

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
MINISTRY OF PUBLIC WORKS, REPUBLIC OF INDONESIA

A STUDY
FOR
ARTERIAL ROAD SYSTEM DEVELOPMENT
IN
GERBANG KERTOSUSILA REGION
(SURABAYA METROPOLITAN AREA)

FINAL REPORT
SUMMARY

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JULY 1997

PACIFIC CONSULTANTS INTERNATIONAL
YACHIYO ENGINEERING CO., LTD.

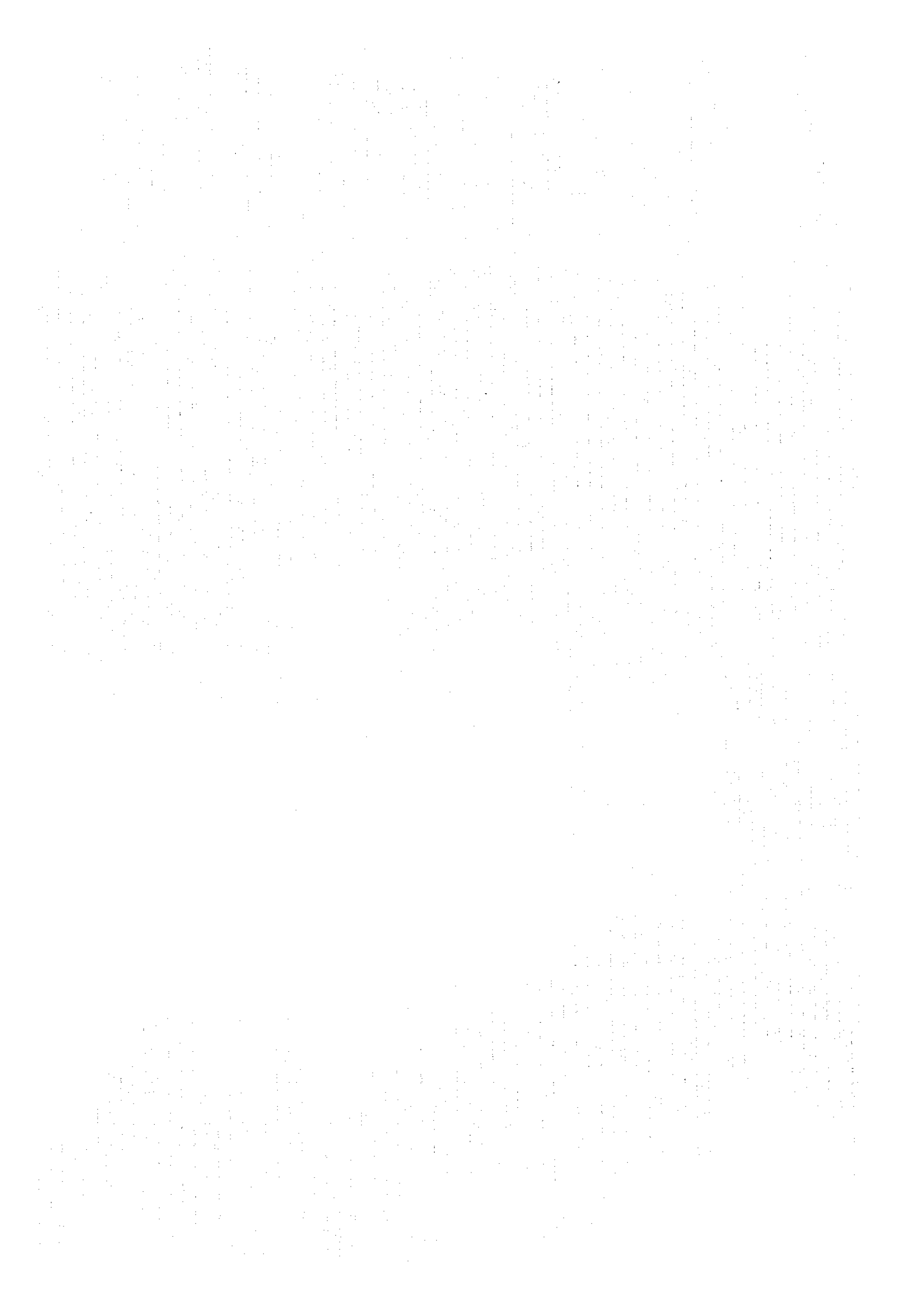
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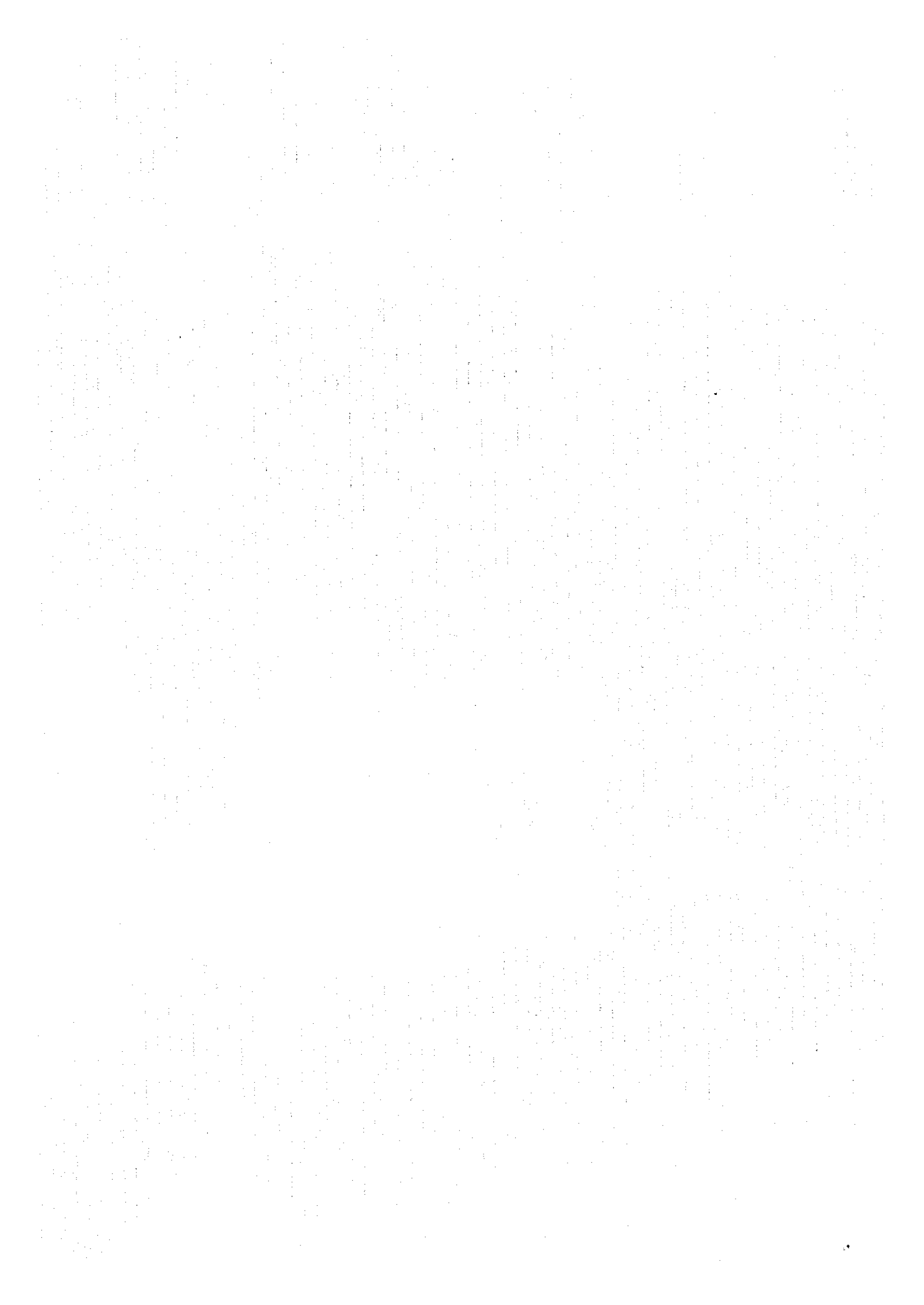
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The exchange rate applied in this study is:
US\$ 1.00 = Rp. 2,350
(as of January 1997)

Preface

In response to a request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct "A Study for Arterial Road System Development in Gerbang Kertosusila Region" in the Republic of Indonesia and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Indonesia a study team headed by Mr. Isamu Gunji, Pacific Consultants International, several times between February 1996 and June 1997.

The team held discussions with the officials concerned of the Government of Indonesia, and conducted field surveys 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.

July 1997



Kimio Fujita
President

Japan International Cooperation Agency

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July 1997

Mr. Kimio Fujita
President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

Dear Sir:

We are pleased to officially submit herewith the final report of "A Study for Arterial Road System Development in Gerbang Kertosusila Region (Surabaya Metropolitan Area)" in the Republic of Indonesia.

This report complies the result of the study which was undertaken in the Republic of Indonesia from February 1996 to June 1997 by the Study Team, jointly organized by Pacific Consultants International and Yachiyo Engineering Co., Ltd.

We would like to express our deep appreciation and sincere gratitude to all those who extended their kind assistance and cooperation to the Study Team, particularly the officials concerned of the Directorate General of Highways, Ministry of Public Works and East Java BAPPEDA.

We also acknowledge and appreciate greatly the excellent support given by your agency and the Embassy of Japan in the Republic of Indonesia.

We sincerely hope that this report will be help for the development of Gerbang Kertosusila Region and the country as a whole.

Very truly yours,



Isamu Gunji
Team Leader
A Study for
Arterial Road System Development
in Gerbang Kertosusila Region
(Surabaya Metropolitan Area)
in the Republic of Indonesia

**A Study for Arterial Road System Development
in
Gerbang Kertosusila Region (Surabaya Metropolitan Area)**

Study Period: February 1996 - July 1997
Counterpart Agency: Directorate General of Highways,
Ministry of Public Works

Outline of the Study

1. Study Background

Recent high and stable economic growth in Indonesia has enabled such large cities as Jakarta and Surabaya to accept promising real estate business and investments, and these investments are concentrated either to the central business district or along major arterial streets. Housing development is taking place on a large scale in the periphery of the present urbanized area. Such a current urbanization trend is intensifying the traffic in the city center, and producing all day traffic jams on arterial streets. Surabaya is not exceptional.

Industrial development is a strategic policy to promote the regional development, and it is planned particularly along the northern coastal area of the Gerbang Kertosusila Region (Surabaya Metropolitan Area).

The road development in the Surabaya Metropolitan Area faces the strong urbanization and industrialization drive, and which is evolving in the central city area and extending to the urban and suburban areas. In order to cope with this, it has been expected to formulate a long-term master plan of arterial road system that comprehends the prospective future city and regional development.

2. Study Objectives

Study objectives consist of :

- ♦ to formulate a master plan for arterial road system, which is comprised of primary arterial, primary collector and secondary arterial roads in Gerbang Kertosusila Region;
- ♦ to undertake a feasibility study on priority road projects selected through the evaluation at the master plan development study; and
- ♦ to conduct a technical transfer on transport planning and engineering to designated Indonesian counterparts.

3. Study Area and Planning Target Year

The study area covers Gerbang Kertosusila (GKS) region, i.e. Kotamadya Surabaya, Kabupaten Gresik, Kabupaten Sidoarjo, Kabupaten Mojokerto, Kotamadya Mojokerto, Kabupaten Lamongan and Kabupaten Bangkalan. The analysis area, however, is further extended to Kabupaten Tuban, Kabupaten Pasuruan, and in general to East Java Province as a whole.

A planning target year of the Study is set to be the year 2018 which is the last fiscal year of the Second 25-year National Development Plan, and also the year 2008 is set as an intermediate year of the planning time horizon.

4. Outline of Road Master Plan

4.1 Future Socio-Economic Framework

A future socio-economic framework of GKS region was based upon the relevant national, regional and urban development policies and plans, and it is shown in the below table.

Table 4.1 Future Socio-Economic Framework of GKS

Major Socio-Economic Components		1996	2008	2018
GRDP: (Bil. Rp. at 1993 Const. Prices)	Primary	1,775	2,243	2,593
	Manufacturing	8,850	26,368	65,968
	Others	14,022	31,580	75,829
	Total	24,647	60,191	144,390
Population: (×1,000)		7,788	9,107	9,731
Employment: (×1,000)	Primary	814	776	675
	Manufacturing	657	1,141	1,454
	Others	1,900	2,646	3,064
	Total	3,371	4,563	5,193

4.2 Strategy of Arterial Road Network Development

Development strategies or criteria to formulate the arterial road network have been employed separately for SMA region outside SMA and for GKS as shown below:

(1) Surabaya Metropolitan Area (SMA)

- ♦ A primary road system inside SMA should evolve as the urbanization progresses. Particularly, a primary function of the ring road at present will shift to the outer ring road in future.
- ♦ Basically, a grid pattern is applied to diversify the accessibility of urban roads;
- ♦ "Urban units" and proper spacing of street network should be planned to improve urban environment;
- ♦ Streets to support the urban public transport should be planned, such as Light Rail Transit and Busway that can share the same road space; and
- ♦ Traffic flows should be segregated, i.e. goods vs. passenger movements and intercity vs. intraurban movements.

(2) GKS region outside SMA

- ♦ A primary road system, as defined in the Indonesian design standard, should be organized properly taking into accounts of road functions and city order system;
- ♦ Arterial roads to induce and promote the industrial development along the northern coastal area of GKS should be developed;
- ♦ Strong linkages among harbors and industrial zones should be promoted;
- ♦ By-passes and ring roads should be planned to avoid the through traffic from the urban traffic, and to secure a high mobility of inter-city traffic;
- ♦ A fully-access controlled outer ring road should be planned to limit the spontaneous urban expansion of Surabaya City, and to promote sub-regional center development in GKS region;
- ♦ Combination of radial and ring road patterns should be applied to GKS region outside SMA.

Based upon the above development criteria, a schematic arterial road network was drawn and the preliminary route was examined on the available topographic map to delineate the arterial road master plan for SMA and GKS outside SMA.

4.3 Traffic Demand Forecast and Master Plan Network

(1) Traffic Demand

A conventional stepwise method was applied for the traffic demand forecast. For the execution of transport modeling, TRANPLAN/NIS, a set of transportation planning program was employed.

The traffic demand analysis for SMA was based in person trips, while that for GKS outside SMA was based on vehicular traffic. A total number of traffic zones amounts to 313 zones, of which 163 zones are included in Kotamadya Surabaya and 137 zones in GKS outside Surabaya.

The future traffic demand was estimated, based on the computerized road network, estimated transport models and pertaining socio-economic variables.

(2) Master Plan Network

The arterial road master plan was determined taking into account the following factors:

- ♦ Traffic demand and road capacity;
- ♦ Planned function of roads and expected land uses along the roads,
- ♦ On-going projects or existing plans along the planned road corridor;
- ♦ Practical availability of land, and
- ♦ Coherence of network formulation and route continuity.

4.4 Project Implementation Program

(1) Preliminary Project Cost Estimates

Road segments were identified as projects and extracted from the master plan network, and the project costs were estimated with such breakdowns as construction costs, land acquisition/compensation costs, engineering costs and contingency costs. The total required costs amounted to 11,515 Billion Rupiahs, excluding the on-going, committed projects and toll roads.

(2) Priority Factors and Ranking Method

Selected factors for the project prioritization are as follows:

- ♦ Land availability and social impact;
- ♦ Conformity with national, regional and urban development policies and strategies;
- ♦ Necessity and urgency, and
- ♦ Cost efficiency.

A ranking system was employed and scores were given to the respective projects to list priority projects in descending order, and which will help prepare the budget for road construction in GKS region.

(3) Selected Priority Projects for Feasibility Study

Five(5) routes of highest priority projects were selected eventually in consultation with the Indonesian Steering Committee as presented below:

1. Gresik-Driyorejo Toll Road and the paralleled arterial road (Route-1)
2. Frontage arterial road along Tg. Perak-Waru Toll Road (Route-2)
3. Jl. Raya Rungkut-Jl. J. Suprpto Route (Route-3)

4. South of Cerme- Jl. R. Darmo Permai-Wonokromo-Jl. Jagir Wonokromo-Jl. R. P. Jiwo-New Road Route (Route-4)
5. Kedamen- Jl. Jemur Sari Route (Route-5)

Locations of the selected projects are presented in Figure 4.1.

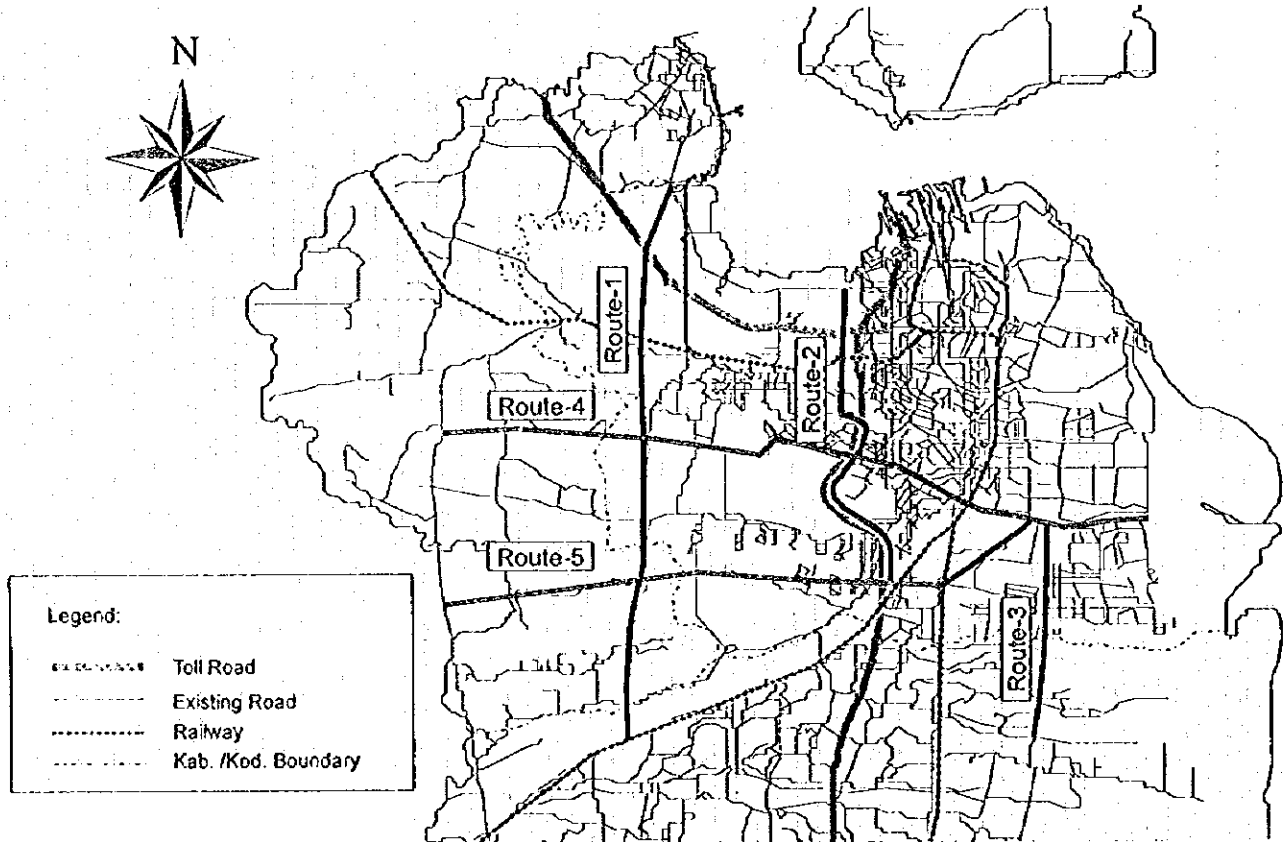


Figure 4.1 Project Locations Selected for Feasibility Study

5. Outline of Feasibility Study

5.1 Significant Features of Project Roads

Significant features to carry out the preliminary design work are summarized as follow:

Table 5.1 Significant Features of Project Roads

The Project Road			Length (km)	Road Function	Type and Class of Roads	Design Speed (km/h)	Number of Lanes
Route-1	Toll Road	Surabaya	8.9	Primary Artery	Type I /Class I	100	6-lane
		Gresik	6.1				
		Sidoarjo	0.5				
	Arterial Road	Surabaya	13.7		Type II /Class I	60	6 or 4-lane + Frontage Road
		Gresik	6.1				
		Sidoarjo	1.0				
Route-2		Surabaya	13.3	Secondary Artery	Type II /Class I	60	4-lane or 4 lane + Frontage Road
Route-3		Surabaya	3.4	Secondary Artery	Type II /Class I	60	4-lane
		Sidoarjo	6.5				
Route-4		Gresik	6.4	Secondary Artery	Type II /Class I	60	6-lane+busway or 6-lane or 4-lane
		Surabaya	21.2				
Route-5		Gresik	9.2	Secondary Artery	Type II /Class I	60	4-lane+busway
		Surabaya	13.4				

5.2 Cost Estimates and Construction Schedule

(1) Initial Investment Costs

Table 5.2 Summary of Initial Investment Cost

Description	Route-1 Toll Road		Route-1 Arterial Road		Route-2 Arterial Road	
	Financial Cost	Economic Cost	Financial Cost	Economic Cost	Financial Cost	Economic Cost
	(mil. RP.)	(mil. RP.)	(mil. RP.)	(mil. RP.)	(mil. RP.)	(mil. RP.)
Construction Cost	545,557	495,961	158,297	143,907	130,873	118,975
Land Acquisition and Compensation	48,305	48,305	22,716	22,716	34,760	34,760
Purchase of Maintenance Equipment	3,025	2,400	1,120	783	797	557
Engineering	54,556	49,596	15,830	14,391	13,087	11,898
Sub-Total	651,443	596,262	197,963	181,797	179,517	166,190
Contingency	65,144	59,626	19,796	18,180	17,952	16,619
Total	716,587	655,888	217,759	199,976	197,469	182,809

Description	Route-3 Toll Road		Route-4 Arterial Road		Route-5 Arterial Road	
	Financial Cost	Economic Cost	Financial Cost	Economic Cost	Financial Cost	Economic Cost
	(mil. RP.)	(mil. RP.)	(mil. RP.)	(mil. RP.)	(mil. RP.)	(mil. RP.)
Construction Cost	23,476	21,342	138,550	125,955	136,021	123,656
Land Acquisition and Compensation	27,561	27,561	34,497	34,497	47,064	47,064
Purchase of Maintenance Equipment	441	309	1,486	1,039	1,217	851
Engineering	2,348	2,134	13,855	12,596	13,602	12,366
Sub-Total	53,826	51,346	188,388	174,087	197,904	183,936
Contingency	5,383	5,135	18,839	17,409	19,790	18,394
Total	59,209	56,480	207,227	191,495	217,694	202,330

(2) Construction Schedule

Table 5.3 Time Schedule

Description	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year
Final Engineering Design	██████████						
Land Acquisition		██████████					
Construction				██████████	██████████	██████████	
Opening to Traffic							██████████

5.3 Environmental Impact Study

According to the Indonesian laws and regulations, Environmental Impact Assessment (AMDAL) was conducted and no significant negative impact was identified, if the resettlement issue is solved properly.

Based on the home interview survey, about 50 to 90% of the sampled households agreed on the project, provided that they were paid at the market price for the land acquisition and compensation.

5.4 Project Economic and Financial Analysis

Economic evaluation results of the selected five routes are found all feasible to exceed 20% of the economic internal rate of return (EIRR).

Table 5.4 Economic Analysis Results at Discount Rate of 15% Per Annum

	Route-1	Route-2	Route-3	Route-4	Route-5
EIRR	26.7%	26.5%	23.9%	31.0%	29.5%
NPV (Billion Rp.)	595.0	134.1	37.5	185.6	194.7
B/C Ratio	2.3	2.3	2.1	2.7	2.7

Source: Estimated by the Study Team.

The financial viability of the toll road project (Route-1: Gresik-Driyorejo Toll Road) is not optimistic. Therefore, it is imperative to raise the fund at a lower rate of interest, possibly from off-shore market. To achieve the low cost fund raising, financial environment favorable to foreign investors, such as a security package agreement with the Government, will have to be created.

Table 5.5 Summary of Financial Analysis Results

		Cost Base Case		Cost Option Case-1		Cost Option Case-2	
Equity / Loan Ratio		40%:60%	30%:70%	40%:60%	30%:70%	40%:60%	30%:70%
Case No.		(a)	(b)	(c)	(d)	(e)	(f)
FIRR	ROI (%)	16.9%	16.9%	18.2%	18.2%	19.9%	19.9%
FIRR	ROE (%)	16.7%	17.4%	18.4%	19.1%	20.6%	21.5%
First Year of Surplus (Year)							
1) Annual Surplus in Profit & Loss		2009	2011	2008	2009	2007	2008
2) Accumulated Surplus in Profit & Loss		2013	2016	2011	2013	2009	2010

Source: Estimated by the Study Team.

5.5 Implementation Plan

Most important elements for implementation the projects are fund sources and executing agencies. Based on the discussion with the Steering Committee, these elements for the respective projects are summarized as follows:

<u>Project Roads</u>	<u>Fund Source</u>	<u>Executing Body</u>
Route-1 (Toll Road) (Artery)	Private Sector / Housing Developer APBN / Housing Developer	Private Sector DGH
Route-2	APBD / Two-step Loan	Kotamadya Surabaya
Route-3	APBN / Foreign Loan	DGH
Route-4	APBD / Foreign Loan / Housing Developer / (APBN)*	DINAS PU-Bina Marga / DGH
Route-5	APBD / Foreign Loan / Housing Developer / (APBN)	DINAS PU-Bina Marga / DGH

Note: (APBN)*: The Project can be supported by APBN

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1. Objectives and Scope of the Study

1.1 Study Objectives

Study objectives are:

- ♦ to formulate a master plan for an arterial road system, which is comprised of primary arterial, primary collector and secondary arterial roads in Gerbang Kertosusila region;
- ♦ to undertake a feasibility study on priority road projects selected through evaluation in the master plan development study; and
- ♦ to conduct technical transfer concerning transport planning and engineering to designated Indonesian counterparts.

1.2 Scope of Work

(1) Study Area

The Study area covers the GKS region, i.e. Kotamadya Surabaya, Kabupaten Gresik, Kabupaten Sidoarjo, Kabupaten Mojokerto, Kotamadya Mojokerto, Kabupaten Lamongan and Kabupaten Bangkalan, as shown in Figure 1.1.

The surrounding areas outside GKS, namely Kabupaten Tuban and Kabupaten Pasuruan, are to be taken into account for the analyses, because the current development trend in these areas draws more attention to the necessity of coherent development with the GKS region.

(2) Target Year

Target year of the Study is set to be the year 2018 which is the last fiscal year of the Second 25-year National Development Plan, and also the year 2008 is set as an intermediate planning time horizon.

(3) Major Work Items

The Study is divided into two (2) phases, i.e. Phase I and Phase II, the former aims to formulate a master plan of the arterial road system in the GKS region, while the latter aims to carry out a feasibility study on priority road projects selected in the Phase I study. The respective study phases are comprised of the following major work items:

Phase I Study: Formulation of Master Plan of Arterial Road System:

- ♦ Collection and analysis of relevant data and information;
- ♦ Transportation facility survey;
- ♦ Supplementary traffic survey;
- ♦ Road inventory survey;
- ♦ Formulation of socio-economic framework;
- ♦ Initial environmental examination;
- ♦ Identification of planning issues;
- ♦ Transport demand forecast and other relevant simulation;
- ♦ Establishment of arterial road network master plan;
- ♦ Preparation of road network development implementation program;

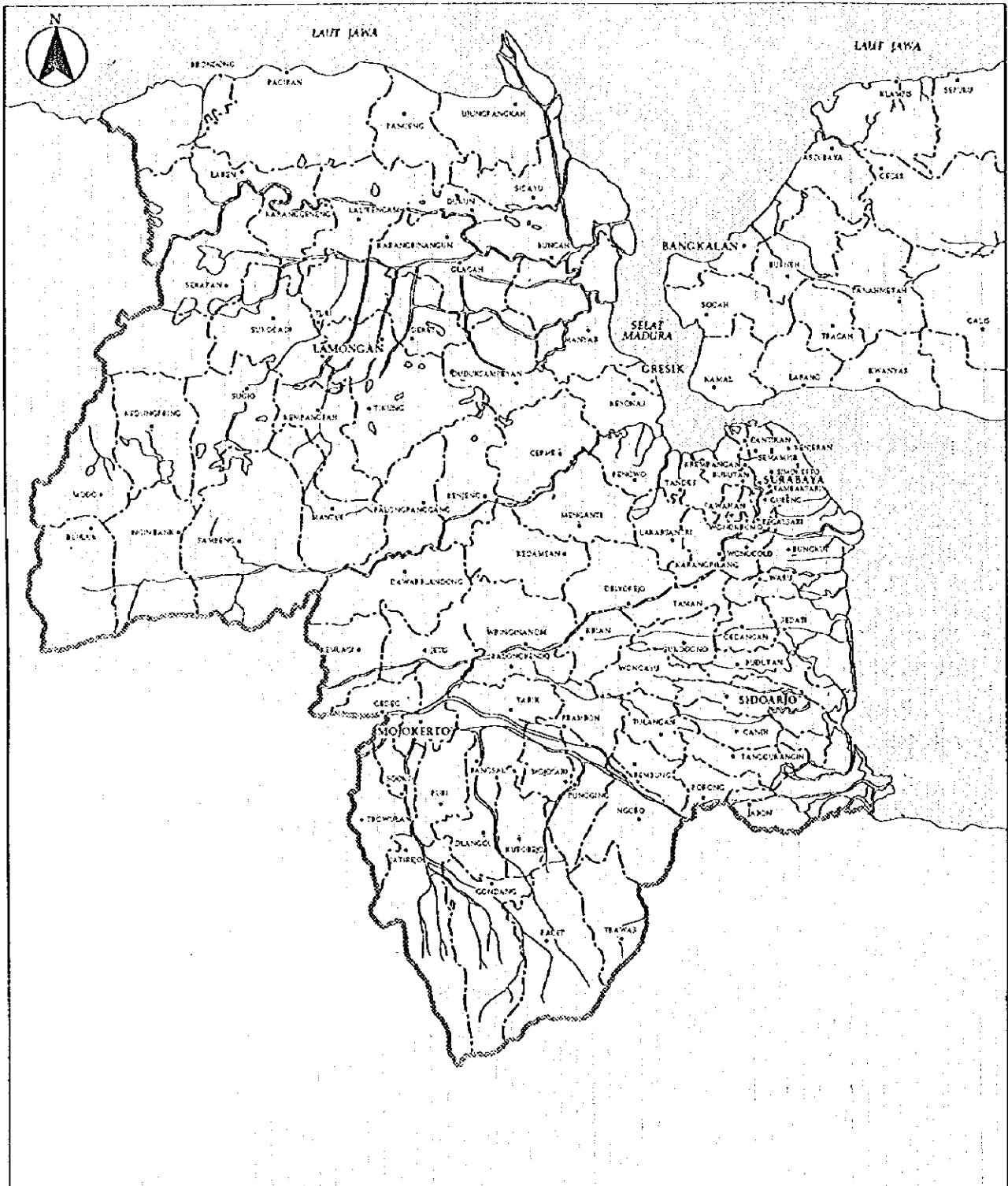


Figure 1.1 The Study Area

- ♦ Alternative route study of selected road projects for feasibility study;
- ♦ Topographic survey and soil investigation for feasibility study routes and;
- ♦ Environmental inventory survey for feasibility study routes.

Phase II Study: Feasibility Study on the Selected Road Projects:

- ♦ Preliminary engineering design ;
- ♦ Cost estimates;
- ♦ Construction planning;
- ♦ Maintenance and operation planning;
- ♦ Environmental impact assessment;
- ♦ Economic and financial analyses;
- ♦ Implementation planning; and
- ♦ Project evaluation and recommendation.

1.3 Study Organization

The members of the JICA Advisory Committee and JICA Study Team are listed below.

JICA Advisory Committee:

<u>Name</u>	<u>Assignment</u>	<u>Organization</u>
Shunji HATA	Chairman	Japan Highway Public Corporation
Yoichi NAKAGAMI	Member	Ministry of Construction, Japan
Kazutaka OKAMOTO	Member	Overseas Economic Cooperation Fund, Japan

JICA:

<u>Name</u>	<u>Assignment</u>	<u>Organization</u>
Masahiro ONO	Coordinator	Japan International Cooperation Agency, Tokyo

JICA Study Team:

<u>Name</u>	<u>Assignment</u>	<u>Company</u>
Isamu GUNJI	Team Leader / Transportation Planner	PCI
Akimasa HIRANO	Highway Planner	YEC
Tomokazu WACHI	Transportation System Analyst	PCI
Yoshinobu NOMURA	Urban / Regional Planner	PCI
Junji SHIBATA	Traffic Engineer	PCI
Akitoshi IIO	Environmental Analyst	YEC
Shun TAKAGI	Aerophoto Mosaic Supervisor / Geodetic Engineer	PCI
Hiroshi NAKAMURA	Soils and Geological Specialist	YEC
Kazuhiro NAGASE	Highway Engineer	PCI
Yoshinori TANAKA	Structural Engineer	YEC
Hiroyuki TAKANO	Construction Plan Specialist / Cost Estimator	PCI
Masatoshi KANEKO	Economic Analyst	PCI
Hitoshi SAKAI	Financial Analyst	PCI
Yoji SAKAKIBARA	Administrative Coordinator	PCI
Hisako KOBAYASHI	Administrative Coordinator	PCI

2. Review of Existing Development Plans

2.1 National and Regional Development Plans

Basic development policies on national and regional levels can be summarized as follows:

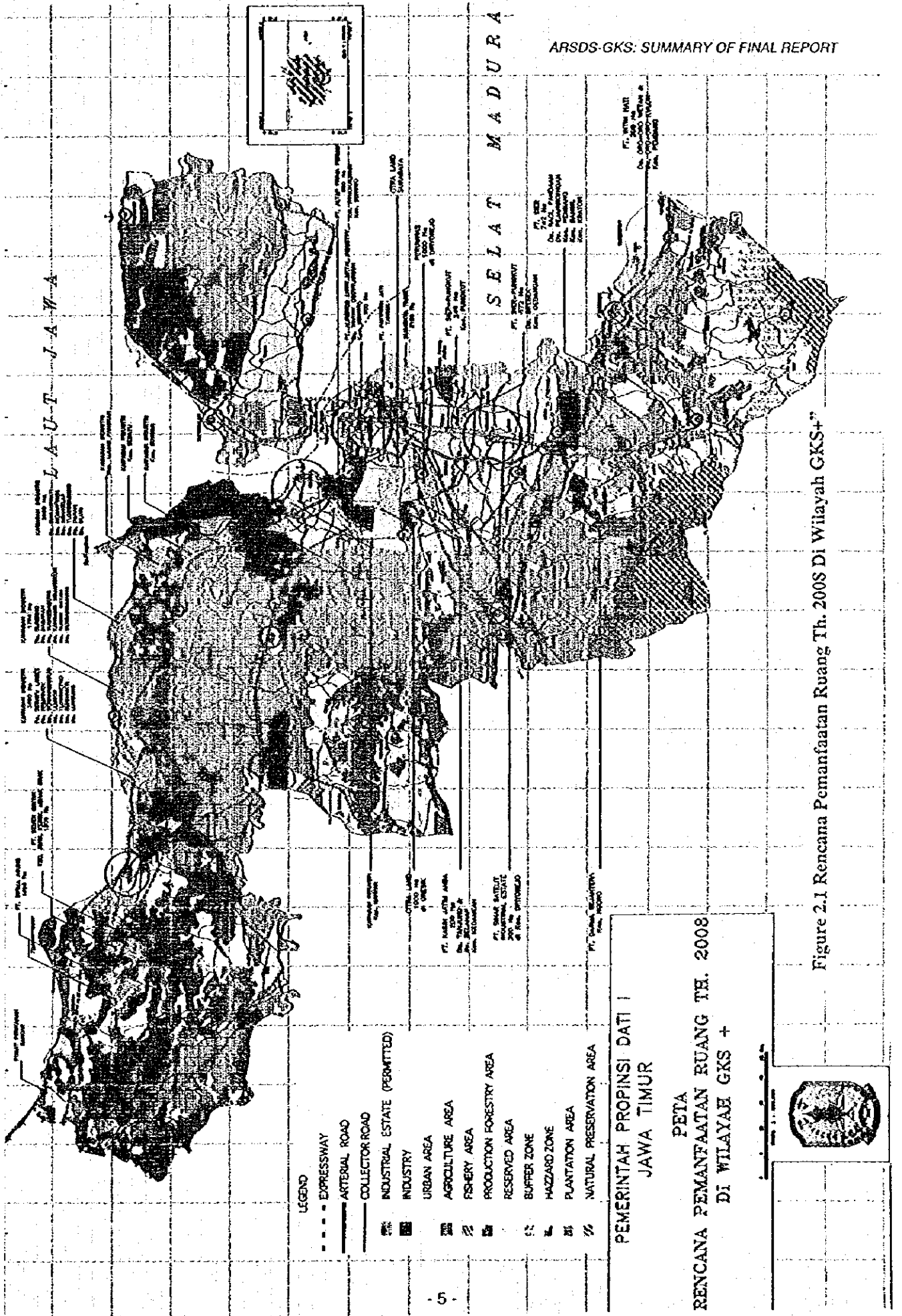
- ♦ Development of regional centers and sub-centers;
- ♦ Proper land use control and management;
- ♦ Further promotion of the development of economically depressed “left-behind” areas;
- ♦ Priority to industrial development as an engine to lead economic development;
- ♦ Preservation of agricultural land to ascertain self-sufficiency for major foods; and
- ♦ Economically efficient and environmentally sound development.

In order to attain the above policies, the following strategies are adopted:

- ♦ GKS is the center region among regional development units of East Java Province;
- ♦ GKS is comprised of Surabaya Metropolitan Area (SMA) and its influence area which consists of such sub-regions as Gresik, Sidoarjo, Bangkalan, Mojokerto and Lamongan;
- ♦ SMA should function as not only the center of GKS/East Java Province but also the center of the Eastern Part of Indonesia;
- ♦ Northern coastal area of Tuban-Lamongan-Gresik should be developed as an industrial zone, particularly for heavy industries;
- ♦ Development along the Pasuruan-Probolinggo corridor should be promoted as an industrial corridor;
- ♦ Surabaya-Madura Bridge should be constructed for the development of Madura Island and industrial development in Bangkalan;
- ♦ Technically irrigated fertile agricultural land of Sidoarjo should be preserved and should not be changed to other land uses.

Allocation of industrial development is one of the most important factors to determine the regional structure. There exist two different ways for industrial allocation in the context of regional development planning. One is shown in “Rencana Umum Tata Ruang Wilayah SWP Gerbang Kertosusila”, which plans to allocate more industrial land to Lamongan(51.2%) and Gresik(29.4%). The other is shown in “Rencana Penataan Ruang Wilayah Propinsi Daerah Tingkat I Jawa Timur”, which reflects a recent development trend of industry and allocates a higher portion of industrial land to Gresik(54.7%) and Sidoarjo(29.7%). The total increase of industrial land use planned is almost the same(the former is 13,871 ha. and the latter 13,329 ha.) in these two plans.

Referring to the national and provincial development policies, “Rencana Umum Tata Ruang Wilayah SWP Gerbang Kertosusila” was adopted in this JICA Study for the industrial land use plan, as shown in Figure 2.1 “Rencana Pemanfaatan Ruang Th. 2008 Di Wilayah GKS+”.



2.2 Urban Development Plan

Basic urban development policies in Surabaya can be summarized as follows:

- ♦ Economically efficient and environmentally sound development;
- ♦ Proper hierarchy and distribution of urban centers(See Figure 2.2 “Urban Centers”);
- ♦ Proper transport systems including public transport;
- ♦ Development of economic formal sectors;
- ♦ Development of urban infrastructure;
- ♦ Development of higher education opportunities.

Based on the above development policies, the following development strategies have been stressed in Surabaya Master Plan 2005.

- ♦ In order to avoid concentration of development to the central urban area of Surabaya, East and West Sub-centers should be developed to disperse such urban functions as government administration, business and commercial activities, educational facilities and so forth.
- ♦ Planned urban expansion towards the east and west should be encouraged with such infrastructure development of east-west transport corridors where vehicular and mass transport means are planned appropriately.
- ♦ In parallel with the development of east-west transport corridors, north-south transport corridors should be improved to secure diversified access routes to the existing Central Business District(CBD).
- ♦ Public transport development should be promoted and private car uses discouraged
- ♦ Industrial development in Surabaya should be induced to Tandes area for manufacturers having less impact on the environment.

Surabaya Master Plan 2005, as shown in Figure 2.3, has been basically adopted in this JICA Study with more emphasis on the importance of east-west transport corridors that include both a conventional road function and an exclusive public mass transport function, as multiple-functional transport corridors.

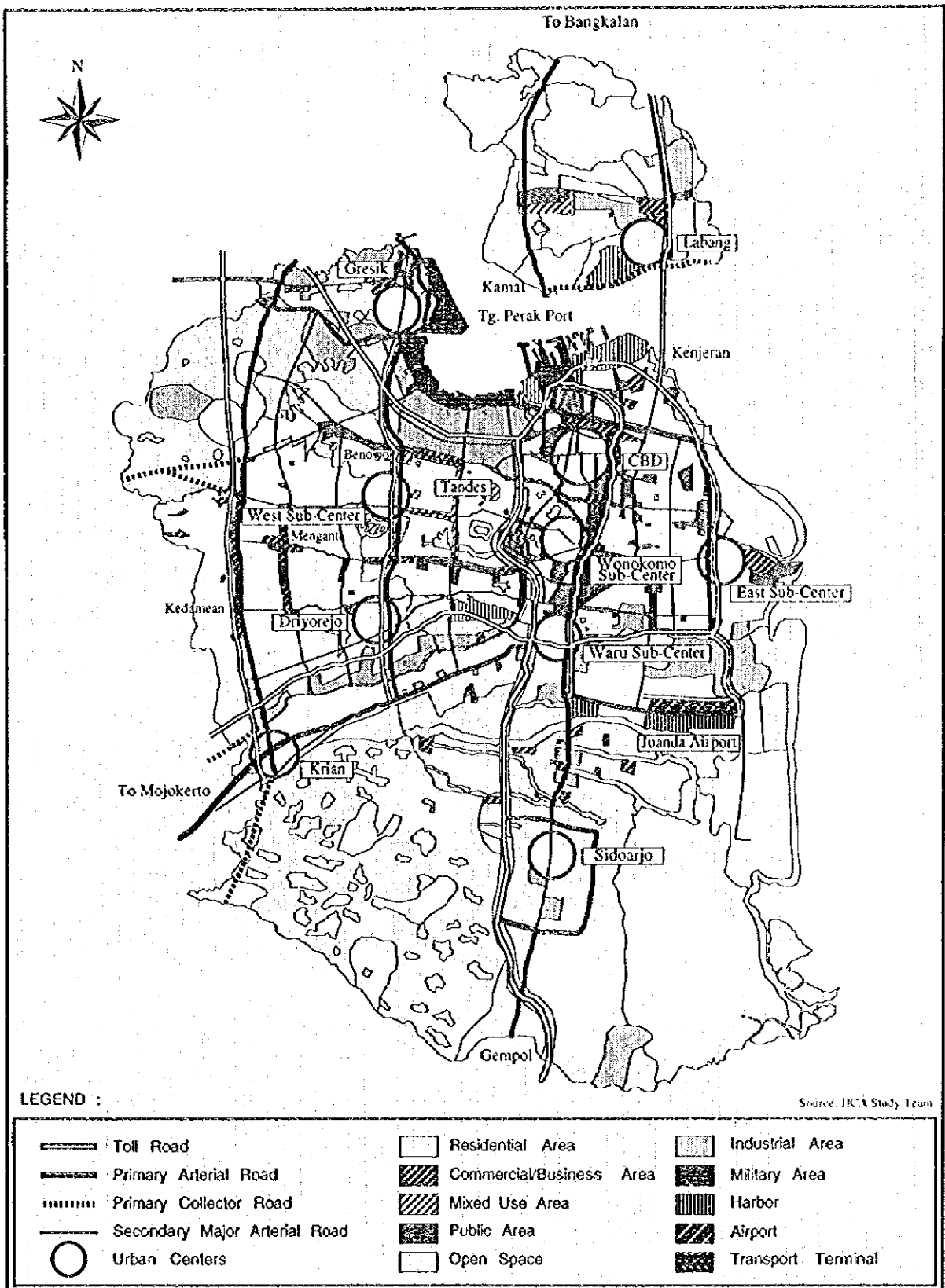


Figure 2.2 Urban Centers

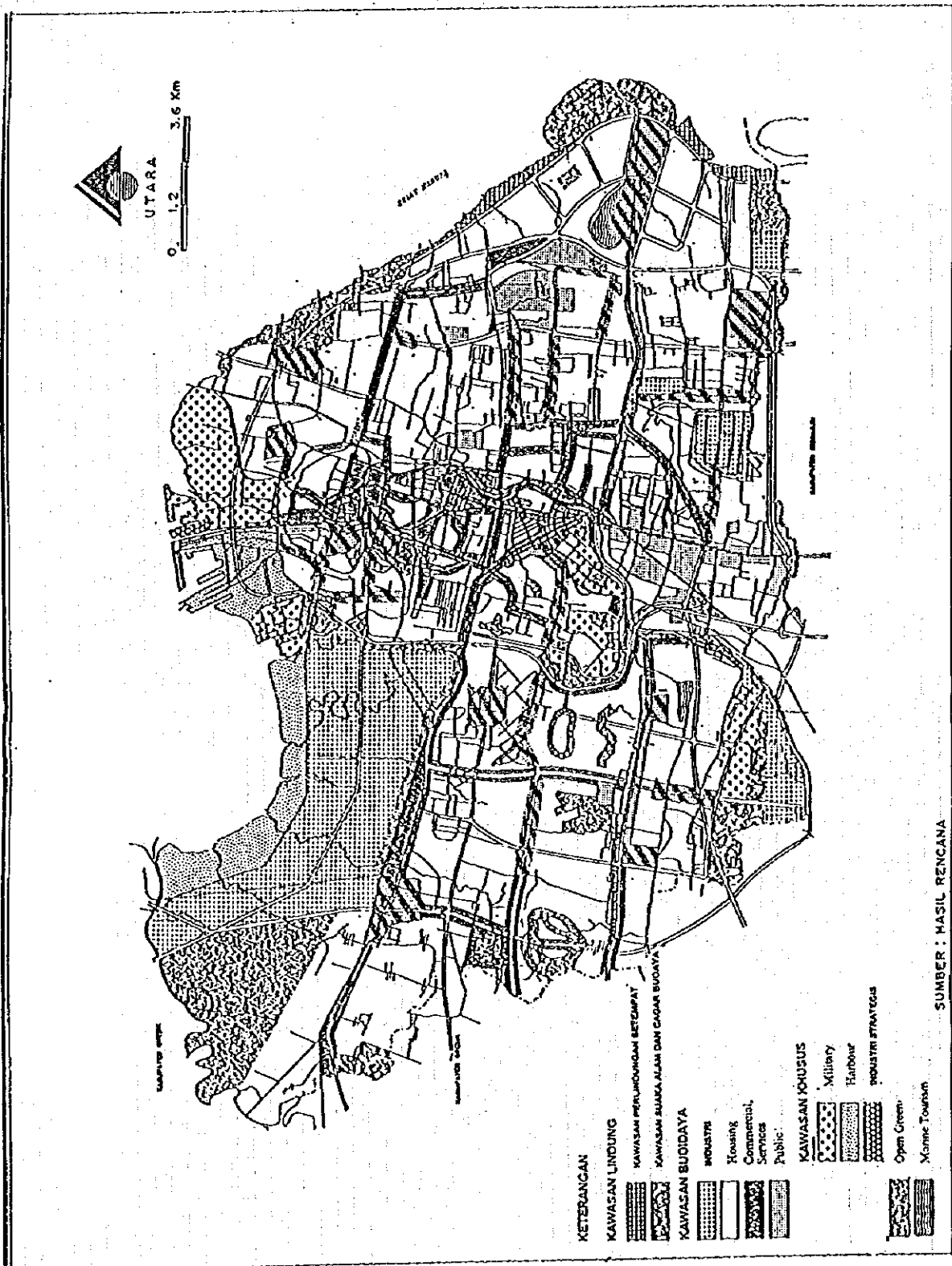


Figure 2.3 Surabaya Master Plan 2005

2.3 Road Development Plans and Projects

Currently, many road sections have been improved and newly constructed in the study area. Besides those, there exist road plans and projects which await the implementation as listed in Table 2.1. Their locations are presented for SMA only in Figure 2.4.

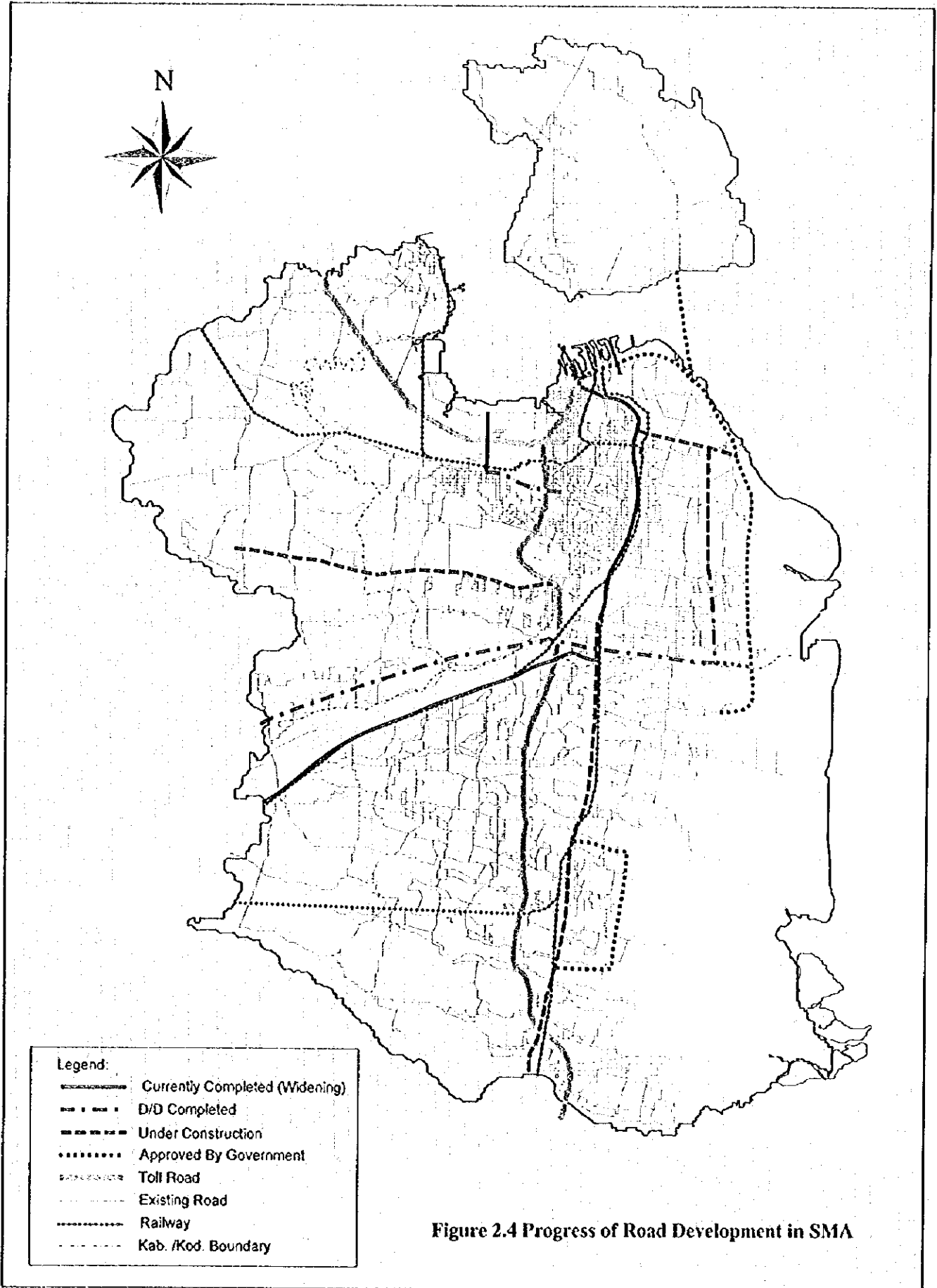
Table 2.1 Summary of Road Development(1)

(As of Sep., 1996)

Description	Name of Road	Length(km)	Remarks	
1. Toll Road	1.1 Urban Operation	Surabaya-Gempol	43.80	
		Surabaya-Kebomas (Surabaya-Gresik)	17.50	Private Investor
		Sub-Total	61.30	
	1.2 Under Construction	Kebomas-Manyar (Surabaya-Gresik)	3.23	Private Investor
		Sub-Total	3.23	
	1.3 Detailed Design Completed	Surabaya-Mojokerto	35.40	Private Investor
		Sub-Total	35.40	
	1.4 Urban Planning	Solo-Mojokerto	212.25	Private Investor
		Waru I.C-Tranjung Perak	31.00	Private Investor
		Pandaan-Malang	28.50	Private Investor
		Pasuruan-Probolinggo	40.00	Private Investor
		Gempol-Pasuruan	32.40	Private Investor
		Gresik-Tuban	75.00	Private Investor
		Gempol-Pandaan	13.54	Private Investor
Surabaya-Madura Bridge		5.44	Private Investor	
Sub-Total		438.13		
Total		534.83		
2. National Road	2.1 Completed	Gempol-Karanglo	51.60	Heavy Loaded Project / OECF
		Mlirip-Waru	32.90	Heavy Loaded Project / OECF
		Waru-Gempol	41.60	
		Mojokerto-Gempol	32.00	
		Sub-Total	157.50	
	2.2 Under Construction	Jombang-Gemakan	20.10	Heavy Loaded Project / OECF
		Gempol-Pasuruan	25.30	Heavy Loaded Project / OECF
		Gresik-Babat	58.80	ADB Loan 1428
		Gresik-Tuban	86.40	IBRD Sector Loan 3712
		Kamal-Ketapang	83.00	IBRD Sector Loan 3712
	Sub-Total	273.60		
	2.3 Detailed Design Completed	Gresik-Sadan-Tuban	75.00	Highway Sector Loan / IBRD
		Sub-Total	75.00	
	2.4 Under Planning	Tuban-Pakah	10.30	Heavy Loaded Project / OECF
Gresik-Surabaya		15.00	Heavy Loaded Project / OECF	
Mojokerto-Mlirip		3.50	Heavy Loaded Project / OECF	
Pakah-Widang		14.80	Heavy Loaded Project / OECF	
Gemakan-Mojokerto		10.70	Heavy Loaded Project / OECF	
Sub-Total	54.30			
Total		560.40		

Table 2.1 Summary of Road Development(2)

(As of Sep., 1996)			
Description	Name of Road	Length(km)	Remarks
3. Urban Road	3.1 Completed	Jl. Margomulyo	3.25 SUDP/OECF
		Jl. Kenjeran Stage IA	0.95 SUDP/OECF
		Sub-Total	4.20
3.2 Under Construction		Jl. Kenjeran Stage II	3.00 SUDP/OECF
		Eastern Midule Ring Road Stage IIB	2.85 SUDP/OECF
		Jl. Nginden-Manur-Ambegan	4.13 SUDP/OECF
		Jl. Tanjungsari to City	0.29 SUDP/OECF
		Jl. Karang Tembok	0.60 SUDP/OECF
		Jl. Putroagung Wetan	0.67 SUDP/OECF
		Jl. Bronggalan	0.52 SUDP/OECF
		Jl. Simpang Dukuh	0.43 SUDP/OECF
		Jl. AR. Hakim	1.89 SUDP/OECF
		Jl. Menganti	17.30 Rural Road IBRD Loan 3712
	Sub-Total	31.67	
3.3 Detailed Design Completed		Jl. Kenjeran Stage IB	0.90 SUDP/OECF
		Eastern Midule Ring Road Stage I	6.39 SUDP/OECF
		Eastern Midule Ring Road Stage IIA	1.59 SUDP/OECF
		Eastern Midule Ring Road Stage IIC	6.61 SUDP/OECF
		Jl. Banyu Urip Stage I	3.10 SUDP/OECF
		Jl. Banyu Urip Stage II	2.77 SUDP/OECF
	Sub-Total	21.36	
3.4 Under Planning		Jl. Ahmand Yani / Jemursati Junction	1.20 Proposed by SUDP/IBRD
		Genteng Kali-Undaan Kulon Bridge	0.06 Proposed by SUDP/IBRD
		Genteng Besar-Mustajab Bridge	0.06 Proposed by SUDP/IBRD
		Jagir Bridge	0.08 Proposed by SUDP/IBRD
		Jl. Tidar & Jl. Kalibutih	0.80 Proposed by SUDP/IBRD
		Ngindan Bridge	0.06 Proposed by SUDP/IBRD
		Jl. Ambengan-Tambaksari	0.81 Proposed by SUDP/IBRD
		Jl. Dharmahusada-Gubedg Flyover	0.08 Proposed by SUDP/IBRD
		Jl. Jemusari-Panjang Jiwo	3.96 Proposed by SUDP/IBRD
		Jl. Lagalan-Kalianyar-Ngaglik	1.52 Proposed by SUDP/IBRD
		Jl. Tanjungsari to City	2.89 Proposed by SUDP/IBRD
		Jl. Pandegiling	1.54 Proposed by SUDP/IBRD
		Jl. Kedungsari-Tegasari-M. Duriat	0.90 Proposed by SUDP/IBRD
		Jl. Indragiri & Jl. Padmosusastro	0.95 Proposed by SUDP/IBRD
		Jl. Putro Agun Wetan-Tambang Boy	1.47 Proposed by SUDP/IBRD
		Jl. Ngaglik-Kapas Krampung	1.38 Proposed by SUDP/IBRD
		Jl. Pandegiling to Jl. Sulawesi	0.95 Proposed by SUDP/IBRD
	Sub-Total	18.70	
Total		75.93	
Grand Total		1,171.16	



2.4 Harbor and Airport Development Plans

(1) Harbor Development Plans

The nominal capacity of Tg. Perak Port is estimated to be 27 million tons per year, but the actual cargo throughput in 1995 was 28.1 million tons, which is about 4% over the port capacity.

Currently, a pre-feasibility study has been carried out by PT. Pelabuhan Indonesia III, intending to select an optimal location for expansion of, or a supplement to the existing Tg. Perak Port. The study examined alternative locations as shown in Figure 2.5, and eventually selected Kali Lamong Site with the following development phases:

Short and Medium Term Development (1995-2005):

- ♦ Development of piers and cargo handling facilities at Gresik Point;
- ♦ Reclamation and development of Kali Lamong Site for the initial stage to cover 250 hectare;
- ♦ Expansion of container terminal at Tg. Perak Port for interinsular transport (1997/1998).

Long Term Development (2005-2025)

- ♦ Complete the final stage of the port development at Kali Lamong Site to cover 500 hectare in total.

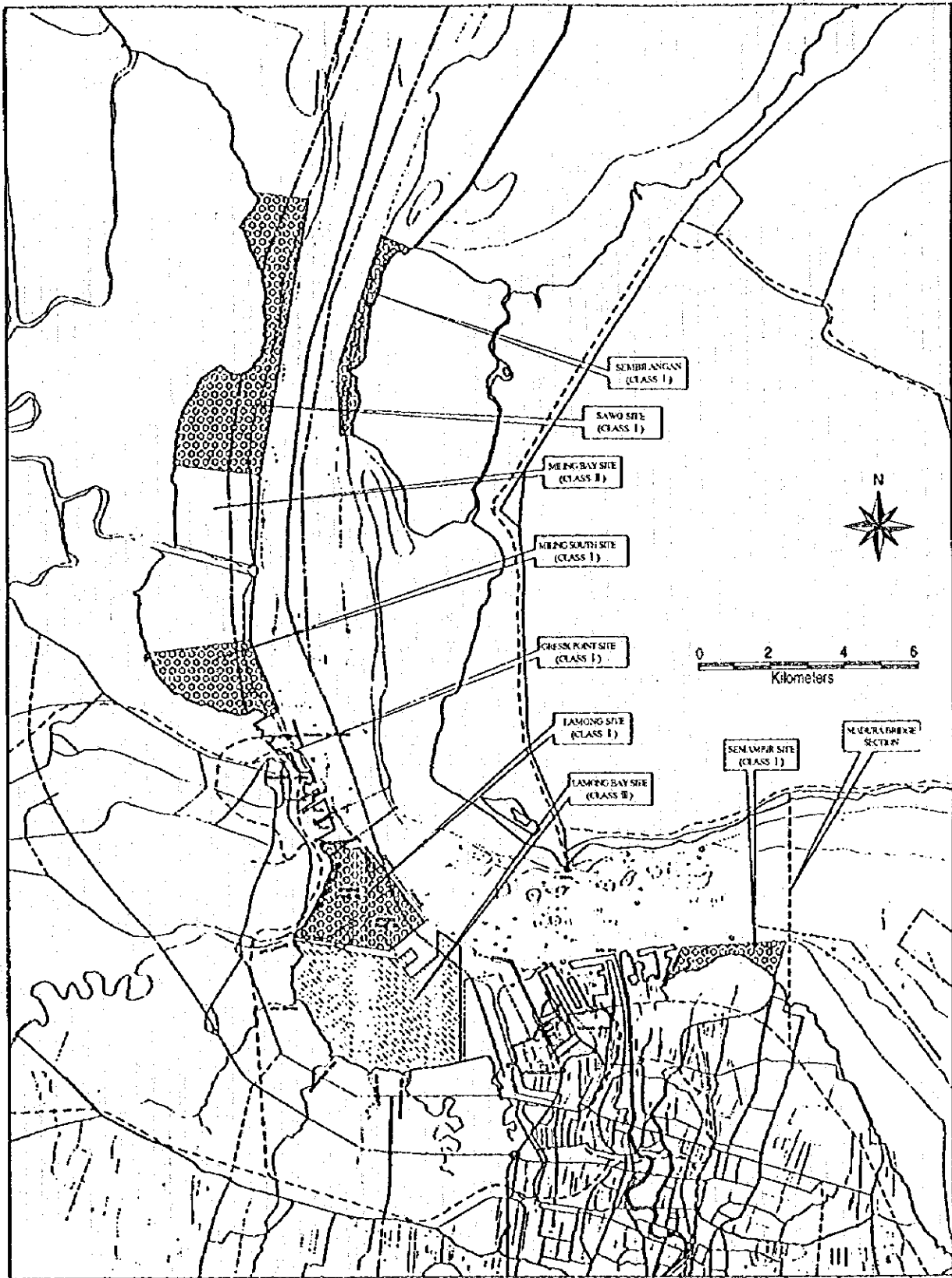
Besides the above plan, there are other port development plans for Tanjung Bumi in Bangkalan for deep sea port development, and for Tuban Port development to facilitate the planned industrial zone development along the northern coastal strip of Kabupatens Tuban, Lamongan and Gresik. These two sea ports face the open sea and their construction costs are estimated to be comparatively higher than for the proposed Kali Lamong Site.

Unless the Tanjung Bumi deep sea port is selected as a national policy to develop trunk ocean-going transport in Madura Island, the selection of Kali Lamong Site is conceived as practical and feasible to supplement the existing Tg. Perak Port.

(2) Airport Development Plan

Juanda Airport commenced international air services in December 1990, and passengers of both domestic and international flights have been increasing remarkably.

Accordingly, a plan to expand the airport terminal was prepared, the detailed design finished recently, and now awaits the finance for implementation.



Source: Pre-Feasibility Study by PT. Pelabuhan Indonesia III

Figure 2.5 Alternative Locations for the Expansion of Tg. Perak Port

2.5 Railway and Public Urban Transport

(1) Railway Transport

The existing railway network, including lines unused at present, is planned to be improved or rehabilitated to function in an effective and safe manner. The Babat-Tuban railway line is planned to be rehabilitated and operated by a private investor for transporting industrial products from Tuban to Babat where the Surabaya-Babat-Semarang-Jakarta Line connects.

Rail container terminals, so called "Dry Ports", have been planned for Malang, Madiun and Kediri rather than at the existing dry port at Rambipuji Jember in East Java.

(2) Public Urban Transport

A recent urban transport study "Surabaya Integrated Transport Network Planning Project (SITNP)" proposes an urban public transport system as presented below:

- Railway commuter service, using the existing railway track between Waru and Surabaya Kota Station;
- Light Rail Transit(LRT) line between Purabaya Intercity Bus Terminal and Tg. Perak Port through Jl. Raya Darmo, Jl. Tunjungan, Jl. Bubutan, Jl. Jembatan Merah, Jl. Rajawali and Jl. Tanjung Perak;
- Two busways: One located in the east-west direction between Surabaya Institute of Technology(ITS) and Kota Satelite Darmo. The other is planned between Tambak Oso Wilangan Bus Terminal and Rajawali through Jl. Kali Anak and Jl. Gresik.

Locations of the proposed plans are presented in Figure 2.6.

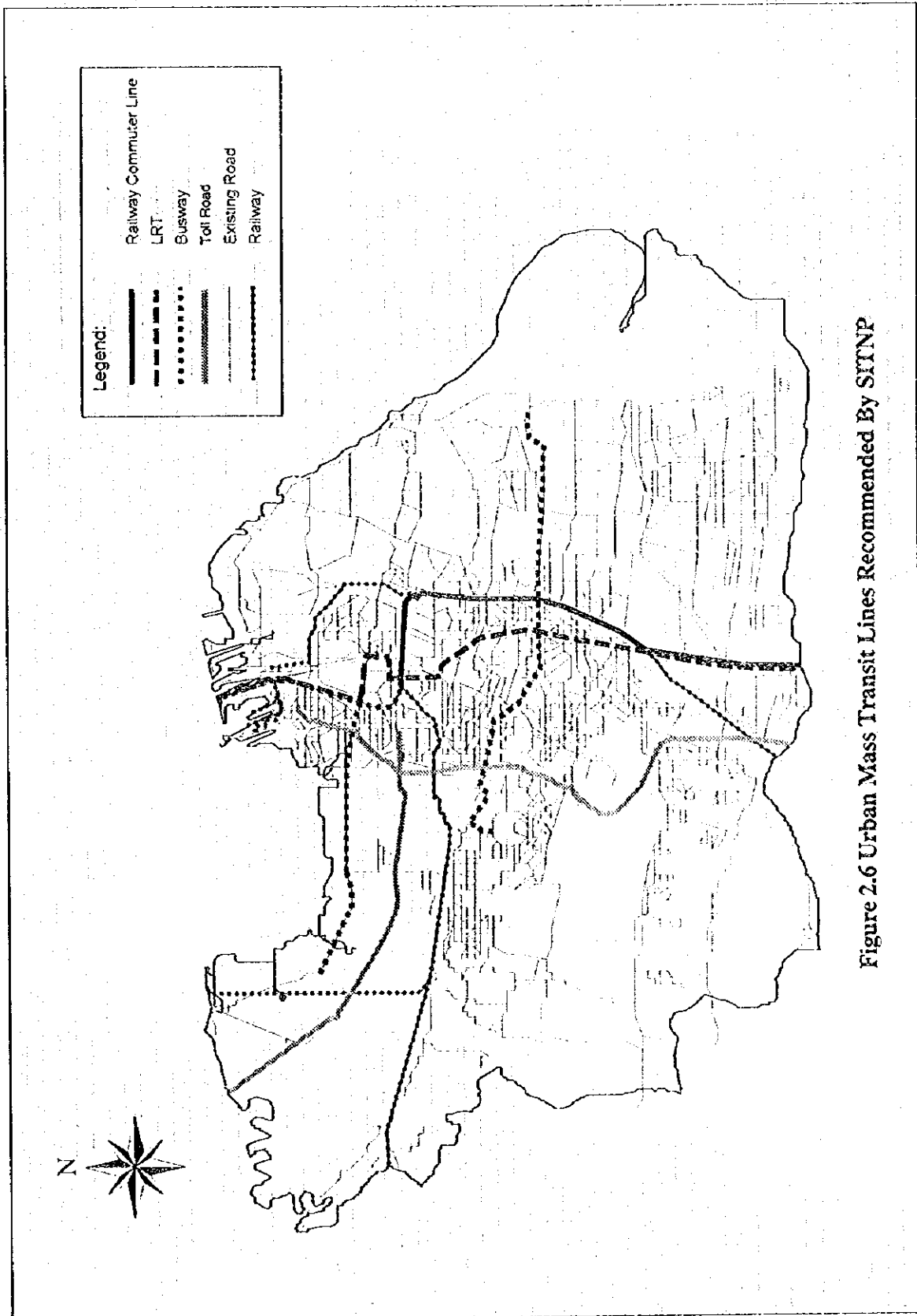


Figure 2.6 Urban Mass Transit Lines Recommended By SITNP

2.6 Emerging Housing and Industrial Development by Private Investors

Currently, housing and industrial development has been taking place rapidly not only in the eastern and western parts of Surabaya City but also in the southern area of Kab. Gresik, to the north of Kotamadya Mojokerto, and the swampy part of the eastern coastal area of Surabaya and Sidoarjo as listed below and presented in Figure 2.7.

- ♦ Citra Land Housing Development and others in the Western Part of Surabaya,
- ♦ Lagna View Housing Development and Marina City Development in the Eastern Part of Surabaya,
- ♦ Kenjerang Housing Development near the approach of Sura-Madu Bridge on the Surabaya side,
- ♦ Driyorejo Housing Development which includes Perumnas low cost housing,
- ♦ Housing Development(Izin Lokasi) in the Southern Part of Kabupaten Gresik,
- ♦ Housing Development(Izin Lokasi) to the North of Gresik City
- ♦ Labang (Bangkalan) Housing Development near the approach of Sura-Madu Bridge on the Madura side,
- ♦ Marina City Development in Sidoarjo
- ♦ Jabon(Kab. Sidoarjo) Industrial Zone Development

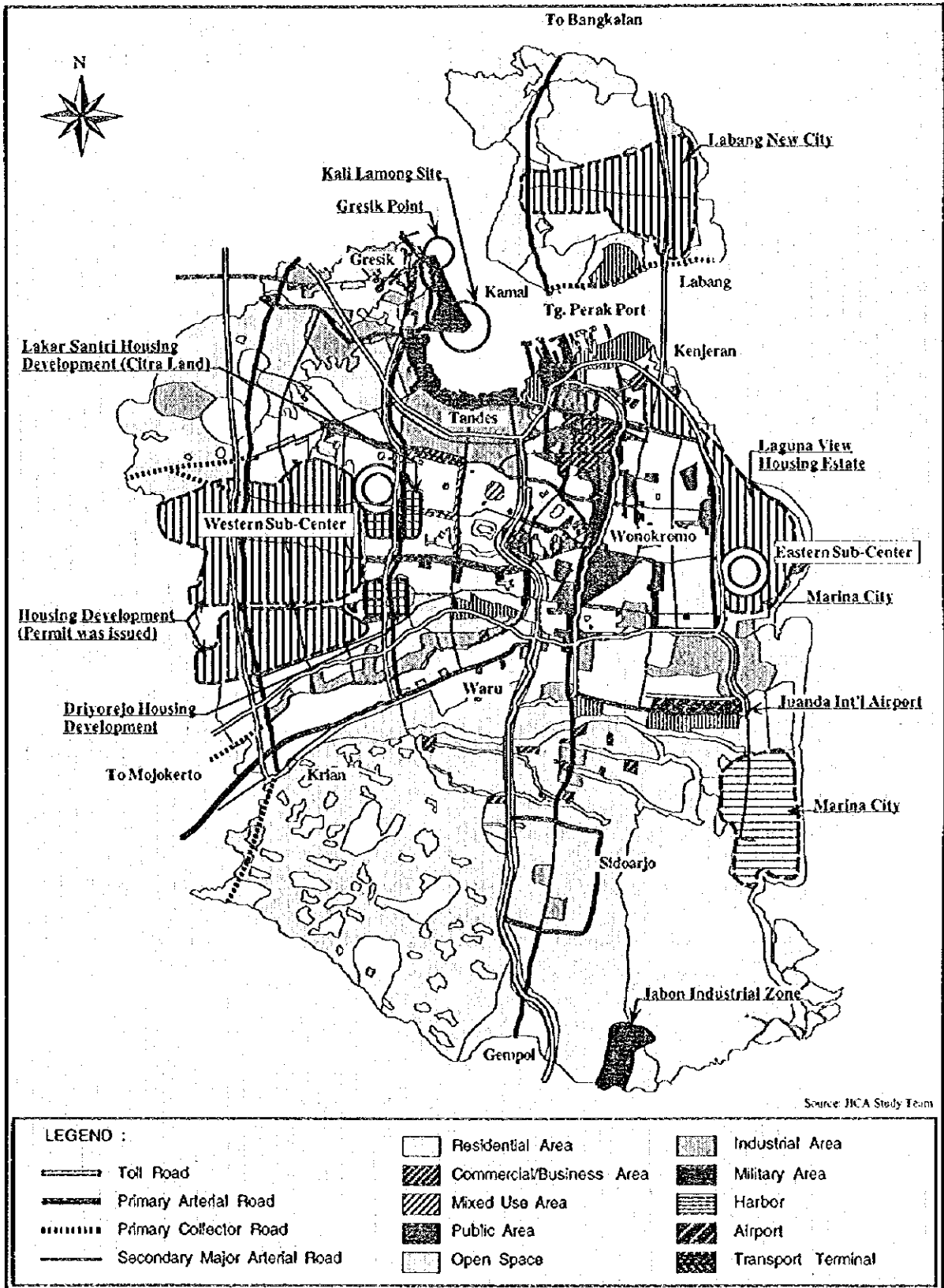


Figure 2.7 Emerging Housing and Industrial Development by Private Investor

3. Future Socio-Economic Framework

3.1 Economic Development Framework

(1) Target Growth of the 2nd Long Term National Plan (PJP II)

According to the 2nd 25-year Development Plan of Indonesia, GDP from the Sixth 5-Year Plan (Repelita VI) to the Tenth 5-Year Plan (Repelita X) is targeted to grow increasingly from 6.2% to 8.7% per annum. Per capita income during PJP II is targeted to be US\$ 2600 (at 1989/90 constant price), which implies an average annual growth of about 6%.

The manufacturing sector is defined as an engine to drive the national economy and it is targeted to grow at 9.4% p.a. in Repelita VI and slow down to 9.1% and 8.7% in Repelita IX and X respectively as shown in Table 3.1.

Table 3.1 Target Growth of National Economy in the 2nd Long Term Plan

	End of Fifth Plan*	Average Growth (% p.a.)				
		Sixth	Seventh	Eighth	Ninth	Tenth
Gross domestic product	6.6	6.2	6.6	7.1	7.8	8.7
1. Agriculture	2.4	3.4	3.5	3.5	3.5	3.5
2. Processing industries	10.0	9.4	9.4	9.4	9.1	8.7
Industries processing non-fuel commodities	11.0	10.3	10.2	10.0	9.5	9.0
3. Others	7.2	6.0	6.3	6.8	8.0	9.5

Note: *) Projected target achieved (average during the fifth Five-year Plan.)

Source: The Second Long Term National Plan

"Other sectors", except for agriculture and manufacturing, is projected to grow continuously, but "Agricultural sector" is expected to maintain a constant growth of 3.5% per annum throughout the PJP II period.

(2) Target Growth of Provincial Economy of East Java

Based on the East Java Repelita VI, and the draft structure plan of East Java Province, GRDP is assumed to grow at 7.0% per annum during 1996-2008, and 8.0% per annum during 2008-2018. Like the national development target, the manufacturing sector is set to grow at a higher rate than others, as shown in Table 3.2, and presented in Figure 3.1.

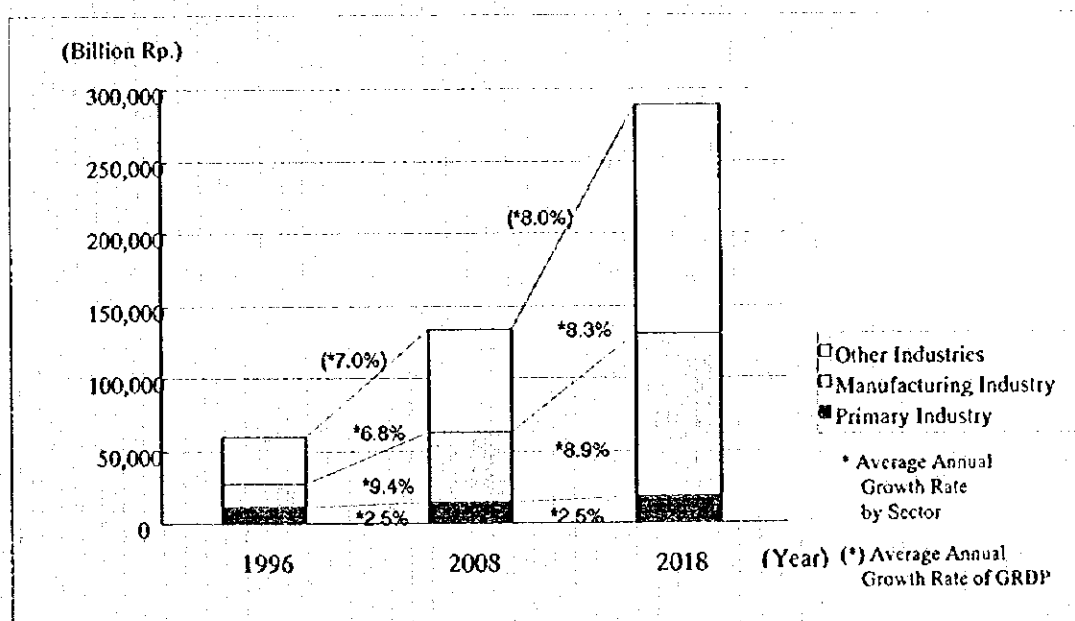
Table 3.2 Target Growth of Provincial Economy of East Jawa

GRDP (Million Rp.)					
	1993	1994	1996	2008	2018
Primary Industry	10,294,166	10,241,488	10,759,963	14,470,954	18,524,045
Manufacturing Industry	12,014,268	13,556,421	16,284,190	47,860,147	112,267,183
Other Industries	26,805,452	28,860,438	32,346,248	71,427,461	157,983,475
Total	49,113,886	52,658,347	59,390,401	133,758,562	288,774,703

Average Growth Rate					
	1994-1996	1996-2008	2008-2018	1996-2018	
Primary Industry	2.50%	2.50%	2.50%	2.50%	
Manufacturing Industry	9.60%	9.40%	8.90%	9.17%	
Other Industries	5.87%	6.82%	8.26%	7.48%	
Total	6.20%	7.00%	8.00%	7.45%	

% Share by Industrial Sector					
	1993	1994	1996	2008	2018
Primary Industry	21.0%	19.4%	18.1%	10.8%	6.4%
Manufacturing Industry	24.5%	25.7%	27.4%	35.8%	38.9%
Other Industries	54.6%	54.8%	54.5%	53.4%	54.7%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Jawa Timur Dalam Angka 1994, JICA Study Team



Source: Jawa Timur Dalam Angka 1994, JICA Study Team

Figure 3.1 Target Growth of Provincial Economy of East Jawa

(3) Target Economic Growth of GKS

Future economic development frameworks of GKS and its member Kabupatens and Kotamadyas are based upon the past development trend, Repelita VI of the respective Kabupatens and Kotamadyas, and available urban and regional development plans. Particularly, the following considerations have been taken into account in the frameworks:

- ♦ GRDP of GKS is set to grow at a higher rate than that of East Java Province, to reflect the center function of GKS in East Java Province.
- ♦ The growth of the manufacturing sector in GKS is set to grow higher than the average GRDP, to reflect the new industrial development along the northern coastal area of GKS.
- ♦ Growth of "Other Sectors", except for Manufacturing and Agricultural Sectors, is assumed to accelerate.
- ♦ The share of the Agricultural Sector in GKS's GRDP is assumed to decrease.
- ♦ Manufacturing sectors of Kab. Lamongan, Gresik and Bangkalan are assumed to grow rapidly to reflect the industrial development policy in GKS region, and to slow down for Kab. Sidoarjo.

As a consequence, GKS economy by industrial sector is assumed to grow as shown in Figures 3.2.

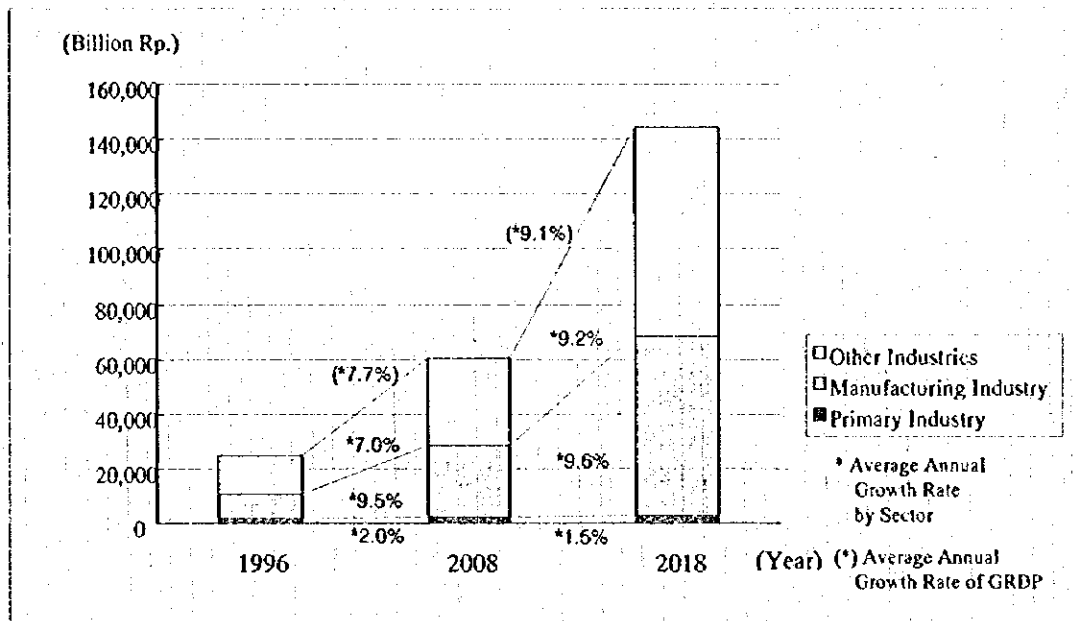
Table 3.3 Target Growth of Provincial Economy of GKS

GRDP (Million Rp.)				
	1994	1996	2008	2018
Primary Industry	1,697,041	1,775,394	2,242,998	2,593,366
Manufacturing Industry	7,351,553	8,849,849	26,367,877	65,967,670
Other Industries	12,475,798	14,021,774	31,580,478	75,826,316
Total	21,524,392	24,647,017	60,191,353	144,387,352

Average Growth Rate			
	1994-1996	1996-2008	2008-2018
Primary Industry	2.2825%	1.9674%	1.4620%
Manufacturing Industry	9.7181%	9.5246%	9.6038%
Other Industries	6.0150%	7.0002%	9.1541%
Total	7.0081%	7.7244%	9.1439%

%Share by Industrial Sector				
	1994	1996	2008	2018
Primary Industry	7.88%	7.20%	3.73%	1.80%
Manufacturing Industry	34.15%	35.91%	43.81%	45.69%
Other Industries	57.96%	56.89%	52.47%	52.52%
Total	100.00%	100.00%	100.00%	100.00%

Source: Jawa Timur Dalam Angka 1994, Produk Domestik Regional Bruto 1996; JICA Study Team



Source: Jawa Timur Dalam Angka 1994, Produk Domestik Regional Bruto 1996, JICA Study Team

Figure 3.2 Target Growth of Regional Economy of GKS

3.2 Future Population Framework

(i) Population Projection for Indonesia and East Java Province

According to the PJP II, the future population of Indonesia is projected to grow at 0.9% per annum at the end of PJP II(2018/2019), while the population growth at the end of PJP I(1993/1994) was 1.7% per annum.

For the future population of East Java Province, the projection made by the Demographic Institute of the University of Indonesia was adopted, since the total Indonesian population projected by the Institute, as shown in Table 3.4, was almost same as PJP II. Consequently, the population in East Java Province is estimated to be 36.4 million persons in 2008 and 37.5 million persons in 2018 as presented in Table 3.5.

Table 3.4 Population Projection for Indonesia

	Population			Annual Average Growth Rate			Urban & Rural Share	
	Total	Urban	Rural	Total	Urban	Rural	Urban	Rural
1990	179,243,375	55,432,788	123,810,587	---	---	---	30.9%	69.1%
1995	194,800,106	71,656,845	123,143,261	1.68%	5.27%	-0.11%	36.8%	63.2%
2000	209,535,490	87,577,147	121,958,343	1.47%	4.09%	-0.19%	41.8%	58.2%
2005	222,841,452	102,534,129	120,307,323	1.24%	3.20%	-0.27%	46.0%	54.0%
2010	235,071,379	116,480,986	118,590,393	1.07%	2.58%	-0.29%	49.6%	50.4%
2015	245,698,893	129,245,269	116,453,624	0.89%	2.10%	-0.36%	52.6%	47.4%
2020	254,214,909	140,309,949	113,904,960	0.68%	1.66%	-0.44%	55.2%	44.8%
2025	261,441,010	150,052,009	111,389,001	0.56%	1.35%	-0.45%	57.4%	42.6%

Source: Projection of Indonesian Population and Labor Force 1995-2025, Demographic Institute, University of Indonesia

Table 3.5 Population Projection for East Jawa Province

	Total	Population		Annual Average Growth Rate			Sex Ratio	
		Male	Female	Total	Male	Female	Male	Female
1990	32,486,610	15,908,610	16,578,000	---	---	---	49.0%	51.0%
1995	33,667,550	16,571,870	17,095,680	0.72%	0.82%	0.62%	49.2%	50.8%
2000	34,813,860	17,215,620	17,598,240	0.67%	0.77%	0.58%	49.5%	50.5%
2005	35,872,730	17,812,960	18,059,770	0.60%	0.68%	0.52%	49.7%	50.3%
2010	36,741,880	18,317,620	18,424,260	0.48%	0.56%	0.40%	49.9%	50.1%
2015	37,341,730	18,687,120	18,654,610	0.32%	0.40%	0.25%	50.0%	50.0%
2020	37,640,690	18,897,990	18,742,700	0.16%	0.22%	0.09%	50.2%	49.8%
2025	37,690,820	18,975,390	18,715,430	0.03%	0.08%	-0.03%	50.3%	49.7%

Source: Projection of Indonesian Population and Labor Force 1995-2025, Demographic Institute, University of Indonesia

(2) Population Projection for GKS and Kab./Kod.

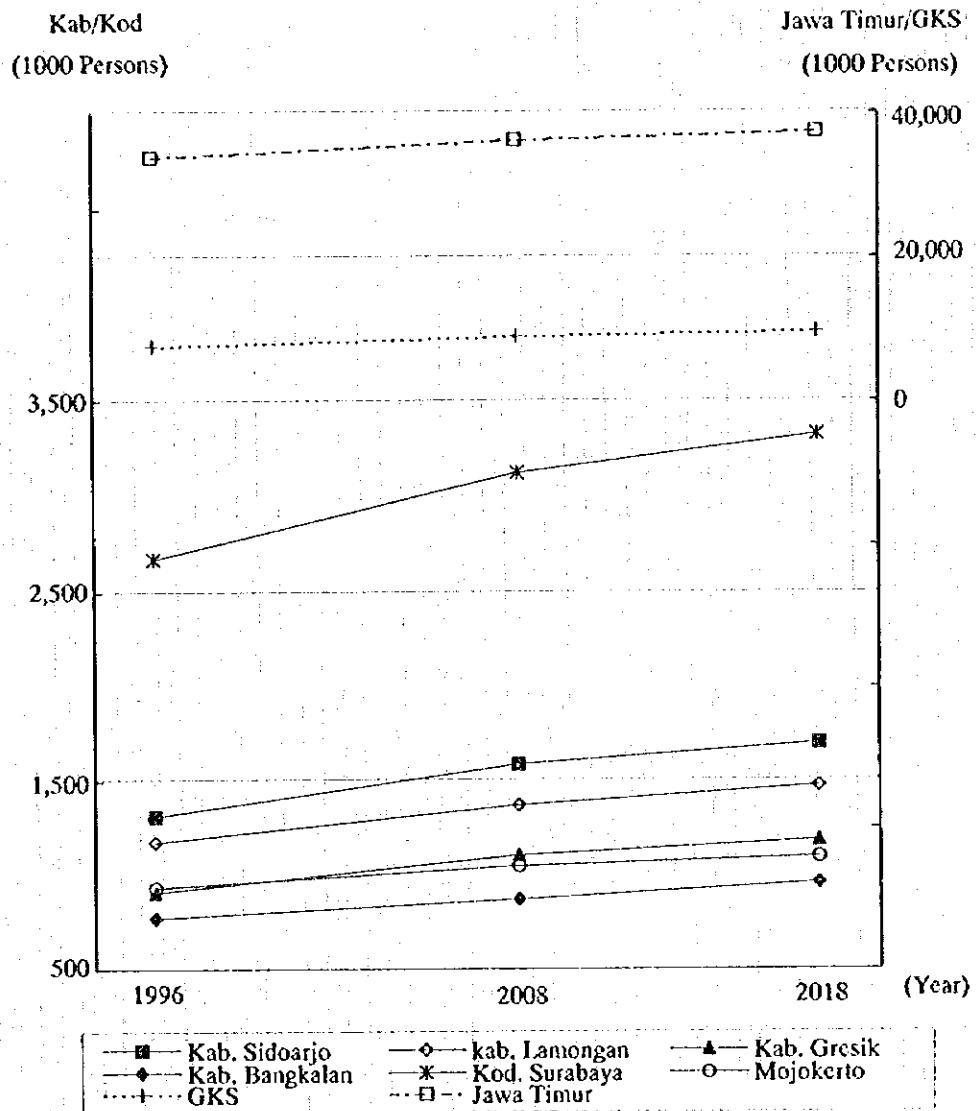
For the GKS future population, the projection made by the GKS 2009 Plan is adopted comparing with other projections made by the Demographic Institute of UI, JATIM Plan 2008 and SITNP Plan, and taking into account the regional function of GKS in East Java Province.

Future population frameworks of Kab./Kod. in GKS were based in principle upon the relationship with the target economic development set previously, and appropriate growth of per capita income in the respective Kab./Kod., which should not expand the income gaps in the region. As the result, the future population in GKS is estimated as given in Table 3.6 and Figure 3.3.

Table 3.6 Estimated Future Populations of Kab./Kod. in GKS

Kab. Kod	Population			Annual Average Growth Rate	
	1,996	2,008	2,018	1996-2008	2008-2018
Sidoarjo	1,315,682	1,587,899	1,698,523	1.58%	0.68%
Gresik	910,298	1,102,424	1,182,181	1.61%	0.70%
Bangkalan	775,392	870,093	955,464	0.96%	0.94%
Kod.Surabaya	2,671,907	3,127,073	3,322,200	1.32%	0.61%
SSGB	5,673,278	6,687,489	7,158,368	1.38%	0.68%
Lamongan	1,180,215	1,369,909	1,476,480	1.25%	0.75%
Mojokerto(Kab,Kod)	934,990	1,049,342	1,096,500	0.97%	0.44%
GKS	7,788,483	9,106,740	9,731,348	1.31%	0.67%
Others	26,105,269	27,284,981	27,789,472	0.37%	0.18%
Total	33,893,752	36,391,721	37,520,820	0.59%	0.31%

Source: JICA Study Team



Source: JICA Study Team

Figure 3.3 Estimated Future Population of Kab./Kod. in GKS

3.3 Employment Projection

(1) Projection of Total Employment

A total labor force projection for Indonesia has been made by the UI Demographic Institute. Future regional labor force in GKS and Kab./Kod. was estimated to reflect the respective population future growth, with results as shown in Table 3.7.

Table 3.7 Future Projection of Total Employment in Study Area

Year	Kab./Kod.	Population	Labor Force		Employment	
1996	SIDOARJO	1,315,682	568,782	43.2%	554,904	42.2%
	GRESIK	910,298	433,197	47.6%	422,627	46.4%
	BANGKALAN	775,392	327,238	42.2%	319,253	41.2%
	KOD.SURABAYA	2,671,907	1,152,770	43.1%	1,124,642	42.1%
	SSGB	5,673,279	2,481,987	43.7%	2,421,426	42.7%
	LAMONGAN	1,180,215	532,439	45.1%	519,447	44.0%
	MOJOKERTO	934,990	440,836	47.1%	430,080	46.0%
	GKS	7,788,484	3,455,262	44.4%	3,370,953	43.3%
2008	SIDOARJO	1,587,899	816,898	51.4%	796,966	50.2%
	GRESIK	1,102,424	626,234	56.8%	610,954	55.4%
	BANGKALAN	870,093	409,069	47.0%	399,088	45.9%
	KOD.SURABAYA	3,127,073	1,561,680	49.9%	1,523,575	48.7%
	SSGB	6,687,489	3,413,881	51.0%	3,330,583	49.8%
	LAMONGAN	1,369,909	711,062	51.9%	693,712	50.6%
	MOJOKERTO	1,049,342	551,867	52.6%	538,401	51.3%
	GKS	9,106,740	4,676,810	51.4%	4,562,696	50.1%
2018	SIDOARJO	1,698,523	931,976	54.9%	909,236	53.5%
	GRESIK	1,182,181	717,946	60.7%	700,428	59.2%
	BANGKALAN	955,464	491,167	51.4%	479,183	50.2%
	KOD.SURABAYA	3,322,200	1,758,142	52.9%	1,715,243	51.6%
	SSGB	7,158,368	3,899,231	54.5%	3,804,090	53.1%
	LAMONGAN	1,476,480	823,088	55.7%	803,005	54.4%
	MOJOKERTO	1,096,500	601,422	54.8%	586,747	53.5%
	GKS	9,731,348	5,323,741	54.7%	5,193,842	53.4%

Source: JICA Study Team

(2) Employment by Industrial Sector

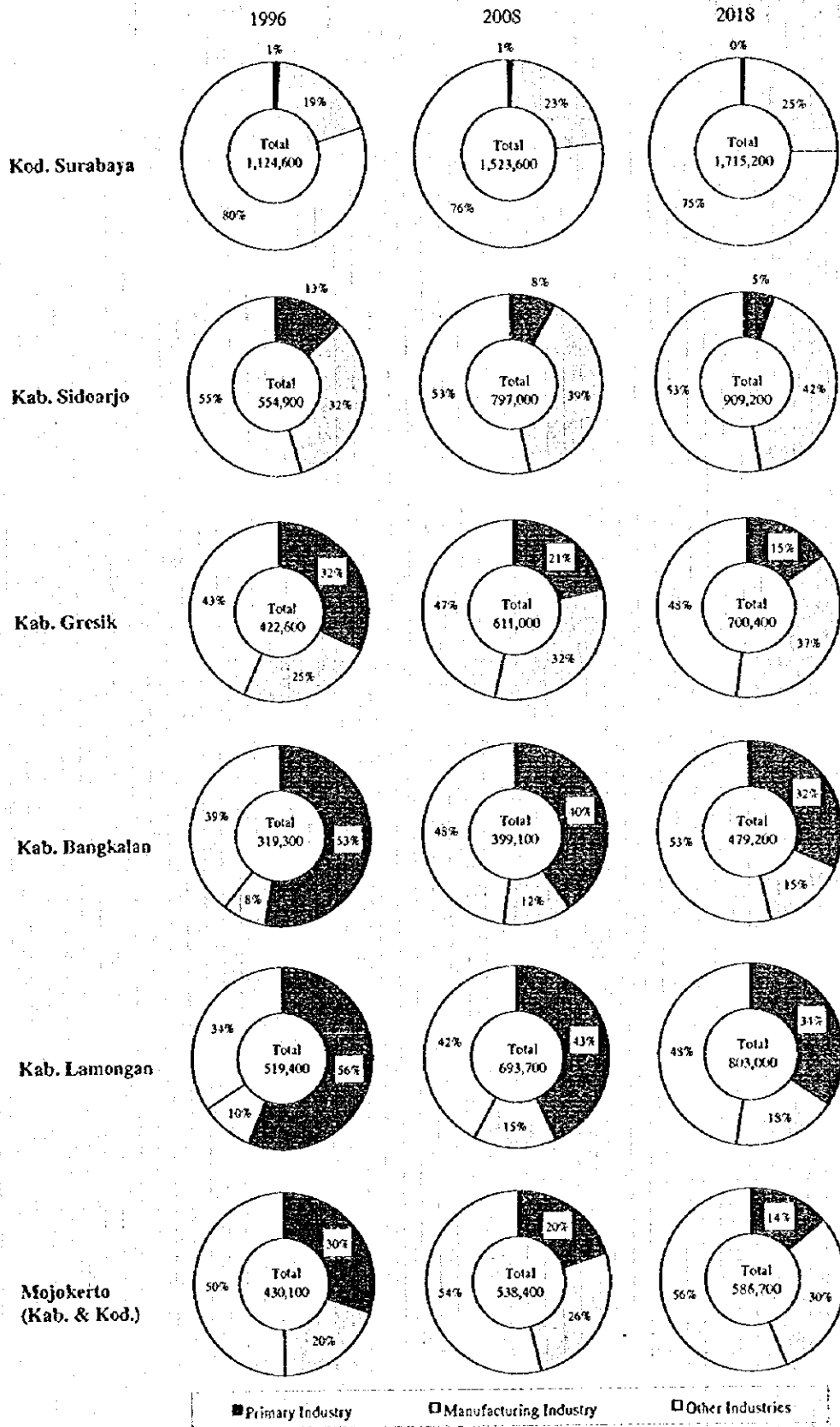
Sectoral GRDP per employment, derived from the census data in 1990, was used to estimate a future employment structure of GKS. As a consequence of the analysis, the future sectoral employment of GKS was estimated to be shared as presented in Table 3.8.

Considering the future development of the sectoral economy by Kab./Kod. in GKS and productivity of sectoral employment, future employment by industrial sector was estimated as shown in Figure 3.4.

Table 3.8 Estimated Sectoral Shares of GKS Employment

Year	Primary	Manufacturing	Others	Total
1996	813,907	657,408	1,899,638	3,370,953
	24.1%	19.5%	56.4%	100.0%
2008	775,658	1,140,674	2,646,364	4,562,696
	17.0%	25.0%	58.0%	100.0%
2018	675,199	1,454,276	3,064,367	5,193,842
	13.0%	28.0%	59.0%	100.0%

Source: JICA Study Team



Source: JICA Study Team

Figure 3.4 Estimated Future Sectoral Employment of Kab./Kod. in GKS

4. Development of Arterial Road Network

4.1 General Policy

The primary and secondary road systems are the principal components of the road network. The primary system is the road network for inter-regional traffic and mainly serves the traffic between urban centers. The secondary system serves within an urban area. These two systems should be integrated and connected smoothly. In each of the systems, such road functions as arterial, collector and local should be properly organized in accordance with the city order system or hierarchy of center functions within the urban area. Linkages between the two systems and the road functions are defined as shown in Tables 4.1 and 4.2.

Table 4.1 Linkages and Access Control of Primary Road System

	Linkages with:		Access Control	
	Centers	Secondary System	Through Traffic	Access Control
Regional Expressway	First order cities(SWP)	Major arterial street	Major	Full access control
Arterial Road	First order cities(SWP)	Major and minor arterial streets	Major	Partial access control
Collector Road	Mutual connection of central cities of Kabupatens and Kotamadyas and between those and other centers of WPP	Major and minor arterial streets	Partial	No access control
Local Road	Mutual connection between other centers of WPP	Minor arterial street	Minor	No access control

Note: SWP - Satuan Wilayah Pengembangan (Regional Development Unit)
WPP - Wilayah Pengembangan Partial (Local Development Unit)

Table 4.2 Linkages and Access Control of Secondary Road System

	Linkages with:		Access Control		Spacing
	Land Use	Primary System	Through Traffic	Access Control	
Major Arterial Street	Major traffic generators such as CBD, Sub City Centers, and Industrial Estates	Regional expressway, Arterial road, Collector road	Major	Partial access control	1.5 to 3 km
Minor Arterial Street	Secondary traffic generators and CBD	Arterial roads, Collector roads	Partial	Partial access control	0.8 - 1.5 km
Collector Street	Local district	None	Minor	No access control	0.4 - 0.8 km
Local Street	Local district	None	Minor	No access control	Varies

4.2 Development Concept of Arterial Road Network in GKS

In order to support regional development policies in GKS, the arterial road network should be developed with the following policies and strategies:

- Surabaya City is defined as the primary center of East Java Province. Secondary centers are

defined in each regional development unit. Linkages between Primary and Secondary Centers, and those between Primary (or Secondary) Centers should be realized by the primary arterial road network;

- ♦ Arterial road development to induce and promote industrial development along the northern coastal area of GKS;
- ♦ Promotion of strong linkages between harbors and industrial zones;
- ♦ By-passes and ring roads should be planned to segregate through traffic from urban traffic, and to secure high mobility of inter-city traffic;
- ♦ In order to limit the spontaneous urban expansion of Surabaya City, a fully access-controlled outer ring road should be planned together with a land use control scheme; and sub-regional centers to be promoted outside the outer ring road;
- ♦ A road network pattern should be developed in a combination of radial and ring roads in the area outside Surabaya Metropolitan Area, but inside GKS(SWP1) as shown in Figure 4.1.

4.3 Development Concept of Arterial Road Network in SMA

Primary Road System in SMA

The primary road system mainly serves for inter-regional or inter-city transport, but it also serves in the urban area for such linkages as toll roads, access roads to harbor, airport, industrial estate, inter-city bus terminal and cargo terminal as it now stands in Surabaya, presented in Figure 4.2 (1/3).

It is convenient to have inter-regional facilities inside the city, so that provide short distances and time to access destinations in the city. However, this does not last long, since urban traffic, particularly commuting, shopping and business trips, will rapidly increase as the city grows, and conflict occurs between the inter-regional and urban traffic. The former requires a service of large volume and high mobility transport, while the latter requires that of small/diversified volume and easy access transport.

In order to avoid such traffic conflict in the city, these two types of traffic flows are generally separated by means of land use planning where the inter-regional facilities are allocated outside the city, so that the inter-regional transport does not enter the city. Distribution of the inter-regional traffic is made by a ring road and a secondary arterial road system inside the city.

The ring road provides a passage for the traffic going through the city and for traffic dispersing to diversified destinations in the city. As the city expands the ring road function is moved outside the existing one. The ring road, as a primary arterial road, should be flexible in terms of its location corresponding to urbanization and land use changes. Accordingly, the primary road system in SMA will evolve as shown in Figure 4.2 (2/3), and will result in a network as presented in Figure 4.2 (3/3) at the ultimate stage of urbanized SMA.

The Western Ring Road has been planned in the IUIDP as a primary arterial road. It will, however, change to a secondary arterial road when the Gresik-Driyorejo road (Outer Ring Road I) is prepared as a primary arterial road. Likewise the Gresik-Driyorejo primary arterial road will change to a secondary arterial road, when the Gresik-Krian road (Outer Ring Road II) is prepared as a primary arterial road. Therefore, the Gresik-Driyorejo road (Outer Ring Road I) should function as a primary arterial road before the Gresik-Krian road (Outer Ring Road II) is constructed.

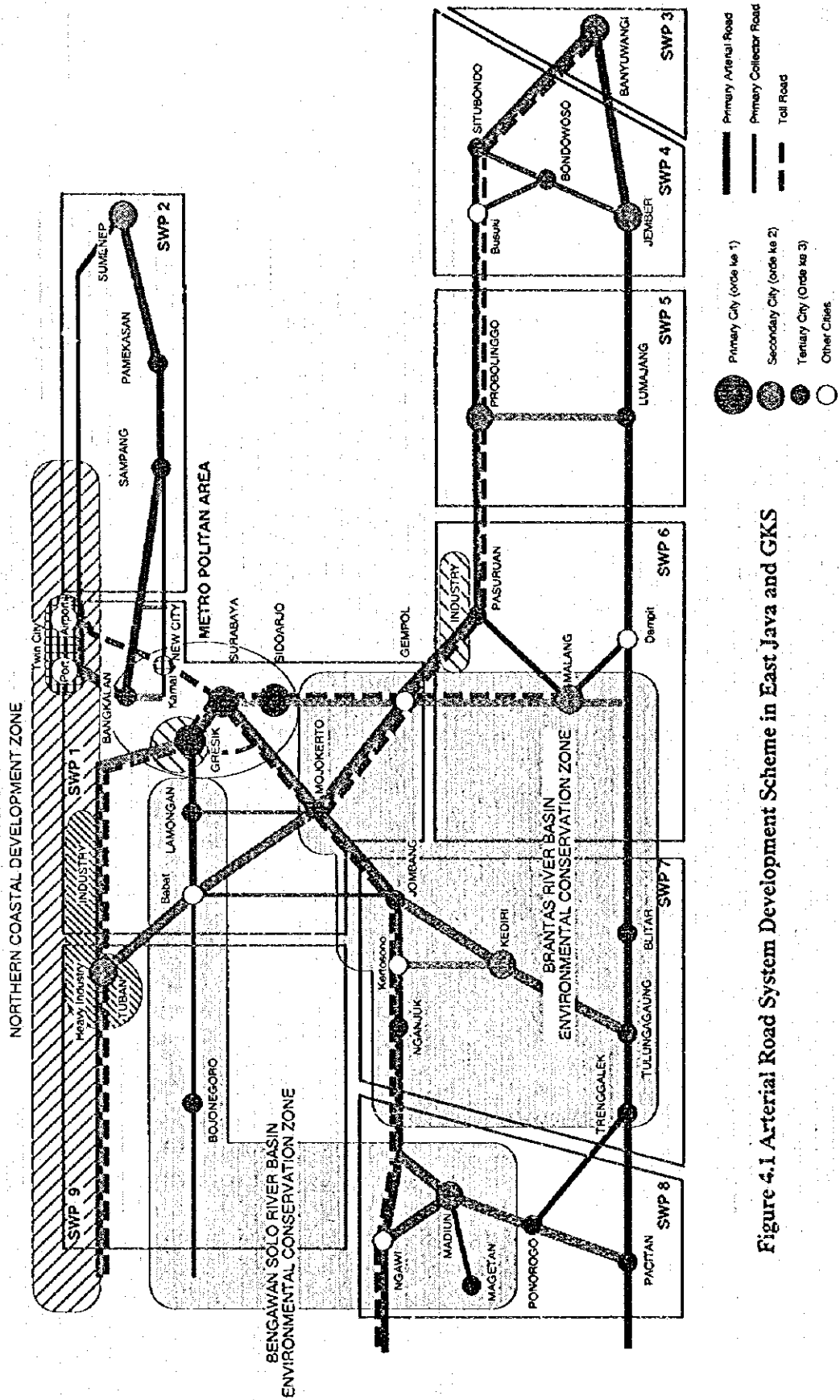


Figure 4.1 Arterial Road System Development Scheme in East Java and GKS

(2) Secondary Road System in SMA

The secondary road system in SMA is proposed taking into account the following elements:

- ♦ Basically, a grid pattern is adopted to diversify the accessibility of urban roads;
- ♦ “Urban Units” and their proper spacing should be planned to improve the urban environment;
- ♦ Major arterial streets should be developed at an interval of 2 to 3 kilometers, while minor arterial streets should be planned to supplement the major arterial streets at intervals of 1.0 to 1.5 kilometers.
- ♦ Streets to support urban public transport should be planned, such as LRT or Busway systems that can share the same road space; and
- ♦ Traffic flows should be segregated , i.e. goods vs. passenger movements and intercity vs. intraurban movements.

Eventually, a schematic arterial road network in SMA is proposed as presented in Figure 4.2 (3/3).

After the preliminary route study of the proposed network schemes, a basic road network plan in 2018 has been prepared as shown in Figures 4.3 and Figures 4.4.

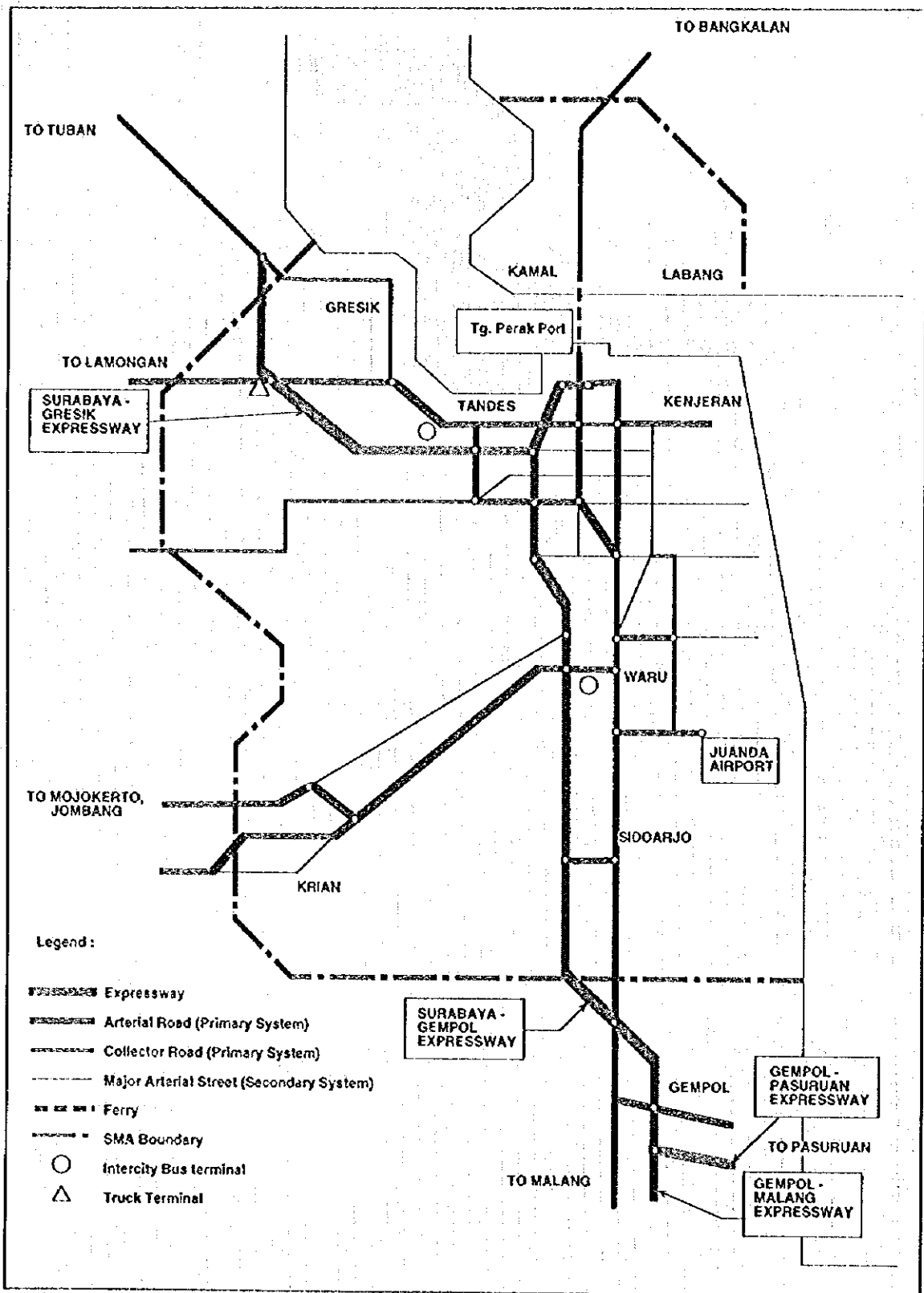


Figure 4.2 (1/3) Existing Primary Road System in SMA

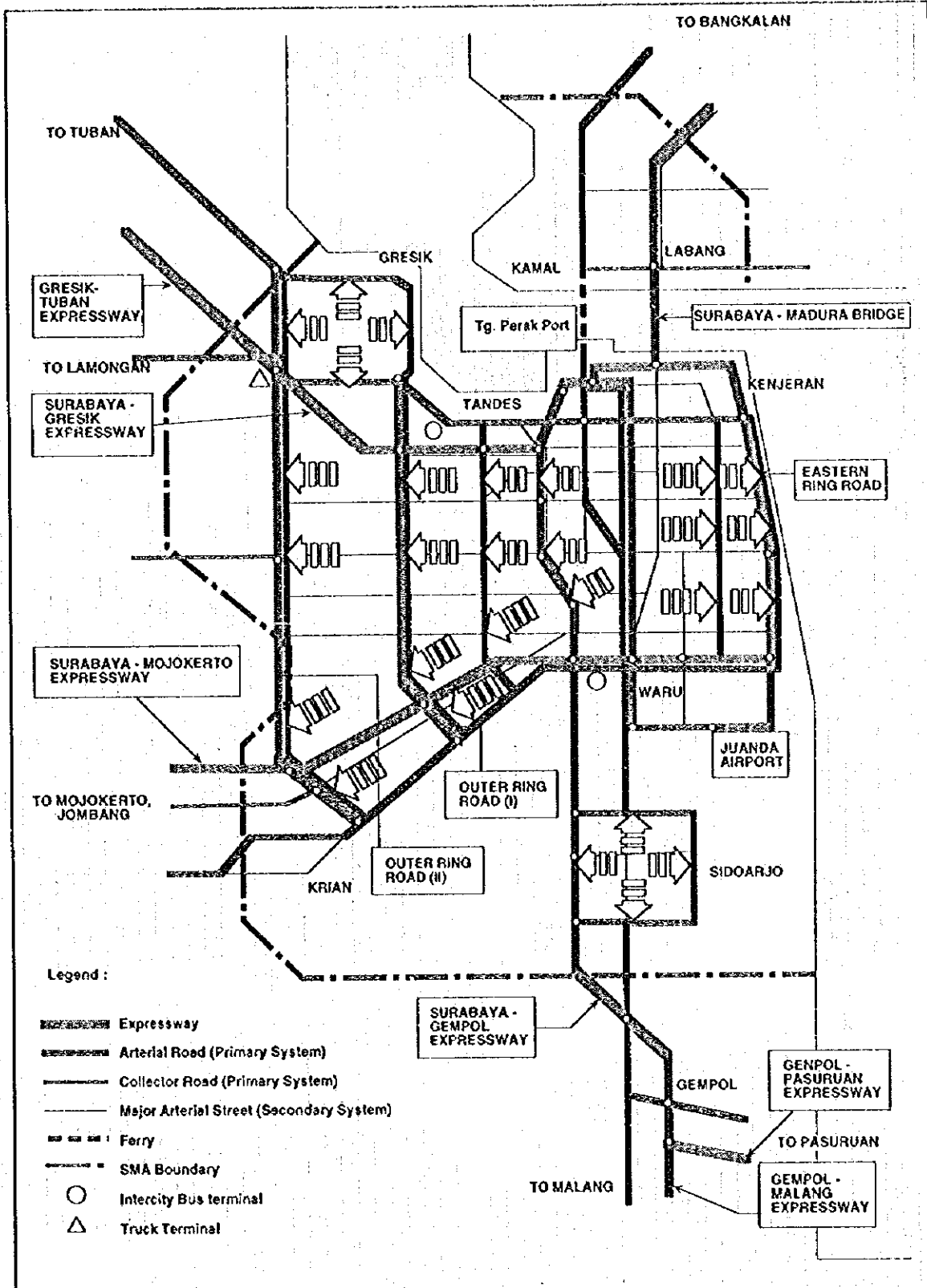


Figure 4.2 (2/3) Progressive Development of Primary Road System in SMA

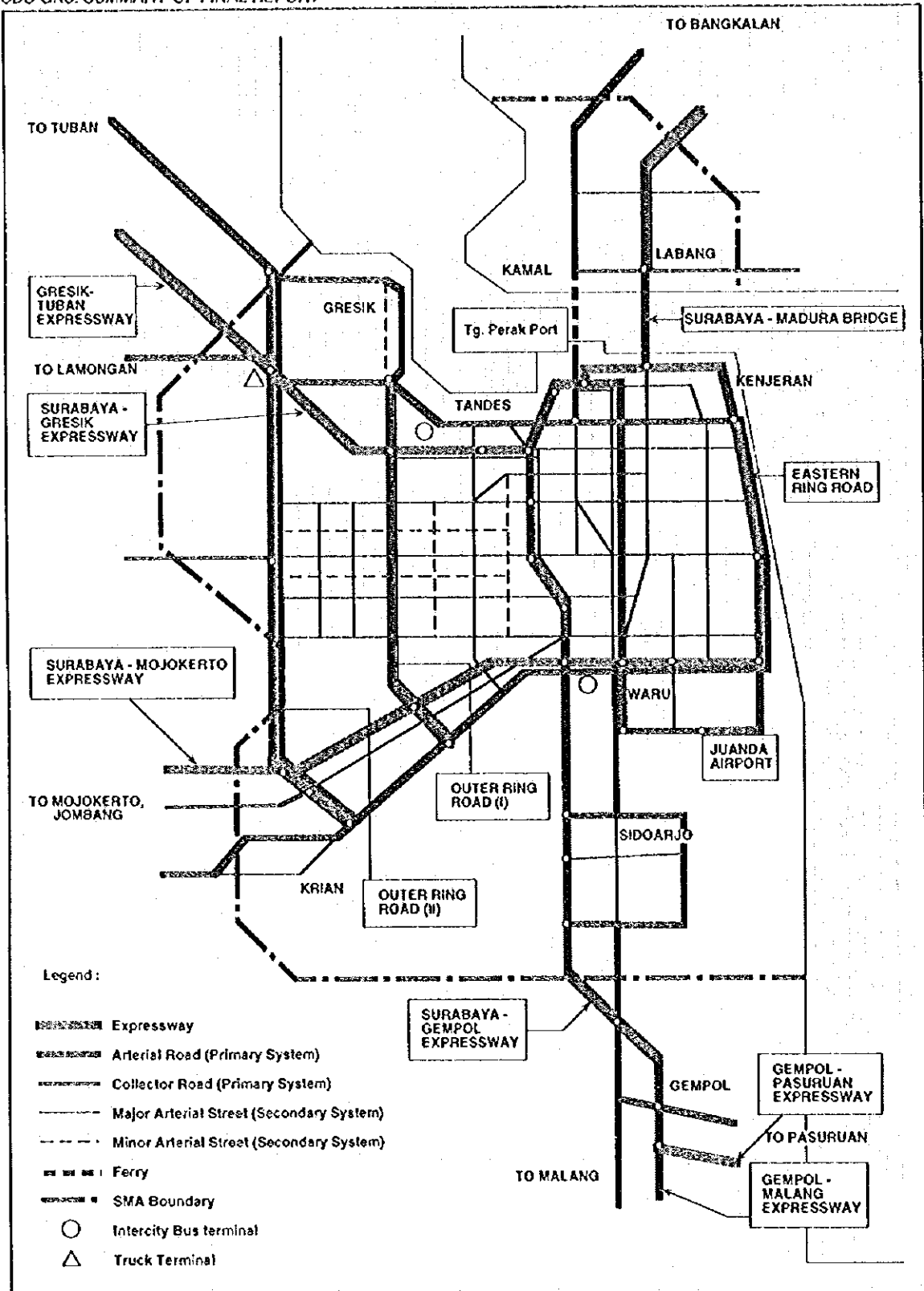
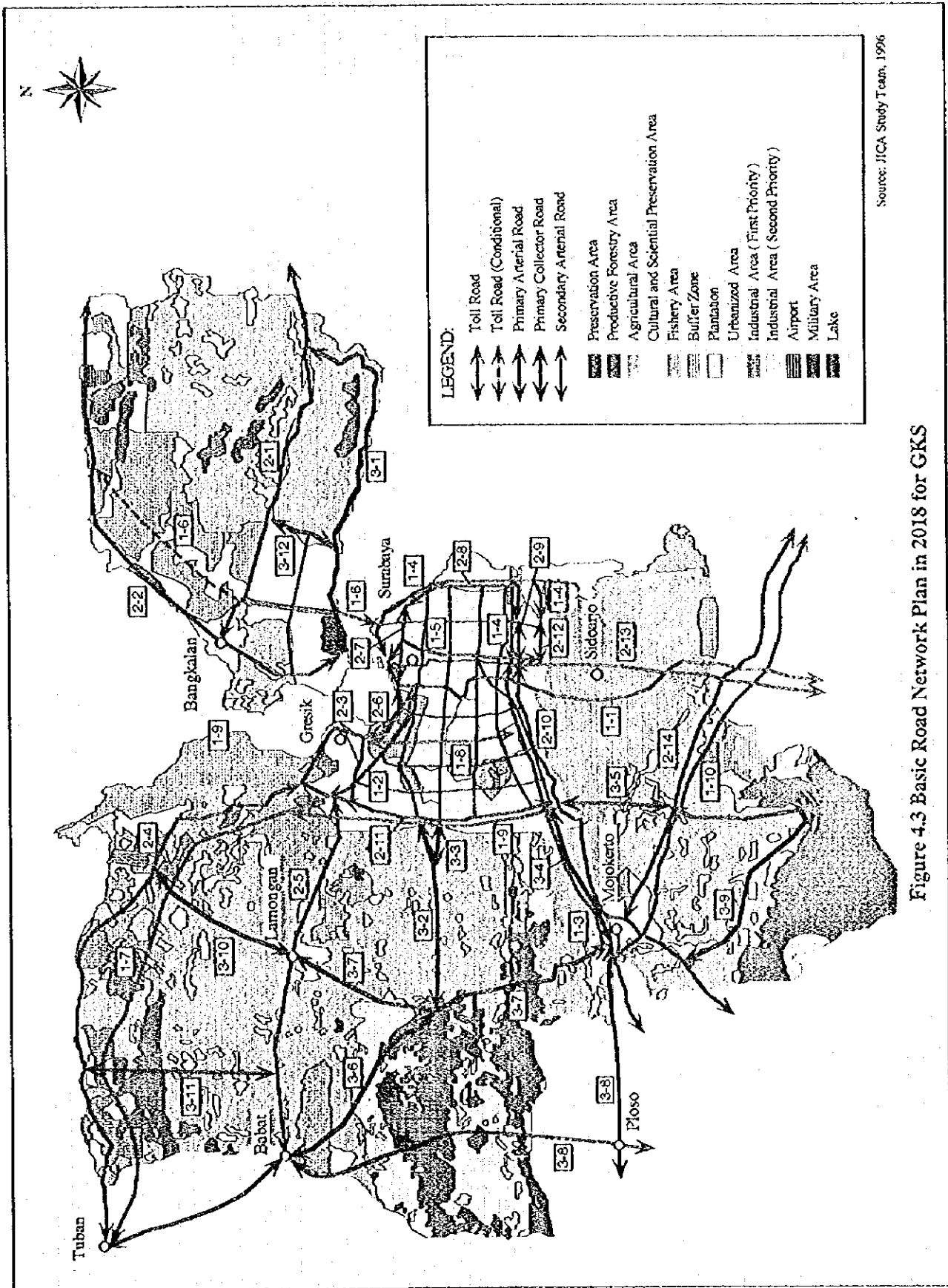


Figure 4.2 (3/3) Ultimate Stage of Primary Road System in SMA



Source: JICA Study Team, 1996

Figure 4.3 Basic Road Network Plan in 2018 for GKS

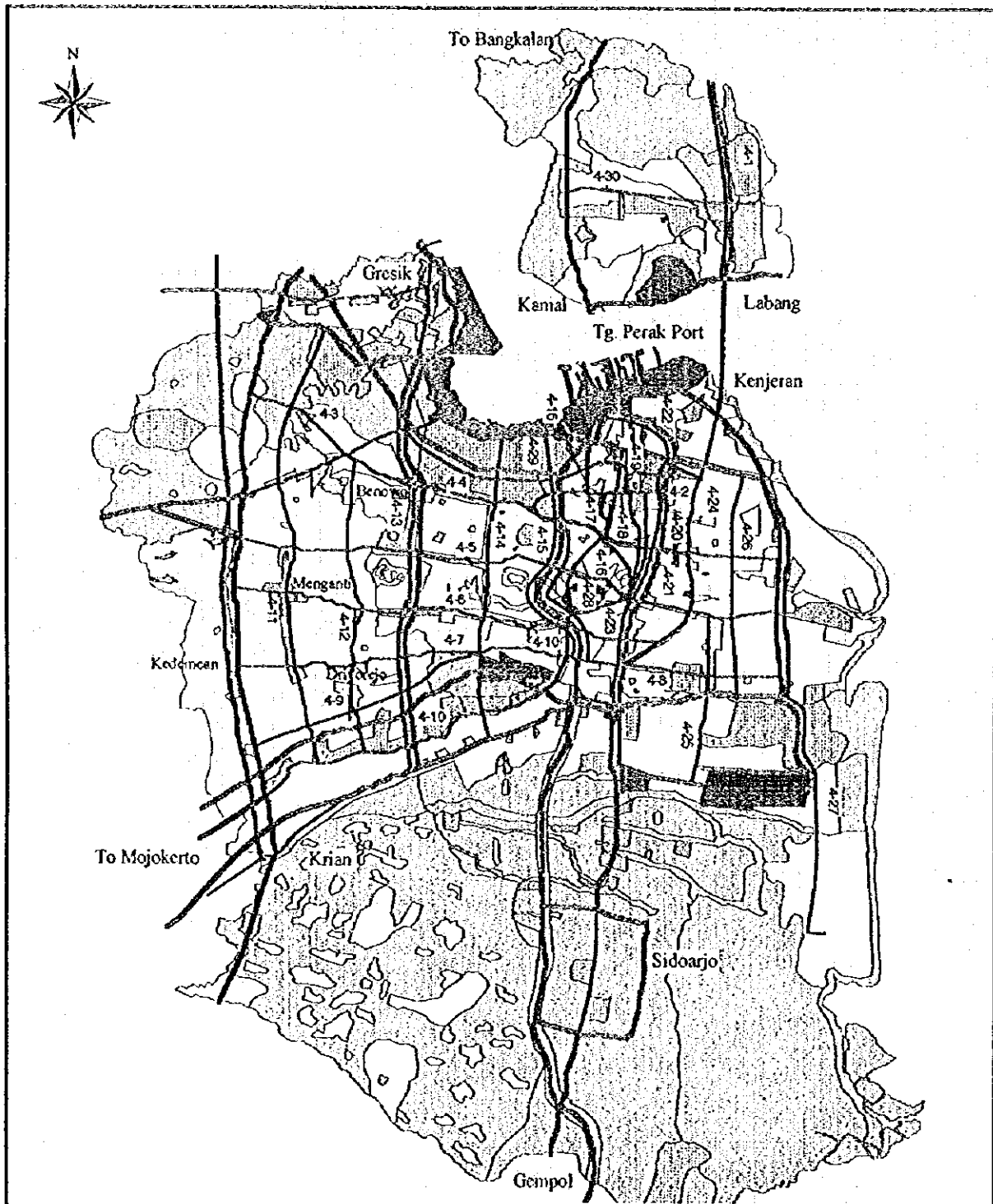


Figure 4.4 Basic Road Network Plan in 2018 for SMA

Source: JICA Study Team, 1996

LEGEND :	
	Toll Road
	Primary Arterial Road
	Primary Collector Road
	Secondary Major Arterial Road
	Residential Area
	Commercial/Business Area
	Mixed Use Area
	Public Area
	Open Space
	Industrial Area
	Military Area
	Harbor
	Airport
	Transport Terminal

5. Future Traffic Demand Forecast and Arterial Road Master Plan

5.1 Methodology

A conventional step-by-step method was applied for the traffic demand forecast as shown in the flow diagram of Figure 5.1. For the execution of transport modeling, TRANPLAN/NIS, a set of transportation planning programs, was employed.

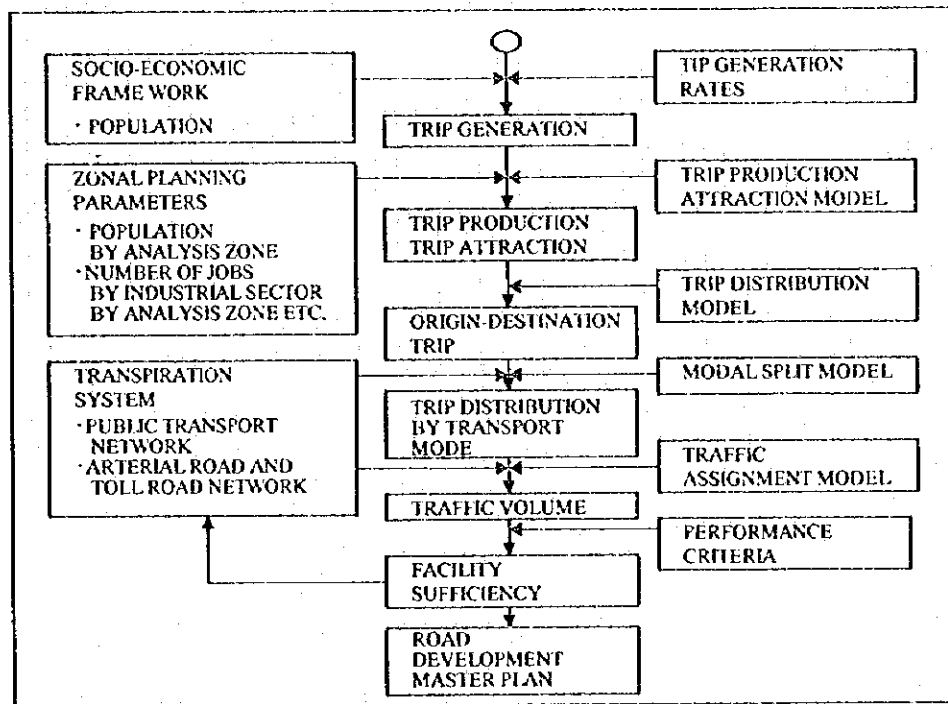


Figure 5.1 Transportation Modeling Process

The traffic demand analysis in GKS was based on vehicular traffic, while that in SMA was based on person trips. Accordingly, traffic surveys pertaining to the respective traffic demand analyses were carried out, i.e. roadside interview and classified traffic count surveys on the designated screen /cordon lines; small scale home interview surveys in selected areas, and a person trip generation factor survey at typical facilities of traffic generators.

5.2 Zone System and Definition of Road Network

The total number of traffic analysis zones amounts to 313 zones, of which 163 zones are included in Kotamadya Surabaya, 137 zones in the other Kotamadyas/Kabupatens of GKS.

The existing and planned road networks were digitized to prepare a computer-based network by adding link attributes for utilizing capabilities of the transport planning program.

5.3 Transport Modeling and Traffic Demand Forecast

In the process of the traffic demand analysis, various transport models were estimated, comprising the following models:

- ♦ Trip generation model,

- ♦ Trip production and attraction models,
- ♦ Trip distribution model,
- ♦ Modal split model, and
- ♦ Traffic assignment model.

Based on the computerized road network, estimated transport models and socio-economic variables in these models, a future traffic demand was forecast as shown in Figure 5.2. Corresponding to the estimated traffic demand, the required number of traffic lanes was estimated as presented in Figure 5.3.

5.4 Arterial Road Master Plan

An arterial road master plan was determined taking into account the following factors:

- ♦ Traffic demand and road capacities,
- ♦ Planned function of roads and expected lane uses along the roads,
- ♦ On-going projects or existing plans along the planned road corridor,
- ♦ Practical availability of land (considering the existing ROW),
- ♦ Coherence of network formulation and route continuity.

The number of lanes was eventually proposed for the road network in 2018 as shown in Figures 5.3 and 5.4.

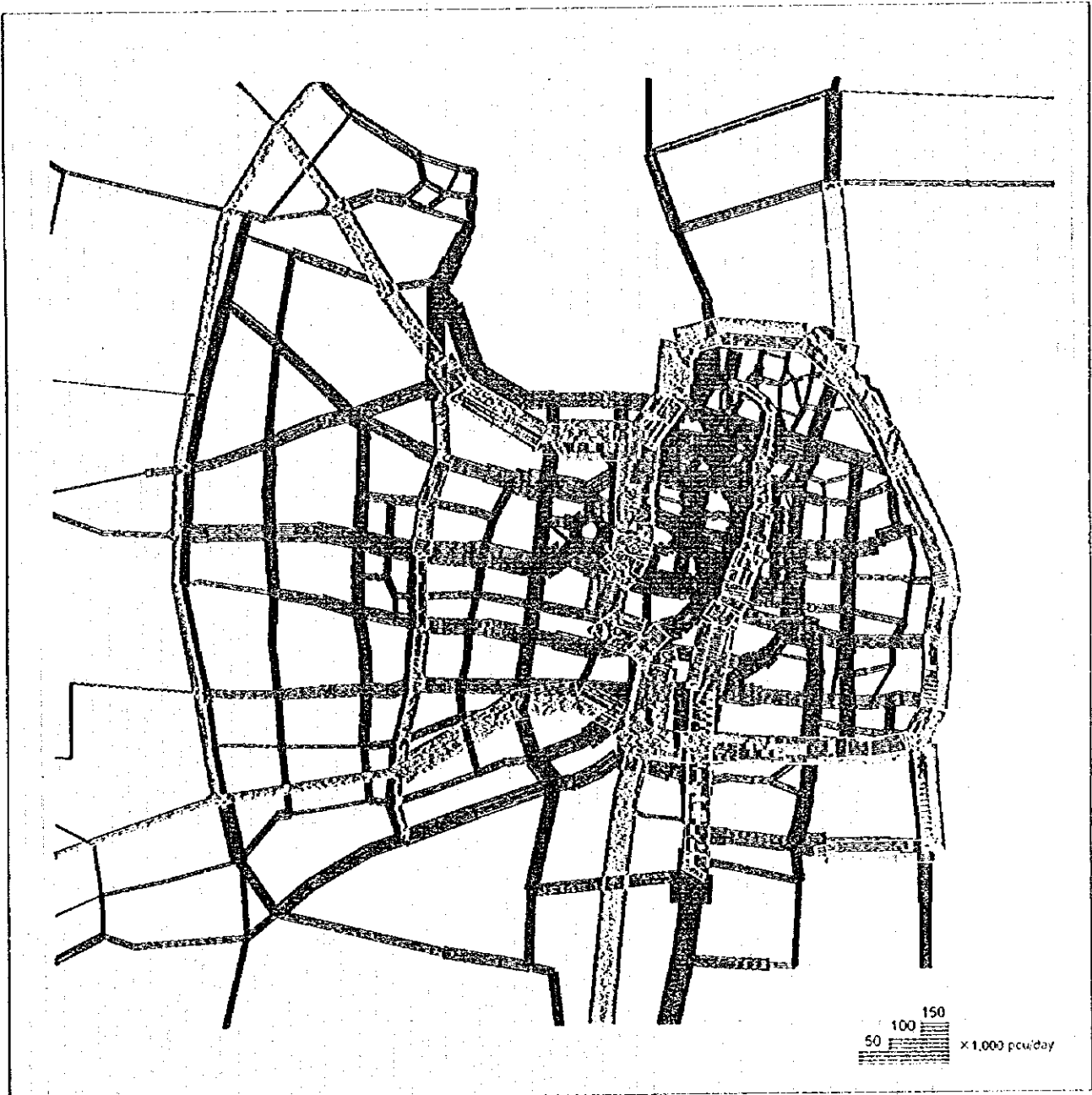


Figure 5.2 Forecast Future Traffic Demand in SMA 2018

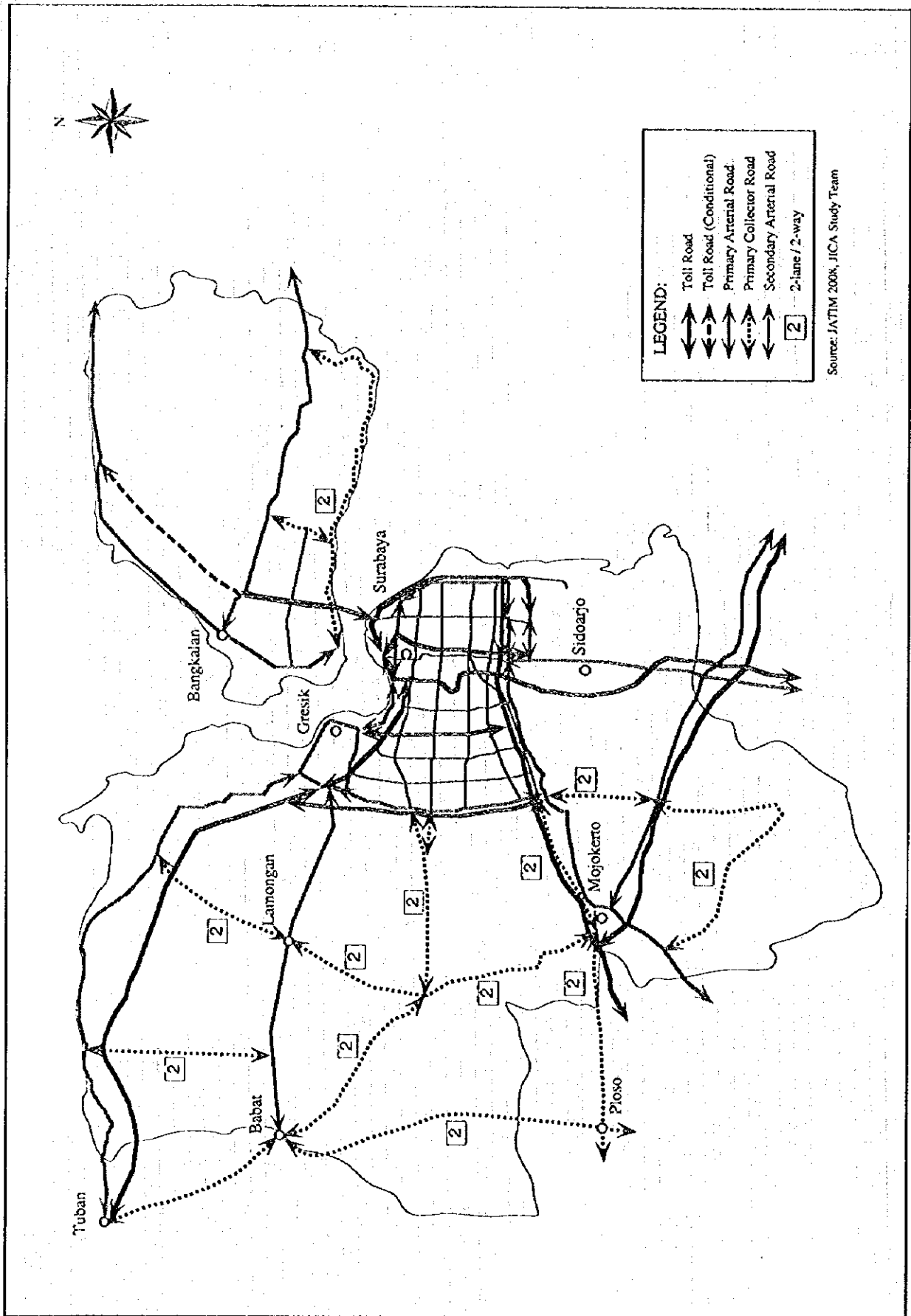


Figure 5.3 Arterial Road Development Master Plan in GKS

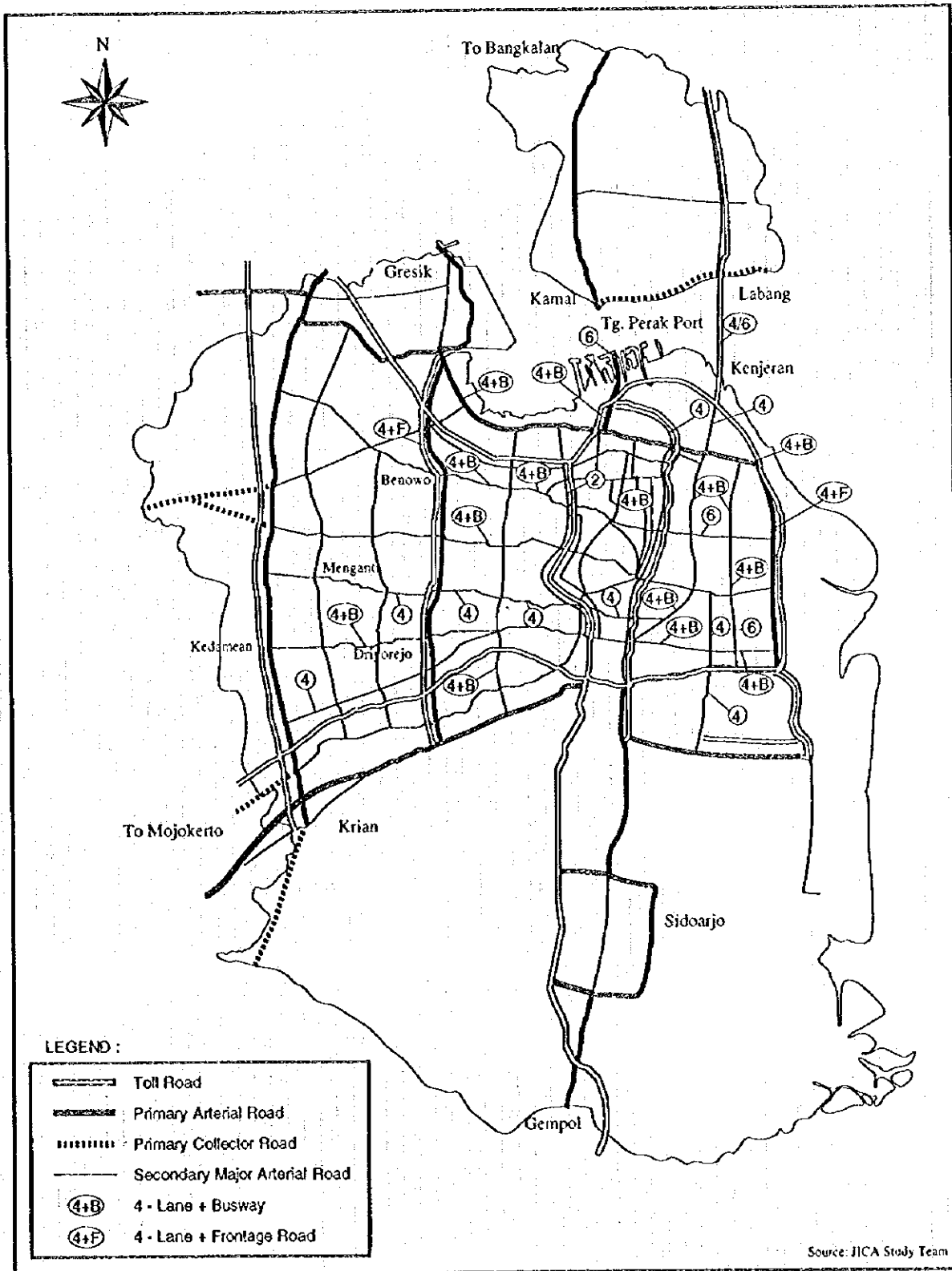


Figure 5.4 Arterial Road Development Master Plan in SMA

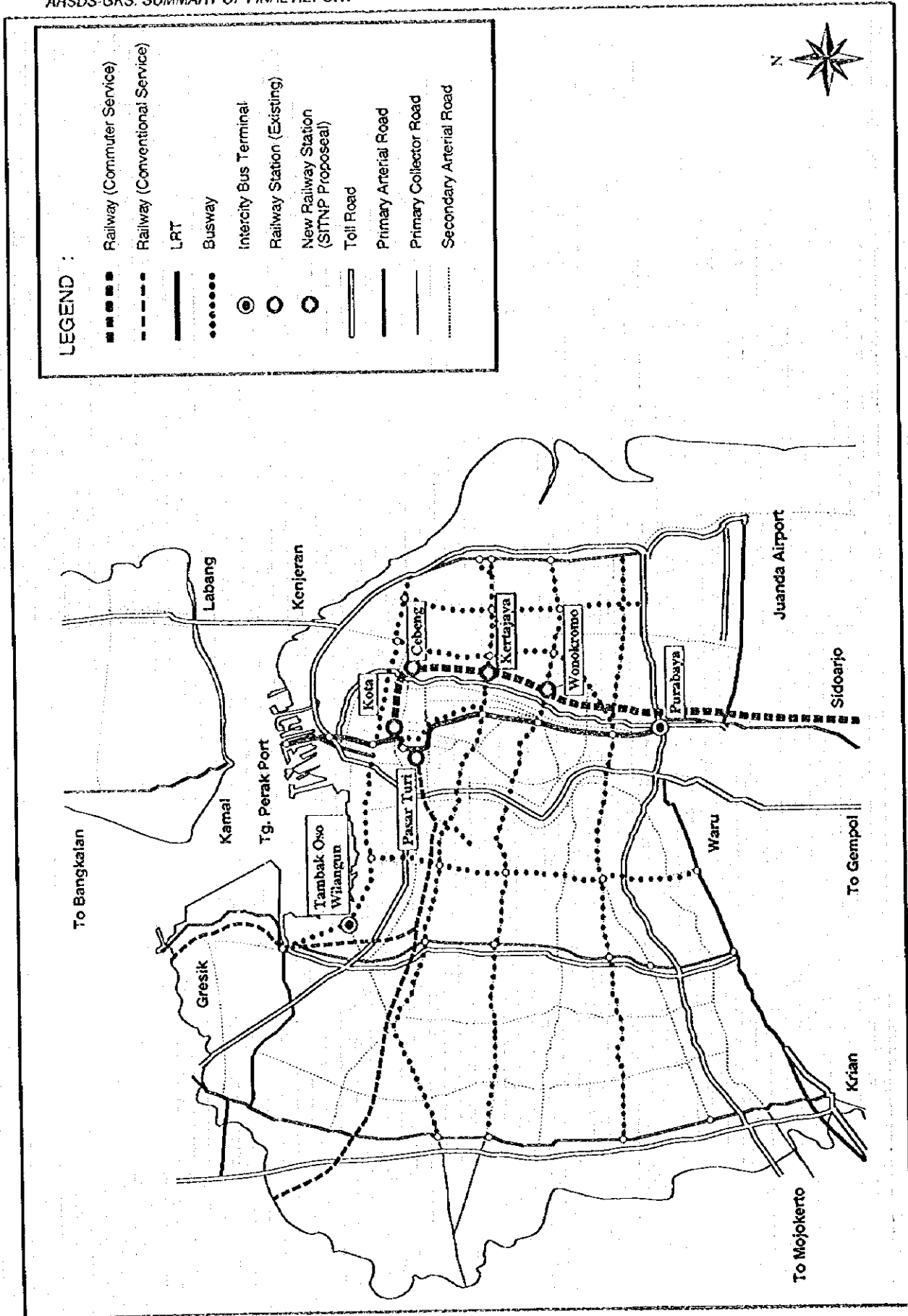


Figure 5.5 Public Transport Network