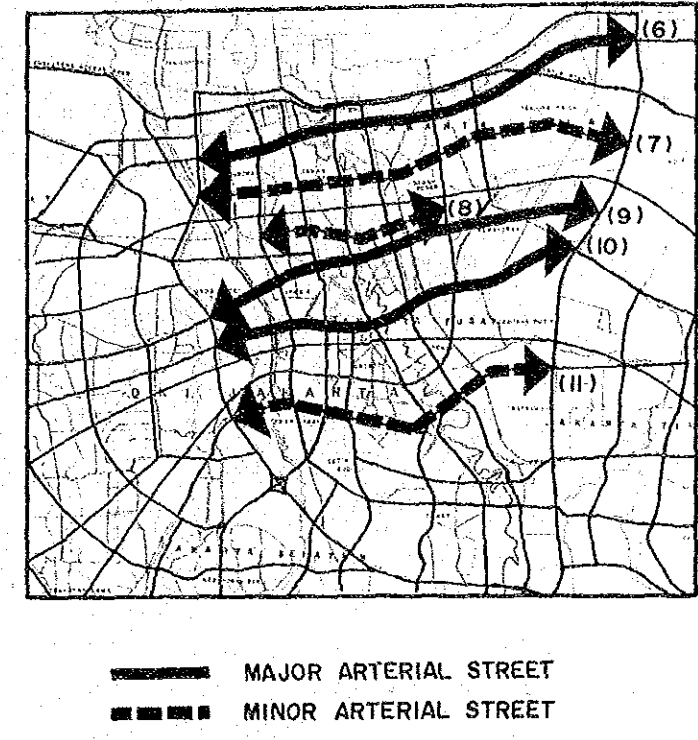
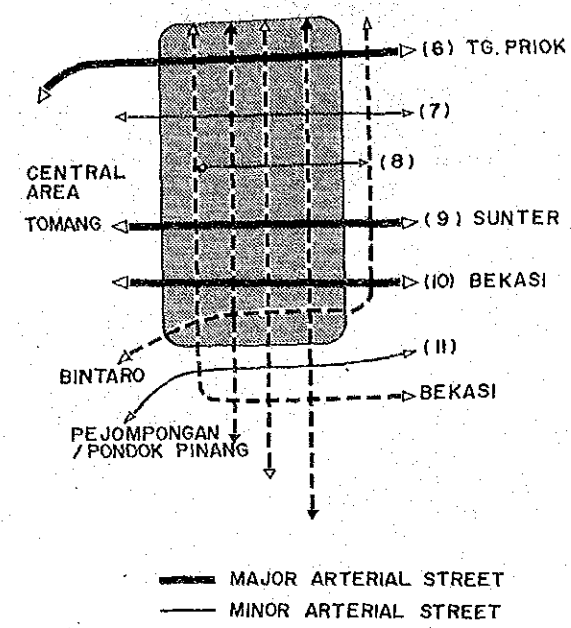


Fig. 3.5.10 EAST - WEST ACCESS DIVERSIFICATION

3.5.6 ARTERIAL ROAD AND STREET NETWORKS IN TANGERANG AND BEKASI

Concerning the development of arterial road and street networks in Bekasi and Tangerang, the ARSDS team's proposal was made by attaching importance to the following three guidelines:

- Preservation of the existing road networks of the Cell System
- Introduction of the Multi Corridor System
- Development of activity centers in Tangerang and Bekasi

EXISTING ROAD AND STREET NETWORKS

Except the freeways, the existing road and street networks show the pattern of the Cell System with their radiating roads and streets.

The ARSDS team first attached importance upon these radiating roads and streets, which take the form of the Cell System, for the sake of their identical urban development in the Jakarta Metropolitan System.

INTRODUCTION OF MULTI CORRIDOR SYSTEM

In order to reinforce the above network of the Cell System following the Multi Corridor System described in Section 3.3.3, multiple arterial roads and streets should be laid out to provide physical conditions for vigorous urban development of both cities.

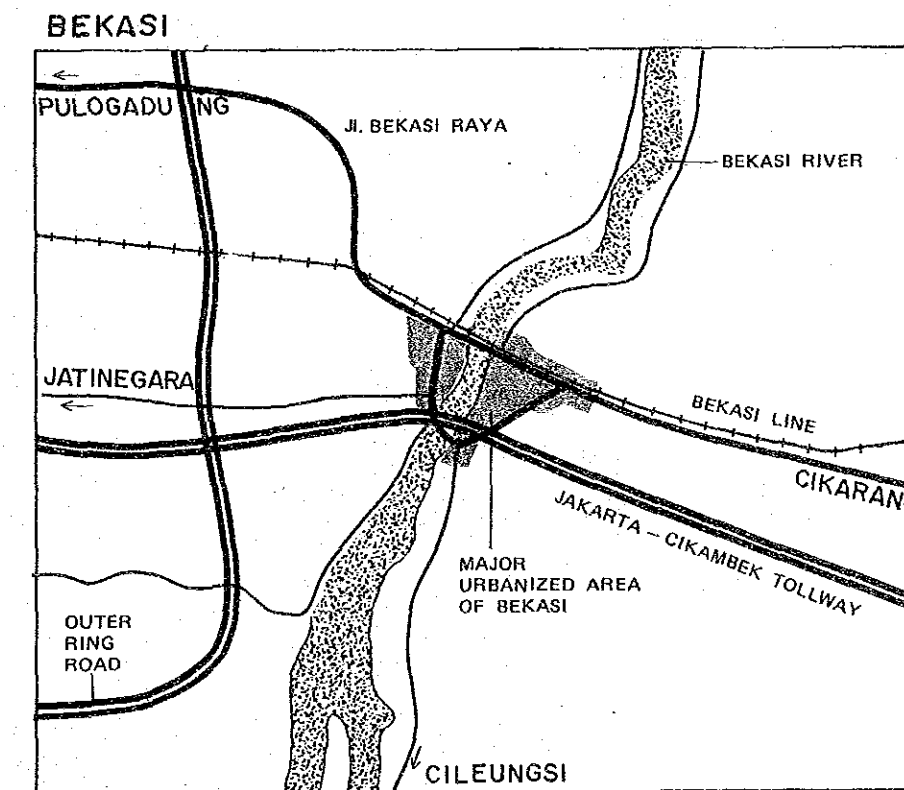
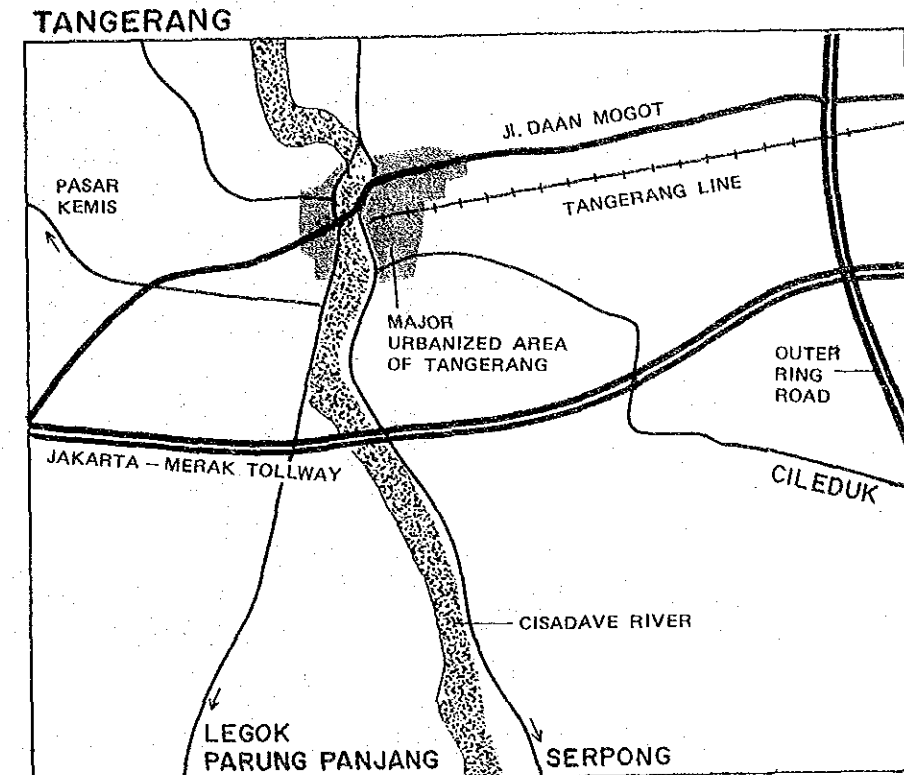
ACTIVITY CENTER DEVELOPMENT IN TANGERANG AND BEKASI

In order to induce vigorous development of Tangerang and Bekasi, the arterial road and street networks in both areas should be laid out so as to create multiplied effects on the incentives of development, both for Tangerang and Bekasi, and for the development of their Secondary Centers.

The development of activity centers in both the cities and the Circuit Medium/Mass Transportation Corridor are deeply interrelated in the staging of the implementation program described in Section 7.4.2.

In providing a single Medium/Mass Transportation Corridor connecting Tangerang and Bekasi, direct accesses would first be provided between Jakarta and New West Center and New East Center.

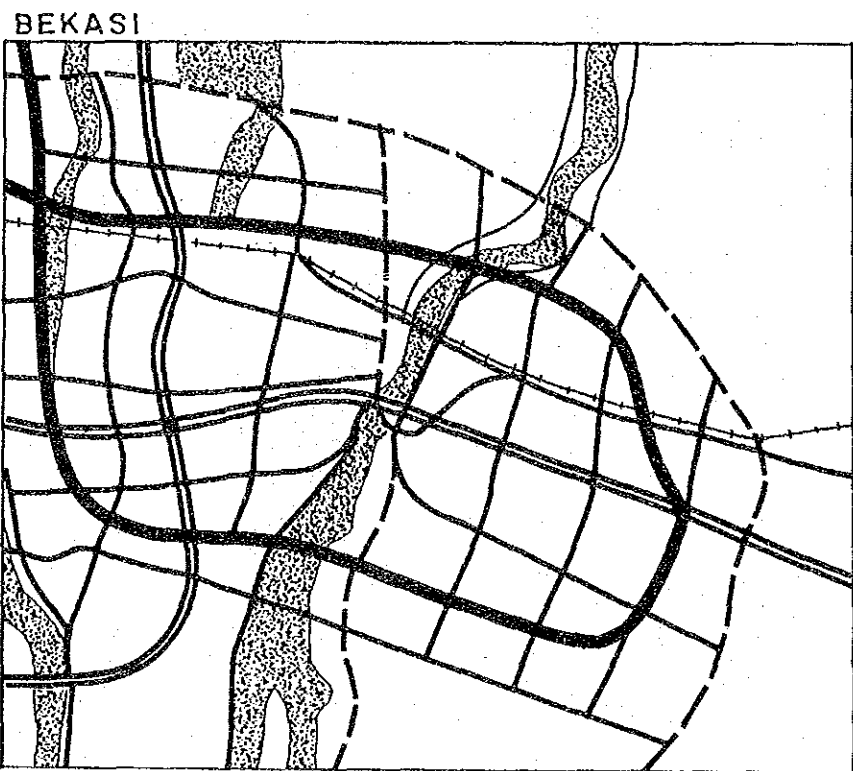
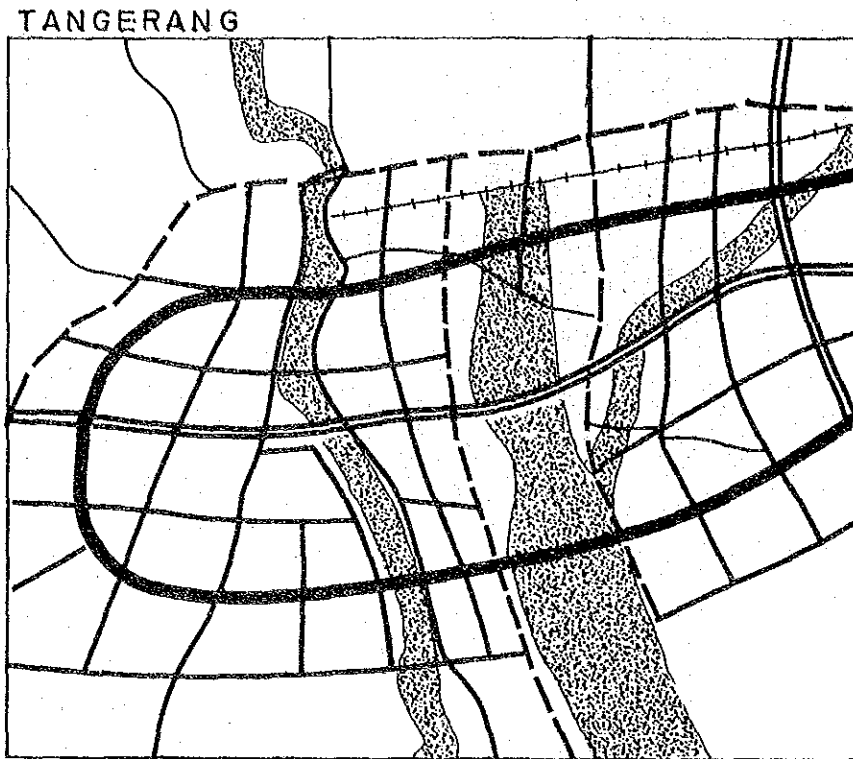
Next direct accesses between New West Center and Tangerang, and between Bekasi and New East Center would be provided. At the same time, the development of the Secondary Centers of each city and the provision of direct accesses between the Secondary Centers and the Sub Center of each city would be promoted. Once the Sub Centers of both cities have been sufficiently developed, the other part of the Circuit Medium/Mass Transportation corridor can be provided which connects all the centers with Jakarta.



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- Toll Way, — Arterial Road, — Rura' Road
- + + + + + Rail Way, [shaded box] Preservation Area

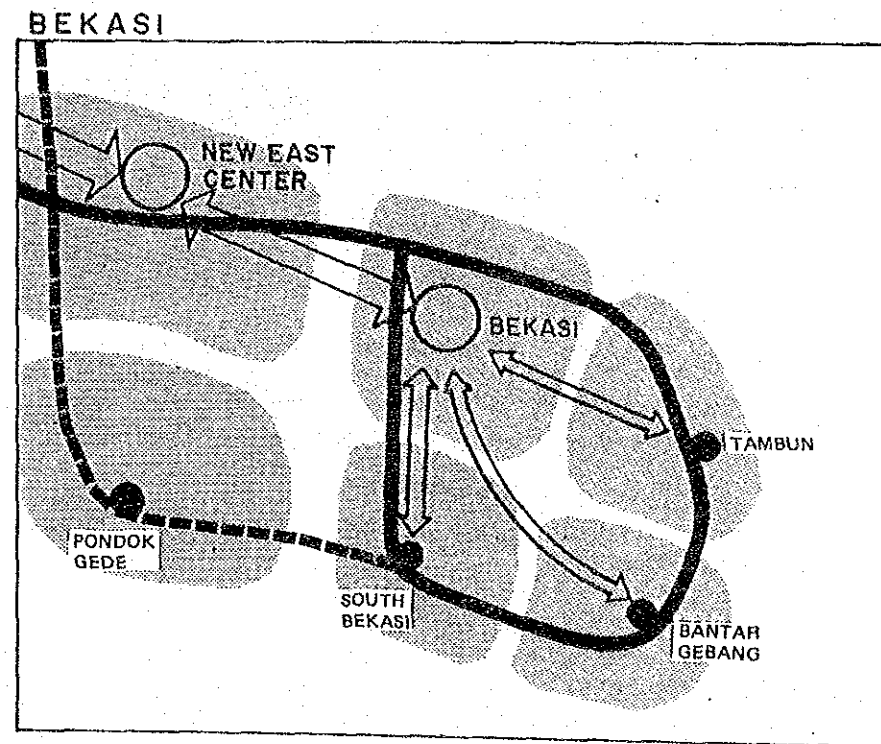
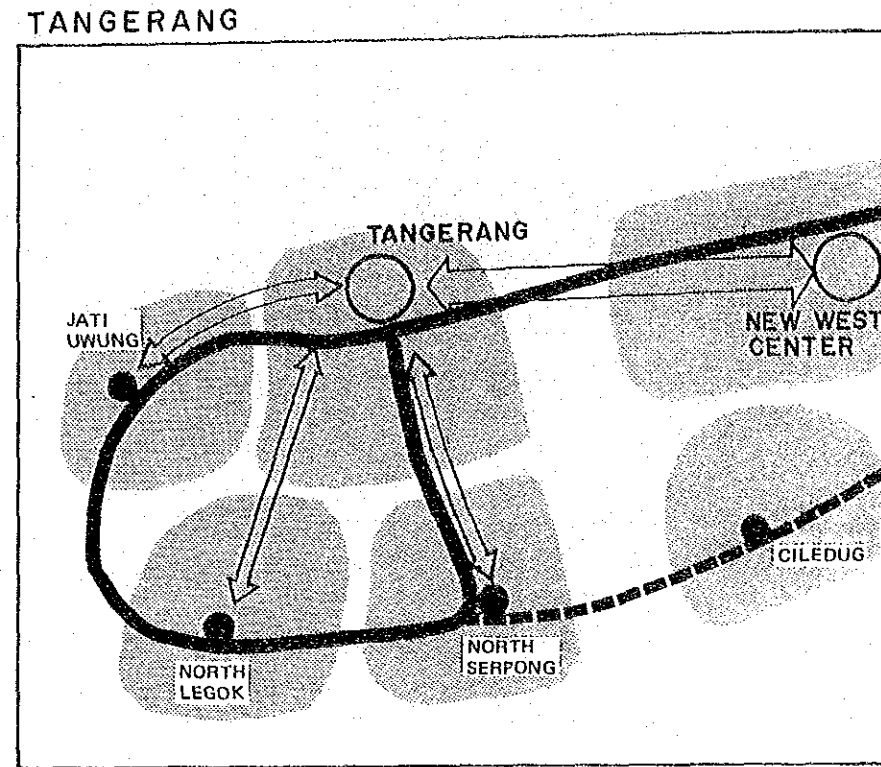
Fig. 3.5.11 EXISTING ROAD NETWORK



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— Primary Arterial Road, — Arterial Street
 — Rural Road, — Mass Transportation Corridor

Fig. 3.5.12 INTRODUCTION OF MULTI CORRIDOR SYSTEM



LEGEND

○ Sub Center ● Secondary Center ↔ Direct Access
 — Mass Transportation Corridor in Pelita VI
 — Mass Transportation Corridor in Pelita VII

Fig. 3.5.13 ACTIVITY CENTER DEVELOPMENT

3.5.7 SPACING OF ARTERIAL STREETS AND URBAN UNIT

The required density of arterial streets varies according to the area's landuse. A recommended guideline for spacing of arterial streets is shown in the table below.

Area	Principal Landuse	Spacing
Central Area	Commerce, Business and Administration	0.5 km
Intermediate Area	Commerce, Business and Housing	1.0 km
Suburban Area	Housing	2.0 km

This guideline is applied to networking of the arterial streets, especially in deciding the location of minor arterial streets after the location of major arterial streets has been decided.

This section will describe the details of how this spacing guideline was determined, by reviewing criteria such as pedestrian radius and local transportation service within the urban unit which is enclosed by arterial roads and streets.

URBAN UNIT AND PEDESTRIAN RADIUS

The pedestrian radius to the bus stop on arterial street is considered as one assessment criterion. By limiting large bus service to the surrounding arterial streets, the ARSDS team considers a 15 minute walking distance (1 KM) to the bus stop as the maximum limit, and this corresponds to the urban unit with 2 KM grid size in the suburban area. This maximum pedestrian radius can be shortened by providing micro and mini bus services on the collector streets in the grid.

In the Central Area where the commercial and business functions are concentrated, the ARSDS team considers a 3 to 4 minute walking distance (250 M) to the bus stop as the maximum limit, and this corresponds to the urban unit with a 0.5 KM grid size in the Central Area.

For the intermediate area, the ARSDS team selected 1.0 KM as the intermediate grid size between the two areas. In this case the maximum pedestrian radius is 500 M and the walking time is 7 to 8 minutes.

LOCAL TRANSPORTATION SERVICE FOR URBAN UNIT

1) Central Area - 0.5 KM Grid

Large buses should only run on the surrounding arterial streets and people would walk to the bus stop. The bajaj would provide service crossing the arterial streets, but would be prohibited from running on the arterial streets.

2) Intermediate Area - 1.0 KM Grid

Large buses should only run on the surrounding arterial streets and people could either walk or take a bajaj to the bus stop. The bajaj would provide service to the next grid by crossing the arterial streets but would be prohibited from running on the arterial streets.

3) Suburban Area - 2.0 KM Grid

Large buses would only run on the surrounding arterial streets and people would either walk or take a bajaj or becak to the bus stop. The Bajaj would provide service to the next grid by crossing the arterial streets but would be prohibited from running on the arterial streets.

By providing service with micro and mini buses on the collector streets in the urban unit and shortening the pedestrian radius therewith, the service standard of medium/mass transportation would be raised.

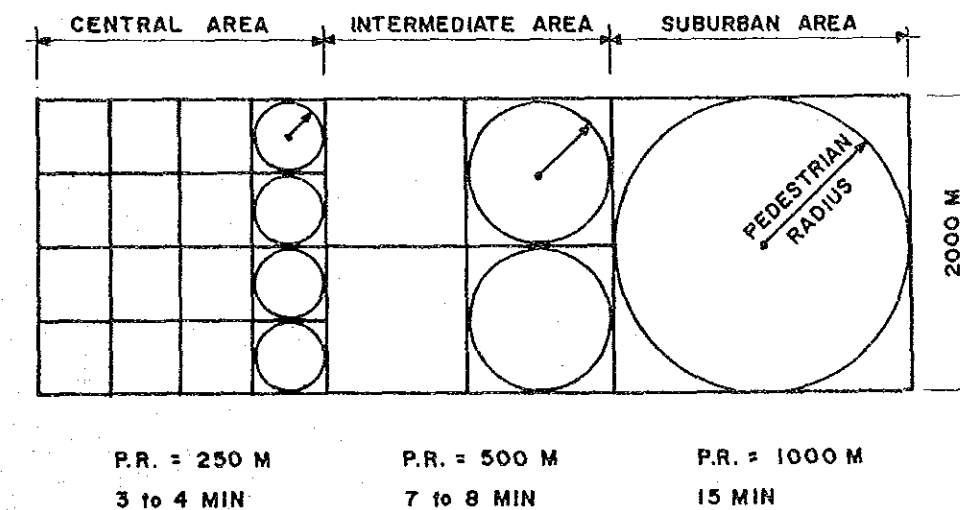


















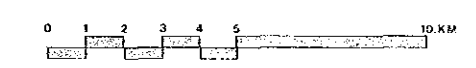
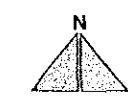


Fig. 3.5.14 PEDESTRIAN RADIUS AND SPACING OF ARTERIAL STREETS

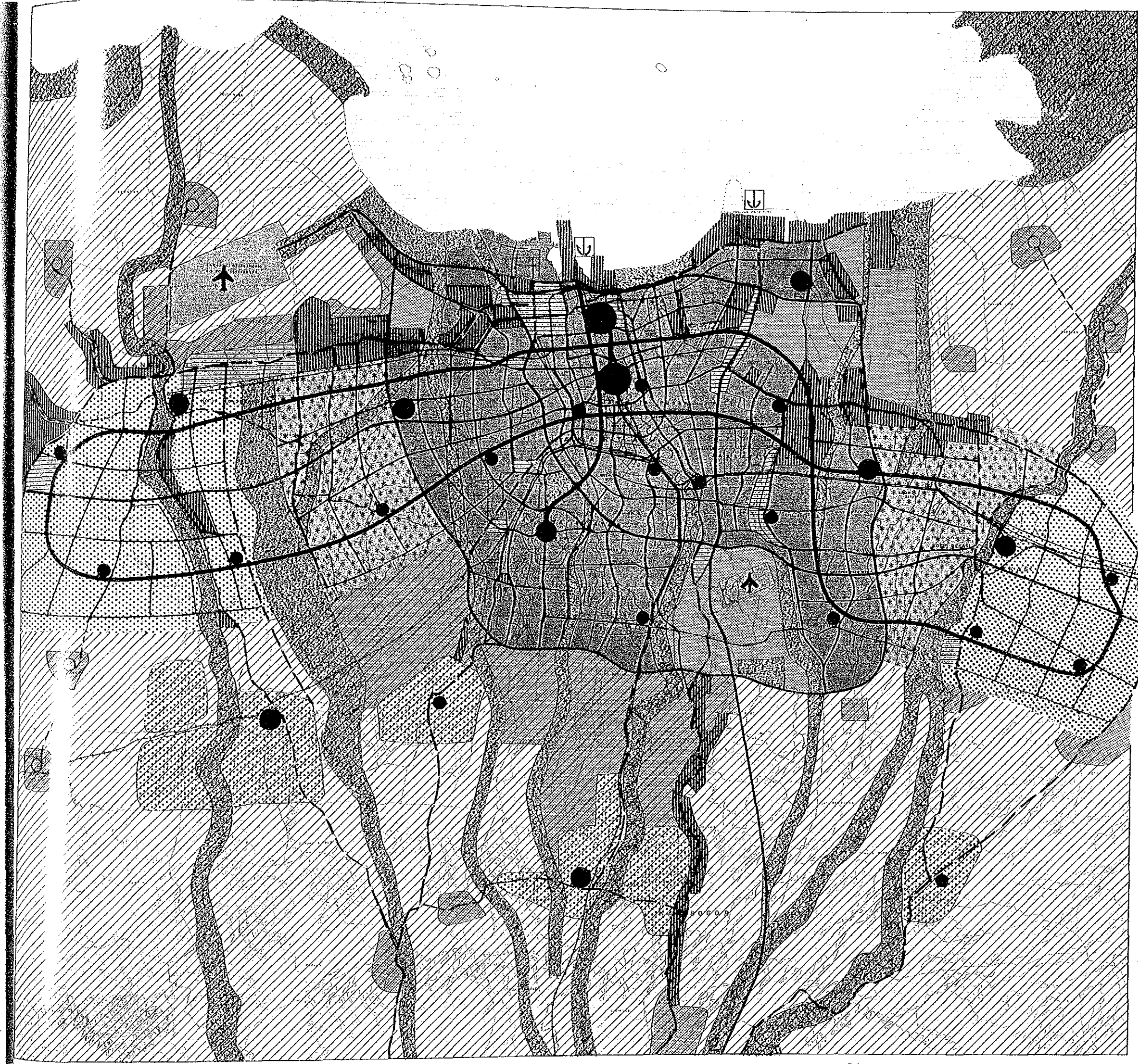
Fig. 3.5.15
**MAJOR LAND DEVELOPMENT AND
 TRANSPORTATION NETWORK**

LEGEND

-  Urbanized Area in Jakarta
-  Conurbation Area
-  Urban Development Area of Core City
-  Industry
-  Mixed Industry and Trade
-  Agriculture
-  Agriculture with Low Density Housing
-  Green Preservation / Recreation
-  Limited Development Area
-  Metropolitan Center
-  Sub Center
-  Secondary Center
-  Rural Center
-  Airport
-  Harbour
-  Medium/Mass Transportation Corridor
-  Freeways
-  Primary Roads
-  Secondary System Streets
-  Rural Roads
-  Railway



**ARTERIAL ROAD SYSTEM
 DEVELOPMENT STUDY
 IN JAKARTA METROPOLITAN AREA**



CHAPTER

4

TRANSPORTATION POLICY AND PLANNING

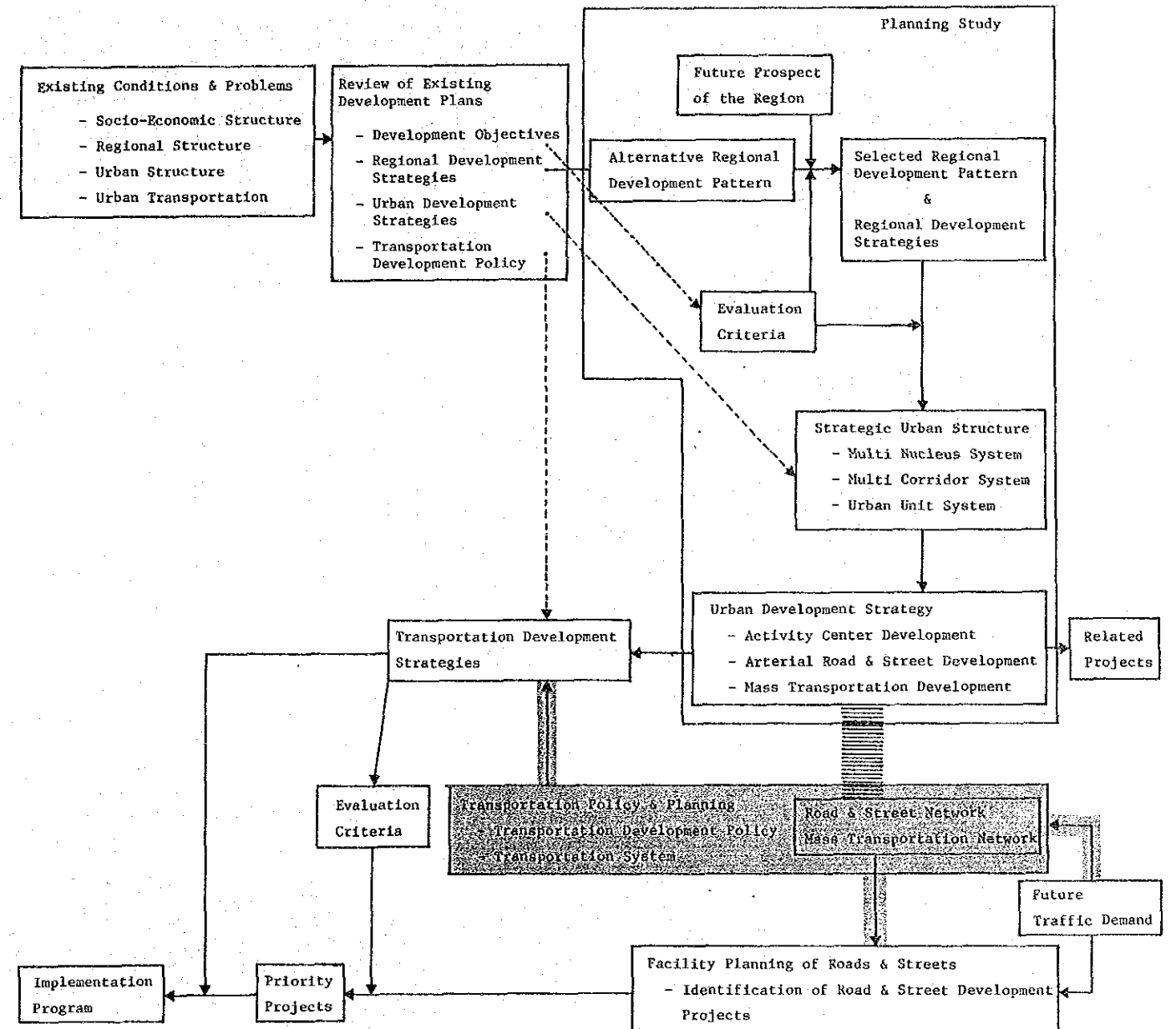


The transportation development policy and the transportation system development will be recommended in this chapter through the overview of the existing urban transportation problems and the future prospects of urban transportation. The transportation network location is based on the urban structure in Chapter 3. The basic consideration of each transportation system is based on the future traffic demand described in Chapter 5.

Transportation development cannot be discussed separately from urban development. The aspects of urban development and transportation development were examined and described together in Chapter 3. This chapter is a summary from a transportation planning point of view.

The recommended transportation development strategy suggests that each transportation system development should be closely related, not only to the other transportation system developments, but also to the urban development strategies. The recommended strategy is closely related to how to efficiently establish the Jakarta Metropolitan Area in the multi nucleus pattern.

The recommended transportation development strategy will be reflected in the implementation program in Chapter 7.



4.2.1 OVERVIEW OF THE CURRENT SITUATION OF URBAN TRANSPORTATION

DEFICIT OF URBAN TRANSPORTATION INFRASTRUCTURE

Almost all of the urban travellers in the Jakarta Metropolitan Area depend on roads and streets, since the existing railway cannot attract more than 1% of the total transportation demand. The existing railway facilities were originally made for inter-city goods and passenger transportation. The landuse along the railway lines was formed with no relation to the railway, thereby making it difficult for the existing railway to attract more passengers.

Congestion of roads and streets is already severe in degree and has daily duration in the Central Area and regional corridors. Moreover, congestion prevails on some streets in the suburban areas despite the low level of private automobile ownership (40 cars per thousand inhabitants).

The predominant mode of public transportation is the conventional bus, which covers almost all of the urban and suburban areas. However the buses are inadequate in reliability and comfort because, in particular, they are adversely affected by street congestion.

URBAN STRUCTURE CONVENIENT FOR CAR USERS

At present Jakarta has an urban structure which is convenient for car users in the following three aspects:

- The main structure is composed of wide streets with more than 8 lanes which connect the major urban functions to each other
- While office buildings of the modern business sector are located along the wide streets, the activity centers with modern functions have not yet been well developed
- The Jakarta Intra Urban Tollway System which is under construction and the completed three regional tollways are supposed to provide high speed transportation services

This convenience for car usage and the deficiencies of urban public transportation previously described, encourages the more affluent people to use automobiles and motorcycles, resulting in more congestion on the roads and streets.

URBAN SPRAWL AND URBAN TRANSPORTATION INFRASTRUCTURE

The urban sprawl which is taking place with dependence on the existing roads, especially in the southern area, was originally caused by the deficit of urban transportation infrastructure, which is essential for a planned urban land supply to accommodate the increasing urban population. The urban sprawl results in additional investment to strengthen the capacity of existing roads, and this causes additional urban sprawl and investment. Moreover, because the landuse formed by urban sprawl is dispersed, the provision of urban infrastructure cannot be efficient.

TRAVEL BEHAVIOR OF PEOPLE

According to the analysis of the ARSDS Person Trip Survey, it is very clear that differences in income level significantly influence the choice of transportation mode in Jakarta at present. Higher income groups depend on private transportation modes to a higher degree. While the high income group prefers private passenger cars, the lower income group, which can not afford automobiles, uses motorcycles as a mode of private transportation. As a representative mode of public transportation, the conventional bus system, which provides low level of service at present, is mostly used by the lower middle and low income groups. It is obvious from the modal composition trend that the share of public transportation have been decreasing. If the service level of public transportation is not improved, an increase in the utilization of private passenger cars and motorcycles in future can not be avoided as income levels rise.

4.2.2 OVERVIEW OF FUTURE PROSPECT OF URBAN TRANSPORTATION

As described in Chapter 3, the Jakarta Metropolitan Area will suffer from large changes in socio-economic conditions, and will need to change urban structures. The major factors influencing the future urban transportation will be examined and the future prospect will be described in this section.

POPULATION INCREASE AND URBAN EXPANSION

Assuming that the population increases at the same speed as the last decade, the population of DKI Jakarta is expected to exceed 17 million in 2005. However, in the Structure Plan the population is not to exceed 12 million in 2005 through promoting other regions' development in dispersing the population increase potential around the outside of the Jakarta Metropolitan Area. In order to accommodate the increasing population within the metropolitan area, the suburban areas need to be newly developed by providing urban transportation infrastructure, instead of by urban sprawl relying on existing roads.

Provision of urban transportation infrastructure is essential for not only the residential area development, but also for activity center development in the suburban areas.

Moreover, even when the decentralized multi nucleus urban pattern is established, the urban expansion will still increase trip lengths.

Table 4.2.1 PROJECTION OF POPULATION, 1980 & 2005

	Unit : million persons	
	1980	2005
DKI Jakarta	6.5	12.0
Metropolitan Area outside of DKI Jakarta	1.2	4.9
Jakarta Metropolitan Area	7.7	16.9

INCREASE OF POPULATION AND INCOMES

According to the ARSDS Home Visit Survey 1985, higher income people take more trips than lower income people. When the income level of people rise, this implies that the total person trips will increase more rapidly than the growth rate of population. As described in Chapter 3, the regional development strategy with a high economic growth is selected for this region. This strategy projected the increase in income levels as shown in Table 4.2.2.

Table 4.2.2 POPULATION CHANGE BY INCOME GROUP, 1985 - 2005

Income Group	1985		2005		Growth Rate 1985 - 2005
	('000)	(%)	('000)	(%)	
High Income Group	305	3.9	876	7.3	2.87
Upper Middle Income Group	955	12.2	4,080	34.0	4.27
Lower Middle Income Group	2,850	36.4	6,300	52.5	2.21
Low Income Group	3,719	47.5	744	6.2	0.20
Total	7,829	100.0	12,000	100.0	1.53

Note: This is the high economic growth case of the selected strategy

The growth in income influences the increase of car ownership potential and the actual choice of transportation mode. In the high economic growth case of the selected strategy, the motor vehicle ownership potential is predicted to increase up to approximately 100 passenger automobiles and 270 motorcycles per 1,000 inhabitants in 2005. The existing level of motor vehicle ownership is still low at 40 passenger automobiles and 90 motorcycles per 1,000 inhabitants.

Table 4.2.2 shows that the population of the upper middle income group, who presently are firstly oriented to automobile use and secondly to motorcycle use, will increase the most, and the population of the lower middle income group, who presently are oriented to motorcycle use, if affordable, rather than public transportation, will increase second most. The change in population by income group implies that higher levels of urban transportation services will be demanded by the people in the future.

TRANSPORTATION DEVELOPMENT

The past transportation development relying mainly on road and street development could not catch up with the increased traffic demand in Jakarta. If the existing trend of urban sprawl and car orientation is not changed, it will be impossible to provide enough roads and streets with adequate levels of service to meet the car traffic demand, which is rapidly increasing due to the increase of population, incomes and the urban expansion described above. Once a dispersed urban structure depending on individual transportation modes is established, the urban structure cannot generate enough traffic demand to make medium/mass transportation financially feasible.

4.3 TRANSPORTATION DEVELOPMENT POLICY

Based on the general transportation development policy described in Section 2.5.2 and through consideration of the urban development strategies in Chapter 3, the following transportation policy is recommended.

- a) Transportation services in the metropolitan area should be expanded at a reasonable speed and should be continuously improved.
- b) Homogeneous and continuous transportation services should be prepared over the different administration divisions to secure socio-economic consolidation within the metropolitan area.
- c) The medium/mass transportation required for the future should have a wide enough coverage, a high enough speed and large enough transportation capacity to be competitive with the advantages of individual transportation modes.
- d) The measures to create and attract passengers of medium/mass transportation through urban development and redevelopment should be emphasized in order to increase ridership of mass transportation.

It should be recognized that infrastructure planning only within the transportation sector cannot deal with the future urban traffic demand of a megalopolis such as the Jakarta Metropolitan Area. This point was made clear through the analysis of present urban transportation problems.

- e) A bus system with higher level of services in punctuality, comfort and speed should be provided to attract more passengers from the higher income group.

This is because a medium/mass transportation system in the Jakarta Metropolitan Area is expected to depend on a bus system until 2005 at the earliest, due to the delay in the on-going rehabilitation program and the forthcoming modernization program of the existing railway facilities and system.

- f) Priority measures for the bus system, such as reserved bus lanes and priority bus lanes, should be considered in the case of improvements and new construction of roads and streets, especially for the corridors directly accessing to the Central Area and activity center areas.
- g) Priority should be given to east-west transportation development as one of the necessary infrastructures to induce east and west development. At the same time, additional transportation infrastructure towards the southern areas should not be provided in order to control the limited development in the southern areas.

- h) The design of transportation facilities and services should satisfy users' needs, but should also not incur dissatisfaction of non-users.
- i) Para-transits, such modes with capacity and size of bemos and bajajs should function to supplement the medium/mass transportation system and to reduce individual transportation use in specific areas.

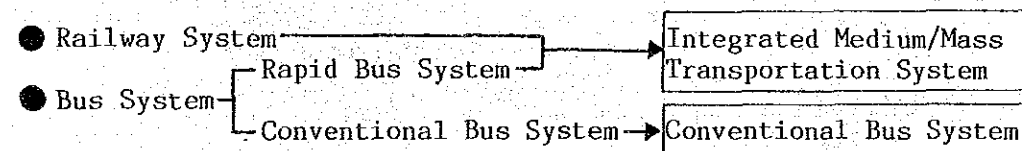
4.4 RECOMMENDED TRANSPORTATION DEVELOPMENT STRATEGY

The transportation development policy should be interpreted into actions. These actions are broadly classified into two categories. One is "facility and system development" and the other is "traffic management". Transportation system development needs to be carried out continuously for the long term, with a proper long term perspective which is based on a comprehensive transportation system. On the other hand, traffic management should deal with the actual existing problems at all times according to the transportation system.

Actions in each transportation system development should be taken in coordination with not only actions in other transportation system developments, but also with urban system development. The transportation development strategy, which will be recommended in this section, is a strategic implementation of actions coordinated among several system developments related to the Jakarta Metropolitan Area.

The system developments related to the Jakarta Metropolitan Area can be categorized in the following way:

Mass Transportation System



Road & Street System

- Primary Road System
- Secondary Street System

Urban System

- Multi Nucleus System
- Multi Corridor System
- Urban Unit System

RECOMMENDED TRANSPORTATION DEVELOPMENT STRATEGY

Each target system for transportation development is recommended in the following sections and the urban system was discussed in Chapter 3. Major points of the recommended strategy are as follows:

- 1) Each transportation system development should support the urban development strategies. First priority should be given to the formation of the east-west development axis. This applies to both the medium/mass transportation system development and the arterial street system development.
- 2) It is important to first establish the major infrastructures required for the long perspective and to later provide the minor infrastructures according to the demand following the progress of development.
- 3) The final target of the medium/mass transportation system development should be an integrated guideway transportation system consisting of the improved existing railway system and the other new guideway transportation system converted from the busway.
- 4) At the initial stage a rapid bus system based on an exclusive busway and reserved bus lane should be developed. To meet this end, Medium/Mass Transportation Corridors and arterial street development is essential.
- 5) To attract enough passengers to the rapid bus system operated on the Medium/Mass Transportation Corridor, development of activity centers and housing in the east and west suburban areas should be promoted. The housing development around railway stations in the suburban areas is a key to increase the ridership of the suburban railway lines.
- 6) Arterial street development in the Central Area should follow the formation of the east-west development axis. The improvement of the existing north-south axis should be tackled as soon as possible and the other existing traffic problems be dealt with by traffic management measures and on-going projects.
- 7) To encourage medium/mass transportation usage, restraint of private automobile use should be conducted together with the arterial street development in the Central Area.
- 8) The on-going freeway system development should be continued in order to relieve the existing congestion.

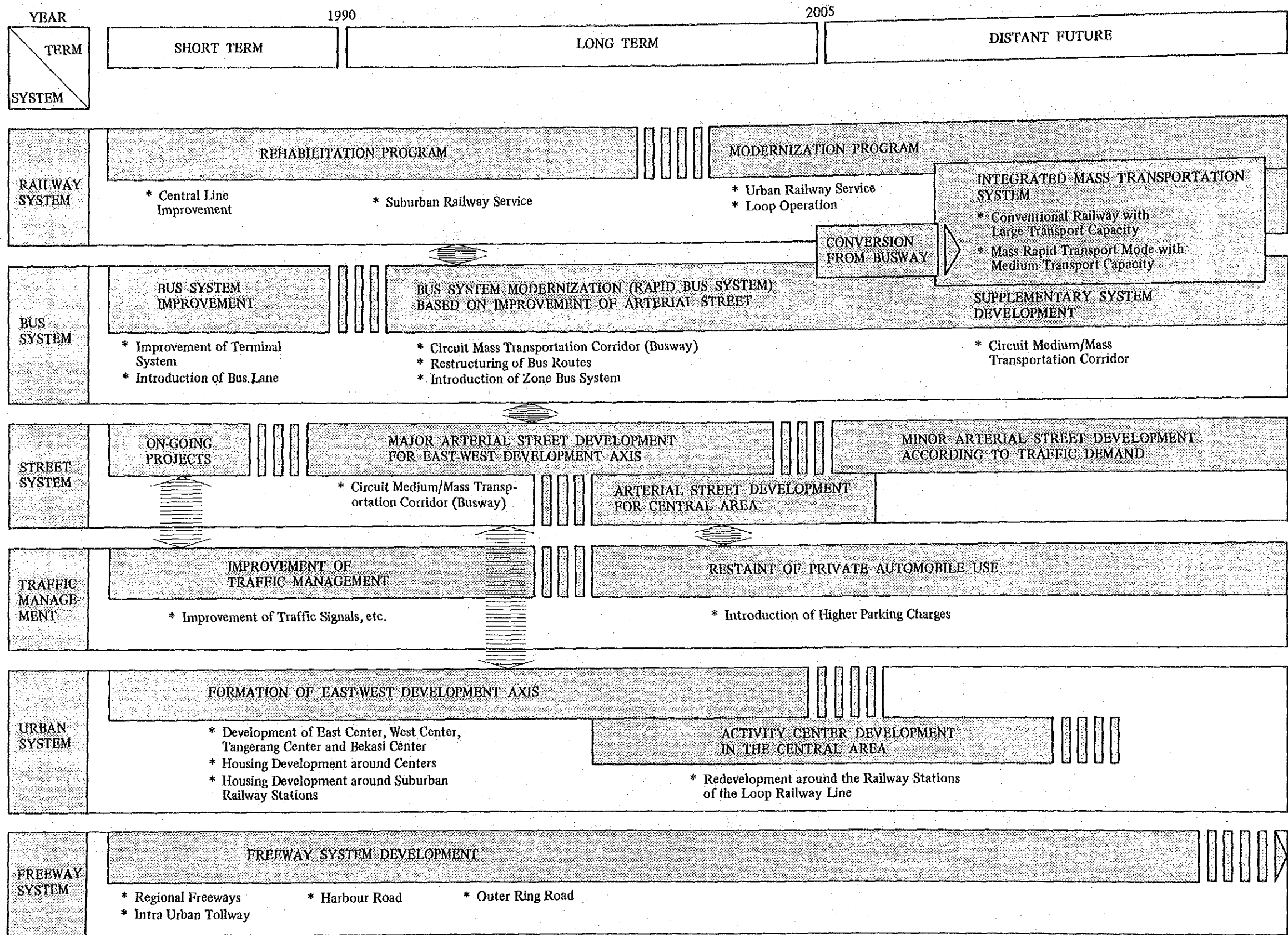


Fig. 4.4.1 RECOMMENDED TRANSPORTATION DEVELOPMENT STRATEGY

4.5 RECOMMENDED TRANSPORTATION SYSTEM

4.5.1 PRIMARY ROAD NETWORK SYSTEM

DEFINITION OF PRIMARY ROAD

In 1985 the Department of Public Works of the Indonesian Government published a regulation on roads that included a new definition of the primary road system for regional development at a national level in place of the old definition of the primary road system for major goods movements. The new definition states that the primary roads should be provided for (1) metropolitan-wide goods and person movement from first level city to second level city and from second level city to third level city within the Jakarta Metropolitan Area, as well as for (2) regional movement between the Jakarta Metropolitan Area and other regional development units.

FREEWAY SYSTEM

The Jakarta Intra Urban Tollway, the Harbor Road, the Outer Ring Road and the three regional freeways, which are supposed to be operated as tollways, compose the so-called Jakarta Metropolitan Freeway System which connects the major primary functions. The freeway system is one of the major elements of the primary road network system in the Jakarta Metropolitan Area.

RECOMMENDED PRIMARY COLLECTOR ROAD

Since first priority is to be given to east-west Development in the Jakarta Metropolitan Area, secondary arterial streets, in addition to primary arterial roads, should be provided to connect Tangerang and Bekasi to Jakarta. However, since continuous urbanization in the southern limited development area is prohibited, the following primary collector roads corresponding to (1) previously described, will play important roles in regional goods and person movement and in metropolitan-wide bus and individual transportation:

- * Tangerang - Serpong Road
- * Bekasi - Cileungsi Road
- * Tambun - Cileungsi Road

RECOMMENDED BY-PASS ROAD

In the east and west regional corridors and in the northern Jakarta corridor, primary arterial road truck routes should be provided along the northern boundaries of the development zones to achieve separation from those arterial streets which are mainly for person movement. This corresponds to (2) previously mentioned above. The recommended primary road network contains the following new by-pass roads for attaining this purpose:

- * Tangerang By-pass Road
- * Kota By-pass Road
- * Bekasi By-pass Road

4.5.2 CARGO TRANSPORTATION TERMINAL SYSTEM

At the present time, cargo transportation is obliged to accept a low level tariff controlled by the national government, and large truck operations are regulated by route and time band in order to avoid influencing urban transportation in large cities. Under these circumstances no modern cargo transportation system has yet to be established. However, in order to support future industrial development, cargo transportation will need rationalization and systematization based on an efficient primary road network throughout the nation with cargo terminals around the cities.

TRUCK POOLS

The eleven truck pools that are planned to be constructed will be temporarily used until cargo terminals are introduced. However, a certain number of truck pools in industrial and warehouse areas will still be needed after the introduction of cargo terminals in order to avoid the long time road side parking caused by large truck operation regulations in Jakarta.

CARGO TERMINALS

Regulation of large truck operations within Jakarta should be continued in the future so as to preserve good urban environments and to avoid further congestion which would make cargo delivery by large trucks more inefficient. In order to cope with these situations and to rationalize cargo transportation, system separation between intra-urban cargo delivery and inter-urban cargo delivery is recommended. Cargo terminals are facilities connecting intra-urban cargo delivery by small trucks with the inter-urban cargo delivery by large trucks.

In the Jakarta Metropolitan Area, five cargo terminals are recommended to be located along the regional corridors outside the Outer Ring Road. The location of the East cargo terminal and the Bintaro cargo terminal are oriented toward both railway cargo and truck cargo, as shown in Fig. 4.5.1.

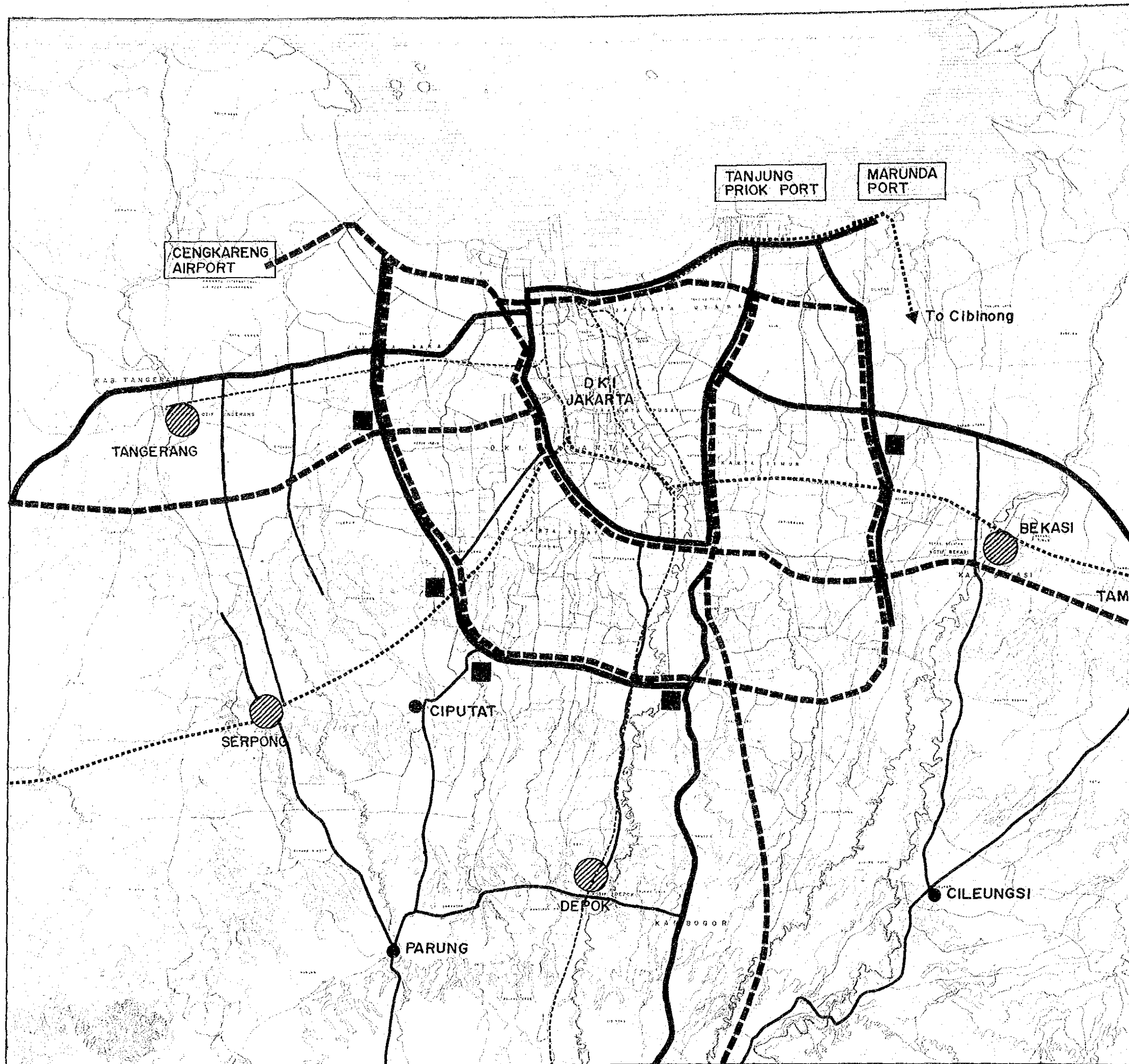
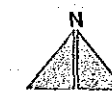


Fig. 4.5.1
RECOMMENDED PRIMARY ROAD
NETWORK AND CARGO
TRANSPORTATION SYSTEM

- LEGEND :**
- NETWORK SYSTEM COMPONENT**
- : Primary Arterial Road : Freeway
 - : Primary Arterial Road
 - : Primary Collector Road
- CARGO TERMINAL**
- : Inter-regional Cargo Terminal
- KEY FACTORS FOR NETWORK AND TERMINAL SYSTEM**
- : First Level Primary Function
 - : Second Level City
 - : Third Level City
 - : Railway Line for Cargo and Passenger
 - : Railway Line for Passenger



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4.5.3 SECONDARY STREET NETWORK SYSTEM

The recommended secondary street system in the Jakarta Metropolitan Area is designed to provide service mainly for person movement within the area, rather than for traffic passing through the area or for rural oriented traffic. The secondary street system is based on the primary road system supporting goods and regional movement.

GENERAL CLASSIFICATION OF ARTERIAL STREETS

The overall secondary street system is designed to be composed of the arterial street system, the collector street system and the local street system. The collector street system differs from the arterial street system in that facilities on the collector system may penetrate neighborhoods and distribute trips from the arterial streets through the area to the ultimate destination, which may be on a local or collector street. The collector street collects traffic from local streets in the neighborhood and channels it into the arterial street system.

This system development serves the purposes of efficiently using street space and improving the environment by excluding through traffic in each urban unit. These purposes can't be achieved unless the arterial street system, the collector street system and the local street system are all properly located and developed. The system development of collector and local streets is dealt with in the context of urban unit development in Section 6.4.3. The secondary arterial street network system is described in Table 4.5.1.

Table 4.5.1 SECONDARY ARTERIAL STREET NETWORK SYSTEM

Functional Classification	Characteristics of Mobility and Access
Arterial Street	- Mainly serving through traffic, rather than land access
Collector Street	- Both land access and mobility functions are well balanced - Generally not to allow through traffic - To connect local streets to arterial streets - To only allow connection between adjacent urban units
Local Street	- Primarily to maintain land access function - To connect with collector streets - Not favorable to connect directly with arterial street

SPACING OF ARTERIAL STREETS

The required spacing of secondary arterial streets varies according to the area's landuse; it is closely related to trip-end density characteristics in the highly developed Central Area and also to the

access distance to arterial streets in residential areas. A recommended guideline for spacing of arterial streets is shown in Table 4.5.2 and is applied to the networking of arterial streets. The spacing of 0.5 km in the Central Area was checked according to transportation capacity and trip-end density.

Table 4.5.2 GUIDELINE FOR SPACING OF ARTERIAL STREETS

Area Classification	Spacing	Remarks
Urban Area	- Central Area	0.5 km
	- Other Urban Areas	1.0 km
Suburban Area	2.0 km	If the area is highly developed, 1.0 km may be adopted

Note: The Central Area is the area enclosed by the Loop Railway Line. The other urban areas are the urban areas outside the Central Area. The suburban area is outside of the Jakarta Intra Urban Tollway.

RECOMMENDED SECONDARY ARTERIAL STREET NETWORK SYSTEM

The secondary arterial street network system in the Jakarta Metropolitan Area should be composed of major arterial streets, minor arterial streets and Medium/Mass Transportation Corridors as shown in Fig. 4.5.2. As described in Chapter 3, the Multi Corridor System of arterial roads and streets is essential to induce development of activity centers and residential areas in a multi nucleus urban pattern in the east and west development zones, because provision of arterial roads and streets is always a central component of any strategy to guide urban development. Conversely, providing no arterial streets connecting the southern limited development zone to the Jakarta urban areas is regarded as an important tool to restrict southern urban sprawl.

The major arterial streets should serve the activity centers, the highest traffic volume corridors, and the longest trip desires within the metropolitan area. The major arterial streets should carry a high proportion of the total urban area travel in minimal mileage. In addition, significant intra-area travel, such as between the Central Area and outlying residential areas, between major inner city communities, or between suburban activity centers, should be served by major arterial streets.

The minor arterial streets should interconnect with and support the major arterial streets and provide service to trips of moderate length at a somewhat lower level of speed than major arterial streets.

In addition, considering the transportation development policy "establishment of the predominant role of medium/mass transportation", it is recommended that the arterial street system should contain corridors, connecting suburban areas to the Central Area, which have higher capacities for rapid medium/mass passenger transportation than other arterial streets. The major and minor arterial streets should have local bus routes to the Medium/Mass Transportation Corridor.

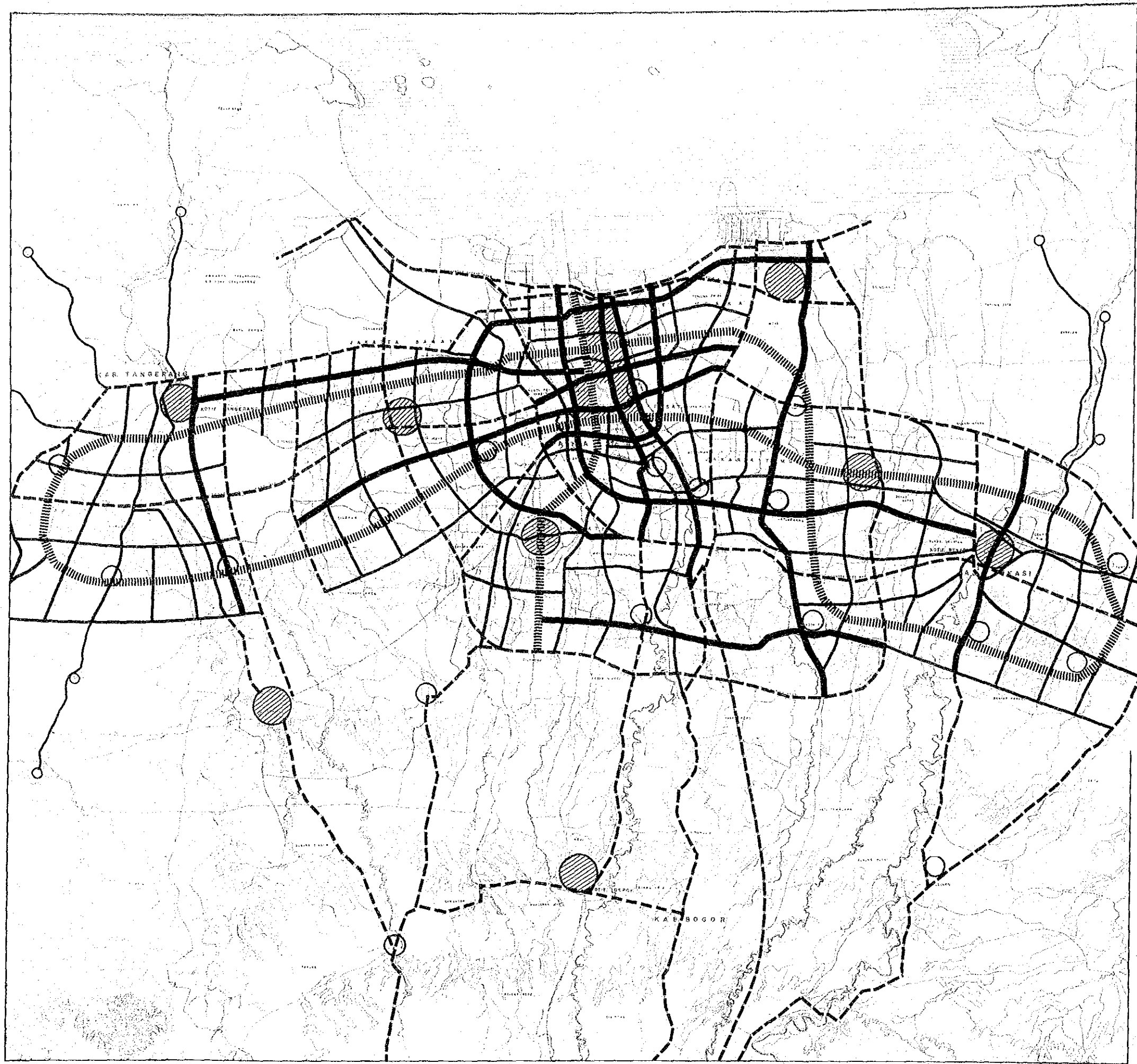



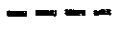
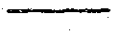
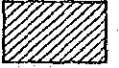





Fig. 4.5.2
RECOMMENDED SECONDARY ARTERIAL STREET NETWORK

- LEGEND :**
- NETWORK SYSTEM COMPONENTS**
-  : Mass Transportation Corridor (Busway + Arterial Street)
 -  : Secondary Major Arterial Street
 -  : Secondary Minor Arterial Street
- OTHERS**
-  : Primary Road
 -  : Rural Road
- KEY FACTORS FOR NETWORK SYSTEM**
-  : Metropolitan Center
 -  : Sub Center
 -  : Secondary Center
 -  : Rural Center



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4.5.4 BUS NETWORK SYSTEM

Due to the delay in the rehabilitation and modernization program of the existing railway facilities and systems, the bus system will have to play a predominant role for at least the next twenty years to achieve the transportation development policy of "Establishment of the predominant role of medium/mass transportation". The bus system will have to become a basic trunk transportation with a wide coverage and with a high volume public transportation capacity. In consideration of this situation, the rapid bus system consisting of an exclusive busway and reserved bus lanes is recommended for the year 2005 as a transitional system until the integrated medium/mass transportation system is established on a separated track consisting of the existing railway and the new guideway system recommended. The recommended bus network system cannot be established unless the arterial street network is properly located and developed.

RECOMMENDED BUS NETWORK SYSTEM

- 1) In the Jakarta Metropolitan Area, except for the southern limited development zone, the line-haul services from suburban areas to the Central Area should be operated through reserved bus lanes (curb lanes for bus priority) or exclusive busways (busway on separated right-of-way from arterial streets) in the Medium/Mass Transportation Corridors. The line-haul bus routes using these Medium/Mass Transportation Corridors start from activity centers in the suburban areas or from terminals near the Outer Ring Road and go to certain points in the Central Area. The bus routes from activity centers in the southern limited development zone are carried on primary roads outside the Outer Ring Road and on the Medium/Mass Transportation Corridors or reserved bus lanes inside of the Outer Ring Road.
- 2) The Central Area should be served by the zone bus system which operates bus routes with short lengths terminating at station plazas on the loop railway line. The zone bus system should cover the feeder services for the line-haul services of the Medium/Mass Transportation Corridors, the suburban railway lines and intra-travel within the Central Area. In the urban area enclosed by the Intra Urban Tollway, the bus terminal system should not be adopted so as to avoid traffic congestion around terminals caused by the concentration of bus routes.
- 3) Intra-travel within suburban areas should be covered by bus routes operating between activity centers in order to ensure accessibility to suburban activity centers from outlying residential areas and to encourage the activities of the centers. In suburban areas the bus terminal system should be adopted to accommodate bus routes terminating at activity centers. However, the bus terminals should be equipped with passenger platforms and bus stopping facilities, but not with bus parking facilities.

- 4) The urban areas outside of the Central Area and inside of the Intra Urban Tollway should be covered by the bus routes carried on the Medium/Mass Transportation Corridors and reserved bus lanes.
- 5) The access to arterial bus routes in suburban residential areas should be served by para-transit operations such modes with capacity and size of bemos and bajajs. (Refer to Section 6.4)
- 6) Inter-city buses should be operated separately from intra-city and metropolitan-wide bus services. Inter-city bus routes should connect to intra-city and metropolitan-wide bus routes at inter-city bus terminals located in the regional corridors near the Outer Ring Road. The inter-city terminals would need large bus parking space in addition to bus stopping facilities and passenger platforms.

MEDIUM/MASS TRANSPORTATION CORRIDOR

The Medium/Mass Transportation Corridor at the initial stage is recommended to have a joint right-of-way of busway and arterial streets. The right-of-way of the busway is designed to be convertible into a guideway system with a higher capacity and a higher speed.

Development of the Medium/Mass Transportation Corridors can avoid the following two basic difficulties with Rail transit on separated right-of-ways. First, the minimum capacity of any type of rail transportation system is very large while costs of construction is inevitably high. Secondly, the difficulty is that rail transportation systems are constrained in the sense that once a route has been developed, it is fixed in location and in the type of traffic. The capital costs for Medium/Mass Transportation Corridors with busways, or all day reserved bus lanes, are much less than those for heavy railway or light railway systems. Bus transportation using the Mass Transportation Corridors has flexibility of operations, while railway or other fixed guideway systems do not.

The rapid line-haul bus service with high-volume public transportation capacity provided by the Medium/Mass Transportation Corridors with busways, or all day reserved bus lanes, is essential to attract higher income passengers and to reduce private automobile use. In the east and west development zones, the Multi Corridor System and the Medium/Mass Transportation Corridors with busways can be expected to induce development of activity centers and residential areas in a multi nucleus pattern along the two corridors to attract not only medium and lower income families, but also higher income families.





In addition to the Medium/Mass Transportation Corridors with busways, or reserved bus lanes at all times, reserved bus lanes during peak hours should be provided on selected arterial streets to enforce the arterial bus network in the urban areas, as shown in Fig. 4.5.3.

Freeways can be used for operating express bus services. Express bus services may consist of (1) direct nonstop connection between suburban activity centers and the Central Area by regional freeways, and (2) using local routes on parallel streets for collecting passengers, the buses can enter the freeway for the express run and distribute passengers on local streets.



Fig. 4.5.3
RECOMMENDED BUS SYSTEM

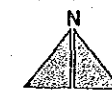
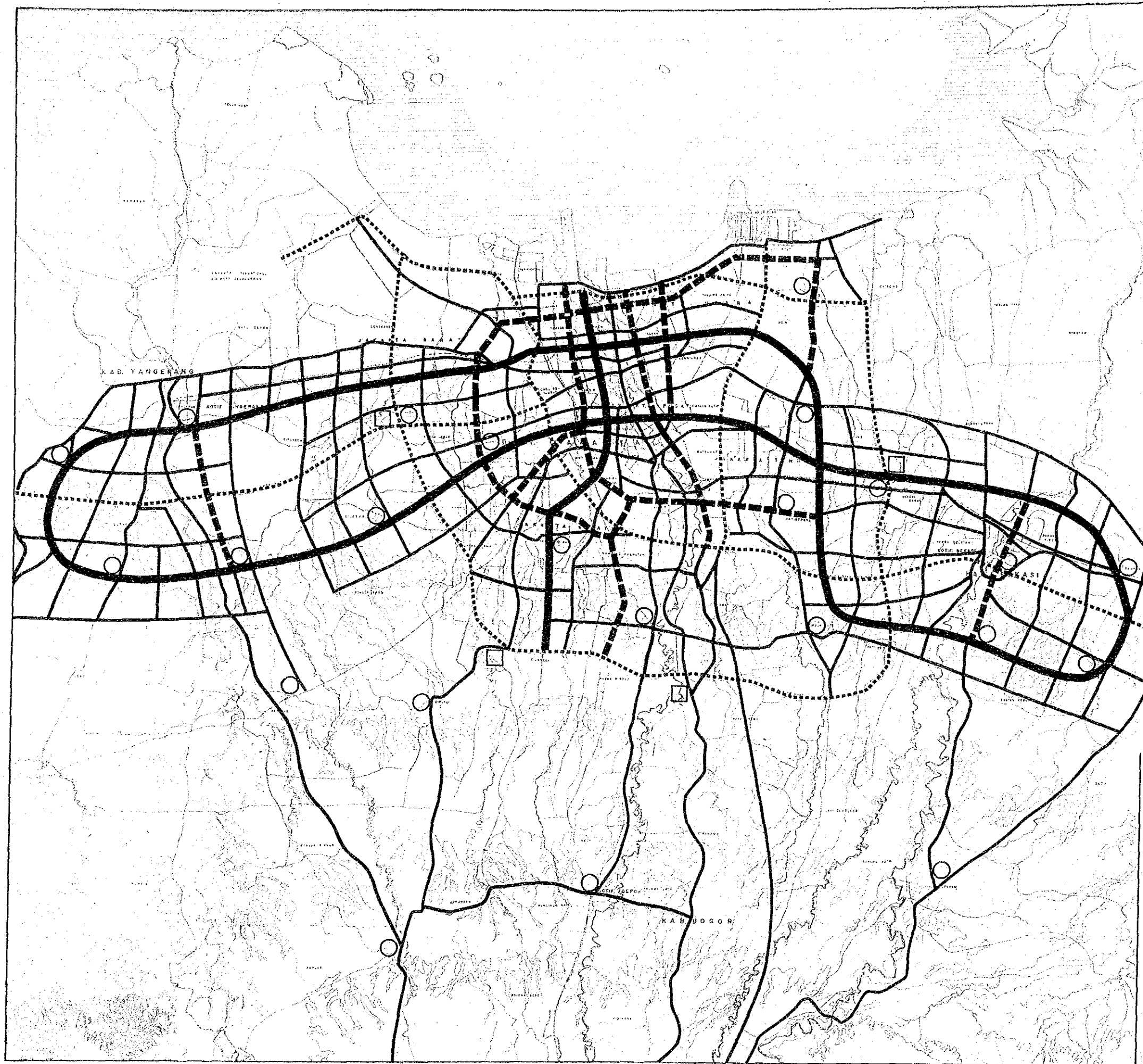
LEGEND :

Major Bus Operation Roads & Streets

-  : Mass Transportation Corridor with Busway or All Day Reserved Bus Lane
-  : Arterial Street with Reserved Bus Lane during Peak Hours
-  : Road & Street without Reserved Bus Lane during Peak Hours
-  : Freeway with Express Bus Service

Bus Terminal

-  : Inter-city Bus Terminal
-  : Activity Center Bus Terminal



**ARTERIAL ROAD SYSTEM
DEVELOPMENT STUDY
IN JAKARTA METROPOLITAN AREA**