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JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF PUBLIC WORKS

REPUBLIC OF INDONESIA

**THE FEASIBILITY STUDY
ON
URBAN ARTERIAL ROAD SYSTEM
DEVELOPMENT PROJECT
IN
JAKARTA METROPOLITAN AREA**

FINAL REPORT

SUMMARY

JANUARY, 1995

**PACIFIC CONSULTANTS INTERNATIONAL
YACHIYO ENGINEERING CO., LTD.**

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国際協力事業団

27628

Note

The exchange rates used in the Study are:

\$1.00 = Rp.2,150 = JY100

JY1.0 = Rp.21.5

(as of the end of August 1994)

Preface

In response to a request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct a Feasibility Study on Urban Arterial Road System Development Study in Jakarta Metropolitan Area and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Indonesia a study team headed by Mr. Nobuwaka Yamakawa, Pacific Consultants International (PCI), and composed of members of PCI and Yachiyo Engineering Co., Ltd. (YEC), three times between April, 1993 and October, 1994.

The team held discussions with the officials concerned of the Government of Indonesia and conducted field surveys and studies at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

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

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

January, 1995



Kimio Fujita
President

Japan International Cooperation Agency

THE FEASIBILITY STUDY ON URBAN ARTERIAL ROAD SYSTEM
DEVELOPMENT PROJECT IN JAKARTA METROPOLITAN AREA

January, 1995

Mr. Kimio Fujita
President
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

Dear Sir,

We are pleased to submit you the final report entitled "THE FEASIBILITY STUDY ON URBAN ARTERIAL ROAD SYSTEM DEVELOPMENT PROJECT IN JAKARTA METROPOLITAN AREA".

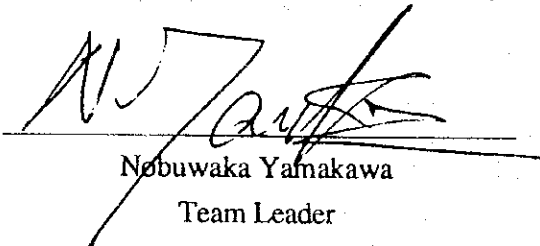
This report has been prepared by the Study Team in accordance with the contracts signed on March 5, 1993, November 15, 1993 and June 10, 1994 between Japan International Cooperation Agency and Pacific Consultants International/Yachiyo Engineering Co., Ltd.

The report examines the existing conditions in DKI Jakarta and surrounding area concerning traffic and transportation, systems, reviews the structure plans and other plans, analyses them and presents the results of a feasibility study.

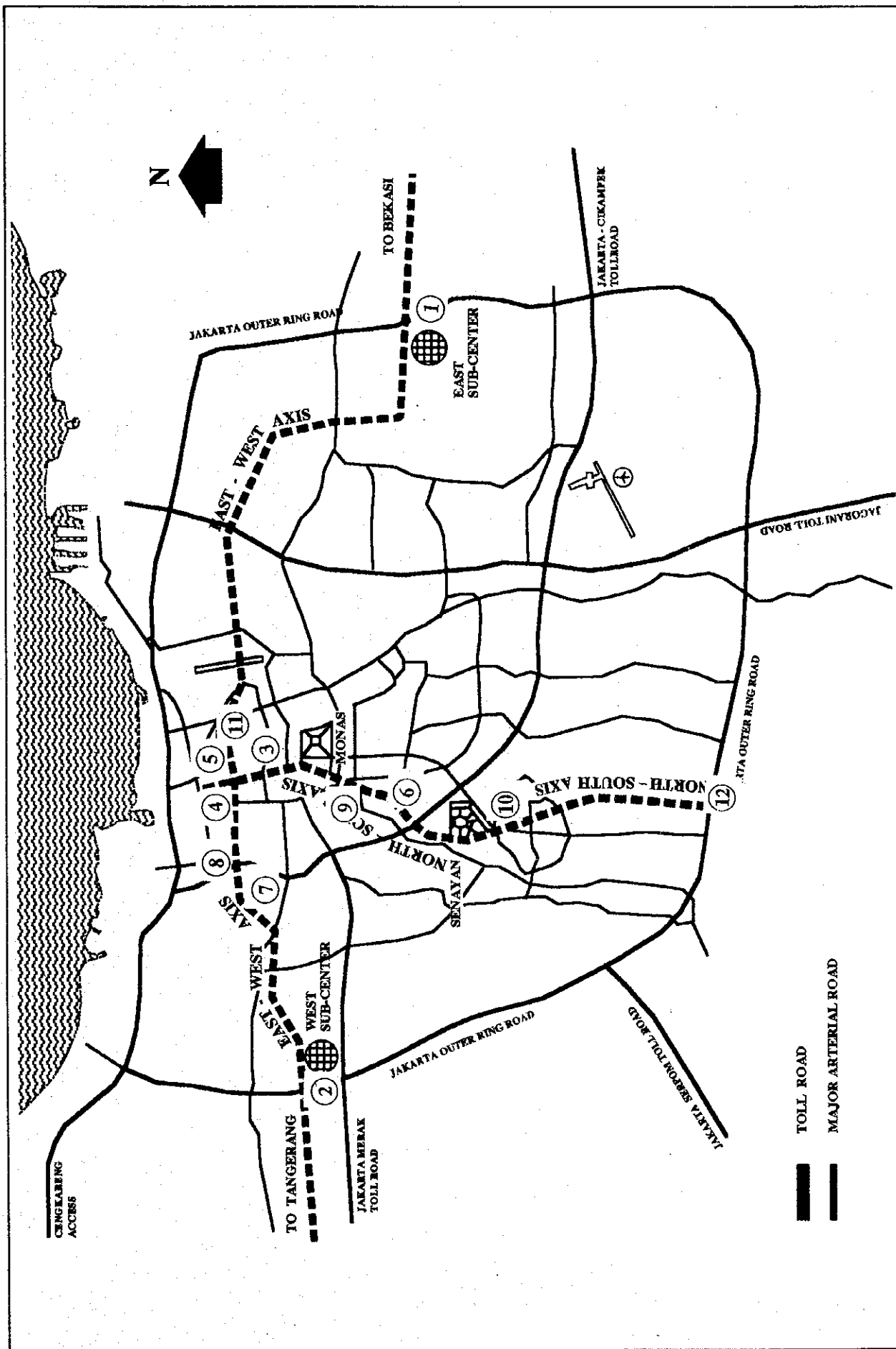
The report consists of Summary, Text, Appendix and Drawings. The Summary summarizes the results of all studies. The Text presents the results of whole study. The Drawings presents the preliminary engineering designs.

All member of the Study Team wish to express grateful acknowledgment to the personnel of your Agency in Tokyo and in Jakarta, Advisory Committee, Embassy of Japan in Jakarta, and also to officials specially the member of Steering Committee and counterparts of the Government of Republic of Indonesia for their assistance extended to the Study Team. The Study Team sincerely hopes that the results of the study contribute to the realization of the projects.

Yours faithfully,



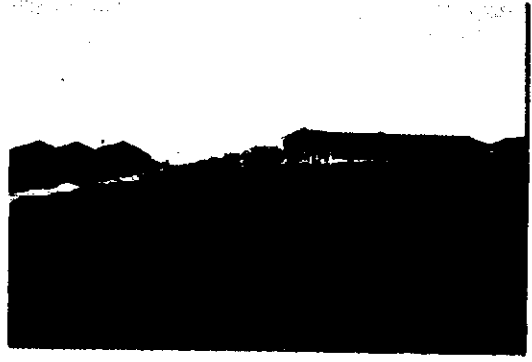
Nobuwaka Yamakawa
Team Leader



PROJECT LOCATION MAP



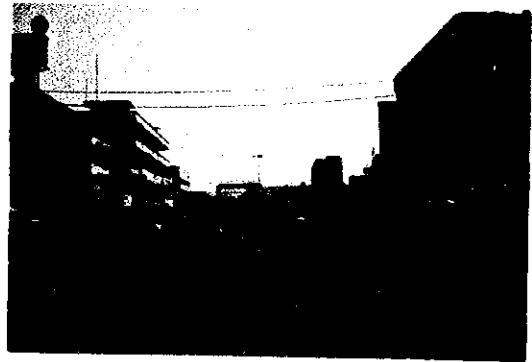
① East Primary Center



② West Primary Center



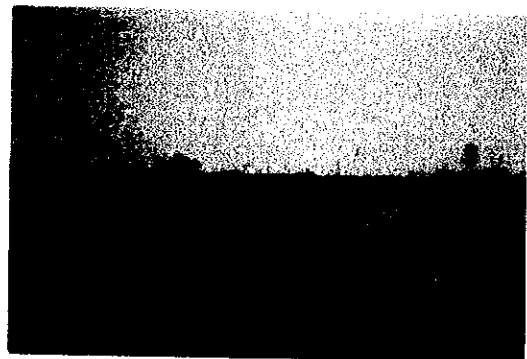
③ Congested Jl. Gajah Mada and Kali Ciliwung



④ Jl. Mangga Besar heading to Mangga Besar Extension



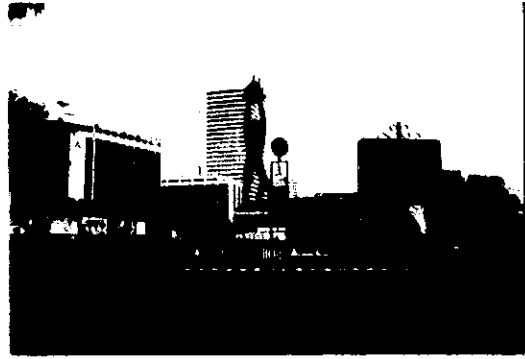
⑤ Elevated Central Railway Line crossing Jl. Mangga Besar



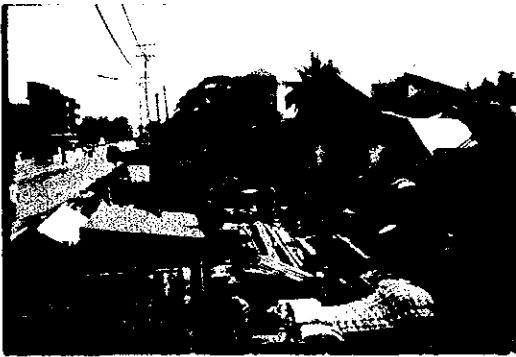
⑥ Kali Malang/Banjir Kanal



⑦ Tangerang Railway Line



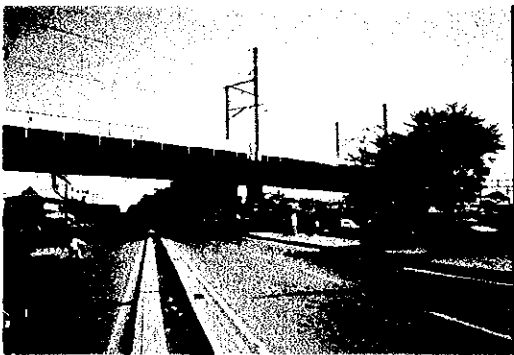
⑧ Senayan Statue



⑨ Land Acquisition on Jl. Jati Baru



⑩ Evacuation on Northern Extension of S-W Arc



⑪ Steel Box Girder fabricated in Indonesia



⑫ Construction of Jakarta Outer Ring Road

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1. INTRODUCTION

1. INTRODUCTION

1.1 Background

DKI Jakarta, the capital of Indonesia, is among the largest cities in the world that will have 11.2 million population in 2010. It results in growing 1.55% p.a. and 1.4 times as much as 8.2 million in 1990 census. Growth is more outstanding in Jabotabek as a whole. Tangerang and Bekasi, for example, are expected to have 4 times more population and 3.4 times more job opportunities for the coming two decades. Even though it continues to expand her urbanized area toward its surrounding, especially for east and west fringe of the city based on the development policy of Jabotabek Metropolitan, DKI Jakarta still retains the hub of financial, commercial and administrative activities in Indonesia.

Rapid expansion of social and economic activities stimulates motorization in the urban area and resultingly chronic traffic congestion takes place on major arterial streets in the central business districts as well as on radial roads in the suburbs.

To cope with such traffic situation in Jakarta, the Government of Indonesia has been implementing the various measures such as the expansion of one way traffic controlled area, increase of intersection with no right turning, application of exclusive bus lane and 3 in 1 regulation in the CBD as short term schemes. The Government also has medium and long term improvement plans to construct toll roads and flyovers, to improve the existing railway for commuters and to introduce Light Rail Transit (LRT) system.

The Feasibility Study on Urban Arterial Road System Development Project in Jakarta Metropolitan Area (hereinafter referred as "the Study"), which was one of the major recommendations from Arterial Road System Development Study in Jakarta Metropolitan Area conducted by JICA in 1987 (hereinafter referred as "ARSDS"), aims at formulating a basic road development plan for the North-South Axis and the East-West Axis and examining the feasibility of selected priority sections of the axes.

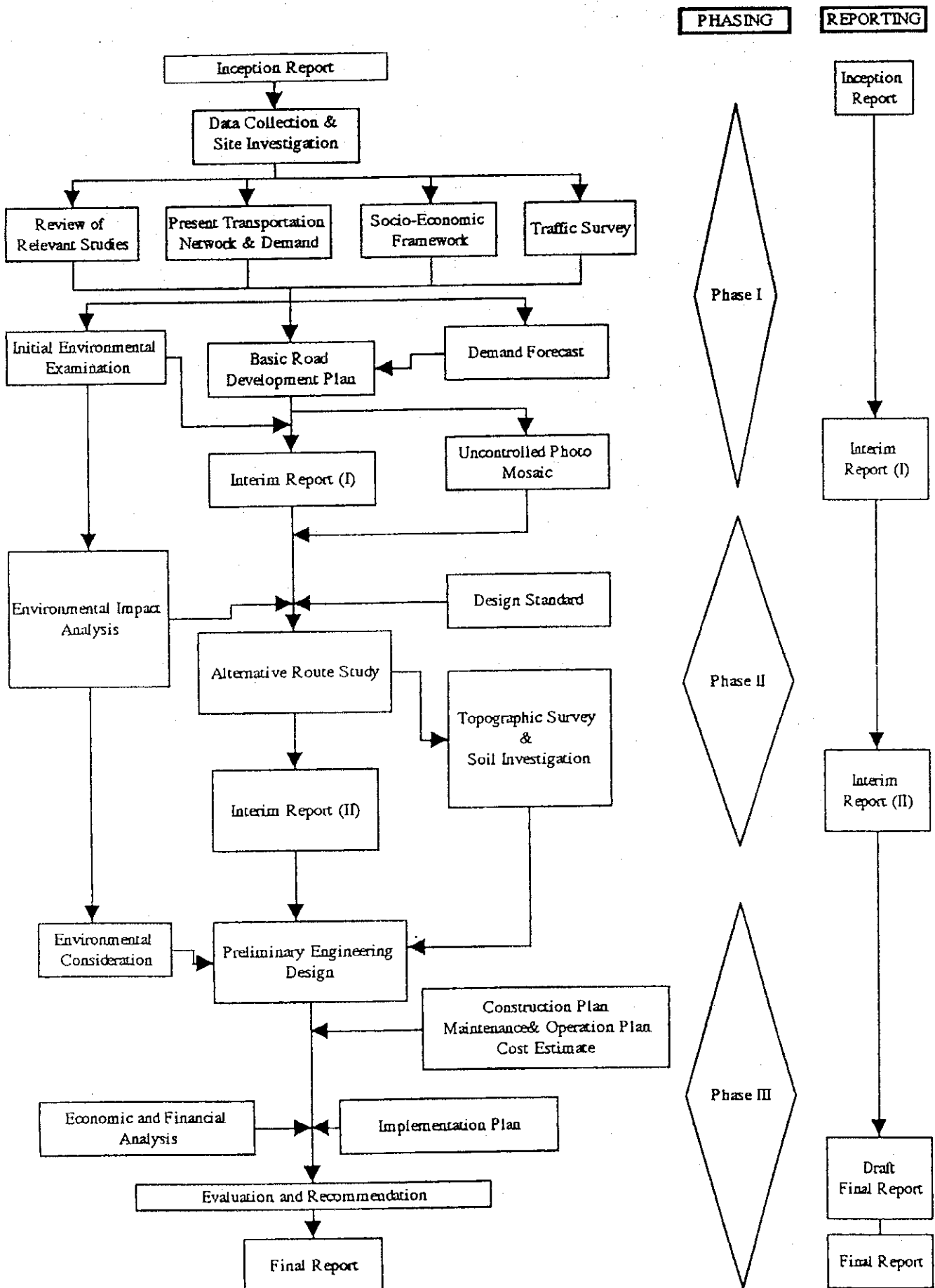
1.2 Study Objectives and Approach

The Study conducted under the above condition is comprised of the following major components :

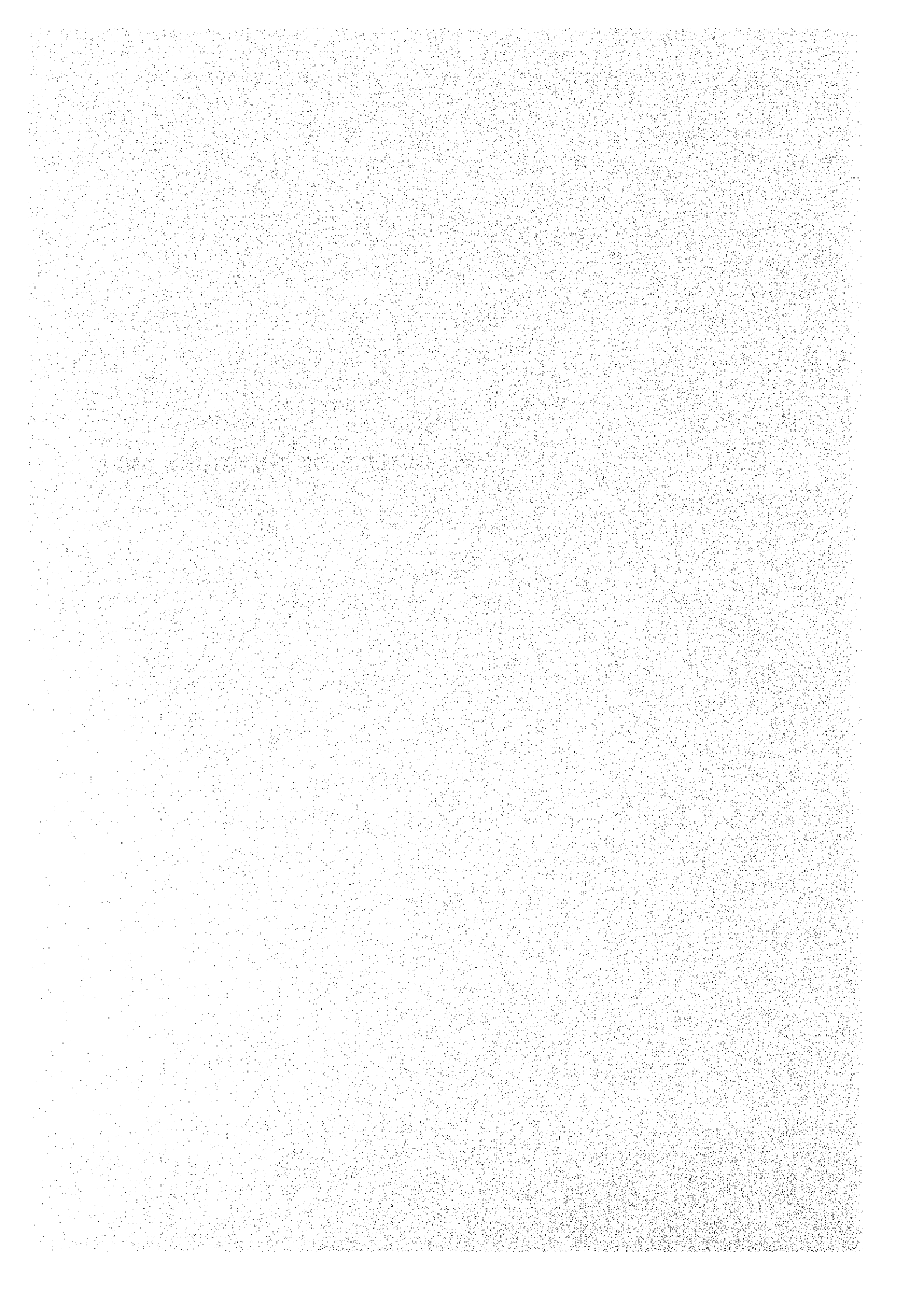
- (1) to formulate a basic road development plan for the East-West corridor between Tangerang and Bekasi (approximately 70 kilometers in length) and North-South corridor between Harbour Road and Outer Ring Road (approximately 20 kilometers in length) in Jakarta Metropolitan Area, and to select priority sections of the two corridors; and
- (2) to carry out a feasibility study on the selected sections of the said corridors.

The study approach and phasing are presented in Fig. 1.1.

Fig. 1.1 Study Approach and Phasing



2. OUTLINE OF THE STUDY AREA



2. OUTLINE OF THE STUDY AREA

2.1 Present Socio-Economic Conditions

- 1) DKI Jakarta is enclosed by West Java province which is further divided into 20 Kabupaten (Regencies) and 4 Kotamadya (Municipalities) each of which possesses the same second level of autonomy (Tingkat II). Jabotabek consists of DKI Jakarta, Kab. and Kod. Bogor, Kab. Kod. Tangerang and Kab. Bekasi.

DKI Jakarta as the capital city (province) is so dominant that the existing urban development of Jakarta is expanding over her administrative boundary into Botabek Region. In order to overcome the administrative discrepancy between DKI Jakarta and West Java province and to create a comprehensive development plan for Jabotabek, the Jabotabek Development Coordination Board (BKSP Jabotabek) was established by Presidential Decree No. 13 in 1976.

- 2) Jakarta's urbanization has been geographically developed in the north-south direction as its natural environs allow. A rapid urban growth and population concentration into the central Jakarta brought adverse influence to environment. This eventually caused, in the northern Jakarta, settlement, frequent flooding/inundation and penetration of brackish water into the ground water. It was finally determined by the government, as the result of Jabotabek Metropolitan Plan study, to encourage the development in the east-west direction rather than the north-south direction.
- 3) As proved by the comparison of 1980 and 1990 census results, the population has grown at a higher speed not only in the east and west Jakarta but also south Jakarta and its fringe area of Botabek. In the CBD, the land use has varied rapidly from housing to business offices, and thereto more commuters are attracted accordingly.
- 4) The 1985 home interview survey revealed that a travel pattern of "To Work" purpose is concentrated to following five (5) traffic zones;

Glodok (North Kota)
Cideng (South Kota)
Gambir (Monas)
Menteng, and
Kebayoran Baru (Blok M)

Excluding Kebayoran Baru zone, remaining four (4) zones as shown in Fig. 2.1 are defined as the CBD in DKI Jakarta.

The comparison of 1980 and 1990 census results indicates that population in these zones were decreased, and many of highrise buildings are construction along major arterial roads of these zones; and also their adjacent zones. Therefore, it will be certain to conceive that the commuting demand to these zones has been lasting in a rising trend, and to define it as

Fig. 2.1

DEFINITION OF
CORRIDOR STUDY AREA

LEGEND:

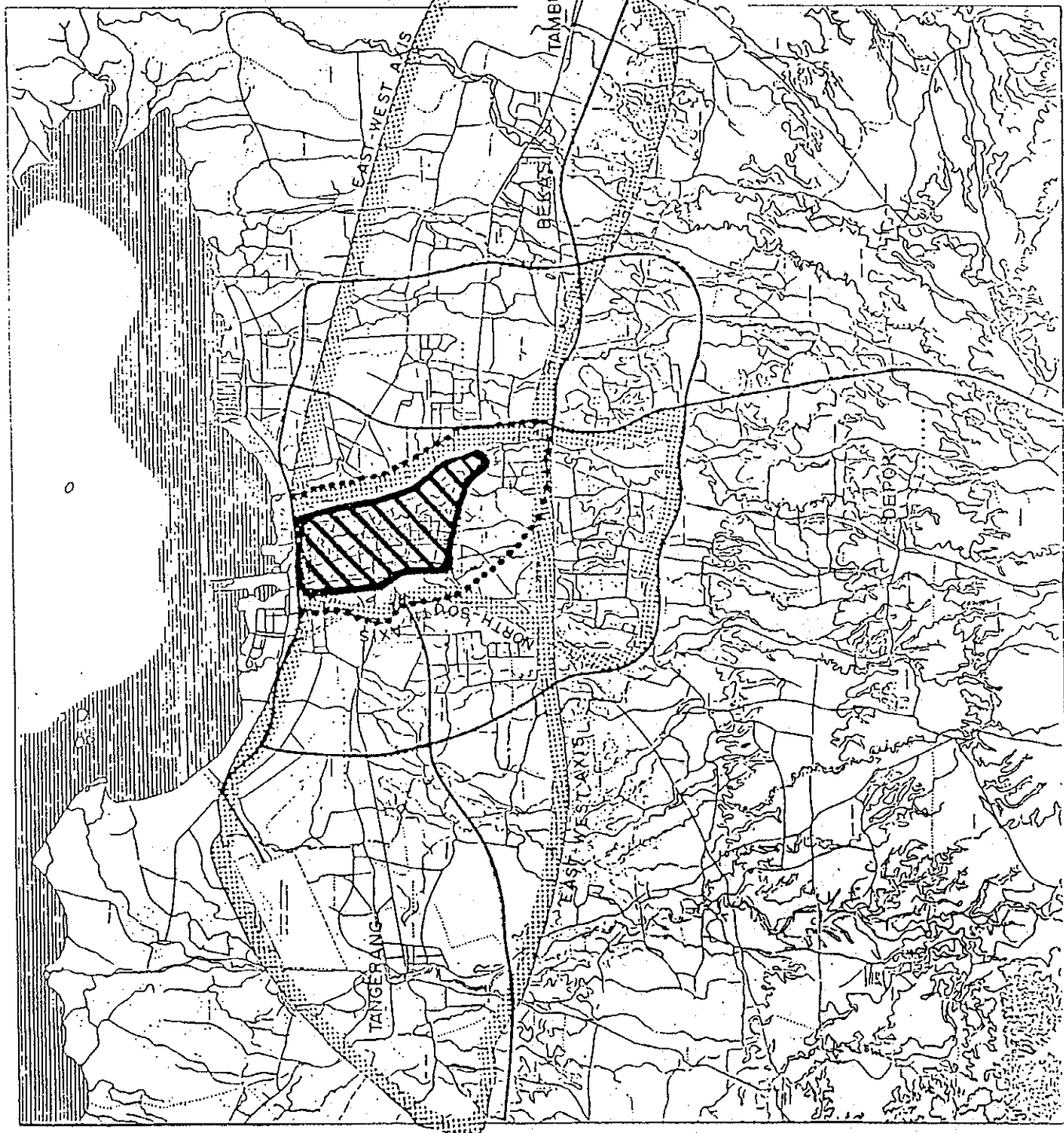
— TOLLWAY



Central Business District
(CBD) in DKI Jakarta



FEASIBILITY STUDY ON
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the CBD. This can be confirmed by estimated 1993 OD matrix and verified by screen line traffic volumes.

- 5) In Botabek and Jabotabek the population growth rate from 1980 to 1990 shows 4.9% and 3.6%, respectively (Table 2.1), trends which suggest that Botabek could have around 18 million and Jabotabek as a whole could possibly have as much as 29 million inhabitants in the year 2005.

Table 2.1 Population in Jabotabek

Unit : 1,000 persons, (%)

Region	Area km ²	Population Census		
		1971	1980	1990
DKI Jakarta	655.7	4,579 (54.9)	6,503 (54.6)	8,210 (48.4)
Botabek	5,924.7	3,761 (45.1)	5,413 (45.4)	8,746 (51.6)
Bogor	3,380.7	1,863 (22.3)	2,741 (23.0)	3,949 (23.3)
Tangerang	1,259.8	1,067 (12.8)	1,529 (12.8)	2,724 (16.1)
Bekasi	1,284.2	831 (10.0)	1,143 (9.6)	2,073 (12.2)
Jabotabek	6,580.4	8,340 (100%)	11,916 (100%)	16,956 (100%)

Region	Density 1990 Persons/ha	Annual Growth Rate (%)	
		1971/1980	1980/1990
DKI Jakarta	125.2	4.0	2.4
Botabek	14.8	4.1	4.9
Bogor	11.7	4.4	3.7
Tangerang	21.6	4.1	5.9
Bekasi	16.1	3.6	6.1
Jabotabek	25.8	4.0	3.6

Source : Sensus Penduduk Jawa Barat 1971, 1980 & 1990

- 6) A population movement took place between the census of 1971 and that of 1980 whereby the residential population of the central area of DKI Jakarta decreased, while simultaneously the population in the outskirts and fringe areas surrounding DKI Jakarta, especially in the south and south-western areas steeply increased.
- 7) Commuters from Botabek to Jakarta in 1993 was estimated at 277,800 persons per day (Table 2.2), which was 4.1 times as much as those in 1985. Commuters from Bekasi has increased distinctively compared to the other two directions.

Table 2.2 Commuters between DKI Jakarta and Botabek

Direction		1985	1993	Growth
From	To	(Persons/day)	(Persons/day)	93/85
Bogor	Jakarta	27,100	102,500	3.78
Tangerang	Jakarta	20,866	74,800	3.58
Bekasi	Jakarta	19,825	100,500	5.07
Total to Jakarta		67,791	277,800	4.10
Jakarta	Bogor	10,883	32,100	2.95
Jakarta	Tangerang	9,512	29,900	3.14
Jakarta	Bekasi	8,418	28,300	3.36
Total to Botabek		28,813	90,300	3.13

Net In-Commuters to Jakarta from	1985	1993	Growth 93/85
Bogor	16,217	70,400	4.34
Tangerang	11,354	44,900	3.95
Bekasi	11,407	72,200	6.33
Total from Botabek	38,978	187,500	4.81

Source : ARSDS and analysis result of 1993 traffic count survey.

Commuters to Botabek in 1993 was about one-third of those to Jakarta, and they grew directionally, more or less, even about 3 times as much as those in 1985.

Net in-commuters to Jakarta indicates the balance of job opportunities and employed population either in DKI Jakarta or Botabek.

- 8) The regional economic growth is relatively high in Sumatra compared to Java and other major islands in terms of non-oil/gas products. Inside Java island, West Java province keeps the highest growth, among other four provinces, which averages 8.0% p.a. during 1984-1990. Jakarta's average growth was incidentally the same as Indonesia's (6.8% p.a.) over the period 1984-1990, and being improved in the late 1980s.

Regional shares of GDP remain almost the same, in terms of non-oil/gas products at current price comparison, showing a dominant share of Java being about 60%, Sumatra 19%, West Java 16% and Jakarta 14%, as presented in Table 2.3.

Table 2.3 GRDP and Regional Distribution

Regions*	Year (Billion Rupiah at Current Prices)							
	1984	(%)	1986	(%)	1988	(%)	1990	(%)
Sumatra	12,906	(18.4)	16,439	(18.6)	23,565	(19.4)	31,076	(18.6)
Java	42,687	(60.8)	54,518	(61.7)	74,525	(61.3)	101,379	(60.1)
DKI Jakarta	10,211	(14.5)	12,680	(14.4)	16,796	(13.8)	22,855	(13.7)
West Java	10,707	(15.2)	14,264	(16.2)	20,534	(16.9)	27,945	(16.7)
Other	21,769	31.0)	27,574	(31.2)	37,195	(30.6)	50,579	(30.3)
Province								
Other Islands	14,656	(20.9)	17,340	(19.6)	23,516	(19.3)	34,547	(20.7)
Indonesia*	70,249	(100%)	88,297	(100%)	121,606	(100%)	167,002	(100%)
Indonesia**	89,885	(128%)	102,683	(116%)	142,105	(117%)	196,919	(118%)

Source : Statistical Year Book of Indonesia, 1992, BPS

Note * Excluding oil and its products

** Including oil and its products

Basic socio-economic indicators are compared among regions as summarized in Table 2.4.

Table 2.4 Basic Socio-Economic Indicators

Development Region	Population, 1990 (Census data, totals rounded)	Av. Ann. Growth Rate (+% p.a)		GRDP (Rp. Million)	GRDP per capita ('90 prices) (Rp rounded)
		71-80	80-90		
Botabek	8,876,390	4.1	5.1	6,754,628	760,970
Banten	3,202,920	2.6	2.6	3,424,353	1,069,130
Bandung Raya	9,499,780	2.6	2.1	8,313,412	875,120
Sukabumi	1,967,700	2.5	1.9	956,443	486,070
Purwasuka	3,261,700	2.2	1.7	2,488,013	762,800
Cirebon	5,275,990	2.4	1.7	(*)7,317,976	1,387,030
Priangan Tim	3,293,890	1.7	1.1	2,103,246	638,530
Sub-Total West Java	35,378,370	2.7	2.6	31,358,071	886,360
DKI Jakarta	8,254,040	3.9	2.4	22,855,440	2,769,010
Total, West Java and Jakarta	43,632,410	2.9	2.5	54,213,511	1,242,500
Total Jabotabek	17,130,430	4.0	3.7	29,610,068	1,728,510
Total Indonesia	179,379,000	2.4	2.0	196,919,200	1,097,780
Jakarta As % of Total DKI/West Java	18 %			42 %	x2.23
Jabotabek As % of Total DKI/West Java	39.3 %			55 %	x 1.39
Jabotabek As % of All Indonesia	9.5 %			15 %	x1.57

Source : Technical Report "Economy" of JMDPR, January 1993

Note (*) excludes oil

National figures are preliminary only.

- 9) The expenditure of central government comprises Routine Expenditure and Development Expenditure, amounting 58,166 billion Rp. in 1992/1993. The share ratios of routine expenditure and development expenditure to the total expenditure amount are about 60% and 40% respectively.

In the breakdown of the development expenditure, the expenditures for Road Facilities amount 679 billion Rp. 972 billion Rp. and 1,225 billion Rp. in the fiscal year 1990/91, 1991/92 and 1992/93 respectively.

The breakdown of development expenditure shows that the expenditures of the Sector of Transportation and Tourism amount 3,042 billion Rp., 3,968 billion Rp. and 4,385 billion Rp. in the fiscal year 1990/91, 1991/92 and 1992/93 respectively, representing the share ratios to the total development expenditure, 16%, 18% and 18% for the said respective fiscal year.

- 10) The expenditure of DKI Jakarta government is composed of Routine Expenditure and Development Expenditure amounting 1,403 billion Rp. in 1993/1994. While the routine expenditure accounts for 58% of the total expenditure amount in the fiscal year 1992/93, the development expenditure accounts for 42%.

The expenditure of the sector of Transportation and Tourism in the fiscal year 1993/94 amounts 142,826 million Rp., representing a share ratio of 22% to the total expenditure amount. The expenditure of the sector of Transportation in the fiscal year 1994/95 (budget) amounts 143,796 million Rp., representing a share ratio of 18% to the total expenditure amount.

- 11) The land use map updating project further analyzed how the previous land cover underwent a transformation to the present one. A general tendency of the land cover transformation can be summarized as follows:

- A residential area is marginally increased by the transformation largely from the high-dense vegetation, agriculture and base land;
- Industrial area is expanding by the penetration into the above three categories but residential area; and
- Agriculture is mostly expanded by the development of base land

According to these transformation matrices it can be said that:

- Residential land cover increased more than double during 1988-1992 for the respective Botabek components, but it only increased about 20 percent for DKI Jakarta.
- Industrial area increased more than 1,000 ha in Jakarta, Tangerang and Bekasi but only 277 ha in Bogor, which looks unlikely compared with

the manufacturing sector growth in the GRDP of Bogor. More detailed analysis will be required to use Bogor figures in particular.

2.2 Present Traffic and Transportation Conditions

1) Traffic survey result revealed the present traffic conditions as follows :

- i) It is apparent that pressure on traffic demand crossing Jakarta border is distinctively heavy as shown in Table 2.5, 2.6 and Fig. 2.2. A demographic growth pattern also implies that the out-migration of Jakarta residents to Botabek area has undergone a comparatively high speed as shown in Table 2.7.

Table 2.5 Cordon Line Traffic Volume by Type of Vehicle in 16 Hours, 1985, 1988 and 1993

Year, Direction*	16-Hour Traffic Volumes (06:00-22:00)					
	Motor- cycle	Sedan/ Van	Bus	Truck	Total w/o . MC.	Total With M.C.
Year 1985 :						
West	21,382	19,604	10,414	16,254	46,272	67,654
South	23,483	34,450	14,950	18,380	67,780	91,263
East	25,490	26,468	16,257	15,697	58,422	83,912
Total	70,355	80,522	41,621	50,331	172,474	242,829
Year 1988 :						
West	26,524	26,753	16,662	23,418	66,833	93,357
South	33,293	66,985	25,995	36,147	129,127	162,420
East	45,174	39,154	27,177	27,389	93,720	138,894
Total	104,991	132,892	69,834	86,954	289,680	394,671
Year 1993 :						
West	54,839	85,786	21,504	34,818	142,108	196,947
South	51,418	115,323	41,592	27,833	184,748	236,166
East	60,046	125,562	27,559	43,336	196,457	256,503
Total	166,303	326,671	90,655	105,987	523,313	689,616

Source : Traffic Count Survey results in ARSDS (1985), Outer Ring Road (1988) and this study (1993)

Note * : Please refer to Fig. 2.2 for directional segments of the cordon line

Table 2.6 Growth of Cordon Line Traffic Volume by Direction

Year, Direction*	Average Annual Growth Rate (% p.a.)					
	Motor- cycle	Sedan/ Van	Bus	Truck	Total w/o . M.C.	Total With M.C.
1985-1988 :						
West	7.4	10.9	17.0	12.9	13.0	11.3
South	12.3	24.8	20.2	25.3	24.0	21.2
East	21.0	13.9	18.7	20.4	17.1	18.3
Total	14.3	18.2	18.8	20.0	18.9	17.6
1988-1993 :						
West	15.6	26.2	5.2	8.3	16.3	16.1
South	9.1	11.5	9.9	-0.5	7.4	7.8
East	5.6	26.2	0.3	9.6	16.0	13.1
Total	9.6	19.7	5.4	4.0	12.6	11.8
1985-1993 :						
West	12.5	20.3	9.5	11.1	15.1	14.3
South	10.3	16.3	13.6	5.3	13.4	12.6
East	11.3	21.5	6.8	13.5	16.4	15.0
Total	11.4	19.1	10.2	9.8	14.9	13.9

Fig. 2.2
DIRECTIONAL SEGMENT
OF CORDON LINE

- Legend:**
- Traffic Count Station
 - ▬ Directional Segment of Cordon Line
 - Year 16-Hour Traffic Volume
1985 Motorcycles are not included



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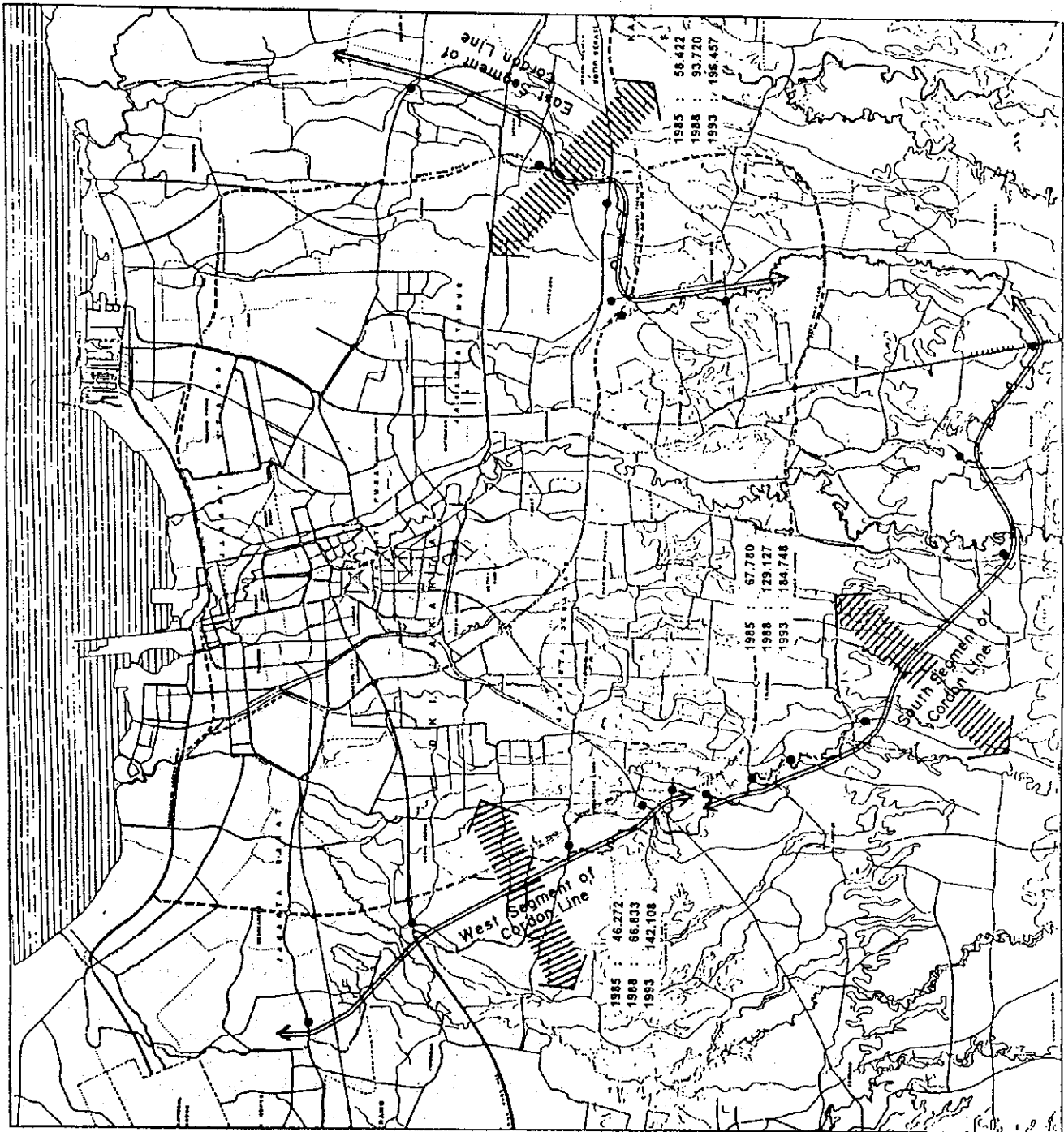


Table 2.7 Numbers of In and Out-Migrants 5 Years of Age and Over to and from DKI Jakarta by Place of Origin/Destination, 1975-1980 and 1985-1990 (numbers in thousands)

Parameter, Region and Time Period	Status of Present Residence		
	Urban	Rural	Total
Place of Origin (In-migrants)			
West Java			
1975-1980	-	-	212
1985-1990	-	-	213
Other Regions			
1975-1980			535
1985-1990			606
Total Indonesia			
1975-1980	-	-	747
1985-1990	-	-	820
Place of Destination (Out-migrants)			
West Java			
1975-1980	88	159	247
1985-1990	538	157	695
Other Regions			
1975-1980	74	61	136
1985-1990	148	150	298
Total Indonesia			
1975-1980	161	221	382
1985-1990	686	307	993

Source : 1980 and 1990 Censuses.

- ii) The east screen traffic volume increased about 80,000 vehicles from 1988 to 1993, but the other two screen volumes underwent little change over the same period. Among the count stations on the east screen (A), a great impact was brought about by the completion of the Jakarta-Cikampek Tollway, which opened to traffic in September 1988. The 1988 traffic count survey was conducted before the tollway opening, so that the impact of the tollway was not reflected in the 1988 traffic volume on the screen (A).
- iii) Jl. Sudirman inter alia has an estimated daily traffic volume of 176,400 veh./day (excluding motorcycles) or 221,400 veh./day (including motorcycles) which is the outstanding volume compared to other radial roads. A peak hour traffic was found during 14:00-15:00 to be 8,500 pcu/hour in the direction from H.I. (Hotel Indonesia) to Semanggi. Since the typical cross section of Jl. Sudirman is a (2-lane frontage + 3-lane main) road/direction, the road capacity is assumed to be 8,000

pcu/hour direction. Hourly fluctuation of the Sudirman traffic is small ranging from 6,500 to 8,500 pcu/hour/direction during 17:00-18:00. Therefore, the congestion ratio is constantly maintained over 0.8.

- 2) The project roads are, in general, situated at the following traffic problems;
 - i) Road network has such problems as no direct connections between east and west, low road density, lack of network concept and road hierarchy, lack of crossing streets, staggered intersection and imbalance of lane number
 - ii) Traffic obstacles are consisting of facilities along streets with traffic frictions, physical and engineering constraints and street vendors
 - iii) Insufficient traffic control and safety facilities
 - iv) Poor bus operation and driver's manner
- 3) From the general traffic problems mentioned above, several specific issues can be abstracted to form a development strategy for the project roads, and they are :
 - (1) Preparation of a basic network plan which is well organized with both regional and urban development plans;
 - (2) Establishment of a road and street hierarchy to accord with the basic network plan;
 - (3) Continuous efforts to enhance road density with a standard, not sub-standard, engineering design;
 - (4) Requirement of proper road management and law enforcement to road users.

The first two issues are concerned with the "Road Transport System Development: and the remainders are concerned with "Road and Traffic Management".

- 4) Table 2.8 shows the average daily passengers carried, and a total number of buses operated in DKI Jakarta in 1988 and 1991.

Table 2.8 Average Daily Bus Passenger and Total Number of Bus Operated in Jakarta (1988 and 1991)

Year	Average Daily Passenger Carried (x 1,000)	Total Number of Bus Operated
1988	1,624	2,606
1991	1,827	2,594

Source : Jakarta Dalam Angka 1992
(DLLAJR DKI Jakarta)

5) About 426 thousand passengers utilize railway daily in Jabotabek area. Of these passenger, 377 thousand passengers, accounting for about 89% of the total passenger, use commuter trains.

6) In 1991, Soekarno-Hatta Airport accommodated 2.8 million and 5.1 million international and domestic boarding and alighting passengers respectively.

Soekarno-Hatta Airport processed about 69,000 tons and 94,000 tons for domestic cargo and international cargo (163,000 tons in total) in 1991 respectively.

2.3 Development Framework of Jakarta in Year 2010

1) Basic Urban Development Scheme in Jabotabek

A basic development scheme for Jabotabek has been analyzed and compared among alternatives in the JMDPR report. The report, as the result, recommends a linear city model extending, in the early stage of the urbanization, about 50 kilometers in the east-west direction with some 10 km in width to absorb additional 9 million population (Fig. 2.3).

This population increase corresponds to the estimated 2005 population (26.6 million) in Jabotabek, and the population distribution is planned for the year 2010 as shown in (Fig. 2.4).

The linear city concept is spined with a ladder type road structure (Fig. 2.5) which would be less traffic pressure on the Jakarta urban core area. This road structure is, in the provincial context, assumed to accord with the West Java transport development concept (Fig. 2.6).

Major goals of the DKI Jakarta Structure Plan (Fig. 2.7) are i) to promote the urban development in the east-west direction, ii) to promote center development for dispersing urban activities, iii) to promote public transport system, including mass transit system, to alleviate excessive traffic loads on streets.

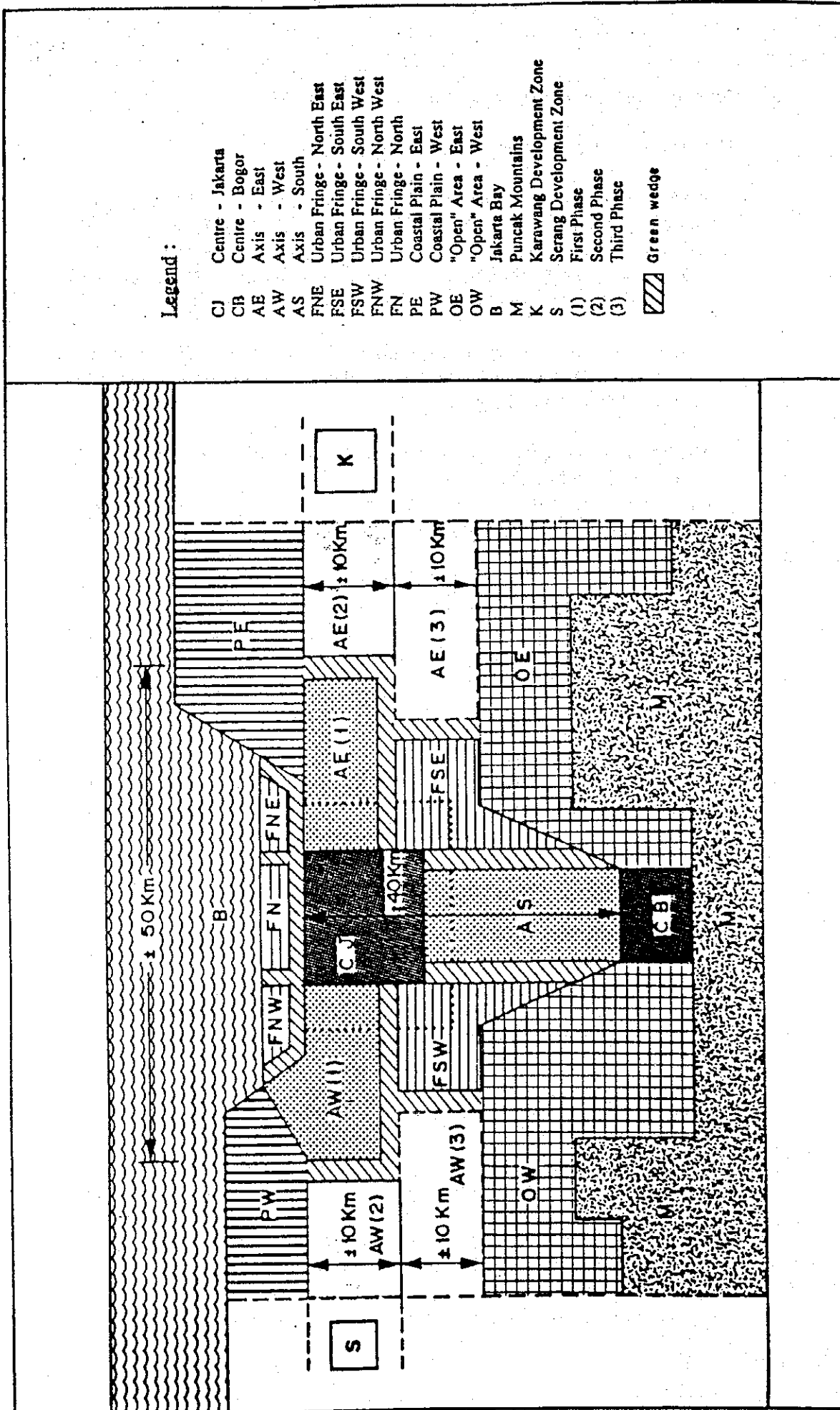
2) Mass Rapid Transit System

The Jabotabek Urban Mass Transit System published in June 1993 by Directorate General of Land Transport and Inland Waterways (PHBD), Ministry of Communications is proposed a mass transit network, based on the use of a combination of Light Rail Transit (LRT) and conventional heavy rail. The system consists of five new LRT lines in combination with two regional rail lines from Bogor and Bekasi including joint use of the Central and Tanjung Priok lines.

The consolidated network as shown in Fig. 2.8 comprises 80 km of new LRT lines, 65 km of conventional rail converted to LRT and 80 km of regional rail, totaling 225 km long and is scheduled to be completed by the year 2015.

3) Future Socio-Economic Framework

A future population framework has been forecast in the JMDPR, based on the population census including the latest 1990 data. According to the forecast (Table 2.9), Jabotabek's population will reach about 30 million in 2010, which means the increase of some 13 million population over 20 years of period during 1990-2010. This increased volume is surprisingly equivalent to the population being nearly 1.5 times as large as the Jakarta's population in 1990. Tangerang and Bekasi are expected to absorb much



Legend :

- CJ Centre - Jakarta
- CB Centre - Bogor
- AE Axis - East
- AW Axis - West
- AS Axis - South
- FNE Urban Fringe - North East
- FSE Urban Fringe - South East
- FNW Urban Fringe - North West
- FN Urban Fringe - North
- PE Coastal Plain - East
- PW Coastal Plain - West
- OE "Open" Area - East
- OW "Open" Area - West
- B Jakarta Bay
- M Puncak Mountains
- K Karawang Development Zone
- S Serang Development Zone
- (1) First Phase
- (2) Second Phase
- (3) Third Phase
- Green wedge


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Fig. 2.3 BASIC URBAN DEVELOPMENT SCHEME IN JABOTABEK


Fig. 2.4

**FUNCTIONAL URBAN AREAS
IN BOTABEK BY POPULATION SIZE
, 2010**

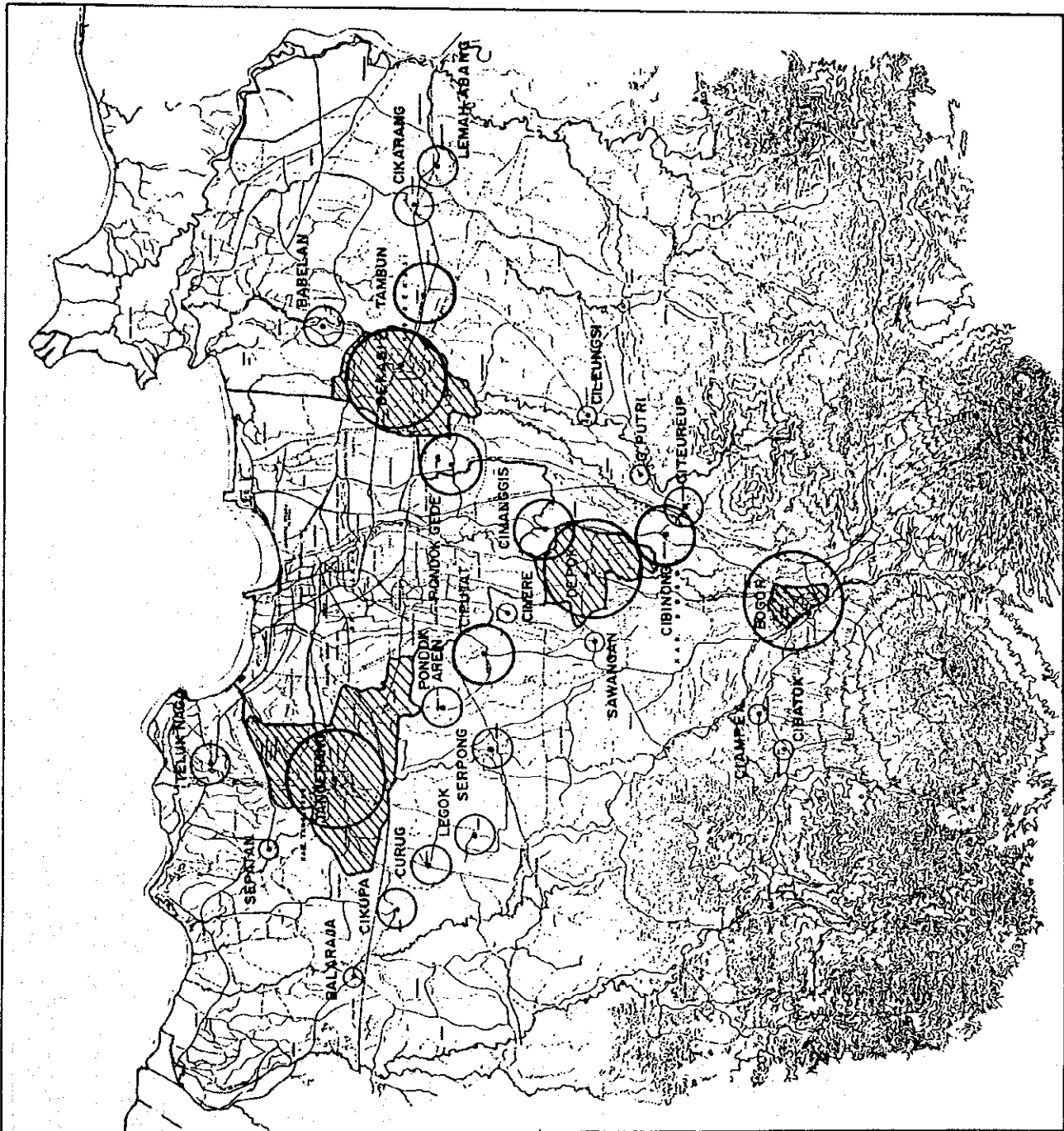
Legend	Population Size
○	1,000,000 and over
○	500,000 - 1,000,000
○	250,000 - 500,000
○	100,000 - 250,000



N

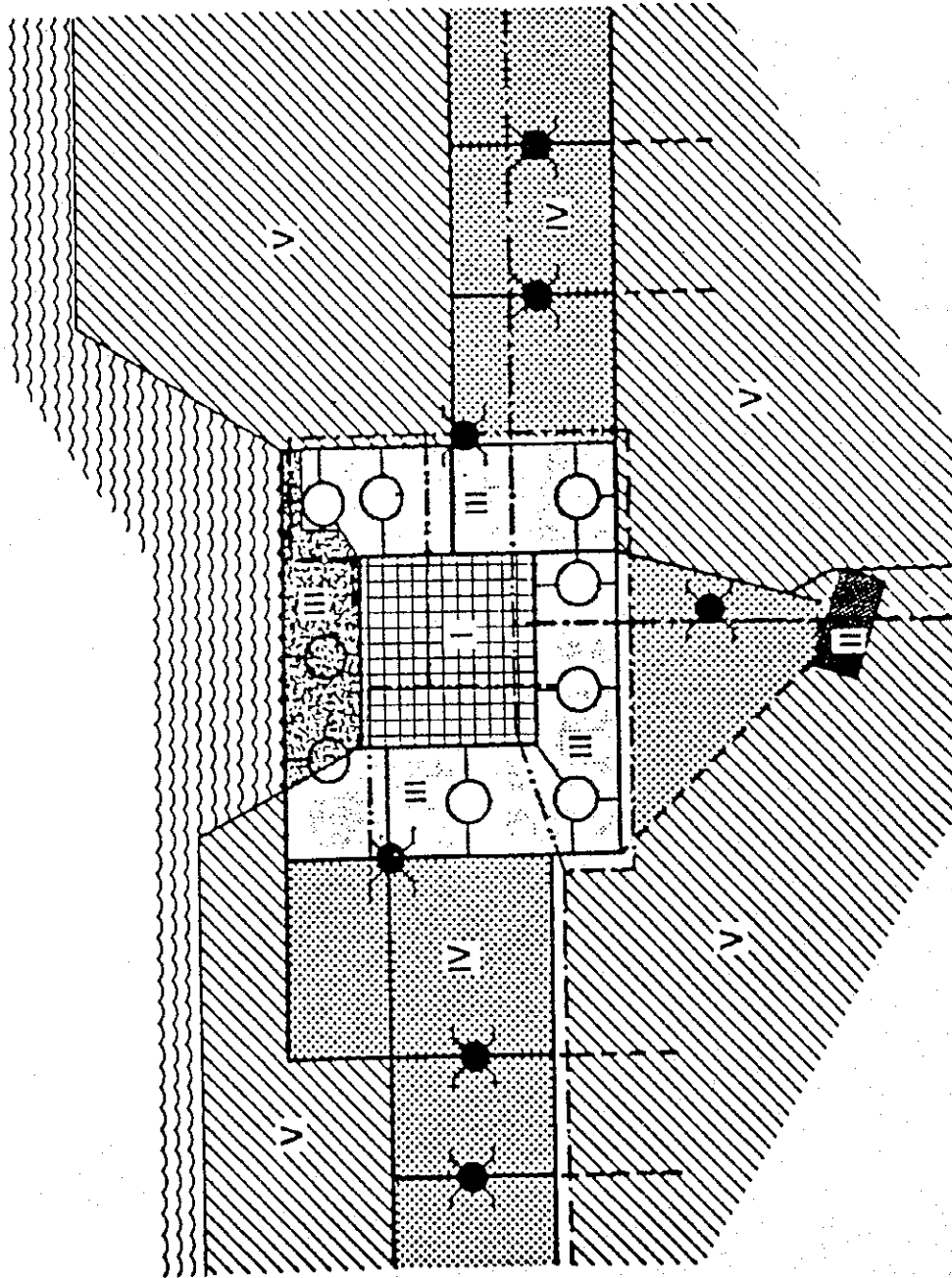


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Legend :

- Heavy Rail
- Light Rail/MRT
- Toll/Arterial Road
- Collector/Secondary Road
- Feeder Road
- Sub (growth) Center
- Urban Fringe Center
- Central Core / DKI
- Central Core / Bogor
- Urban Fringe
- Urban Axis
- Rural Area
- Jakarta Bay
- Waterfront City (reclaimed)



Source : JMDPR (Third Planning Report)

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Fig. 2.5
 TRANSPORTATION SYSTEM CONCEPT, JABOTABEK 2010

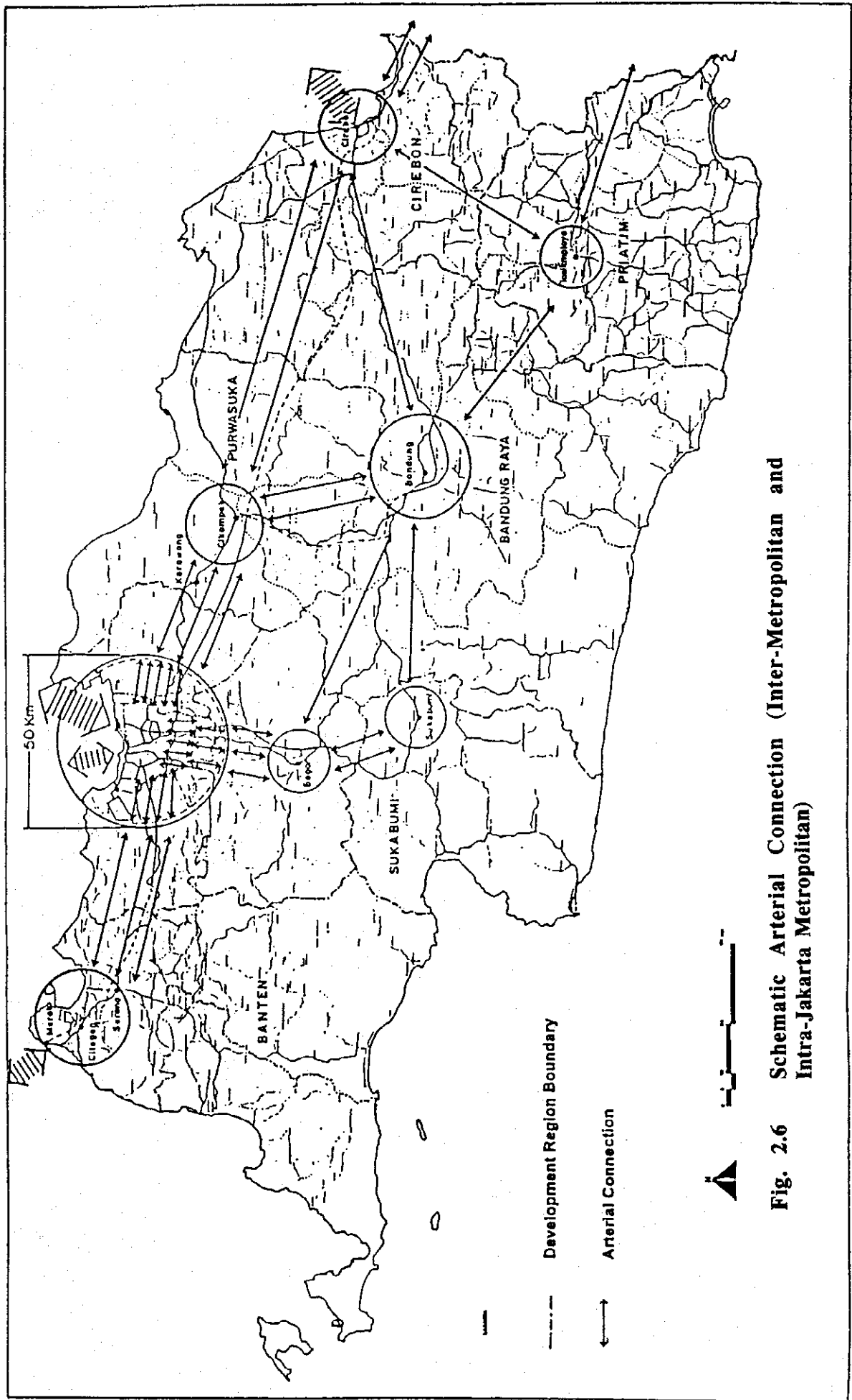
























Fig. 2.6 Schematic Arterial Connection (Inter-Metropolitan and Intra-Jakarta Metropolitan)

Fig. 2.7
DKI JAKARTA
STRUCTURE PLAN 2005

LEGEND

-  Commercial and Business Area
-  Commercial and Business Area with Low Density
-  Industrial and Commercial Mixed Area
-  Residential Area
-  Public Facility Area
-  Special Government Area
-  Industrial Area
-  Agriculture Area with Low Density Housing
-  Agriculture Area
-  Recreation Area
-  Reserved Area for Flood Prevention
-  Eastern and Western Region Commercial Center
-  District Commercial Center
-  Neighbourhood Commercial Center
-  Priority for Expansion
-  Limited Expansion with Improvement
-  Limited Expansion with Renewal
-  Recreation/Garden
-  Recreation/Sport
-  Recreation Reserved Forest
-  Developing Center in the
-  Crossed Area



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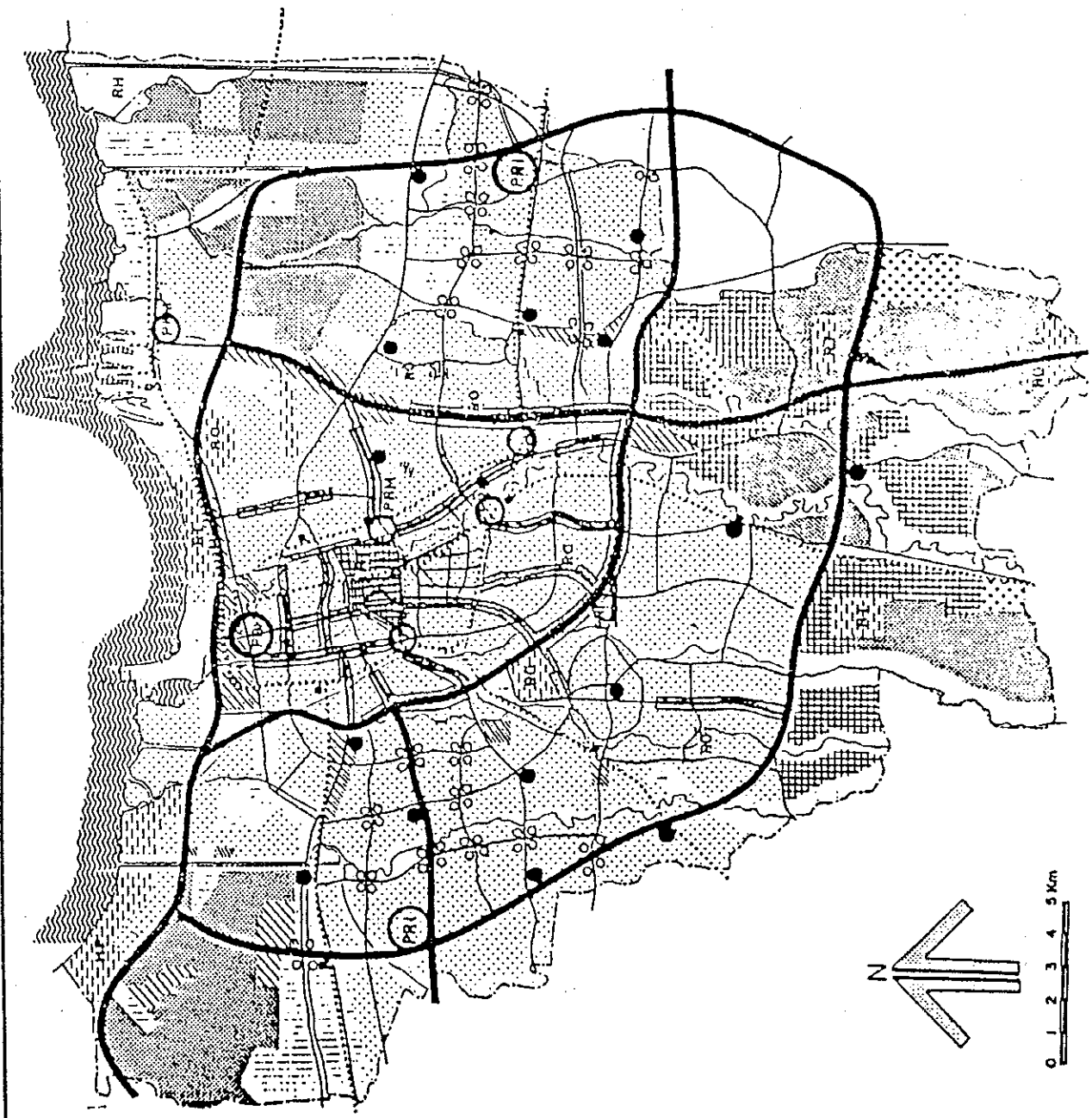


Fig. 2.8

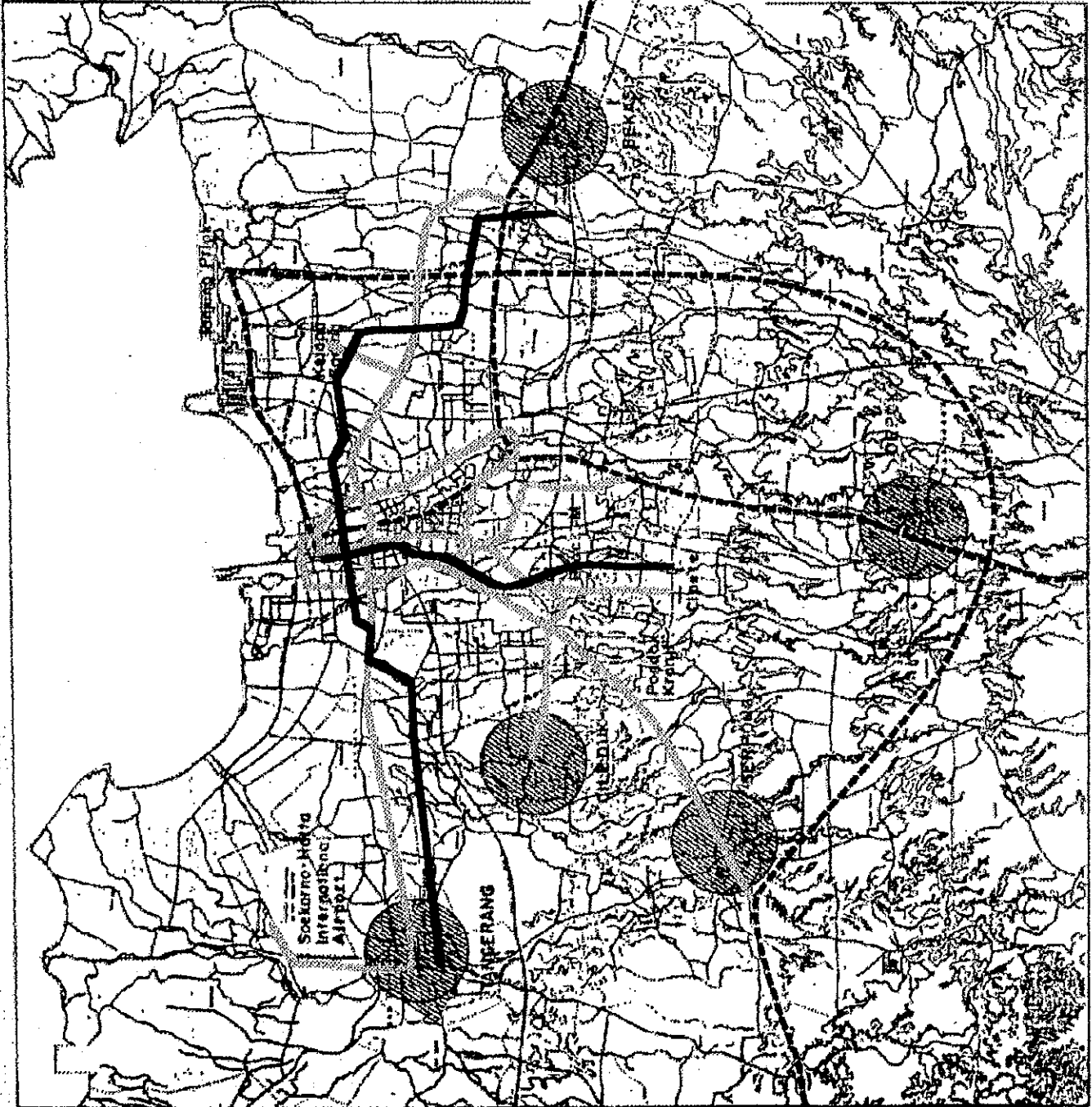
JABOTABEK URBAN MASS TRANSIT SYSTEM YEAR 2015

LEGEND :

- LRT
- HEAVY RAIL
- E - W AXIS
- N - S AXIS



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portions of the increment at such higher growth rates as 4.46% p.a. for Tangerang and 4.29% p.a. for Bekasi.

Table 2.9 Forecast Future Population in Jabotabek

Region	Year (x 1000 persons)					Average
	1990	1995	2000	2005	2010	Growth Rate (% p.a.)
DKI JKT	8,210	8,964	9,738	10,487	11,178	1.55
Botabek	8,746	11,077	13,528	16,103	18,732	3.88
Bogor	3,949	4,810	5,674	6,533	7,407	3.19
Tangerang	2,724	3,570	4,506	5,504	6,523	4.46
Bekasi	2,073	2,697	3,348	4,066	4,802	4.29
Jabotabek	16,956	20,041	23,266	26,590	29,910	2.88

Source : Third Planning Report of JMDPR, July 1993 D.G. of Cipta Karya

As the population grows, employment opportunities should be created correspondingly. Particularly, allocation of work places (jobs) is the matter of importance among the planning components, and this is directly affect the demand to transport facilities.

According to the cordon line traffic survey in 1993, commuters coming in and out of Jakarta are estimated at 277,800 and 90,300 respectively (Table 2.10), which are about 4.1 times and 3.1 times as many as the 1985 figures. The net in-commuters to Jakarta has increased from 39,000 persons per day to 280,800 persons per day in 1993. It is further assumed to grow at least 500,000 persons per day by 2010 as stated in the JMDPR (Table 2.11). As the consequence, a future number of population, employment and jobs are estimated as shown in Table 2.12.

Table 2.10 Commuters between DKI Jakarta and Botabek

Direction		1985	1993	Growth
From	To	(Persons/day)	(Persons/day)	93/85
Bogor	Jakarta	27,100	102,500	3.78
Tangerang	Jakarta	20,866	74,800	3.58
Bekasi	Jakarta	19,825	100,500	5.07
Total to Jakarta		67,791	277,800	4.10
Jakarta	Bogor	10,883	32,100	2.95
Jakarta	Tangerang	9,512	29,900	3.14
Jakarta	Bekasi	8,418	28,300	3.36
Total to Botabek		28,813	90,300	3.13

Table 2.11 Forecast Net In-Commuter Population to Jakarta

Region	Year (Persons)		
	1993	2000	2010
From Bogor	70,400	99,900	117,180
From Tangerang	44,900	70,200	91,326
From Bekasi	72,200	110,700	142,618
From Botabek	187,500	280,800	500,000*

Source : JICA Team's estimate

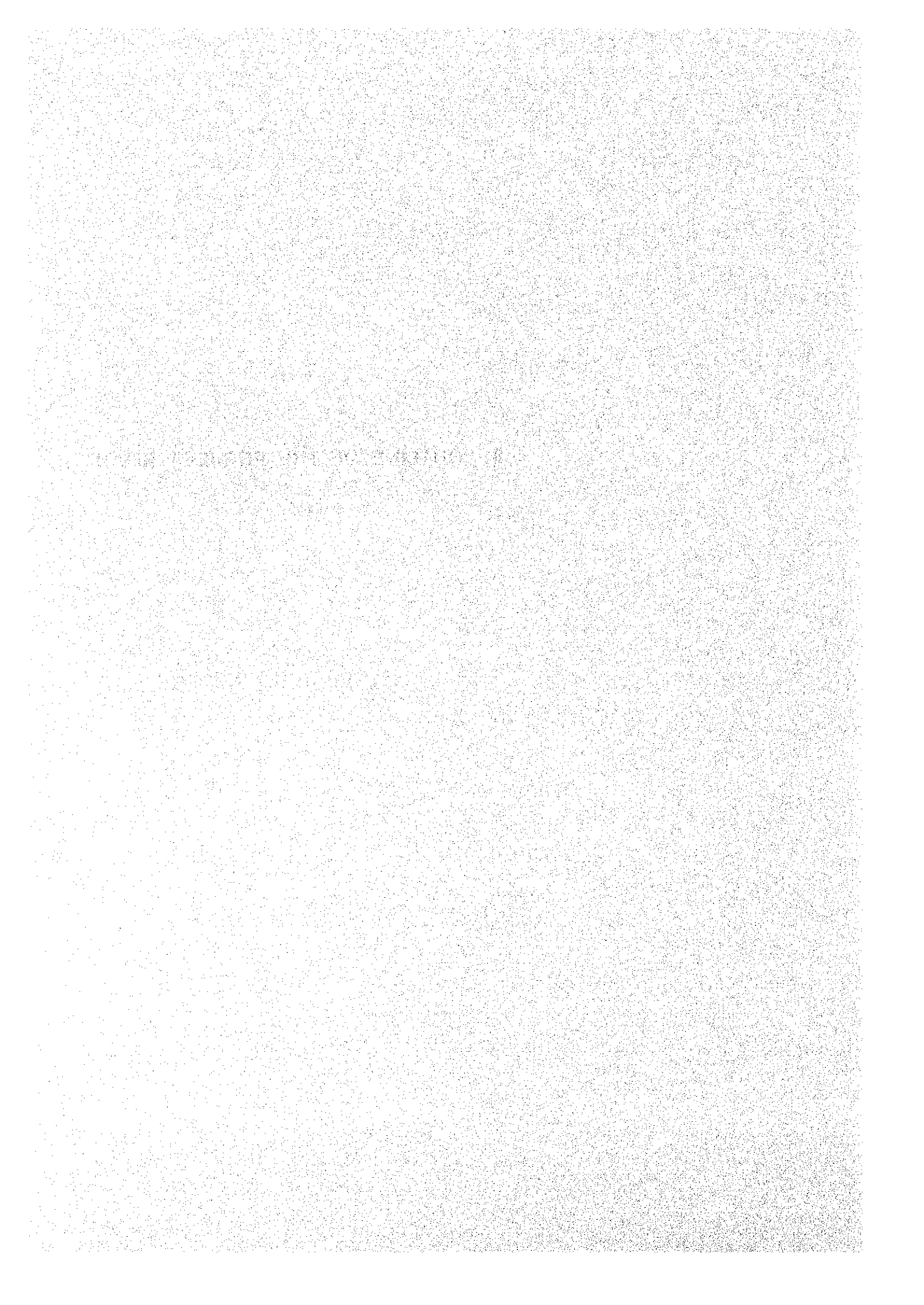
Note * Adopted from Second Planning Report of JMDPR

Table 2.12 Future Socio-Economic Framework in Jabotabek

Region	Year 1990 (x 1000 persons)			Year 2010 (x 1000 persons)		
	Population	Employment	Job	Population	Employment	Jobs
DKI JKT	8,210	2,926	3,030	11,178	4,851	5,351
Botabek	8,746	2,780	2,676	18,732	8,044	7,544
Bogor	3,949	1,212	1,171	7,407	3,181	3,014
Tangerang	2,724	894	867	6,523	2,801	2,671
Bekasi	2,073	674	637	4,802	2,062	1,859
Jabotabek	16,956	5,706	5,706	29,910	12,895	12,895

Note : Summary derived from Table 4.4.8 and Table 4.4.12.

3. OUTLINE OF THE PROJECT ROAD



3. OUTLINE OF THE PROJECT

3.1 Basic Arterial Road System Formation

1) Present Traffic Problem in Jakarta Metropolitan Area

Urbanization taken place in DKI Jakarta and its surrounding has naturally increased and continued toward the higher and upstream southern area from geographical reason. Road network in Jakarta Metropolitan area, which is the most fundamental infrastructure to constitute an urban structure, has been developed by several multi-lane arterial roads and its connecting roads. Ribbon development along major arterial roads, therefore, is dominant urbanization pattern. In order to keep mobility of major arterial roads, connecting roads have generally small capacity. Geographical features and urbanization pattern resulted in poor road network development in east-west direction.

On the other hand, public transportation fully depends on road transport. Although railway passengers for commuting are increasing gradually as commuter trains are introduced by official development aids from Japan and other foreign countries, the share of rail-base commuter remains only 3% and bus transport play important roles in public transport sector.

Rapid expansion of social and economic activities stimulates motorization in the urban area and resultingly chronic traffic congestion takes place on major arterial streets in the central business districts as well as on radial roads in the suburbs.

To cope with such traffic situation in Jakarta, the Government of Indonesia has decided to implement the various measures such as the expansion of one way traffic controlled area, increase of intersection with no right turning, application of exclusive bus lane and 3 in 1 regulation in the CBD as a short term scheme. However, it is impossible to solve traffic problems thoroughly by such traffic management scheme and social environment and living standard suffer damages by chronic traffic congestion.

2) Road Development Plans in Jakarta Metropolitan Area

In such circumstances, DKI Jakarta still retains the hub of financial, commercial and administrative activities in Indonesia and will continue to expand her urbanized area toward its surrounding, especially for east and west fringe of the city based on the development policy of Jabotabek Metropolitan.

The Government has medium and long term improvement plans in line with such development concept to construct toll roads and flyovers, to improve the existing railway for commuters and to introduce Light Rail Transit (LRT) system.

Major goals of the DKI Jakarta Structure Plan are i) to promote the urban development in the east-west direction, ii) to promote center development for dispersing urban activities, iii) to promote public transport system, including mass transit system, to alleviate excessive traffic loads on streets.

In accordance with the development concept, road development plan is formulated and implemented by DKI Jakarta and Directorate General of Highways, Ministry of Public Works.

3) Basic Arterial Road System Formation

The project roads are to work as one of links composed arterial road network system with designated roles and functions in Jakarta Metropolitan Area. The arterial road system is to provide mobility and accessibility for considerable traffic demand as a whole. The DKI Jakarta Structure Plan contains the road development masterplan which is officially approved in the study area, while the Jabotabek Metropolitan Development Plan Review (JMDPR) is prepared as the spatial plan to provide the development framework in the study area. The project roads which were proposed by ARSDS basically coincide with the location of city planning roads in the masterplan. However, recent road development and national economic growth stimulate regional economic activities and regional developments induce drastic change of massive demographic movement and commuters. It results in significant change of trip distribution. Accordingly, the review of roles and functions of each link including the project roads is required. The project roads are placed in the basic arterial road system and their roles and functions are defined in this system formation shown in Fig. 3.1 and Fig. 3.2 based on the above-mentioned review.

3.2 Outline of Project Roads

1) North-South Axis

The north-south corridor is rather confined to the urbanized area of DKI Jakarta, and which already exhibits a large traffic demand along the existing north-south thoroughfare, and its urban structure is considered relatively stable compared to the east-west corridor. Therefore, a targeted role and function of the north-south corridor can be simply defined as a strengthening of the existing north-south thoroughfare.

2) East-West Axis

The East-West corridor is to be planned so as to stimulate the development of planned east and west primary centers, to enhance the road capacity in the new housing development area, and to support through traffic in the central urban area. This east-west axis should primarily play a role of the development inducement with additional and stronger access among several required access routes between Kabupaten/Kotamadya Tangerang and the central business district of DKI Jakarta; and between Kabupaten Bekasi and

the central business district; and the port of DKI Jakarta in order to form the Jakarta Metropolitan Area. Besides above, secondarily the axis take another role as a good arterial access to the central business district from those primary centres under development, e.g. East Primary Centre and from those large scale developments in surrounding area of those primary centers.

3) Alternative Corridor Study

Alternative corridor study is carried out to identify potential alternatives pertaining to similar planning scheme with 2 - 4 km in width in each segment of axis. In order to achieve targeted roles of the project roads, the area of corridor study is horizontally and vertically divided into segments. The paralleled segments are compared each other and a likely combination of the selected segments constitutes one alternative corridor, and it is eventually compared with others to determine the optimum corridor.

The evaluation criteria are set to clarify salient features of each corridor depending on its location. As for the East-West Axis, the selected corridor is located in the north of Jakarta - Merak Toll Road, in the north of Monas and in the north of Bekasi railway line. As for the North-South Axis, the selected corridor is located in the west of Jl. Sudirman.

4) Selection of the Priority Sections

To carry out a tensibility study on priority sections of the East-West Axis and the North-South Axis, the following criteria are set;

- i) Consistency and inevitability on the realization of future arterial and tollway networks
- ii) Inducement and stimulation to a desirable urbanization brought about the impact of road development
- iii) Technical feasibility of project implementation
- iv) Possibility of appropriation of fund

Finally, the priority section of the project roads is concluded inside of JORR. The justifications are as follows;

i) East-West Axis

The necessity of East-West Axis inside of JORR is superior and it will facilitate to made collaboration with DKI Jakarta structure plan 2005, because DKI Jakarta has the structure plan and DPU intensively is implementing their improvement plans, such as widening of arterial roads and construction of new links and flyover.

ii) North-South Axis

Traffic volume on the corridor of S-W Arc demonstrates a sharp growth after the Jakarta Intra Urban Tollway has been developed. Simultaneously, number of office and buildings have been built along Jl. Gatot Subroto. Thus, land availability is found very limited to form an additional interchange with S-W Arc or Jl. Gatot Subroto, and it will be marginally possible to pass over this thoroughfare from technical view points.

Accordingly, it is sure that the priority is given to the whole stretch so as to make the implementation of N-S Axis practical.

3.3 Outline of the Selected Project Roads

1) Relationship between the Project Roads and Road Network in Jakarta Metropolitan Area

The proposed North - South Axis has not the direct junction with the JUIT system because JUIT system as well as the North - South Axis can work efficiently each other as designated roles and functions.

The East - West Axis is expected to work as an arterial road in the west and east sections without any significant effects to existing toll roads. However, in the central section, the Harbour Road will be suffered significant loss by the development of this paralleled high standard arterial road. Therefore the implementation of this section is proposed to be at the last phase.

Since the project roads are planned to strengthen the existing road network in Jakarta and its surrounding and it is sure to find some detour roads and to facilitate to maintain existing traffic during construction, it is possible to secure traffic safety and capacity to avert additional traffic load to existing roads provided that appropriate countermeasures and its appropriation are taken during construction.

Fig. 3.3 presents the route location and its relationship with the functional road network system in Jakarta.

The location of interchange has been prepared based on the designated roles and functions and the road network in Jakarta as shown in Fig. 3.4. The two project roads are expected to provide a high degree of mobility for medium and long trip users in conjunction with a future road network system in Jakarta.

2) Road Classification

Through the study on prevailing design standards in Indonesia and designated type of road, the following design elements are proposed.

Fig. 3.1

CIRCULAR AND RADIAL
ARTERIAL ROAD SYSTEM CONCEPT

- Tollway System (Circular, Radial)
- Existing Radial Arterial Roads
- Additional Radial Roads Proposed (Improvement, New Construction)
- Proposed N-S Axis and E-W Axis



FEASIBILITY STUDY ON
URBAN ARTERIAL ROAD SYSTEM
DEVELOPMENT PROJECT
IN JAKARTA METROPOLITAN AREA

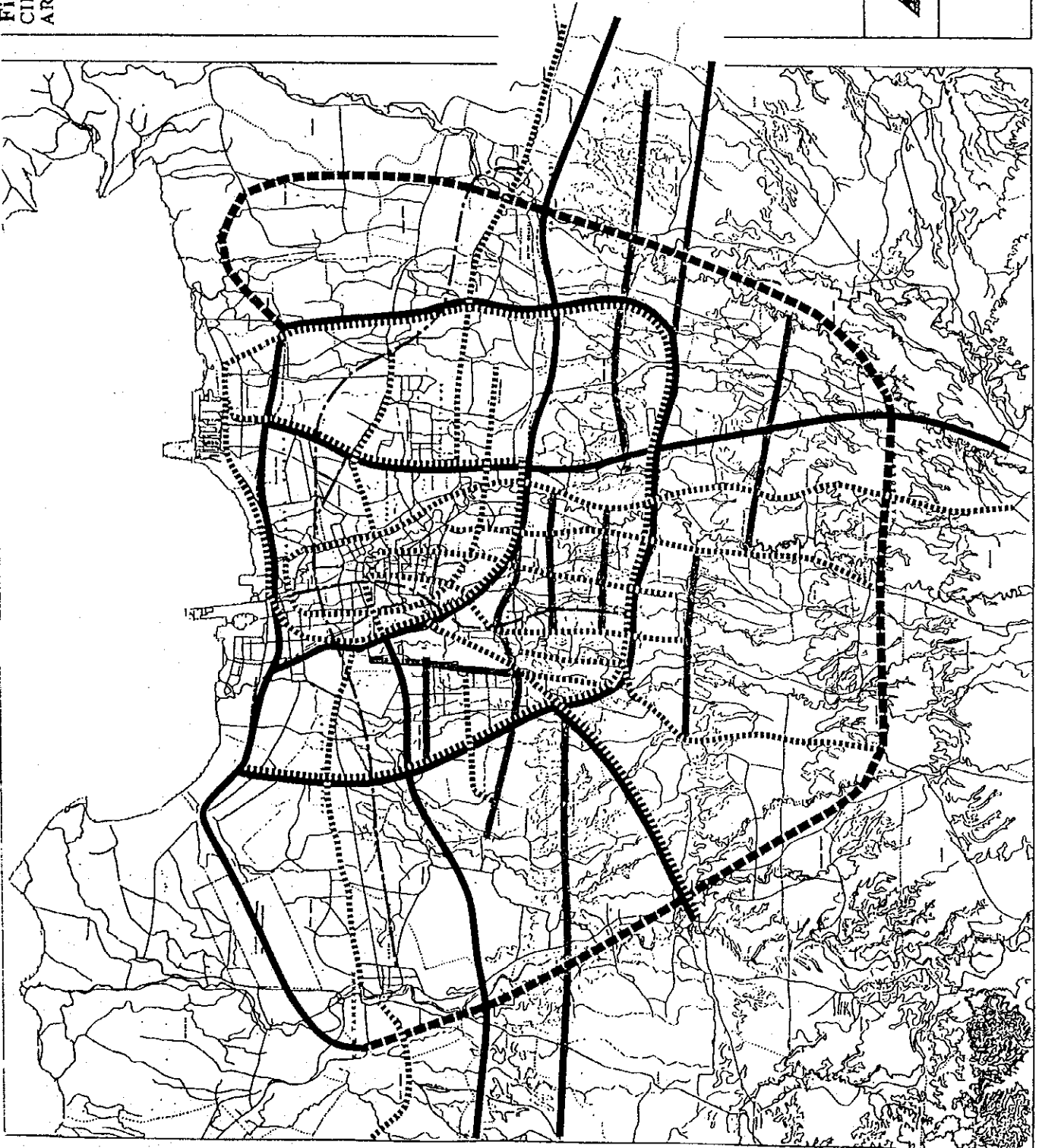
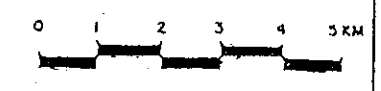
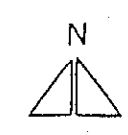
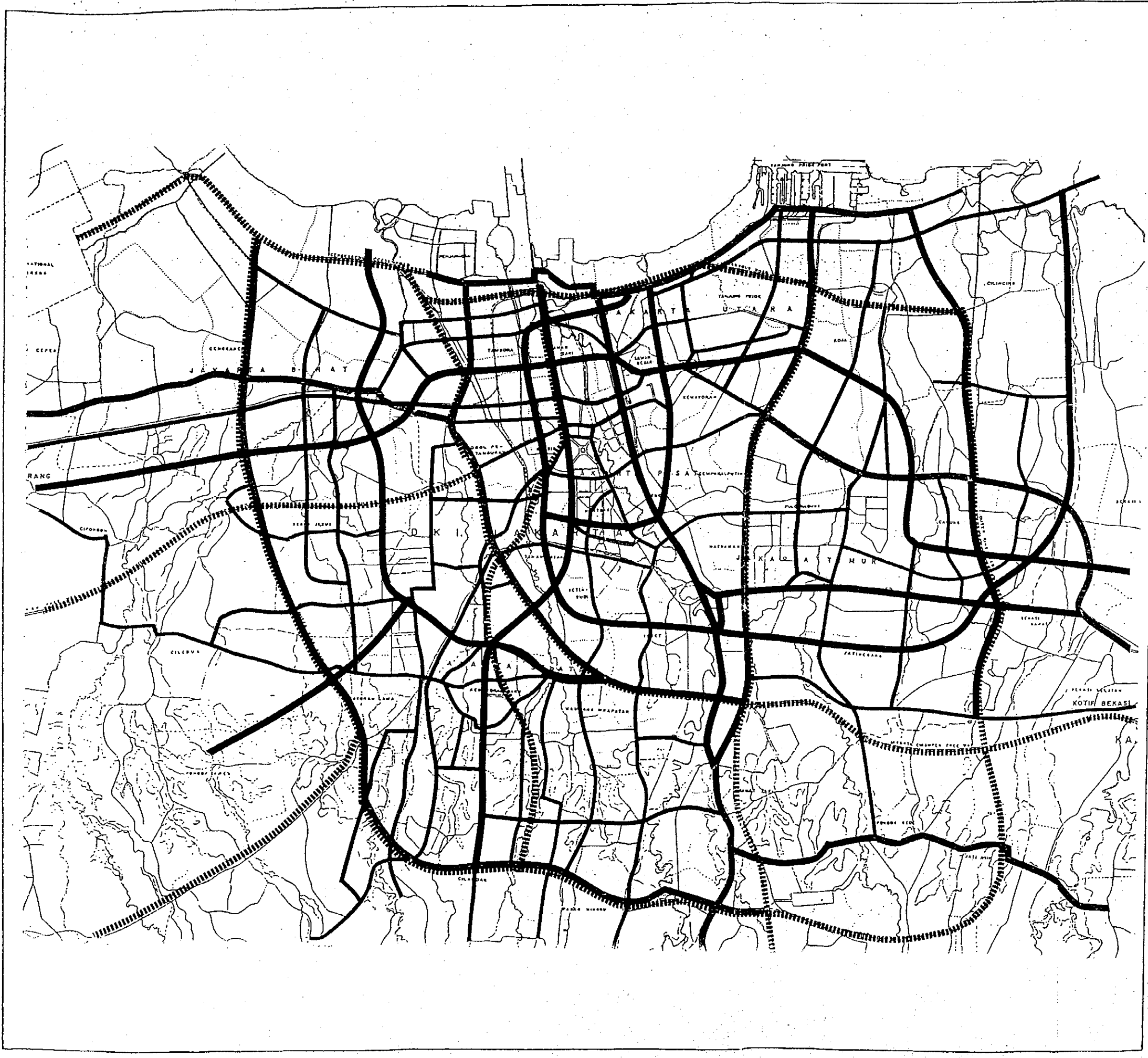


Fig. 3.2
BASIC ARTERIAL ROAD SYSTEM
IN JAKARTA

LEGEND:

- FREEWAY (TOLL)
- MAJOR ARTERIAL ROAD
- MINOR ARTERIAL ROAD



FEASIBILITY ON
 URBAN ARTERIAL ROAD SYSTEM
 DEVELOPMENT PROJECT
 IN JAKARTA METROPOLITAN AREA

Fig. 3.3

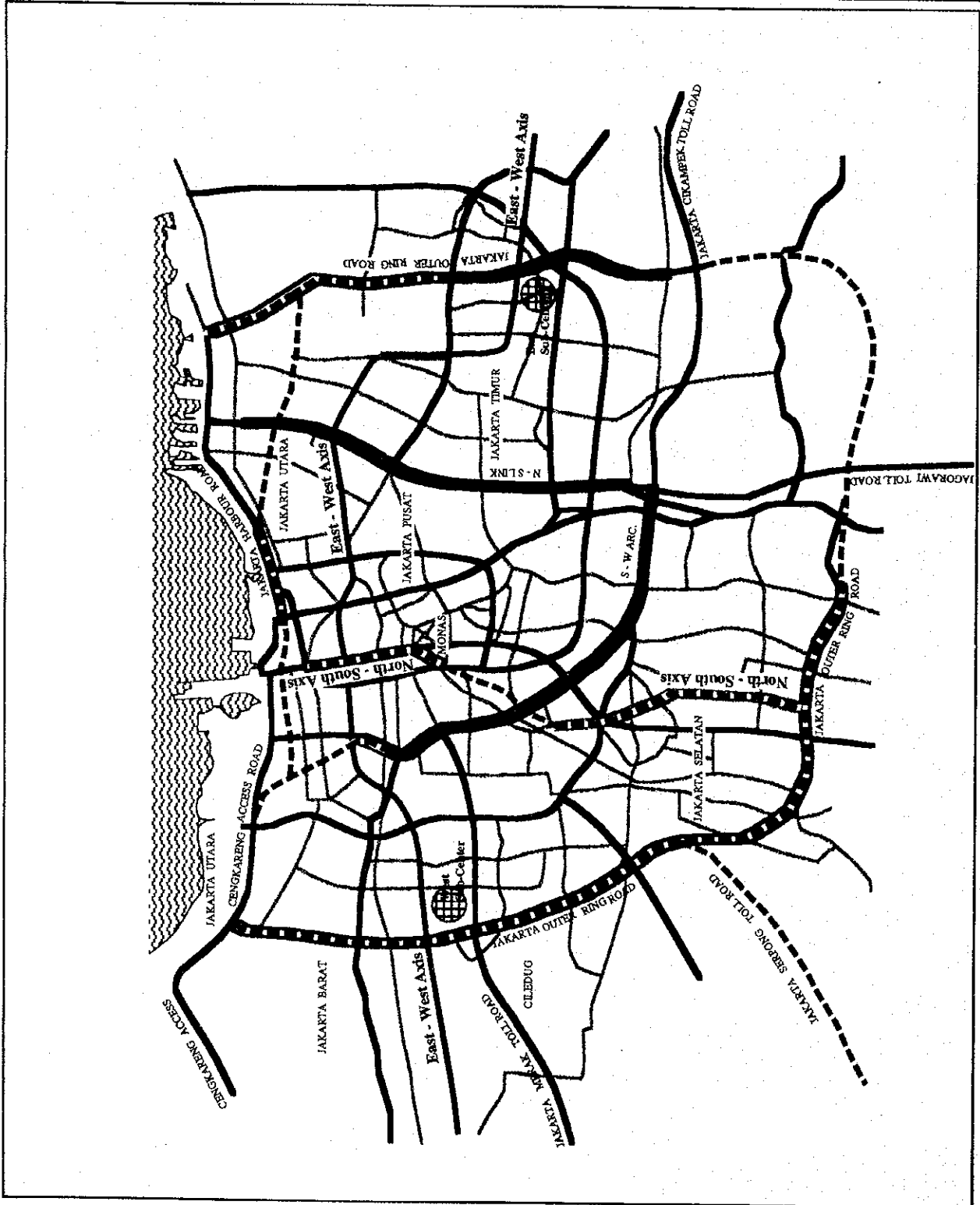
FUNCTIONAL ROAD NETWORK
IN JAKARTA

LEGEND

- TOLL ROAD
(Available at Present)
- TOLL ROAD
(Planned or Under Construction)
- MAJOR ARTERIAL ROAD
- MINOR ARTERIAL ROAD



FEASIBILITY STUDY ON
URBAN ARTERIAL ROAD SYSTEM
DEVELOPMENT PROJECT
IN JAKARTA METROPOLITAN AREA



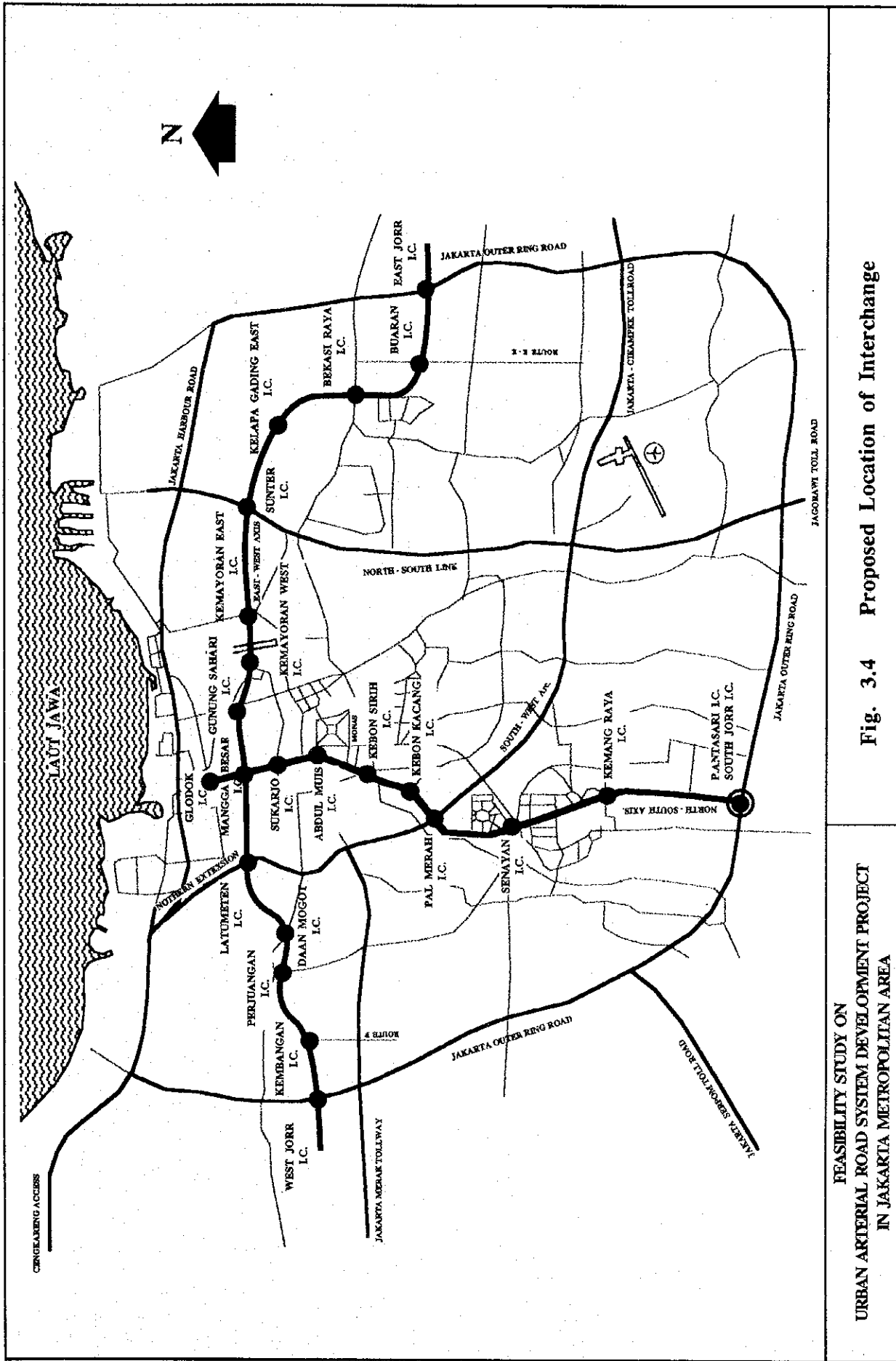


Fig. 3.4 Proposed Location of Interchange

FEASIBILITY STUDY ON
 URBAN ARTERIAL ROAD SYSTEM DEVELOPMENT PROJECT
 IN JAKARTA METROPOLITAN AREA

a) Road Category

Table 3.1 Category of Project Roads

Project Road	Design Classification			
	Area	Terrain	Type	Class
North-South Axis	Urban	Flat	I	II
East-West Axis	Urban	Flat	II	I

b) Design Speed

Table 3.2 Recommended Design Speed

Project Roads	Design Speed (km/h)
North-South Axis	80
East-West Axis	60

3) Route Description

(1) North-South Axis

i) Route Location

The proposed route of the North-South Axis as shown in Fig. 3.5 is as follows:

- Jl. Gajah Mada/Hayam Wuruk -
- Jl. Abdul Muis -
- Jl. Jati Baru -
- Jl. Pejompongan - Pondok Pinang (Simpruk Bypass) -
- Jl. Gelora -
- Jl. Asia Afrika -
- Jl. Pattimura -
- Jl. Sultan Iskandarsyah -
- Jl. Prapanca -
- Jl. Pangeran Antasari

ii) Location of Interchanges

The location of junctions and interchanges as shown in Fig. 3.5 are selected as follows :

- a) Glodok IC : The northern terminus on Jl. Gajah Mada/Hayam Wuruk in the north of Jl. Mangga Besar
- b) Mangga Besar IC : On/Off ramp on Jl. Mangga Besar and Mangga Besar Extension
- c) Sukarjo IC : On/Off ramp on Jl. Gajah Mada/Hayam Wuruk in the south of Jl. Sukarjo Wiryopranoto
- d) Abdul Muis IC : On/Off ramp on Jl. Abdul Muis
- e) Kebon Sirih IC : On/Off semi-directional ramp on Jl. Kebon Sirih
- f) Kebon Kacang IC : On/Off semi-directional ramp on Jl. Kebon Kacang
- g) Pal Merah IC : On/Off ramp on Jl. Pejompongan in the north of Pal Merah
- h) Senayan IC : On/Off semi-directional ramp on Jl. Singamangaraja and On/Off ramp on Jl. Pattimura
- i) Kemang Raya IC : On/Off ramp on Jl. Prapanca in the north of Jl. Kemang
- j) P. Antasari IC : On/Off ramp on Jl. Pangeran Antasari in the north of Jakarta Outer Ring Road
- k) South JORR IC : Y-type junction with tollway of Jakarta Outer Ring Road

iii) Number of Lanes

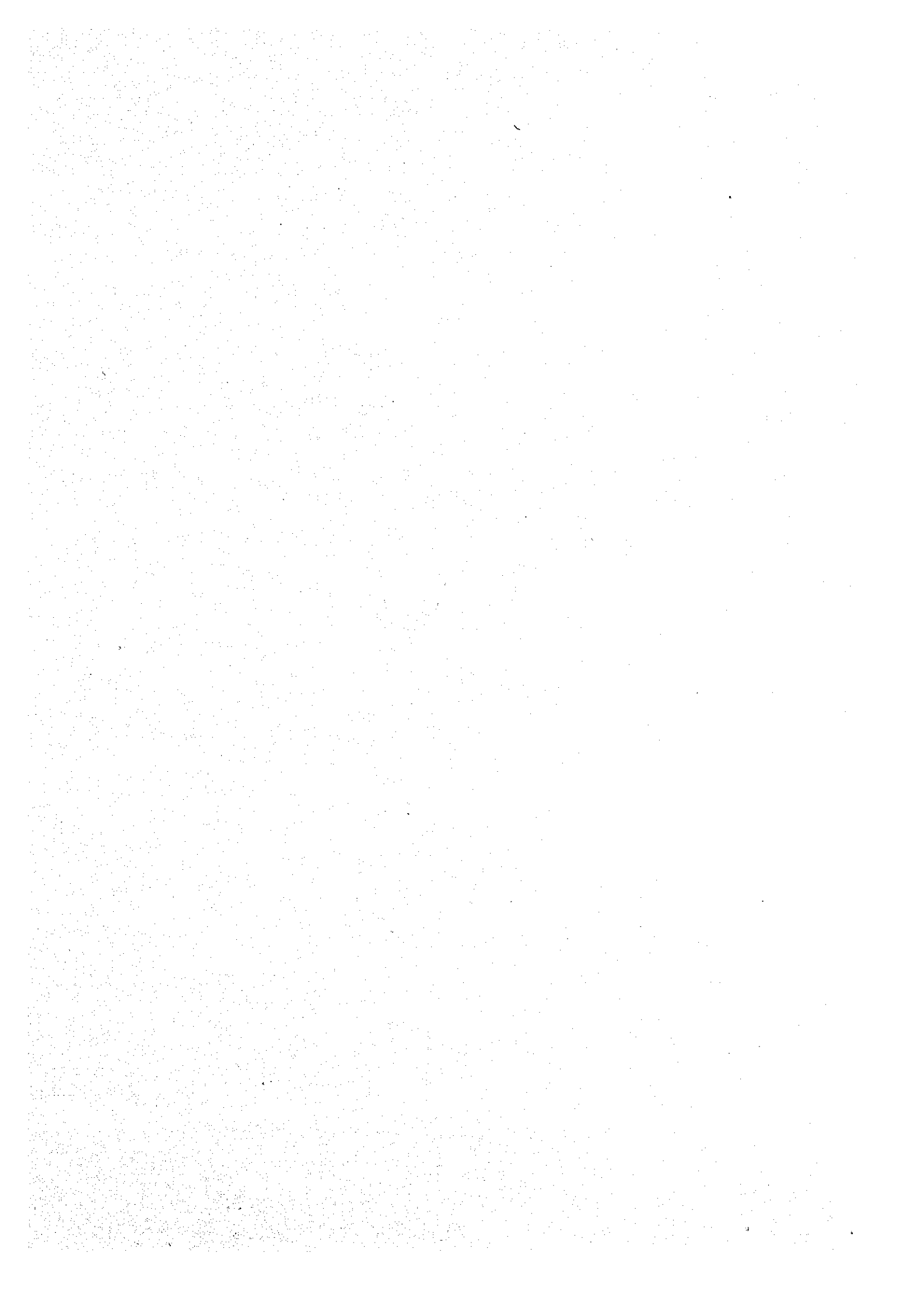
- 4 lanes : from Glodok IC to Kebon Sirih IC
- 6 lanes : from Kebon Sirih IC to P. Antasari IC

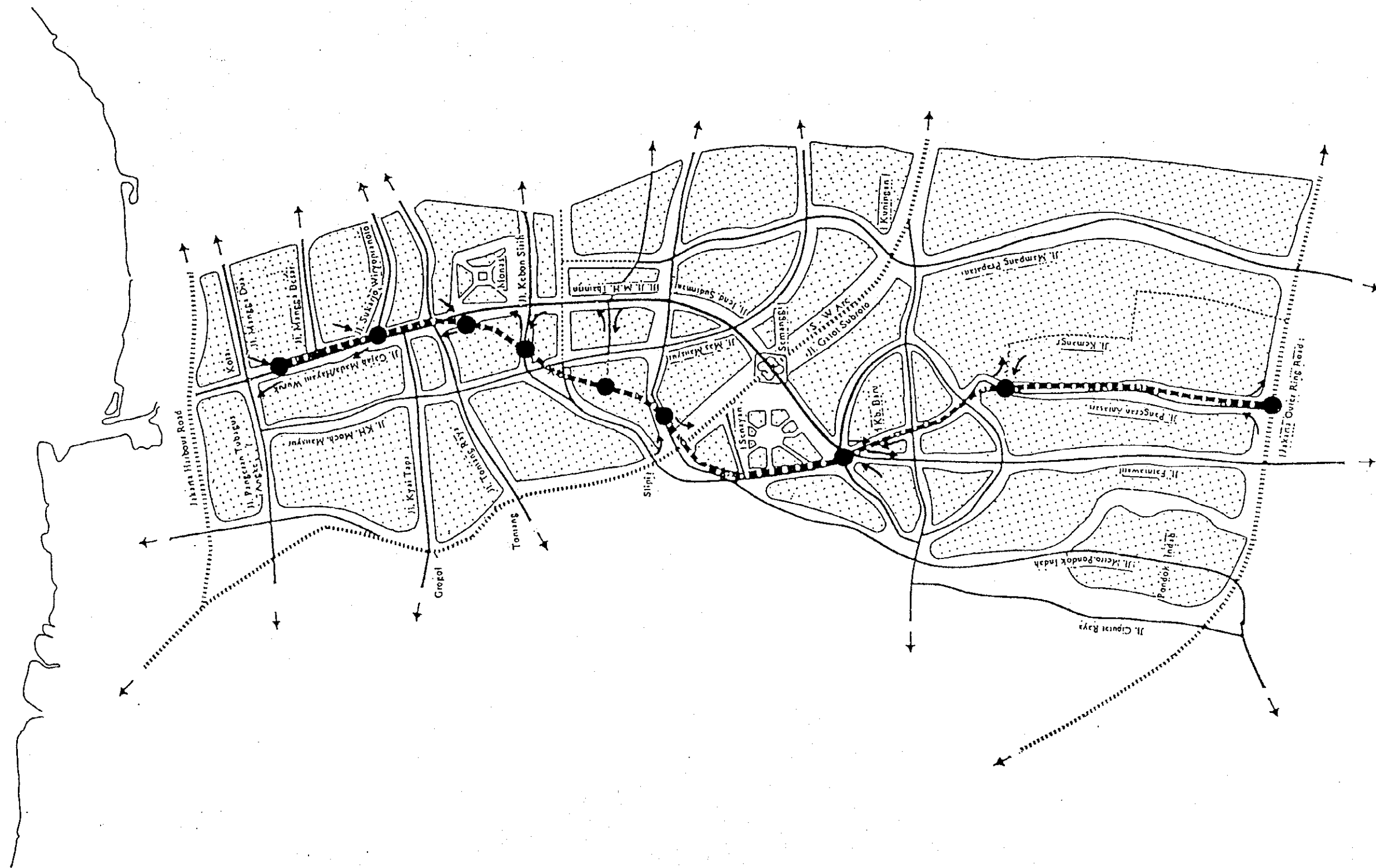
(2) East-West Link

i) Route Location

The proposed route for the East-West Axis is presented in Fig. 3.6.

- The western section of JORR (W1)
- The City Planning road Route K
- The City Planning road along the Tangerang Railway Line
- Jl. Utama Sakti
- Jl. Jelambar Selatan 2
- The City Planning road Mangga Besar Extension
- Jl. Mangga Besar
- Jl. Industri





FEASIBILITY STUDY ON
 URBAN ARTERIAL ROAD SYSTEM DEVELOPMENT PROJECT
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Fig. 3.5 Proposed Route and Interchanges on North-South Axis

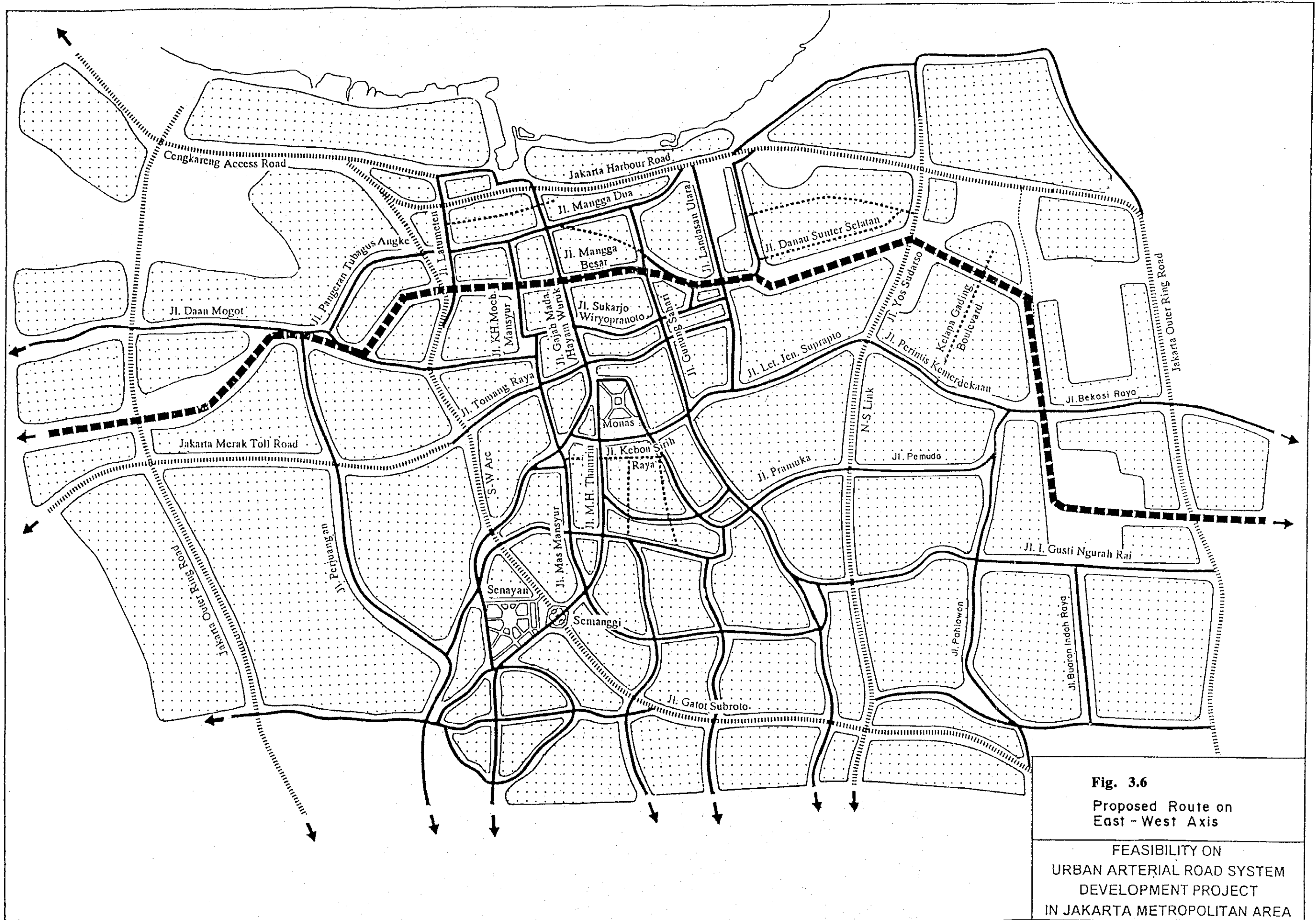
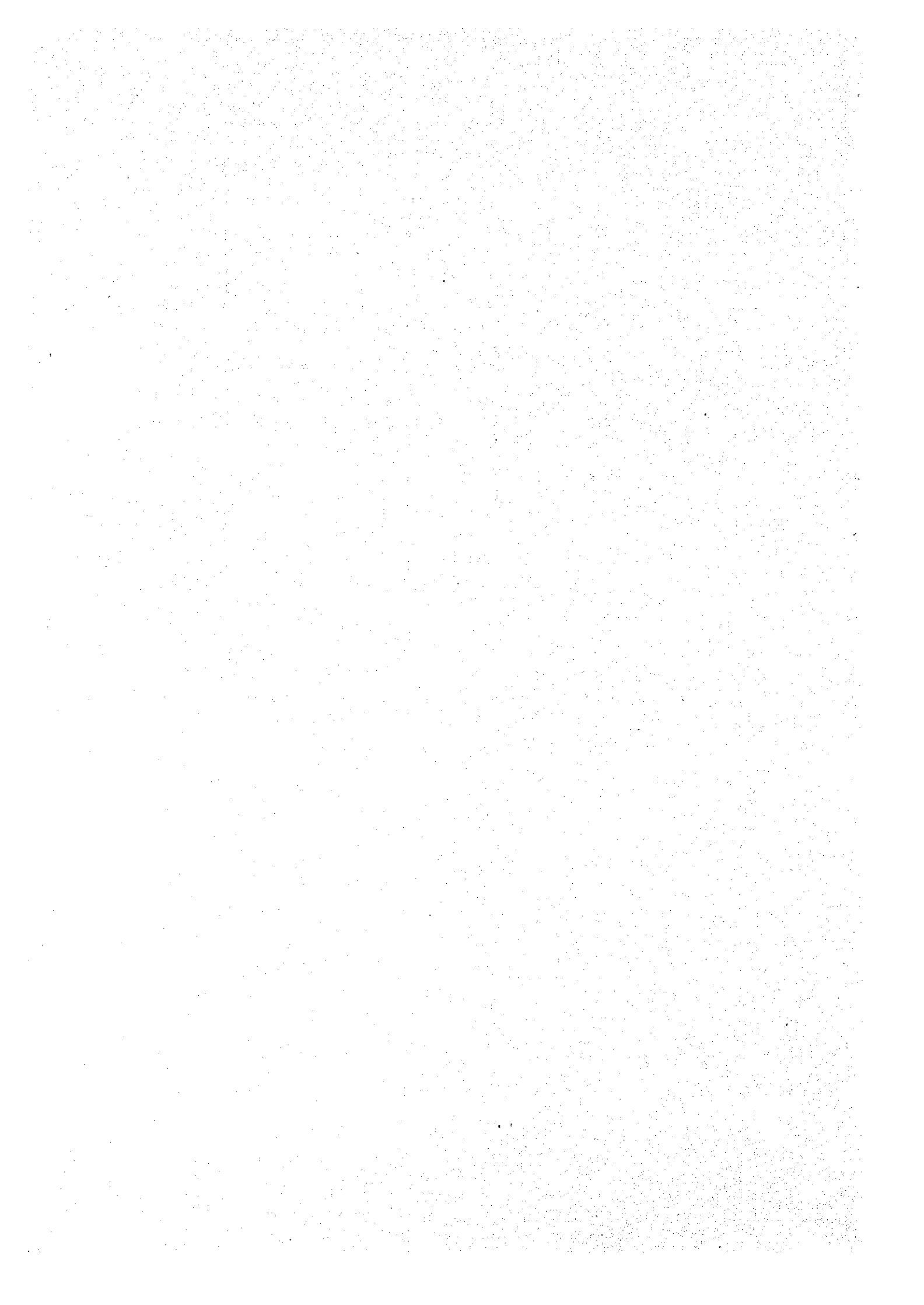


Fig. 3.6

Proposed Route on
East - West Axis

FEASIBILITY ON
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Jl. Landasan Barat/Timur
 Jl. Sunter Jaya
 The City Planning road in the north of Sunter Mas
 Jl. Taman Sunter Indah
 Jl. Danau Indah Raya
 Raya Barat/Timur Boulevard
 Jl. Pegangsaan Dua
 The City Planning road in the east of Pulogadung Industrial Estate
 The City Planning road Route AA
 The eastern section of JORR (E2)

ii) Location of Interchanges

Among many crossing roads, type of interchange will be examined at the following location of major interchanges as shown in Fig. 3.4 due to its functional classification of road and traffic volume.

- a) West JORR IC : IC with frontage roads of JORR Western Section, including U-turn flyovers
- b) Kembangan IC : IC with Jl. Kembangan Utama (Route F)
- c) Perjuangan IC : IC with Jl. Perjuangan (Panjang)
- d) Daan Mogot IC : IC with Jl. Daan Mogot
- e) Latumeten IC : IC with Jl. Latumeten
- f) Mangga Besar IC : IC with the North-South Axis and IC Jl. Gajah Mada/Hayam Wuruk
- g) Gunung Sahari IC : IC with Jl. Gunung Sahari
- h) Kemayoran West IC: IC with Jl. Industri
- i) Kemayoran East IC : IC with Jl. Sunter Raya
- j) Sunter IC : IC with Jl. Yos Sudarso
- k) Kelapa Gading IC : IC with Jl. Penggangsaan Dua
- l) Bekasi Raya IC : IC with Jl. Bekasi Raya
- m) Buaran IC : IC with the northern extension of Jl. Buaran Indah Raya (Route E-E)
- n) East JORR IC : IC with frontage roads of JORR Eastern Section, including U-turn flyovers.

iii) Number of lanes : 10 lanes

ROW = 70 m : from West JORR IC to Mangga Besar IC and
 from Kelapa Gading East IC to East JORR IC
 ROW = 40 m : from Mangga Besar IC to Kelapa Gading East IC

4) Layout of the North-South Axis

The North - South Axis is designed as a full access controlled road to pass built-up area in its entire stretch. In order to make it practical and realistic, the route is selected to pass in public spaces such as the spaces above roads and rivers. Even steel structure of double deck with racket type pier is adopted where severe land conditions are found.

The layout of the North-South Axis is presented in Fig. 3.7. The technical feasibility of the layout shown has been confirmed.

A diamond type interchange is adopted in general where the project road has parallel roads in both sides. The location of On/Off ramp is selected to keep sufficient distance between ramp terminal and adjacent intersections. Where entrance and egress traffic at an interchange has a directional dominance toward a crossing road or where no parallel road exists, other practical types of interchange are studied.

The evaluation of interchange type is discussed for the following interchanges in particular;

- (1) Mangga Besar Interchange (TEXT Fig. 10.5.6)
- (2) Kebon Sirih Interchange (TEXT Fig. 10.5.7)
- (3) Kebon Kacang Interchange (TEXT Fig. 10.5.9)
- (4) Senayan Interchange (TEXT Fig. 10.5.10)
- (5) South JORR Junction (TEXT Fig. 10.5.13)

5) Layout of the East-West Axis

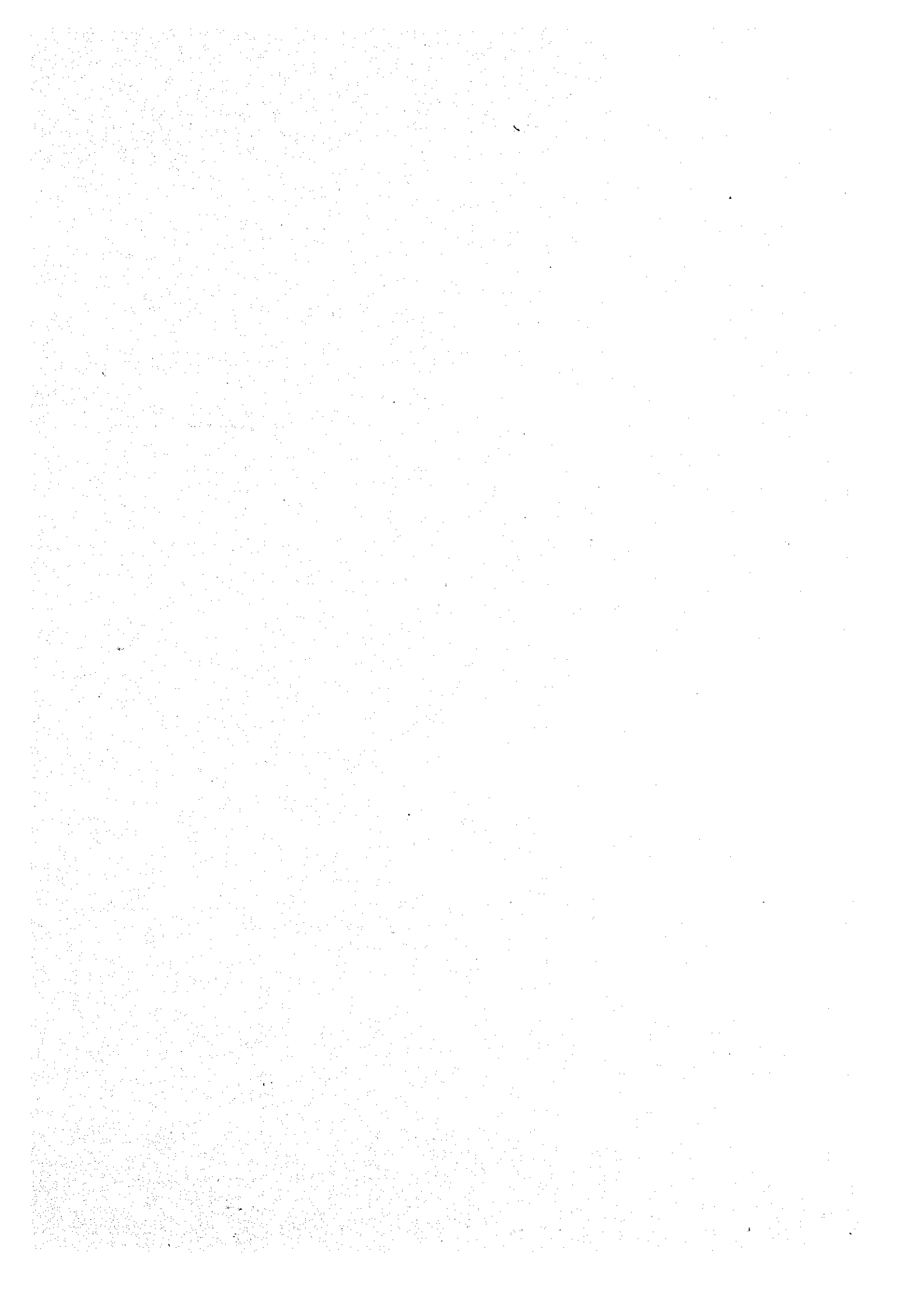
Since the East - West Axis is planned to be a new arterial road it requires considerable land acquisition and property compensation. Where the East - West Axis passes built-up area, 40 m wide ROW is proposed to avert adverse social impacts by excessive demolition. On the other hand, 70 m wide ROW is proposed in an undeveloped area and areas designated as urban betterment. In an undeveloped area, the future ROW will be reserved by a subdivision method during development, while in the areas designated as urban betterment it is necessary to introduce land readjustment techniques in order to acquire land successfully to create considerable public spaces for urban betterment including roads as well as to avert resettlement problems.

The layout of the East-West Axis is presented in Figs. 3.8 and 3.9. The technical feasibility of the layout shown has been confirmed.

A diamond type interchange is adopted in general since the project road has frontage roads in both sides. Where some special considerations are taken into account, such as the configuration of crossing road and physical constraints, other practical types of interchange are studied.

The evaluation of interchange type is discussed for the following interchanges in particular;

- (1) West JORR Interchange (TEXT Fig. 10.5.14)
- (2) Latumeten Interchange (TEXT Fig. 10.5.15)
- (3) Gunung Sahari Interchange (TEXT Fig. 10.5.16)
- (4) East JORR Interchange (TEXT Fig. 10.5.17)



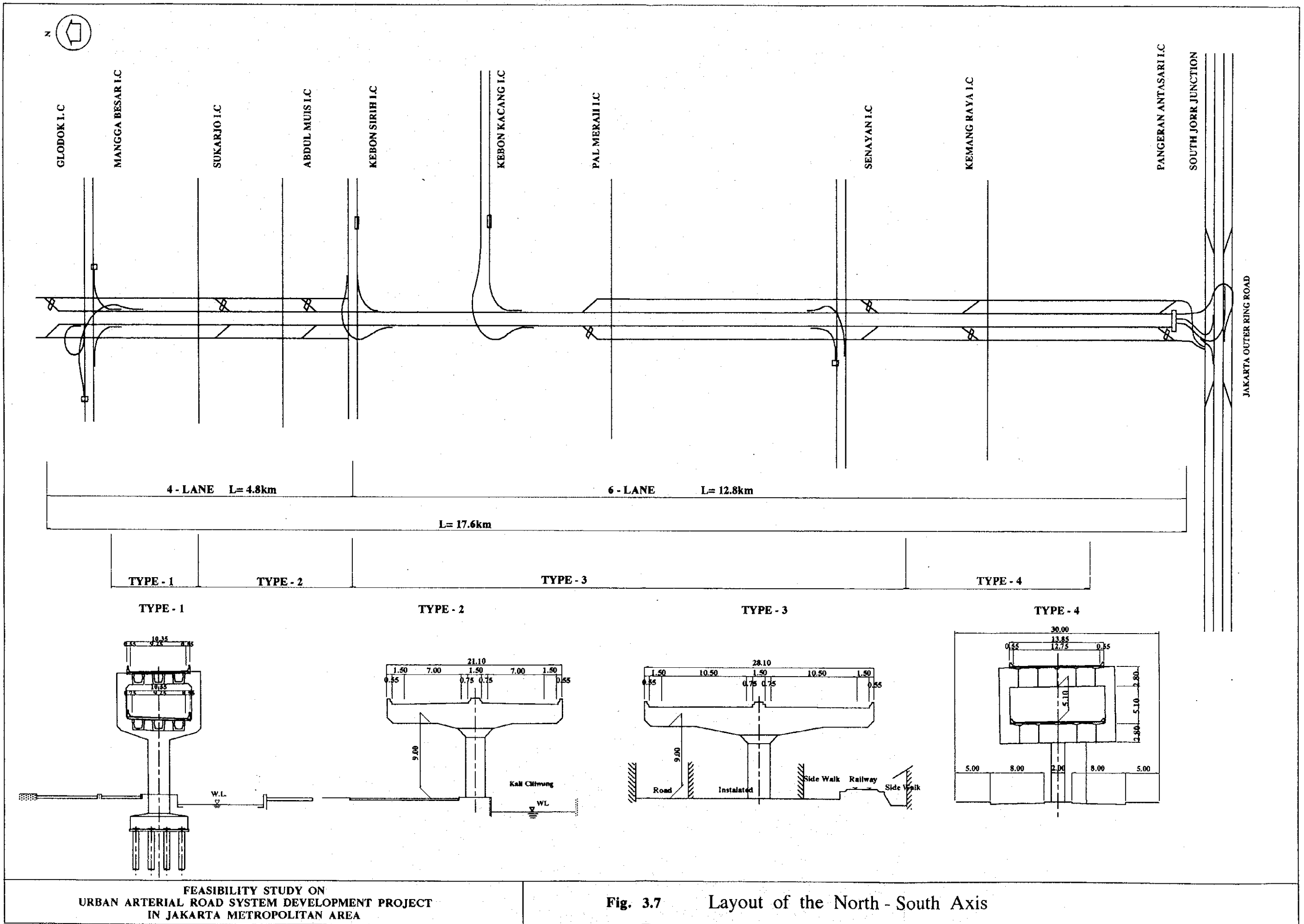
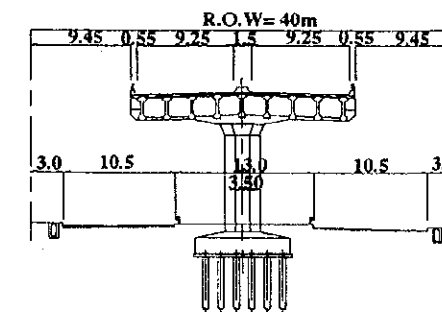
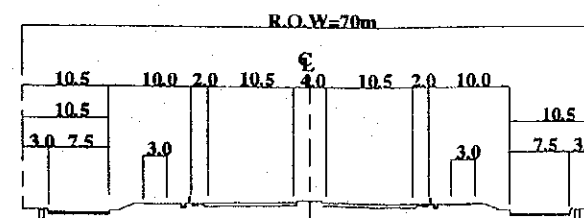
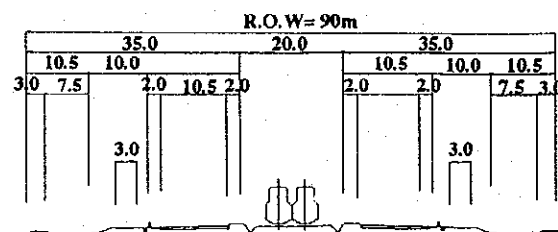
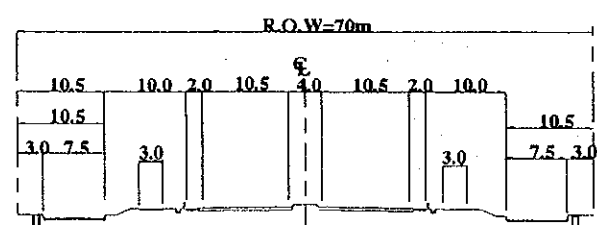
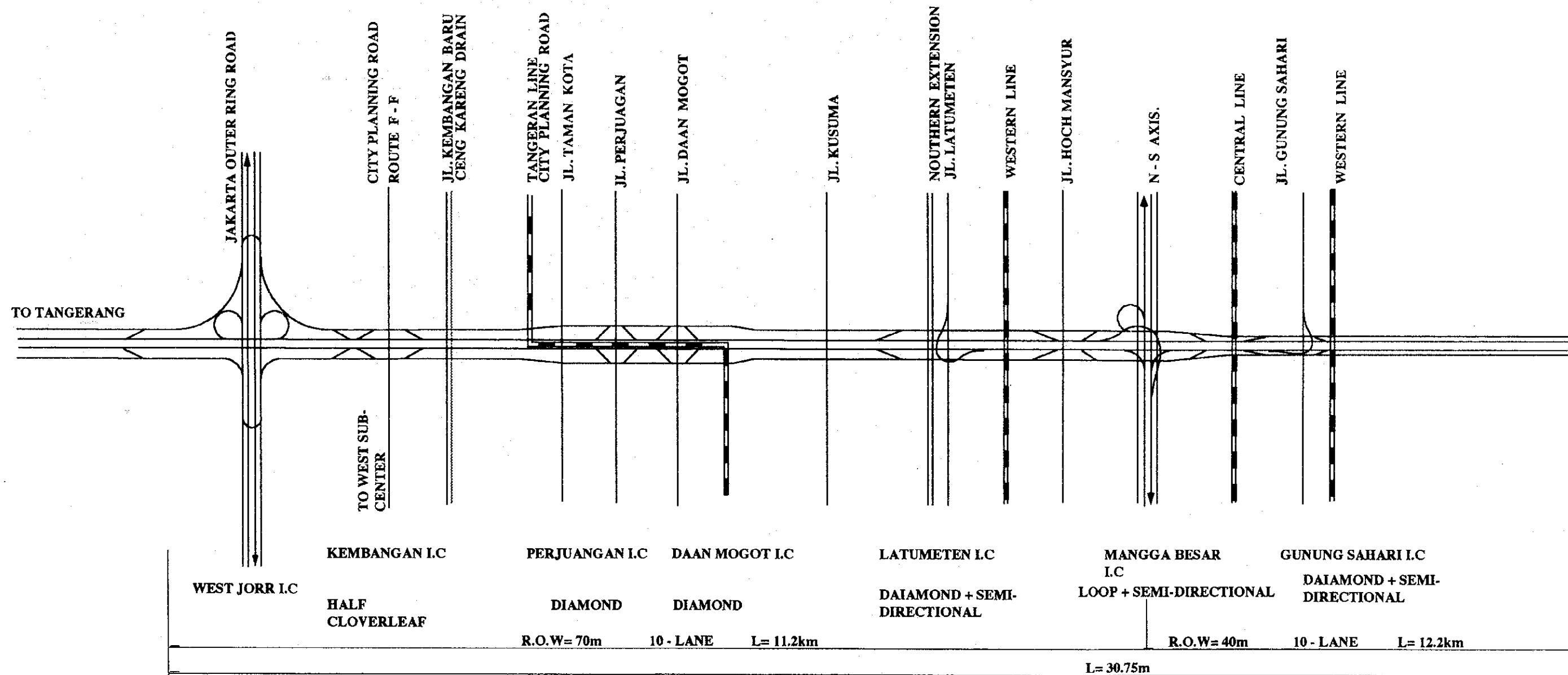


Fig. 3.7 Layout of the North - South Axis



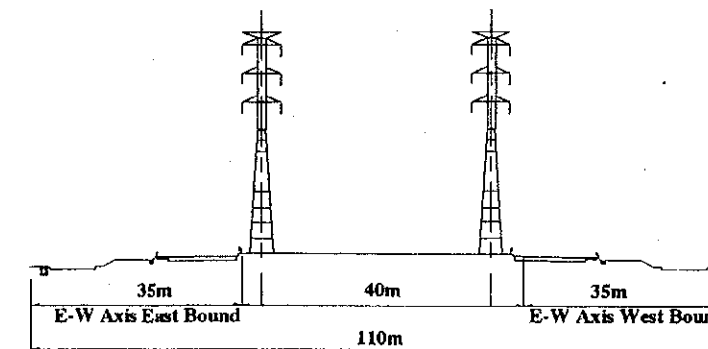
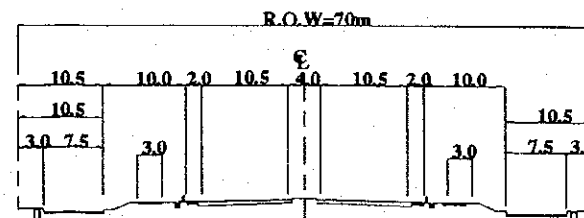
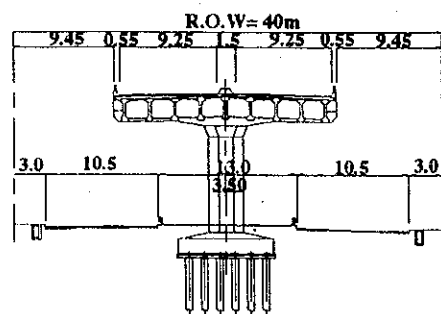
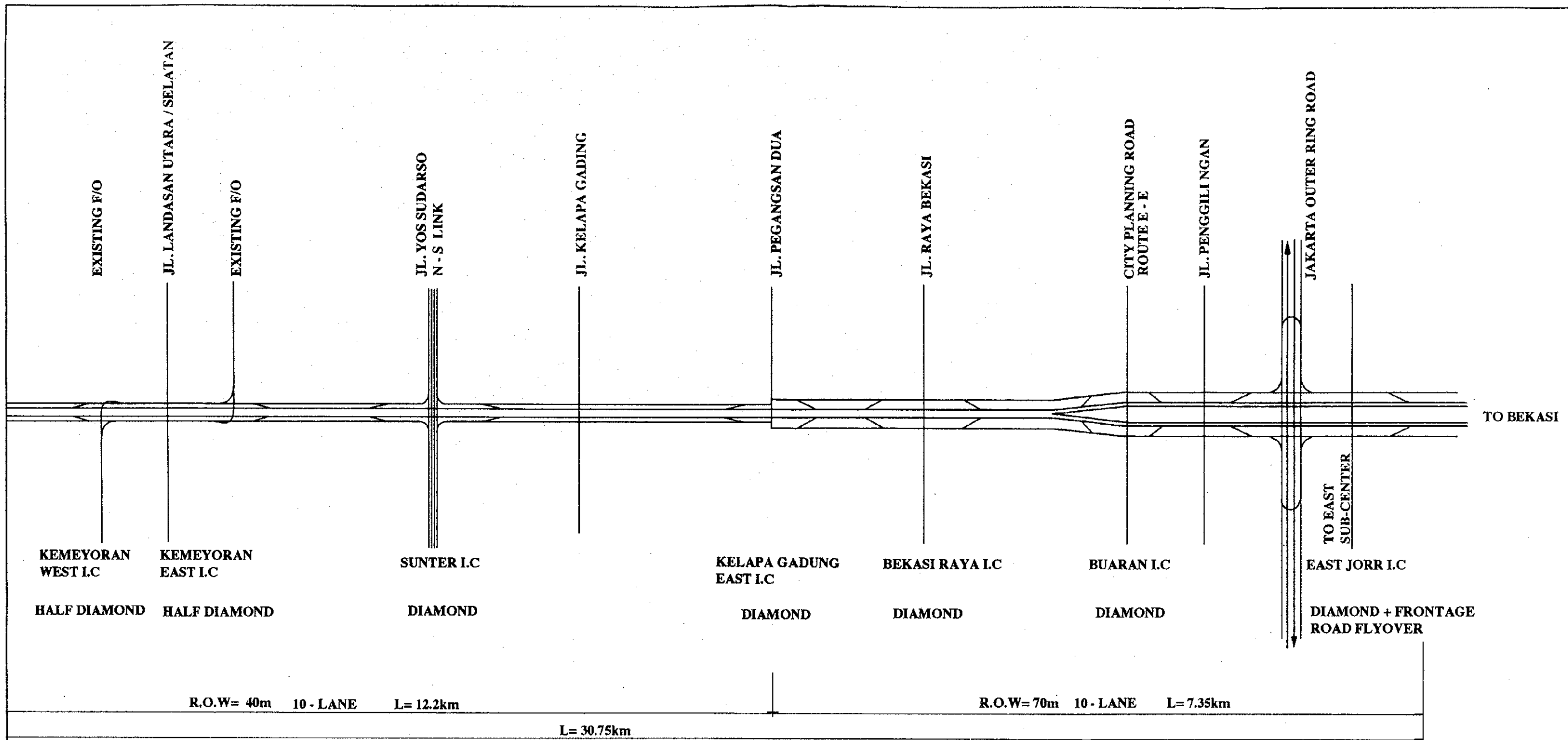
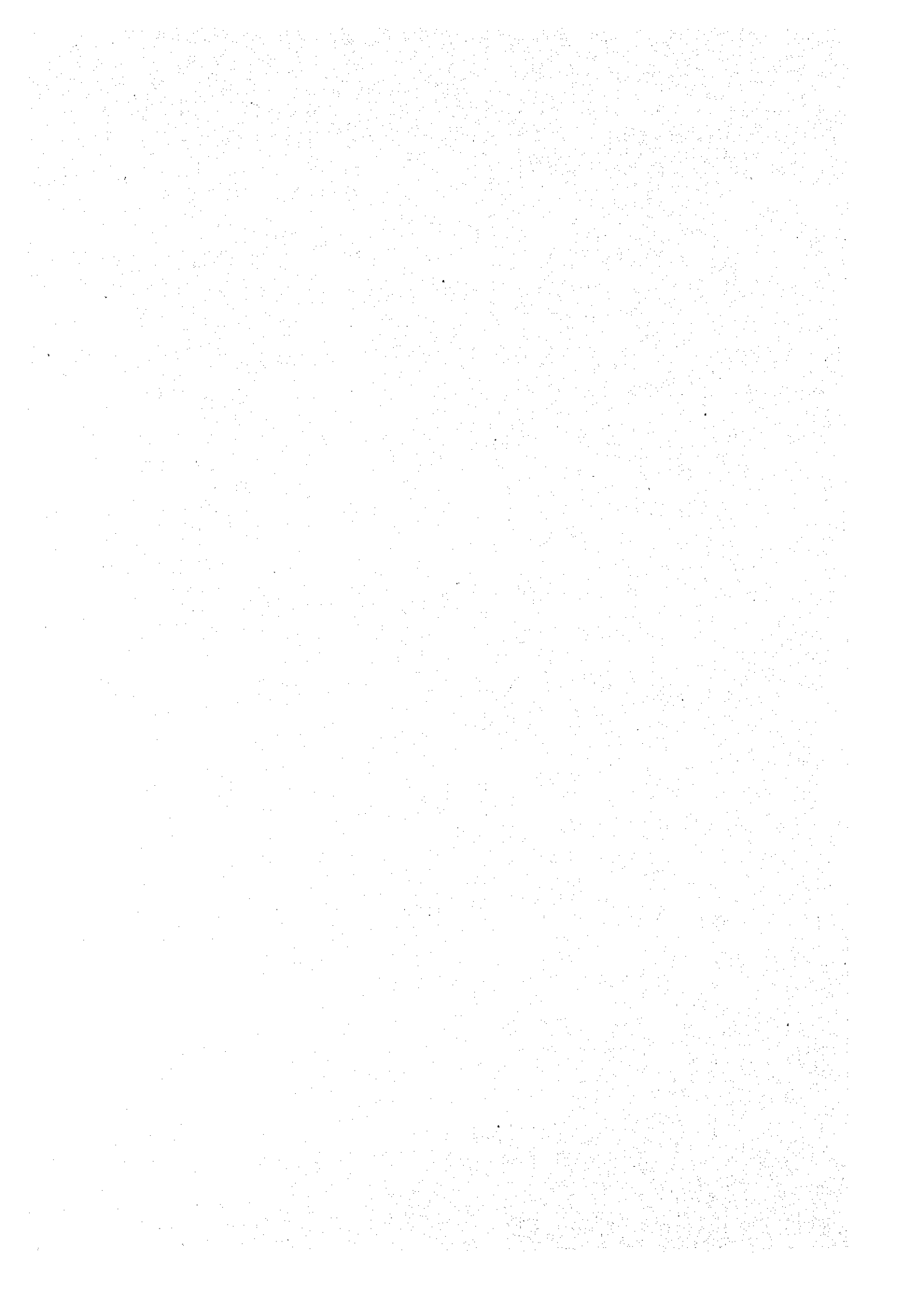


Fig. 3.9 Layout of the East-West Axis (2)



3.4 Transport Modeling and Demand Forecast

3.4.1 Transport Modeling

1) Basic Concept

The travel demand forecasting model employed in this study has its root in the previous study, the 1985 Arterial Road System Development Study (ARSDS). The 1985 ARSDS transport models were verified in a cascading step as shown in Figure 7.1.1.

In the first place, present travel demand was estimated by applying a series of transportation models developed in ARSDS (1985) with 1993 socio-economic indicators. The estimated travel demand was compared with the observed traffic volume and passenger demand to examine an applicability of the previously developed transportation models for demand forecasting. Accordingly, the estimated mode-wise travel demand in the form of origin-destination matrices were calibrated to the observed traffic volume at the screen lines and cordon lines. Once "base year" network and matrices were set up, future network and matrices may then be developed, and traffic assignment routines performed.

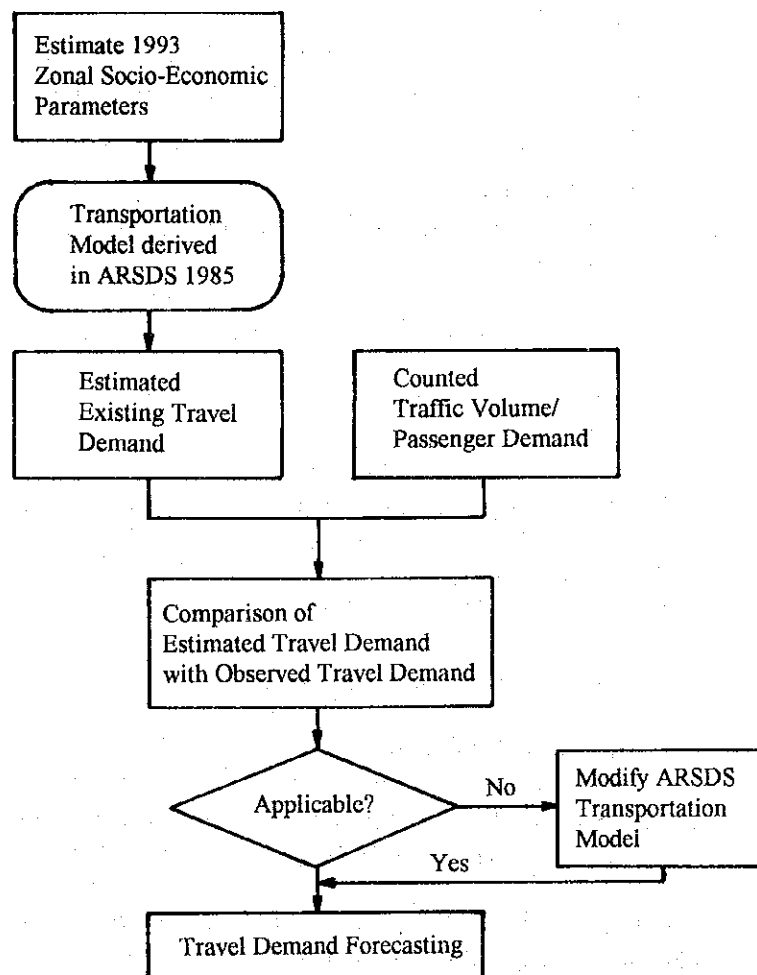


Fig. 3.10 Verification of ARSDS Transportation Models

Besides the model verification, the following important definitions are selected;

- Analysis zones; a revised system of 202 zones shown in Fig. 3.11 while Fig. 3.12 shows the 131-zone system.
- *Vehicle type*
Feasibility and utilization analyses inherent to this study are based on over-the-road motorized vehicle trips subdivided into four categories, namely motorcycles, sedans (comprising private passenger cars, taxis, pick-ups and vans), buses (comprising small, medium and large-size buses) and trucks (comprising all trucks larger than pick-ups).
- *PCU equivalence*
A trip is defined as a one-way movement from an origin zone to a final destination zone. The trip may be completed as a vehicular trip (motorized form of transport) or as a "passenger car unit" (PCU). This stratification accepts that vehicle types will exert differing impacts upon the traffic stream in which they operate. Motorcycles are defined as being equivalent to 0.33 PCU, sedans to 1.00 PCU, trucks to 2.22 PCU and buses to 1.50 PCU.
- *Planning Horizon*
The "base transport condition" is defined as that existing during year 1993. Future year demand is projected in detail for years 2000 and 2010.

2) Modeling Procedure

The procedures for transport demand modeling are conveniently illustrated in Figure 3.13.

For the execution of these tasks, the capability of TRANPLAN/NIS¹ software were employed during all steps of the modeling process.

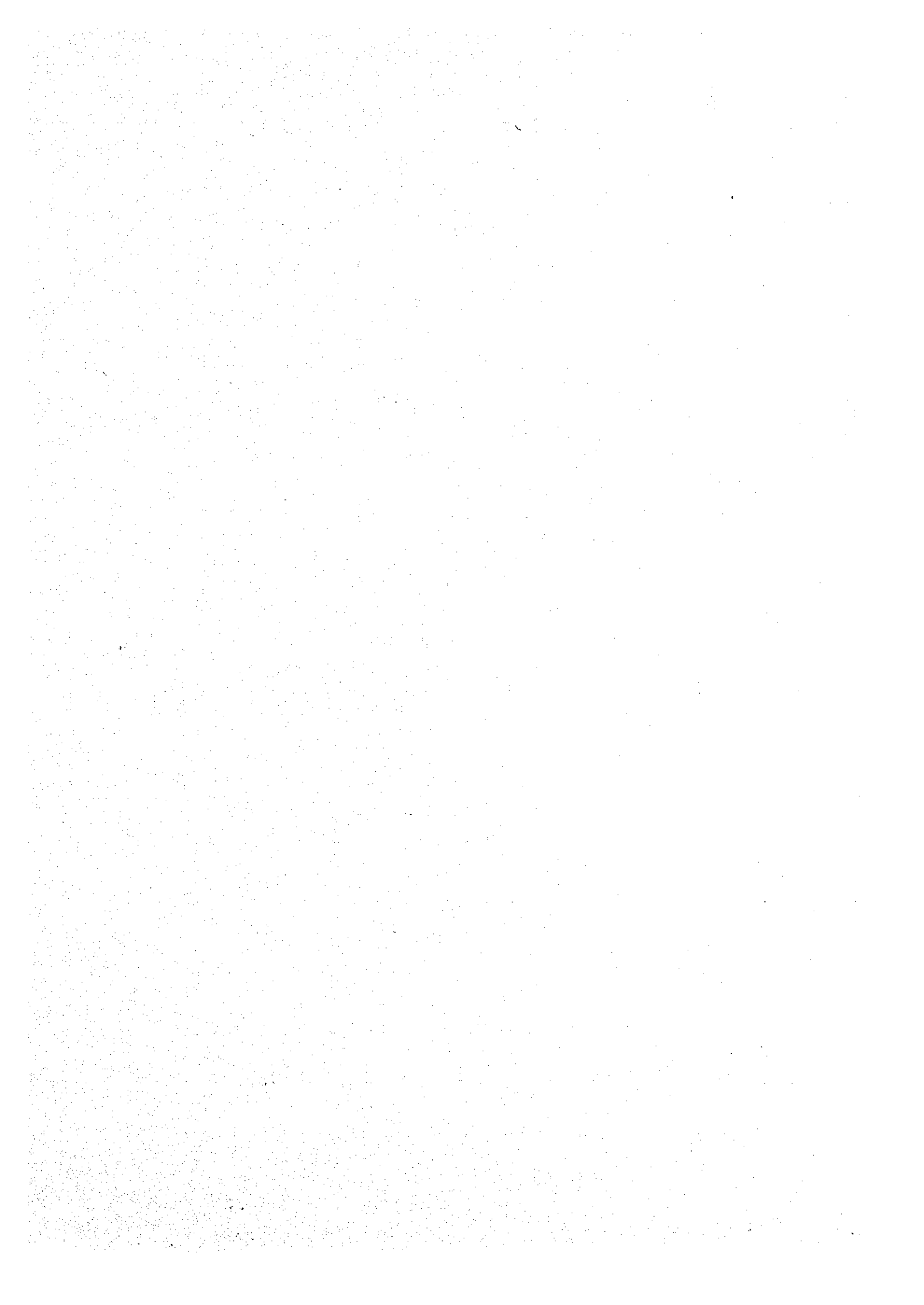
Those step items are as follows;

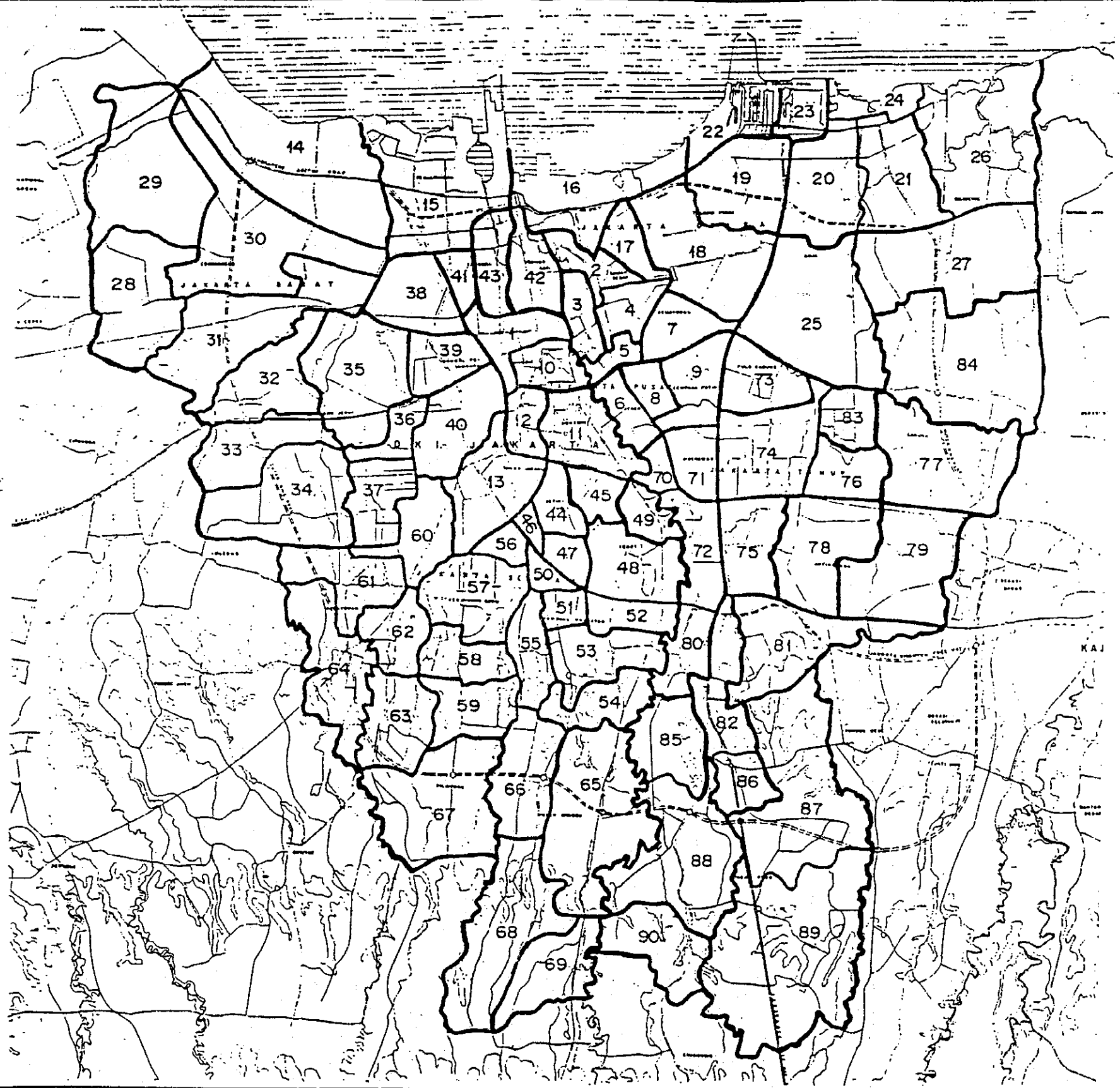
- Network Development
The future network without the project roads consists of DKI Jakarta City Planning roads, proposed tollway network in Jabotabek area and railway and LRT plans in the area.
- Trip Generation Model
- Trip Production/Attraction Models
- Trip Distribution Model
- Modal Split Model (refer to Fig. 3.14).

3) 1993 OD Matrix Calibration

Utilizing the screen line traffic count data, the OD matrices are calibrated to meet the screen line volume and the flows are shown in Fig. 3.15. The procedure is shown in Fig. 3.16.

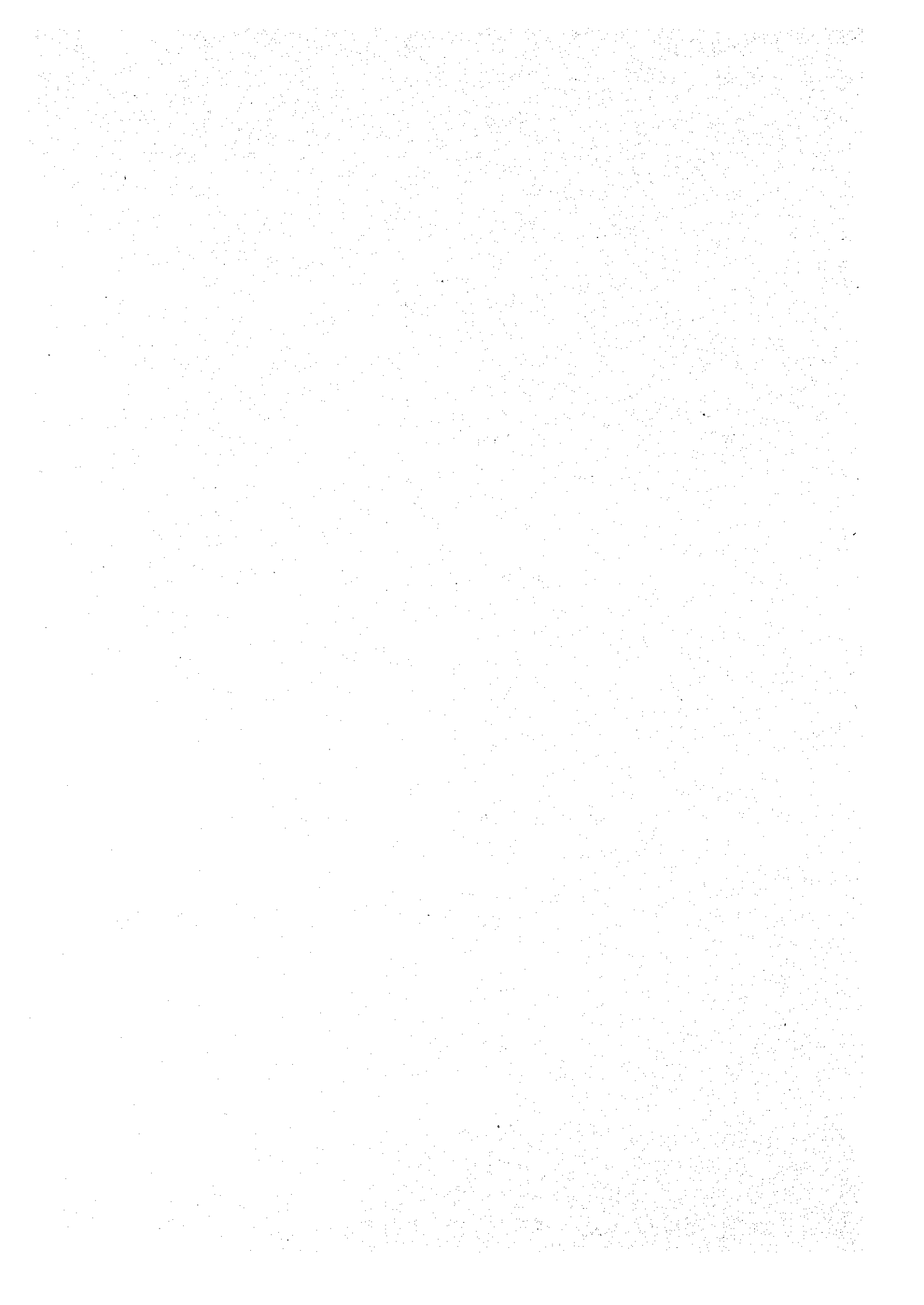
The modal split of person trips by trip purpose are shown in Table 3.3 for Jabotabek and for DKI Jakarta residents.





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Fig. 3.11 TRAFFIC ZONE SYSTEM IN DKI JAKARTA



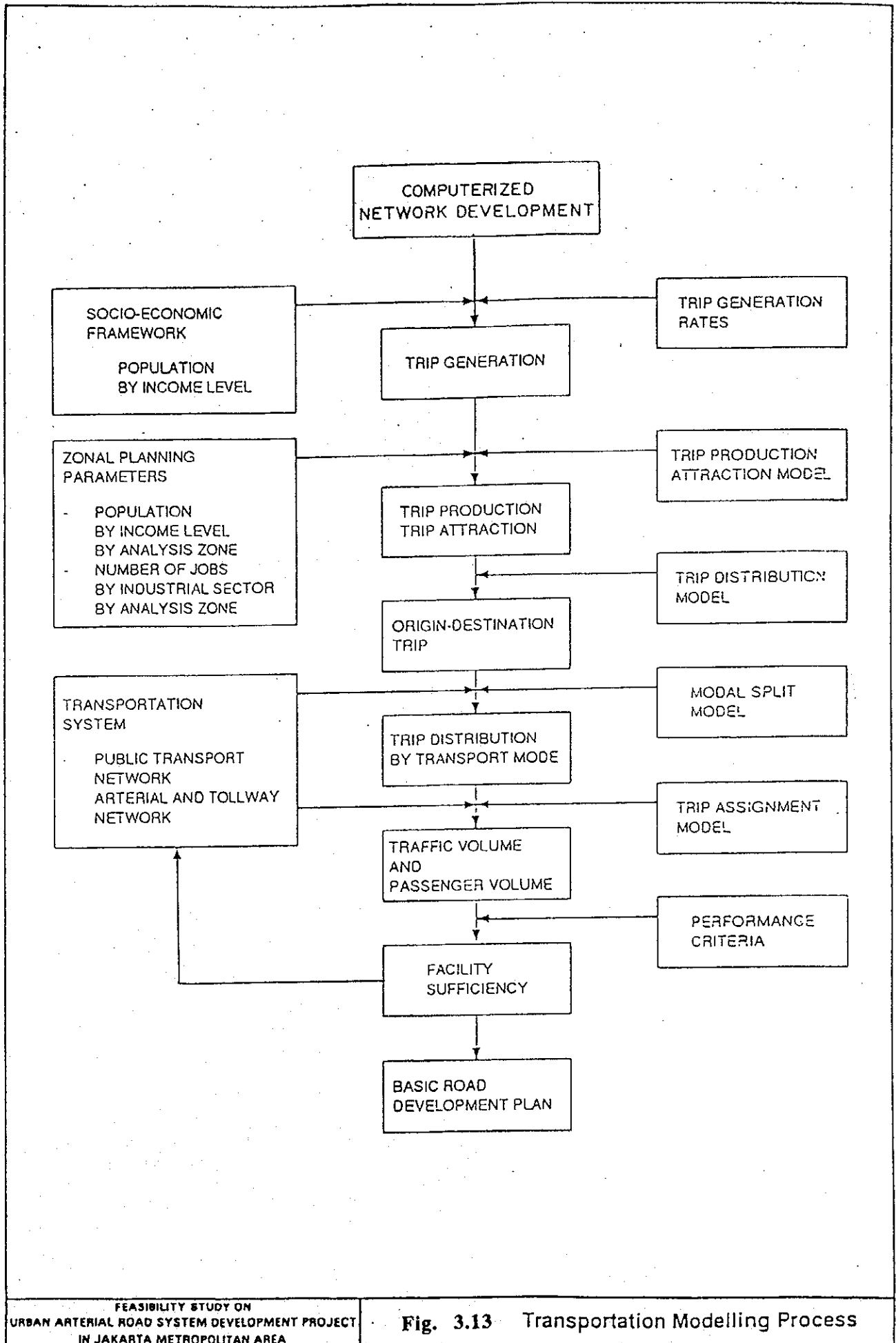


Fig. 3.13 Transportation Modelling Process

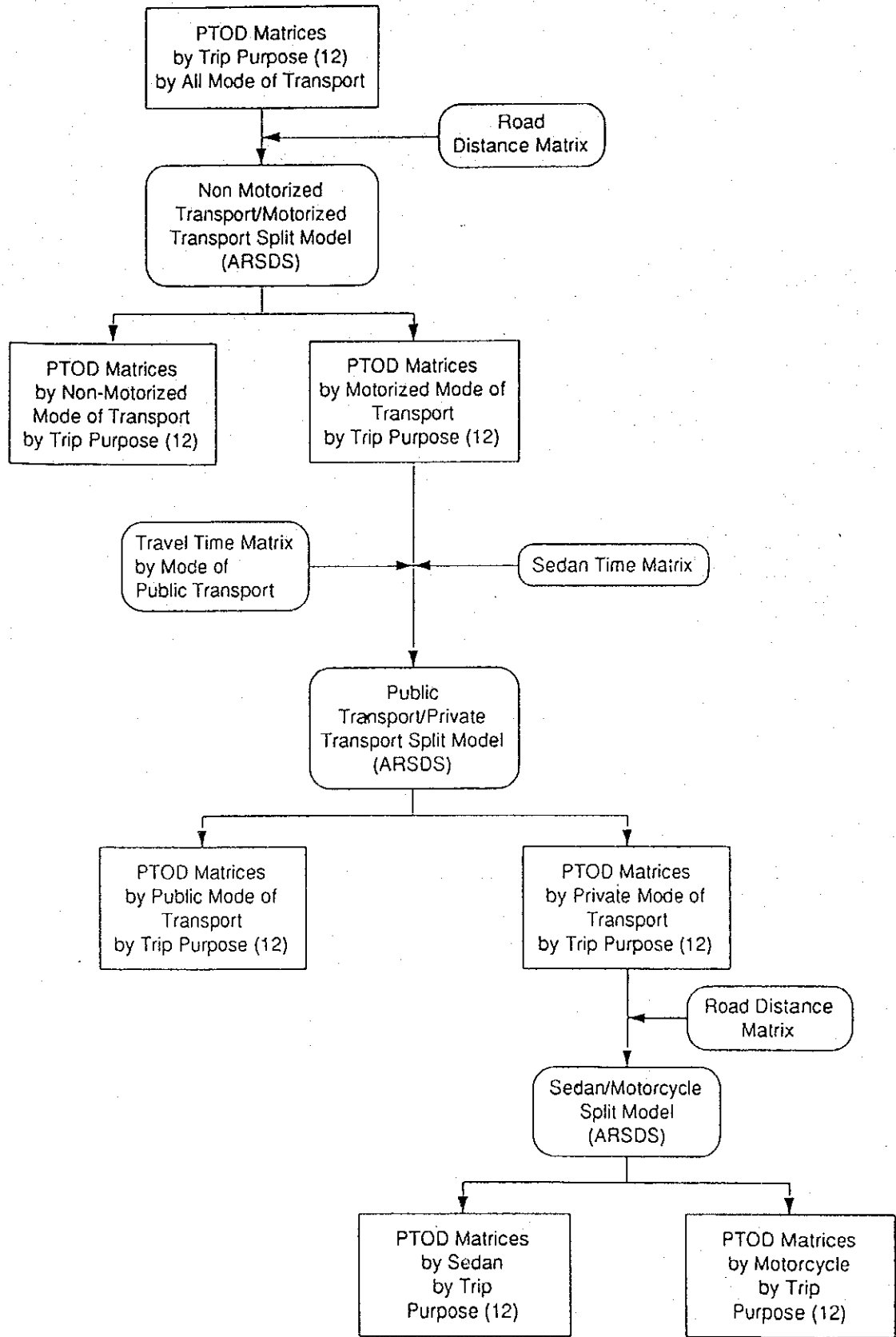
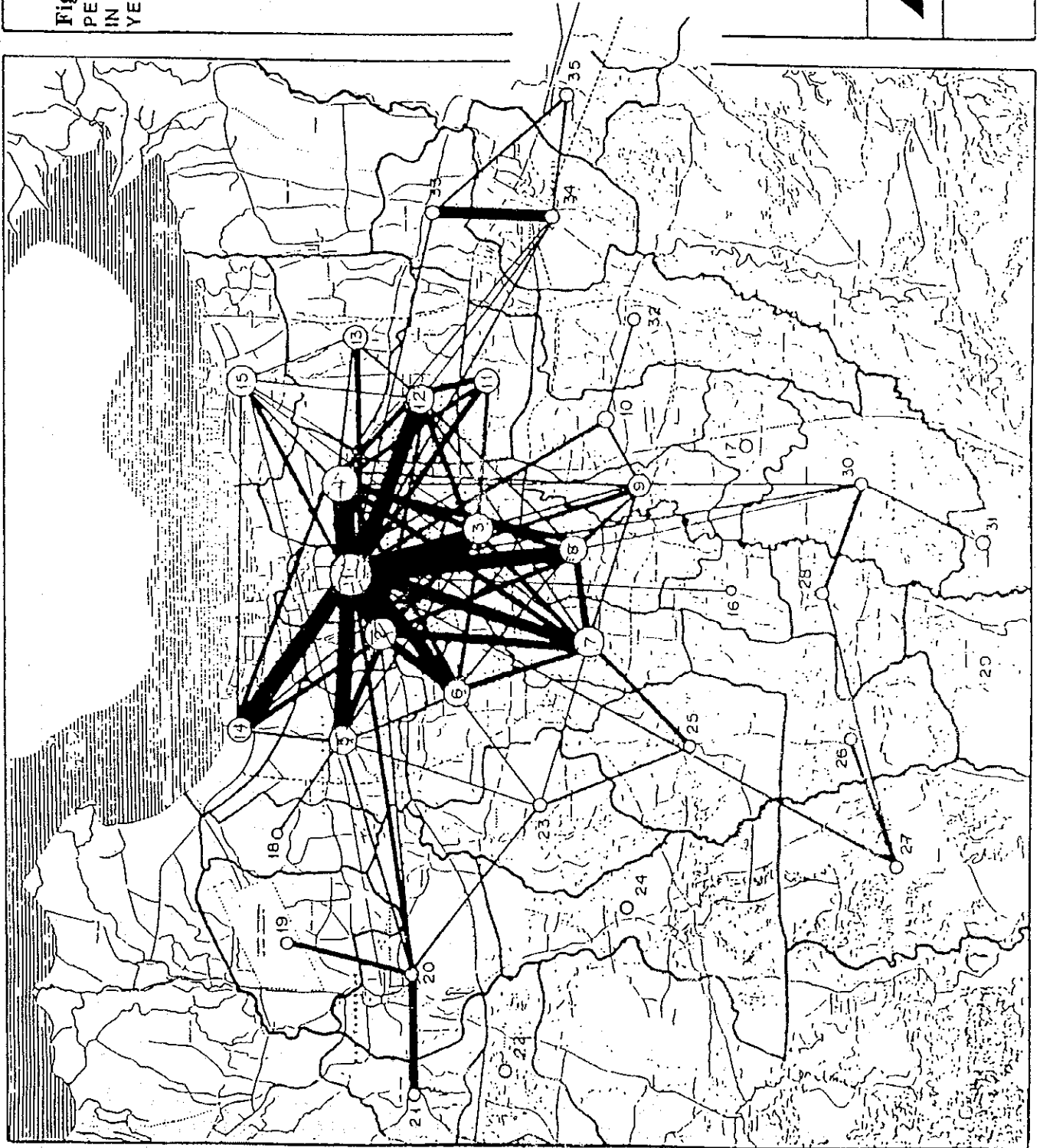


Fig. 3.14 Structure of Modal Split Model

Fig. 3.15
PERSON TRIP FLOWS
IN JAKARTA METROPOLITAN AREA
YEAR 1993



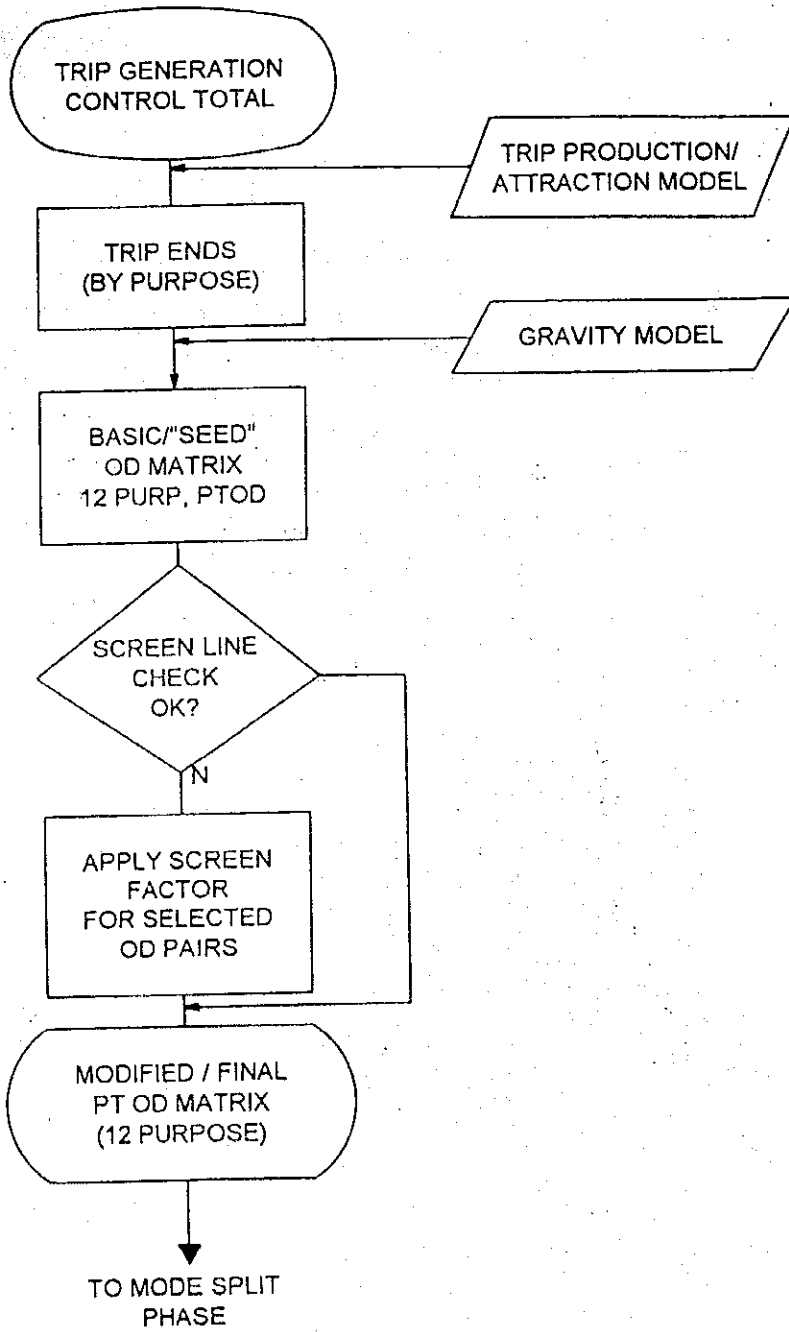


Table 3.3 Year 1993 Modal Split (by Purpose of Trip)

TRIPS BY JAKARTA RESIDENTS
(Includes DKI-DKI and DKI-Botabek trips)

MODE	TRIP PURPOSE							TOTAL	COMP.
	WORK	SCHOOL	BUSINESS	HOME	PRIVATE	SHOPPING	TOTAL		
WALKING	491,252	1,374,323	145,858	3,950,303	696,387	824,569	7,482,691		
PUBLIC TRANSPORT	948,983	834,171	139,552	1,932,367	605,669	274,858	4,735,600	52.90%	
MOTOR CYCLE	304,115	45,022	95,585	518,129	102,640	30,509	1,096,000	12.24%	
PASSENGER CAR	776,516	194,553	286,353	1,326,125	385,455	151,399	3,120,400	34.86%	
SUB.TOT MOTORIZED	2,029,614	1,073,746	521,490	3,776,622	1,093,763	456,765	8,952,000		
TOTAL	2,520,865	2,448,069	667,348	7,726,924	1,790,150	1,281,334	16,434,691		
SHARE	15.34%	14.90%	4.06%	47.02%	10.89%	7.80%			