6.3 Preliminary Route Study and Project Identification

A proposed road network for 2018 in the Gerbang Kertosusila region is listed in Table 6.3.1 and shown in Figure 6.3.1 and Figure 6.3.2.

6.3.1 Toll Road as Primary Arterial Road

1-1) Surabaya - Gempol Toll Road (Widening)

Sub-Code No. 46: The first Toll Road in East Java Province. Completed in 1986 with 4 lanes/2 ways with a length of 43.8 kilometers. Pre-feasibility study for widening to 6 lanes/2 ways has completed Aug. 1996 by Jasa Marga and detailed design work will start 1997. This Toll Road is a part of the road network in "GKS Road Network Master Plan".

1-2) Surabaya - Gresik Toll Road (Maintenance)

Sub-Code No. 7: The second Toll Road in East Java Province started the operation in 1995 with 4 lanes/2 ways. The last section (Kebomas-Manyar) of 3.5 kilometers length is still under construction with 2 lanes/2 ways. This Toll Road is a part of the road network in "The Master Plan of Surabaya 2005". Future widening to 6 lanes/2 ways in the urban area and 4 lanes/2 ways in the rural area is planned.

1-3) Surabaya - Mojokerto Toll Road (New Construction)

Sub-Code No. 28: The detailed design is almost completed. Preparation for stage construction of 4 lanes/2 ways is underway. The total length is 33.8 kilometers with 8 lanes/2 ways in the urban area and 6 lanes/2 ways in the rural area as a future extension. This Toll Road is a part of the road network in "The Master Plan of Surabaya 2005" and "GKS Road Network Master Plan".

1-4) Eastern Middle Ring Road (New Construction)

Sub-Code No. 58: The feasibility study was completed in 1991 financed by OECF of Japan. Preparation for construction by 4 lanes/2 ways (partly 6 lanes/2 ways) is underway by private investor. This Toll Road has a direct connection with the existing Surabaya-Gempol Toll Road, Waru-Tg. Perak Toll Road (N-S Toll Road) and the planned Surabaya-Mojokerto Toll Road through Waru Interchange. This Toll Road is a part of the road network in "The Master Plan of Surabaya 2005". Total road length is 30.9 kilometers.

Table 6.3.1 Road Network 2018

Code No.	Sub-Code No.	Road Function	From	To	Length (km)	DESCRIPTION		
						Road Planning	Loan	Note
(1)	Toll Road							
1-1)	46	P.A.	Surabaya	Gempol	43.8	GKS MP		Widening of Existing Toll Road, D/D will start Jan. 1997
1-2)	7	P.A.	Surabaya	Gresik	20.7	Surabaya2005		Private Investor (Toll Road)
1-3)	28	P.A.	Surabaya	Mojokerto	33.8	GKS MP/ Surabaya2005		Private Investor (Toll Road)

Table 6.3.1 Road Network 2018 (Continued)

Code No.	Sub-Code No.	Road Function	From	To	Length (km)	DESCRIPTION		
						Road Planning	Loan	Note
1-4)	58	P.A.	Eastern Middle Ring Road		30.9	Surabaya2005		Private Investor(Toll Road)
1-5)	53	P.A.	Perak	Waru	20.2			Private Investor(Toll Road), Preliminary Design Stage
1-6)	55	P.A.	Surabaya Madura Toll Bridge					Private Investor(Toll Bridge), complete within 7th 5-year plan
1-7)	34	P.A.	Gresik	Tuban	75.0			Private Investor(Toll Road)
1-8)	40	P.A.	Gresik-Driyorejo Toll		20.6	Surabaya2005		Toll Road, supports the new harbor development at Kali Lamong Site
1-9)	35	P.A.	Outer Ring 2		59.0			Toll Road
1-10)	63	P.A.	Mojokerto	Gempol	32.0			Toll Road
(2)	Primary Arterial Road							
2-1)	1	P.A.	Bangkalan	Torjun	54.0	GKS MP		Depends on Sura-Madu Bridge
2-2)	48	P.A.	Kamal - Bangkalan Ring Road	Ketapang	83.0	GKS MP	Sector Loan 3712 Phase 3/IBRD, Processing for Tender	
2-3)	3	P.A.	Gresik Ring Road		26.5	Gresik MP		Planned by Kab. Gresik, partly completed
2-4)	33	P.A.	Gresik Ring Road	Tuban	78.1	GKS MP	Sector Loan 3712 Phase 3/IBRD, Processing for Tender	
2-5)	4	P.A.	Gresik Ring Road	Babat	50.8	GKS MP	ADB Loan1428,Tender is on going, Jan. '97 Start Construction	
2-6)	5	P.A.	Gresik	Jl. Gresik	13.8	GKS MP/ Surabaya2005	Heavy Loaded Road/OECF	Proposed Busway by SITNP, Existing Primary Artery Road
2-7)	6	P.A.	Jl. Rajawali	Jl. Kenjeran	8.5	Surabaya2005	SUDP/OECF	Alternative route for Existing Primary Artery Through the City
2-8)	59	P.A.	Frontage Road of EMR Road		13.9			Alternative route for Existing Primary Artery Through the City
2-9)	27	P.A.	Eastern M Ring Road Stage 1		6.4	GKS MP	SUDP/OECF, D/D completed	Alternative route for Existing Primary Artery Through the City
2-10)	31	P.A.	Waru-Kerian Bypass	Mojokerto Jombang	68.1	GKS MP/ Sidoarjo MP	Heavy Loaded/ OECF(Candidates)	Existing Primary Artery
2-11)	36	P.A.	Gresik	Kerian	26.9	Gresik MP		Planned by Kab. Gresik
2-12)	32	P.A.	Access to Juanda Air Port		5.2	Sidoarjo 2004		
2-13)	52	P.A.	Waru-Sidoarjo Ring Road	Gempol	41.6	GKS MP	Sector Loan 3712 Phase 2/IBRD, Sep. '97 Complete	Existing Primary Artery
2-14)	62	P.A.	Mojokerto	Gempol	32.0	GKS MP/ Mojokerto MP	Sector Loan 3712 Phase 2/IBRD, Sep. '97 Complete	
(3)	Primary Collector Road							
3-1)	2	P.C.	New Road	Belega	42.0	Labang Development		Depends on Sura-Madu Bridge
3-2)	10	P.C.	Mantup	Outer Ring	21.5	Gresik MP		Small Traffic Assignment
3-3)	15	P.C.	Benjeng	Outer Ring	3.1			Supports the West Surabaya Development
3-4)	30	P.C.	Outer Ring	Mojokerto	15.5	GKS MP/ Surabaya2005		Small Traffic Assignment
3-5)	37	P.C.	Kerian	Mojosari	12.7	GKS MP/ SidoarjoMP/ Mojokerto MP		Small Traffic Assignment
3-6)	61	P.C.	Babat	Mantup	28.0			
3-7)	64	P.C.	Lamongan	Mojokerto	46.3	GKS MP/ Mojokerto MP		Small Traffic Assignment

Table 6.3.1 Road Network 2018 (Continued)

Code No.	Sub-Code No.	Road Function	From	To	Length (km)	DESCRIPTION		
						Road Planning	Loan	Note
3-8)	65	P.C.	Babat	Gedek	64.9	GKS MP		Small Traffic Assignment
3-9)	66	P.C.	Mojosari	Gemekan	33.6	Mojokerto MP		Small Traffic Assignment
3-10)	68	P.C.	Deket	Karang Binagang	21.6			Supports the Pantura Development
3-11)	69	P.C.	Pucuk	Brondong	28.2			Supports the Pantura Development
(4)	Secondary Artery Road							
4-1)	67	S.A.	Labang	Bunneh	13.5			Supports the Labang Development, Frontage Road of Sura-Madu Bridge.
4-2)	8	S.A.	Jl. Dupak	Jl.K.Krampung	6.5	Surabaya2005		
4-3)	9	S.A.	AAWatangrejo	Denowo	11.0			Small Traffic Assignment
4-4)	11	S.A.	Outer Ring	Jl. R.Tandes	13.8	Surabaya2005		
	12	S.A.	Jl.R.Tandes	Jl.Banyu Urip	5.5	Surabaya2005	SUDP/OECF, D/D completed	Proposed LRT Route by SITNP
	13	S.A.	Jl.Pandegiling		2.7	Surabaya2005	propose to SUDP/IBRD	Proposed LRT Route by SITNP
	14	S.A.	Jl.Sulawesi	Jl.R.Kertajaya	6.3	Surabaya2005		Proposed LRT Route by SITNP
4-5)	16	S.A.	Outer Ring	Gre.-Dri. Toll	8.5	Gresik MP		Supports the West Surabaya Development
	17	S.A.	Gre.-Dri. Toll	Jl.R.Darmo P.	5.4	Surabaya2005		Supports the West Surabaya Development, private Investor
	18	S.A.	Jl.R.Darmo P.	Wonokromo	6.6	Surabaya2005		Supports the West Surabaya Development
	19	S.A.	Wonokromo	Jl. R.Panjang Jiwo	7.2	Surabaya2005		Supports the West Surabaya Development
4-6)	20	S.A.	Menganti	Jajar Tunggal	17.3	Surabaya2005	Rural Road/IBRD	Jl. Raya Menganti
	21	S.A.	Jajar Tunggal	Jl. Margorejo	4.2			
4-7)	22	S.A.	Kedamean	Gre.-Dri. Toll	11.1	Gresik MP		Supports South Gresik and Driyorejo Development
	23	S.A.	Gre.-Dri. Toll	Jl. Jemur Sari	14.8			Supports South Gresik and Driyorejo Development
4-8)	24	S.A.	Jl. J. Adayani	EMRR Stage 2	5.4	Surabaya2005		
	25	S.A.	New Road		2.4	Surabaya2005		
4-9)	26	S.A.	Banjaran	Sumur Welt	11.3			Small Traffic Assignment
4-10)	29	S.A.	Wonokromo	Outer Ring Road	33.7	GKS MP/ Surabaya2005		
4-11)	38	S.A.	Pengalangan	Tanjungan	14.7			Small Traffic Assignment
4-12)	39	S.A.	Gempolkurung	Sumput	14.6			Small Traffic Assignment
4-13)	41	S.A.	Gresik	Driyorejo	20.6			Partly by Private Investor
4-14)	42	S.A.	Jl. Margomulyo		3.4	Surabaya2005	SUDP/OECF, under Construction	Alternative route for Existing Primary Artery through the city (No.42-No45),Pre-FS completed as Western Middle Ring Road
	43	S.A.	Jl.R.Tandes	Jl.Prada Indah	2.9	Surabaya2005		Pre-FS completed as Western Middle Ring Road
	44	S.A.	Jl.Prada Indah	Jl.R.Mengant i	2.8	Surabaya2005		Private Investor, Pre-FS completed as Western Middle Ring Road
	45	S.A.	Jl.R.Mengant i	existing N.H.W.	6.6	Surabaya2005		Pre-FS completed as Western Middle Ring Road
4-15)	47	S.A.	Jl. Kali Anak	Waru	15.5			Strengthens the North South Corridor

Table 6.3.1 Road Network 2018 (Continued)

Code No.	Sub-Code No.	Road Function	From	To	Length (km)	DESCRIPTION		
						Road Planning	Loan	Note
4-16)	49	S.A.	Jl. Diponegoro	Jl. Demak	10.9	GKS MP/ Surabaya2005		Existing Primary Artery through the City(Truck Route)
4-17)	70		Jl. Kedungdoro	Jl. Bubutan	3.0			
4-18)	71		Jl. Raya Darmo	Jl. Tidar	5.7			
4-19)	72		Jl. Pemuda	Jl. Jemb. Merah	4.2			
4-20)	73		Jl. Darmokali	Jl. Kayun	4.0			
4-21)	50	S.A.	Jl. ST. Wonokromo	Jl. Kapasari	14.2	GKS MP/ Surabaya2005		Existing Primary Artery through the City(Truck Route)
4-22)	74		Jl. Tg. Perak	Jl. Simokerto	3.6			
4-23)	51	S.A.	Jl. Raya Wonokromo	Waru	5.4	GKS MP/ Surabaya2005		Existing P. Artery through the City(Truck Route), proposed LRT Route by SITNP and N-S Toll Road
4-24)	54	S.A.	Jl.R. Jumursari	Sura-Madu IC	11.9	Surabaya2005	SUDP/IBRD	Surabaya Inner Ring Road
4-25)	56	S.A.	Jl.R Rungkut	Jl. J. Suprapto	9.5	Surabaya2005		
4-26)	57	S.A.	Eastern M Ring Road Stage 2		11.1	GKS MP/ Surabaya2005	SUDP/OECF	
4-27)	75	S.A.	East Coast Extension		13.5			

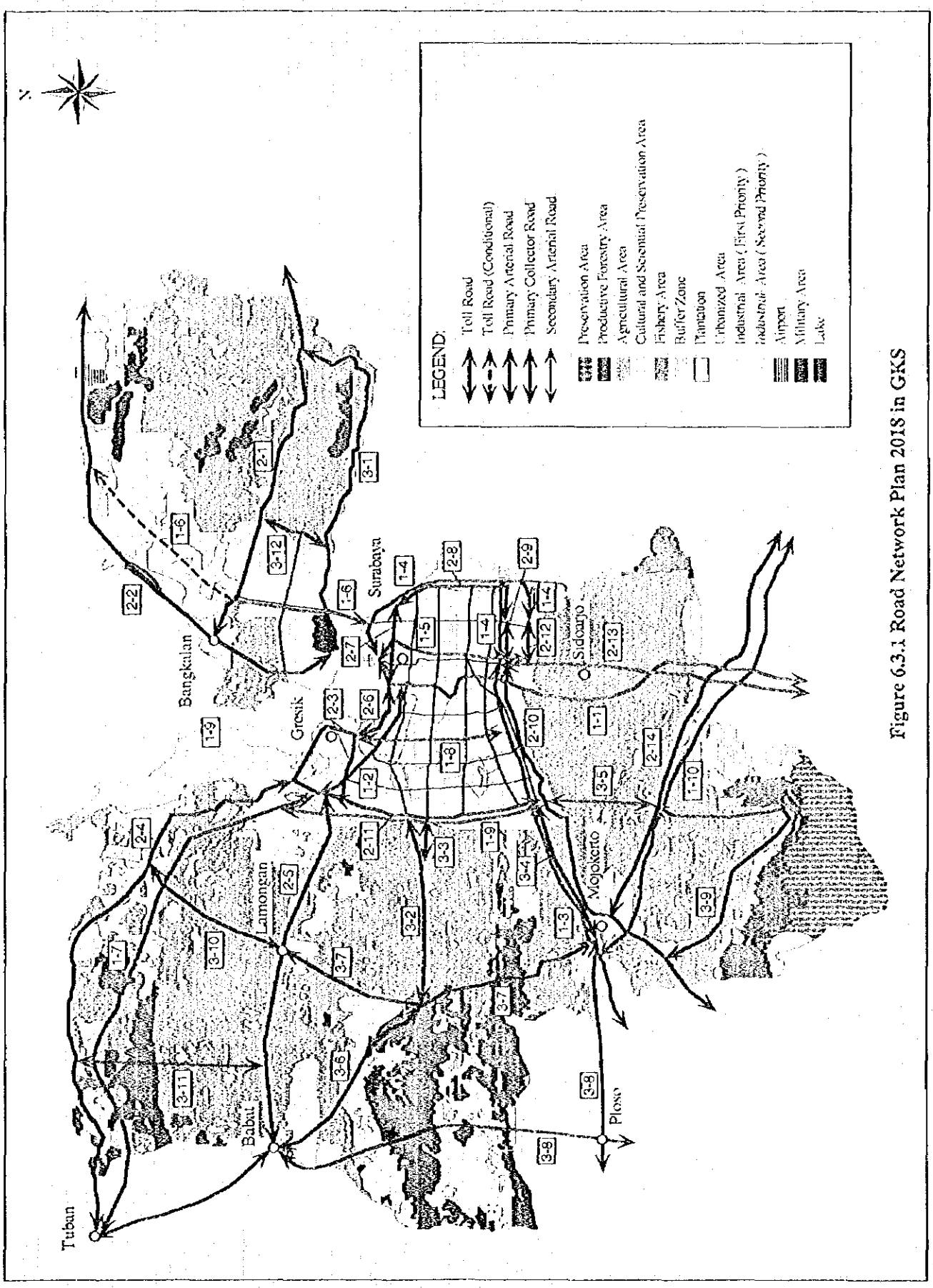


Figure 6.3.1 Road Network Plan 2018 in GKS

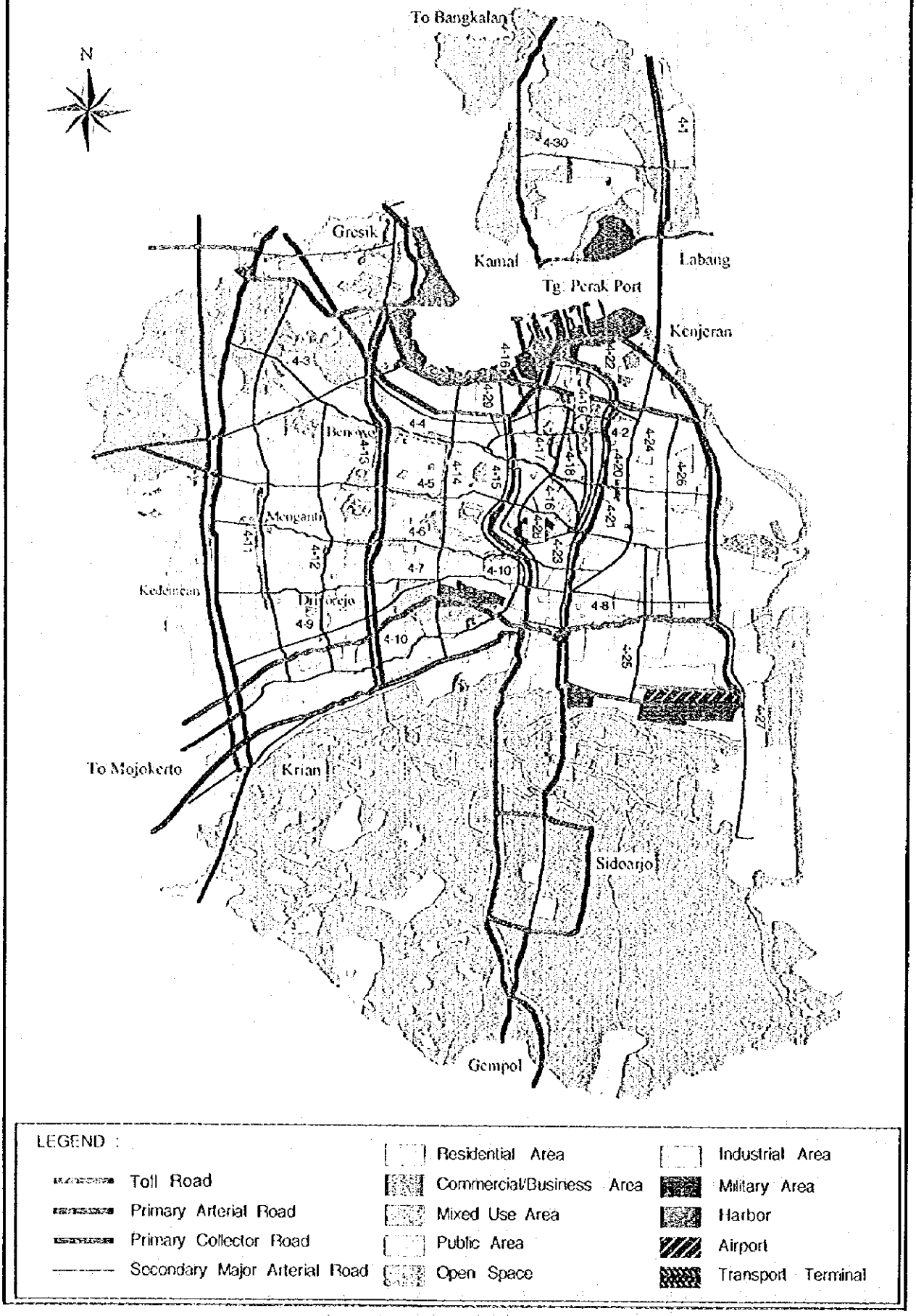


Figure 6.3.2 Road Network Plan 2018 in SMA

1-5) Waru-Tg. Perak (North-South) Toll Road in Surabaya (New Construction)

Sub-Code No. 53: The preliminary study for further detailed design is ongoing by private investor. This Toll Road passes through the center of Surabaya City along with Jl. A. Yani and the existing railway for commuter traffic as an intra-urban toll road. The number of lanes is not yet determined. Total road length is approximately 20.2 kilometers.

1-6) Surabaya - Madura Toll Bridge (New Construction)

Sub-Code No. 55: It is aimed to complete within the 7th 5 year plan. This Toll Bridge will support "the Development Plan of Madura Island". This toll bridge will be extended to Tg. Bumi as a toll road. However the extension is conditional on development of a deep seaport, a new airport, and industrial and housing development (so called twin city development) on Madura island.

1-7) Gresik - Tuban Toll Road (New Construction)

Sub-Code No. 34: This Toll Road is an extension of the Surabaya - Gresik Toll Road mentioned in 1-2) above. The same investor as for Surabaya - Gresik is proposing the extension project. Total length of the road is approximately 75.0 kilometers with 4 lanes. This toll road will contribute much to the northern coastal development of East Java.

1-8) Gresik - Driyorejo Toll Road (New Construction)

Sub-Code No. 40: New proposed toll road network by this study between Gresik and Driyorejo connecting 1-2) Surabaya - Gresik Toll Road and 1-3) Surabaya - Mojokerto Toll Road above. Road length is 20.6 kilometers with 6 lanes/2 ways. This Toll Road will support "the New Port Development in Gresik Point and Kali Lamong Site", "Driyorejo Development by PERUMNAS" and "the Industrial and Warehouse Development in Tandes Area".

1-9) Outer Ring Road 2 (New Construction)

Sub-Code No. 35: New proposed toll road network by this study between Bangkalan and Krian including a second Surabaya-Madura Bridge crossing Madura channel. However the section between Bangkalan and Gresik is conditional on the development of Madura Island. Total road length is 59.0 kilometers.

1-10) Mojokerto - Gempol (New Construction)

Sub-Code No. 63: New proposed toll road network by this study connecting Mojokerto and Gempol, Pasuruan and Probolinggo area. This road network aims at direct connection of these two areas bypassing Surabaya. Road length is approximately 32.0 kilometers with 4 lanes/2 ways.

6.3.2 Primary Arterial Road

2-1) Bangkalan - Torjun (Widening)

Sub-Code No. 1: This is existing provincial road and its function is now a primary collector road. When housing and industrial development in Madura island are realized, it will be necessary to upgrade the road function to a primary arterial road. Total length is 54.0

kilometers with 4 lanes/2 ways. This road is included in the GKS Road Network Master plan.

2-2) Kamal - Bangkalan - Ketapang (Widening)

Sub-Code No. 48: Within this road section, Kamal - Bangkalan is a National Road and its function is primary an arterial road. Bangkalan - Ketapang is a provincial road and its function at present is a primary collector road. As above, when developments in Madura are realized the road function should be upgraded to a primary arterial road to support further development of the deep sea port and the new airport in Tanjung Bumi. The road length is 83.0 kilometers with 4 lanes/2 ways. For this road, Highway Sector Loan 3712, Phase 3 to widen to 2 lanes standard has been allocated by IBRD. The tender for construction is at present being processed. This road is included in the GKS Road Network Master Plan.

2-3) Gresik Ring Road (New Construction and Widening)

Sub-Code No. 3: This ring road has been planned and is partly completed by Kab. Gresik. The function of the road is to bypass the traffic from the city of Gresik and to support the new port development at Gresik Point and at Kali Lamong Site. A new truck cargo terminal is located at the branch of this ring road and the road to Lamongan. The width now planned and completed is only 7.0 meters and it is required to be widened to at least 4 lanes standard. Road length is 26.5 kilometers and it is included in the "Draft Master Plan of Kab. Gresik".

2-4) Gresik - Sedayu - Brondong - Tuban (Widening)

Sub-Code No. 33: This is an existing provincial road functioning as a primary collector road passing along the northern coast of East Java where industrial development is planned as national policy. The function of this road should be upgraded to a primary arterial road to support this development program. Road length is 78.1 kilometers and its width is less than 5 meters. Highway sector loan 3712, phase 3 by IBRD has been allocated to widen the road to 2 lanes standard. The road is required to be widened to 4 lanes standard in the future depending on progress of the northern coastal development. The road is included in "GKS Road Network Master Plan".

2-5) Gresik - Lamongan - Babat (Widening)

Sub-Code No. 4: This is an existing national road connecting Surabaya, Gresik, Lamongan and Babat and is 50.8 kilometers in length. The width is 6 to 7 meters for 2 lanes/2 ways. Widening to 4 lanes standard is planned by ADB Loan 1428. Construction is expected to start in January 1997. This road is included in the "GKS Road Network Master Plan".

2-6) Surabaya(Jl. Gresik) - Gresik (Widening)

Sub-Code No. 5: This is a national road connecting Surabaya and Gresik on the northern cost of Surabaya and is 13.8 kilometers in length. The existing width is 11.0 meters except Jl. Raya Gresik where 4 lanes/2 ways improvement has been completed. This road is one of the candidates for the "Heavy Loaded Program" to widen to 4 lanes standard, financed by OECF of Japan. The road is included in the "The Master Plan of Surabaya 2005" and in "GKS Road Network Master Plan". On this route, together with 2-7) below, a busway is planned by SITNP financed by IBRD.

2-7) Jl. Rajawali - Jl. Kenjeran (Widening)

Sub-Code No. 6: This road connects "East Surabaya" and "West Surabaya" in the northern corridor of the city. A SUDP program to widen to 4 lanes is now ongoing financed by OECF of Japan. Road length is 8.5 kilometers and it is included in "The Master Plan of Surabaya 2005".

2-8) Frontage Road of Eastern Middle Ring Road (New Construction)

Sub-Code No. 59: This is a new proposal by the study team as an alternative route to the existing primary arterial road through the city(truck route). The road is an extension of "Eastern Middle Ring Road Stage 1" below, connecting to Jl. Kenjeran above. The road length is 13.9 kilometers with 4 lanes along the "Eastern Middle Ring Road" (planned Toll Road).

2-9) Eastern Middle Ring Road Stage(New Construction)

Sub-Code No. 27: This road is planned in the SUDP program and is financed by OECF of Japan along the "Eastern Middle Ring Road" (planned Toll Road). The detailed design of 4 lanes is completed and land acquisition is now being processed. This road is included in the "GKS Road Network Master Plan".

2-10) Waru - Taman - Krian Bypass - Mlirip - Mojokerto Bypass - Gemekan - Jombang (Widening)

Sub-Code No. 31: This is existing primary arterial road connecting Surabaya, Mojokerto and Jombang having 68.1 kilometers road length. The road width varies from 6.0 meters to 14.0 meters section by section. This road is a candidate for the "Heavy Loaded Program" financed by OECF of Japan. The Surabaya-Mojokerto Toll Road is planned along this route. The road is included in the "GKS Road Network Master Plan" and the "Master Plan of Kab. Sidoarjo".

2-11) Gresik - Legundi - Krian (New Construction)

Sub-Code No. 36: In the southern part of Kab. Gresik many housing development projects are planned. This road is planned to support these developments. The existing function of the road is as a narrow Kabupaten road but it is planned as a primary arterial road with 50.0 meters width. Together with 2-3), 2-6), 2-7), 2-8), 2-9) and 2-10) above, this road forms an outer ring road of primary artery standard as an alternative route for the existing truck route through the City of Surabaya. Planned road length is 26.9 kilometers and it is included in the road network of "Gresik Master Plan".

2-12) Access Road to Juanda Airport (Maintenance and New Construction)

Sub-Code No. 32: This is an existing access road to Juanda International Airport. Renovation of the airport is planned and the passenger terminal now on the south side of runaway will be relocated to the north side. The existing passenger terminal will function as a cargo terminal in the future. Accordingly, alignment of the road will be modified. This road is included in the "Master Plan of Kab. Sidoarjo 2004".

2-13) Waru - Sidoarjo Bypass - Gempol (Maintenance)

Sub-Code No. 52: This is an existing national road straight down to the south from Surabaya to Malang. At Gempol, the road branches to the east, i.e. Pasuruan, Probolinggo and Banyuwangi. The road function is a primary arterial road. Total length from Waru to Gempol is 41.6

kilometers. At the City of Sidoarjo a bypass is planned at the east parallel to the existing road. This is the only primary arterial road besides the Surabaya - Gempol Toll Road which passes through the technically irrigated agricultural land south of Surabaya. Highway Sector Loan 3712, Phase 2 has been allocated by IBRD to widen to 4 lanes standard and this is expected to be completed in September 1997. This road is included in the "GKS Road Network Master Plan".

2-14) Mojokerto - Gempol (Widening)

Sub-Code No. 62: This is an existing provincial road 5.5 to 6.0 meters wide. Since Pasuruan and Probolinggo area is being industrially developed, direct connection between Mojokerto and Pasuruan will be necessary as a primary arterial road in the future. Road length is 32.0 kilometers and for the Mojosari and Gempol section, Highway Sector Loan 3712, Phase 2 has been allocated by IBRD. It is expected to be completed in September 1997. This road is included in the "GKS Road Network Master Plan" and the "Mojokerto Master Plan".

6.3.3 Primary Collector Road

3-1) New Road in Labang - Blega (New Construction)

Sub-Code No. 2: This road is planned as a new road in the Labang Development Plan relating to Surabaya - Madura Bridge Development. Realization of this road is much dependent on the Surabaya - Madura Bridge Development. The road length is 42.0 kilometers with 2 lanes.

3-2) Mantup - South of Cerme (Widening)

Sub-Code No. 10: This is a narrow Kabupaten road which connects Mantup and Surabaya and is divided into a primary collector road and a secondary arterial road at the crossing point with 2-11) Gresik - Legundi road above. Road length is 21.5 kilometers. This road is included in the "Draft Gresik Master Plan".

3-3) Benjeng (New Road) - South of Cerme (New Construction)

Sub-Code No. 15: This road branches from the above mentioned 3-2) road, 3.1 kilometers west of the crossing point with 2-11) Gresik - Legundi road above. After crossing Gresik-Legundi road, it connects to 4-5) road below after forming a grid pattern road network in the southern Gresik development area. Total road length is 3.1 kilometers.

3-4) Legundi - Mlirip (Maintenance)

Sub-Code No. 30: This is a provincial road and its function is as a primary collector road. Legundi - Mlirip section is a part of the Wonokromo – Mojokerto Road of which the Wonokromo - Legundi section will be a secondary arterial road. Because along the route many industries have located and urbanization is going on in this section, the future function of the Wonokromo – Legundi section is changed to a secondary arterial road. However, between Legundi - Mlirip (Mojokerto) the road passes through technically irrigated land. So the road function of this section remains as a primary collector road. Road length is 15.5 kilometers.

3-5) Krian - Mojosari (Widening)

Sub-Code No. 37: This is an existing provincial road of 12.7 kilometers length and 6.3 meters width. The road function is at present a primary collector road. Major construction materials

such as fill, gravel and stone are obtain at the mountain foot area in Mojosari and are mainly transported by this road. To support future development in Gerbang Kertosusila region, it is necessary to strengthen the road by widening and pavement improvement. The road is included in the "GKS Master Plan", the "Sidoarjo Master Plan" and the "Mojokerto Master Plan".

3-6) Babat - Mantup (New Construction)

Sub-Code No. 61: This is a new road proposal by the study team to connect Tuban area and Pasuruan-Probolinggo area through Mojokerto together with roads 3-7) and 2-14) above. Road length between Babat and Mantup is approximately 28.0 kilometers. These two areas will be developed as another core region in East Java in the future and direct connection of these area becomes necessary.

3-7) Lamongan - Mantup - Gedek - Mojokerto (Widening)

Sub-Code No. 64: This is an existing provincial road and its function is as a primary collector road. Its width is very narrow, sometimes less than 4.0 meters. Since this road connects the capital city of Kab. Lamongan and Mojokerto, it is necessary to widen it for future traffic demand. Road length is 46.3 kilometers.

3-8) Babat - Ploso - Gedek(Widening)

Sub-Code No. 65: This is an existing provincial road and its function is as a primary collector road. Road width now is very narrow at about 5.0 meters. Since this road is a part of the road connecting Tuban and Jombang area, it is necessary to widen it for future traffic demand.

3-9) Mojosari - Gemekan (Widening)

Sub-Code No. 66: This is an existing provincial road the same as 3-5) Krian Mojosari road. The road function is at present as a primary collector road. Total road length is 33.6 kilometers and the width is 4.5 meters in average. This road is also mainly used for transportation of construction materials in the region. Since the road is in very poor condition now, widening and betterment of the pavement is necessary to support development in the region. This road is included in the "Mojokerto Master Plan".

3-10) Deket - Golokan(Widening)

Sub-Code No. 68: This is a very narrow Kabupaten road now connecting Lamongan and Sedayu on the northern coast of East Java. To support northern coastal development it is necessary to upgrade its function to a primary collector road and to increase its width and strengthen the pavement. The road length is 21.6 kilometers and the width is 3.50 to 4.00 meters.

3-11) Pucuk - Brondong(Widening)

Sub-Code No. 69: This is a very narrow Kabupaten road the same as the above road 3-9). It is also necessary to upgrade its function to a primary collector road and to increase its width and strengthen the pavement to support Pantra Development in the northern coastal zone in East Java. The road length is 28.2 meters and its width is 4.50 meters.

6.3.4 Secondary Arterial Road

4-1) Frontage Road of Surabaya-Madura Toll Bridge (New Construction)

Sub-Code No. 67: Since Surabaya - Madura Toll Bridge and its extension are planned as a fully access controlled toll road, it is necessary to have a secondary arterial road along the toll road to support Labang development.

4-2) Jl. Dupak - Jl. K. Kampung (Maintenance)

Sub-Code No. 8: This is an extension of the Surabaya - Gresik Toll Road and is included in "The Master Plan of Surabaya 2005". This road is strengthened as an access road to Surabaya-Gempol and Surabaya-Gresik Toll Road, and it is important to maintain this function.

4-3) Anbeng Anbeng Watangrejo - Benowo (New Construction)

Sub-Code No. 9: This is a new road proposal by the study team as a grid pattern road in the southern Gresik housing development area. Road length is 11.0 kilometers.

4-4) Crossing Point of Roads 2-11) and 3-2) above - Jl. R. Tandes - Jl. Banyu Urip - Jl. Pandegiling - Jl. Sulawesi - Jl. R. Kertajaya (Widening)

Sub-Code No. 11, 12, 13 and 14: A part of this road (Jl. Banyu Urip) is subject to SUDP financed by OECF of Japan and detail design has been completed. The other part (Jl. Pandegiling) is going to be proposed for SUDP financed by IBRD. Total road length is 28.3 kilometers. On a part of the route, a LRT line is planned by SITNP financed by IBRD for mass transit. This is one of the trunk roads connecting the western and eastern parts of Surabaya by the central corridor. The road is included in "The Master Plan of Surabaya 2005".

4-5) Crossing Point of Roads 2-11) and 3-3) above - Gresik-Driyorejo Toll Road - Jl. R. Darmo Permai - Wonokromo - Jl. Jagir Wonokromo - Jl. R. P. Jiwo -New Road (New Construction and Maintenance)

Sub-Code No. 16, 17, 18 and 19: This is a road connecting the east and west city sub-centers through Wonokromo where many trunk roads, railways, rivers, planned toll road and planned LRT line are passing. The study team proposes to install a busway on this route for public transport. Some parts of the route have already been strengthen or are under construction. However it is necessary to extend or widen further to form an effective grid pattern road network to support West Surabaya or south Gresik development.

4-6) Menganti - Jajar Tunggal - Jl. Margorejo Indah (Maintenance and New Construction)

Sub-Code No. 20 and 21: This is Jl. Menganti and its extension to Jl. Margorejo. On Jl. Menganti, Rural Road Improvement Program is ongoing financed by IBRD to improve its road surface. It is necessary to maintain this improved road surface and new construction is required to connect Jl. Menganti and Jl. Margorejo to avoid traffic congestion at the intersection on Jl. Gunungsari.

4-7) Kedamean - Gresik-Driyorejo Toll Road - Jl. Jemur Sari (New Construction and Maintenance)

Sub-Code No. 22 and 23: This is a new proposal by the study team to support Gresik south,

Surabaya west and Driyorejo development. This road partly passes through the former ROW of Surabaya-Mojokerto Toll Road just south of the planned Kedurus reservoir. On this route, the study proposes a busway for public transport connecting the west and east of Surabaya combined with Jl. Jemur Sari and Jl. Jagir Wonokromo. At the crossing point of Jl. A. Yani, a fly over will be studied. Road length is 25.9 kilometers with four lanes and a busway.

4-8) Jl. J. Handayani - Jl. Rungkut Industri Raya to Eastern Middle Ring Road Stage 2 - New Road (Maintenance and New Construction)

Sub-Code No. 24 and 25: This is an existing access road to Rungkut Industrial Estate. The road will be extended to the east to the Eastern Middle Ring Road.

4-9) Banjaran - Sumur Welt (Frontage Road of planned Surabaya-Mojokerto Toll Road: New Construction)

Sub-Code No. 26: This road forms a grid pattern road network in Gresik south development as a frontage road of the Surabaya-Mojokerto Toll Road and is a new proposal by the study team.

4-10) Wonokromo - Sepanjang - Legundi (Existing Provincial Road: Widening and Maintenance)

Sub-Code No. 29: Existing function of this road is as a collector road. This is a part of the Wonokromo - Mojokerto road as Legundi - Mlirip road described in 3-4) above. Since on this section many industries have been located and urbanization is ongoing, the function of the road should be changed to Secondary Arterial Road.

4-11) Pengalengan - Tanjungan (New Construction)

Sub-Code No. 38: This is new proposal by the study team to form a grid pattern road network in the Gresik south development area. Road length is 14.7 kilometers with four lanes standard.

4-12) Gempolkurung - Sumput (New Construction)

Sub-Code No. 39: This is a new proposal by the study team to form a grid pattern road network in the Gresik south development area. Road length is 14.6 kilometers with four lanes standard.

4-13) Frontage Road of Gresik-Driyorejo Toll Road (New Construction)

Sub-Code No. 41: This is a new proposal by the study team along the proposed 1-8) Gresik-Driyorejo Toll Road to serve regional traffic within the west Surabaya development and forming a grid pattern road network.

4-14) Jl. Margomulyo - New Road - Under construction Road - Jl. Raya Menganti - to existing Waru-Mojokerto National Road (New Construction)

Sub-Code No. 42, 43, 44 and 45: This road has been previously studied as the "Western Middle Ring Road" and has been partly realized financed by OECF of Japan or executed by private investor. The part not yet realized should be constructed to realize its full function. Total road length is 15.7 kilometers with four lanes. The study team proposes to install a busway on this route for public transport.

4-15) Jl. Kali Anak - Waru as a Frontage Road of Surabaya-Gempol Toll Road (New Construction)

Sub-Code No. 47: This is a new proposal by the study team from Jl. Kali Anak to Waru as a frontage road on both sides of the existing Surabaya-Gempol Toll Road. The existing road shall be mobilized partly depending on the condition on site. The road length is 15.5 kilometers on each side of the existing toll road. The each side of the road will be mobilized as 2 lanes 2 way operation since both roads are split by the existing toll road. Twenty meters ROW is available on both sides.

4-16) Jl. Diponegoro - Jl. Pasar Kembang - Jl. Arjuno - Jl. Kali Butuh - Jl. Demak (Maintenance)

Sub-Code No. 49: This is an existing truck route passing through the center of Surabaya. As development or expansion of the city realized, the function of truck route should be shifted to primary arterial roads such as roads 2-3), 2-6), 2-7), 2-8), 2-9), 2-10) and 2-11) described herein above. This road will be maintained as a secondary arterial road. The road is included in the "GKS Master Plan" and the "Master Plan of Surabaya 2005".

4-17) Jl. Kedungdoro - Jl. Blauran - Jl. Bubutan (Maintenance)

Sub-Code No. 70: This road is an extension of Jl. Pasar Kembang (existing truck road) passing straight to the north from the intersection of Jl. Pasar Kembang and Jl. Raya Arjuno. The road passes through the Central Business District of Surabaya. The present road function is as a secondary arterial road and it will be maintained as it is now. Road length is 3.0 kilometers.

4-18) Jl. Raya Darmo - Jl. Basuki Rahmat - Jl. Emb. Malang - Jl. Tidar (Maintenance)

Sub-Code No. 71: This road starts from Wonokromo and heads straight to north. However Jl. Emb. Malang and Jl. Tidar head to the west crossing Jl. Kedungdoro and Jl. Raya Arjuno. The present road function is as a secondary arterial road passing through the CBD of Surabaya and it will be maintained as it is now. Road length is 5.7 kilometers.

4-19) Jl. Pemuda - Jl. Tunjungan - Jl. Gemblongan - Jl. Kr. Gantung - Jl. Pahlawan - Jl. Veteran - Jl. Jemb. Merah (Maintenance)

Sub-Code No. 72: This road branches from Jl. Raya Gubeng which runs on the right bank of Kali Surabaya heading to the west (crossing Kali Surabaya) and turns to the north. The road function is as a secondary arterial road and operates as one way forming a trunk road passing the CBD of Surabaya as a shopping center. The road length is 4.2 kilometers.

4-20) Jl. Darmo Kali - Jl. Dinoyo - Jl. Keputran - Jl. Kayun (Maintenance)

Sub-Code No. 73: This is another truck route passing through the center of Surabaya. As development or expansion of the city is realized, the function of truck route should be shifted to the primary arterial road described above. The road will be maintained as a secondary arterial road. Road length is 4.0 kilometers.

4-21) Jl. ST. Wonokromo - Jl. Raya Ngagel - Jl. Sulawesi - Jl. Raya Gubeng - Jl. Biliton - Jl. Kusuma Bangsa - Jl. Kapasari (Maintenance)

Sub-Code No. 50: This is another truck route passing through the center of Surabaya. As development or expansion of the city is realized, the function of truck route should be shifted to

the primary arterial road described above. The road will be maintained as a secondary arterial road. The road is included in the "GKS Master Plan" and the "Master Plan of Surabaya 2005".

4-22) Jl. Tg. Perak - Jl. Sisingamanga - Jl. Sarwajala - Jl. Hangtuah - Jl. Dana Karya - Jl. Sidorame (Maintenance) - Jl. Sidotopo Lor - Jl. Simokerto

Sub-Code No. 74: This is another truck route passing through the center of Surabaya. As development or expansion of the city is realized, the function of truck route should be shifted to the primary arterial road described above. The road will be maintained as a secondary arterial road. Road length is 3.6 kilometers.

4-23) Jl. Raya Wonokromo - Jl. A. Yani (Maintenance)

Sub-Code No. 51: This is the only primary arterial road leading to the south i.e., Gempol, Pasuruan or Mojokerto besides the Surabaya-Gempol toll road forming a truck route connecting Tg. Perak port and the industrialized area south of Surabaya. The road function as truck route will be shifted to the primary arterial road as described above. The existing road function will be maintained as a secondary arterial road. Road length is 5.6 kilometers with six to four lanes.

The road is included in the "GKS Master Plan" and the "Master Plan of Surabaya 2005".

4-24) Jl. Raya Nginden - Jl. Manyar - Surabaya Madura IC (as Surabaya Inner Ring Road: Maintenance and New Construction)

Sub-Code No. 54: Together with route 4-7) mentioned above, this road will connect the west and the east of Surabaya as a secondary arterial road. The road will be an access road to the Surabaya-Madura toll bridge. The study team proposes to install a busway on this route for public transport. The road is included in the "GKS Master Plan" and the "Master Plan of Surabaya 2005" and is part of an SUDP program financed by IBRD. Road length is 11.6 kilometers with four lanes and a busway.

4-25) Jl. Raya Rungkut - Jl. J. Suprapto (to the crossing point of road 2-12, Juanda Air Port Access Road: Widening)

Sub-Code No. 56: This road passes through the center of Rungkut industrial estate as one of the access roads to the estate. Within the City of Surabaya, 25.0 meters ROW is available but the ROW for the Kab. Sidoarjo section is not yet set. Along this road are scattered many industries, housings, markets, public and religious facilities and rice fields. The road crosses the "Eastern Middle Ring Road" (toll road) and the Eastern Middle Ring Road Stage 1 described as 1-4) and 2-9) above as a primary arterial road (alternative truck route). The main access to Rungkut Industrial Estate will be changed to this road from the present access roads, Jl. Jemur Andayani, Jl. Kutisari and Jl. Rungkut Industri Raya. Road length is 9.5 kilometers with four lanes.

4-26) Eastern Middle Ring Road Stage 2 (New Construction)

Sub-Code No. 57: This road part of the SUDP program financed by OECF of Japan and has just started construction as of September 1996 forming a grid pattern in the eastern part of the city of Surabaya. Total length of the road is 11.5 kilometers with four lanes.

4-27) East Coast Extension

Sub-Code No. 75: This road is an extension of the frontage road of the "Eastern Middle Ring

Road" passing east of Juanda air port. This road is connected with Juanda access road 2-12) above. The road length is 4.5 kilometers with four lanes. When the marina city development starts in the future, extension of this road farther to the south will support the development.

6.4 Methodology of Traffic Demand Forecast

6.4.1 Basic Concept

Conventional steps of traffic demand forecast procedures have been applied in the study as depicted in Figure 6.4.1. In this procedure a series of transportation demands will be estimated by the following process.

1. Trip Generation
2. Trip Production and Attraction by Traffic Analysis Zone
3. Trip Distribution
4. Modal Split
5. Traffic Assignment

For the execution of the tasks, TRANPLAN/NIS* software was employed during each step of the modeling process.

For the analysis in GKS, only vehicular trips are dealt with, however, for SMA person trip movements are explicitly analyzed.

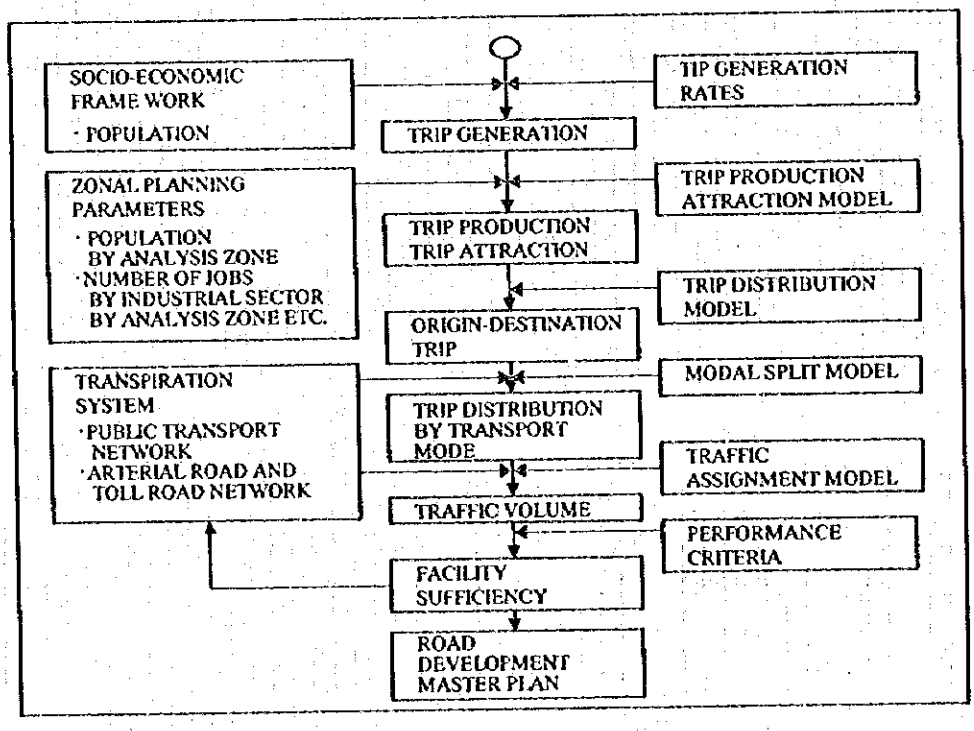


Figure 6.4.1 Transportation Modeling Process

* TRANPLAN (Transportation Planning Modeling Software) and NIS (Network Information System), a set of transportation planning programs distributed by the Urban Analysis Group, Danville, California, U.S.A.

6.4.2 Definitions

For execution of transportation analysis, the following basic definitions are required.

(1) Zone System

The study area is subdivided into traffic analysis zones, the use of which implies that all movement to and from a zone can be adequately represented as starting or ending at a single point in the zone – the zone centroid. This point represents the zonal center of transport activities.

The zone system for the current study was established taking the following points into account.

- Compatibility with the preceding study, SITNP
- Degree of accuracy required for the transportation analysis

Total number of traffic zones amounts to 313 zones, of which 161 zones are included in Kod. Surabaya. Table 6.4.1 summarizes the relationship between administrative units and traffic zones. Figure 6.4.2 and Figure 6.4.3 illustrate traffic analysis zones. Detailed zone code table is contained in the Appendix 4.1.

Table 6.4.1 Composition of Traffic Analysis Zones

Classification	Zone Number	Area	Basic Administrative Units
Surabaya Metropolitan Area (SMA)	1 - 163	Kod. Surabaya	Kelurahan
	164 - 207	A part of Kab. Sidoarjo	Desa or Combination of Desas (Kab. Sidoarjo and Kab. Gresik)
	217 - 224	A part of Kab. Gresik	
	233 - 251	A part of Kab. Gresik	
	261 - 262	A part of Kab. Bangkalan	Kecamatan(Kab. Bangkalan)
	270	A part of Kab. Bangkalan	
Gerbang Kertosusila Region (GKS) (Outside SMA)	208 - 216	A part of Kab. Sidoarjo	Kecamatan or Combination of Kecamatans
	225 - 232	A part of Kab. Gresik	
	252 - 260	A part of Kab. Gresik	
	263 - 269	A part of Kab. Bangkalan	
	271 - 278	A part of Kab. Bangkalan	
	279 - 301	Kab. & Kod. Mojokerto	
		Kab. Lamongan	
Outside Gerbang Kertosusila	302 - 306	Inside Jawa Timur	Combination of Kabupatens
	307 - 312	Outside Jawa Timur	Provinces by direction
Special Zone			
- Juanda Airport	201		
- Tg. Perak Port	313		

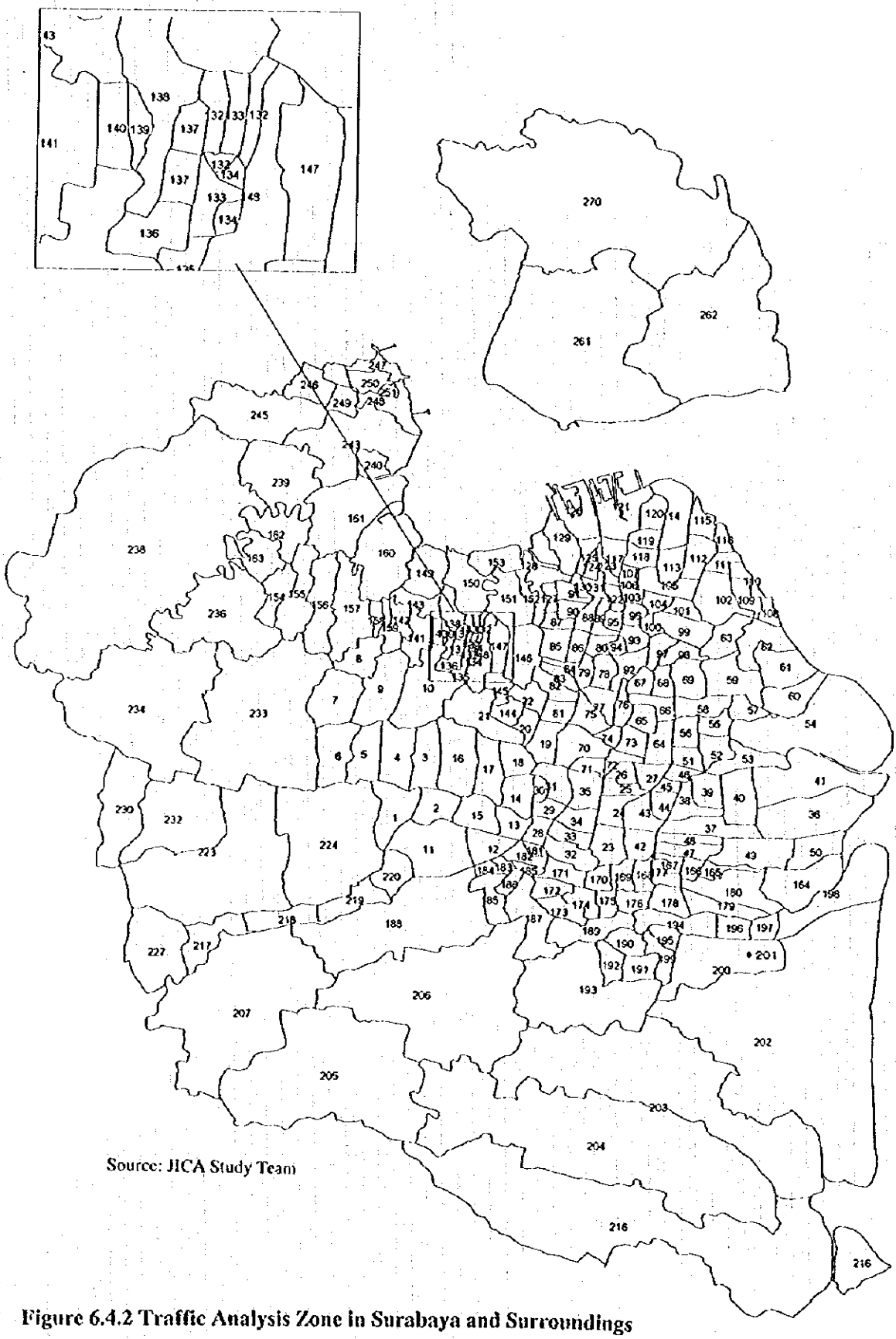
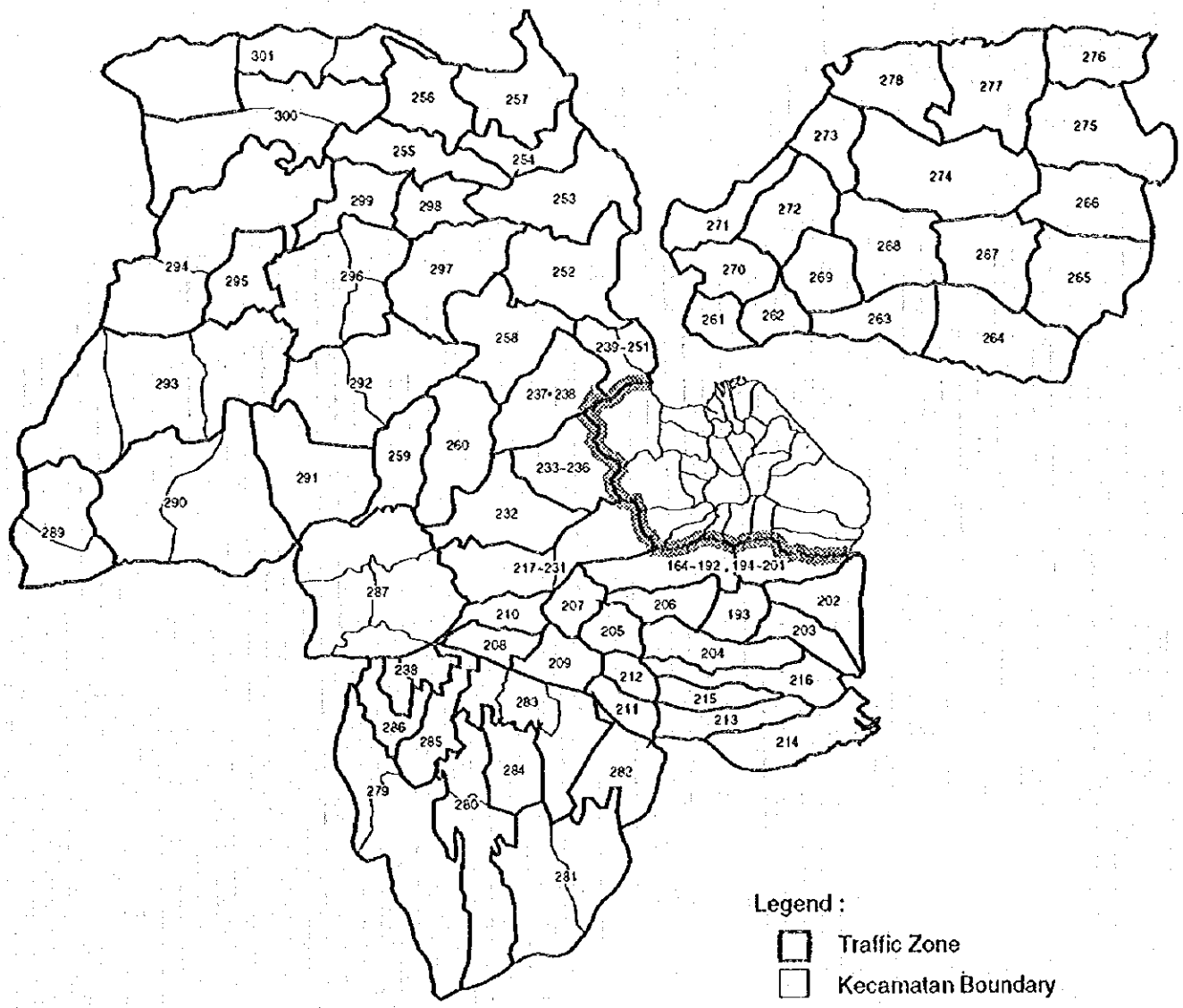


Figure 6.4.2 Traffic Analysis Zone in Surabaya and Surroundings

*201 : Juanda International Airport



Source: JICA Study Team

Figure 6.4.3 Traffic Analysis Zone in GKS

(2) Computerized Road Network

The development of base and future year networks within the study area was performed in the following three steps.

- Analyze the results of the road inventory survey supplemented with Bina Marga's road inventory data as well as road development plans
- Digitize selected arterial road links and toll road links, generally excluding local roads, contained in the network
- Develop computer-based network by adding link attributes for utilizing the capabilities of TRANPLAN/NIS transportation planning program.

The TRANPLAN road network simulation program requires the following data for each link.

A-Node and B-Node Numbers

Link Distance
Free Flow Speed
Link Capacity
Assignment Group Code
Link Group Code

6.5 Transport Modeling

This section describes the analysis on travel characteristics and developed sub-models in the traffic demand forecast procedure, the outline of which is described in Section 6.4.

6.5.1 Trip Generation Model

Total number of trips will be affected by the change of socio-economic structure in future years. Trip generation rates were calculated from the results of the Home Interview Survey. Trip production rates by several categories such as employment status, occupation, and by school type are listed below.

Table 6.5.1 Trip Rate by Employment Status

Employment Status	Home-Based Work	Home-Based School	Home-Based Other	Non-Home Based Business	Non-Home Based Other	Unknown	Total
Working	1.754	0.036	0.317	0.052	0.133	0.069	2.361
Temporally not working	1.167	0.067	0.833	0.000	0.000	0.033	2.100
Seeking jobs	0.089	0.333	1.622	0.044	0.089	0.022	2.200
School	0.041	1.865	0.152	0.001	0.044	0.044	2.147
Housewife	0.103	0.053	1.907	0.010	0.079	0.104	2.255
Assist housekeeping	0.099	0.041	1.893	0.008	0.066	0.050	2.157
Retired	0.333	0.014	1.536	0.029	0.058	0.130	2.101
Others	0.120	0.120	1.400	0.000	0.080	0.040	1.760

Source: *ARSDS-GKS Home Interview Survey, 1996*

Table 6.5.2 Trip Production Rate by Occupation

Occupation	Home-Based Work	Home-Based School	Home-Based Other	Non-Home Based Business	Non-Home Based Other	Unknown	Total
Manager, Director	1.894	0.024	0.212	0.106	0.306	0.035	2.576
Owner of Home Industry	1.554	0.065	0.598	0.130	0.120	0.087	2.554
Doctor, Lawyer, Professor	1.907	0.040	0.225	0.060	0.159	0.073	2.464
Clerical Worker	1.761	0.051	0.291	0.090	0.209	0.073	2.474
Technician	1.721	0.029	0.257	0.088	0.147	0.088	2.331
Shop person of Retail Shops	1.719	0.088	0.351	0.000	0.123	0.053	2.333
Shop person of Temporary Shops	1.438	0.078	0.484	0.094	0.109	0.047	2.250
Craftsman	1.600	0.080	0.220	0.060	0.140	0.060	2.160
Construction Labor	1.863	0.039	0.235	0.000	0.039	0.020	2.196
Factory Labor	1.851	0.026	0.167	0.019	0.041	0.071	2.175
Public Transport Driver	1.767	0.033	0.067	0.033	0.067	0.233	2.200
Private Transport Driver	1.771	0.000	0.286	0.057	0.229	0.029	2.371
Housemaid, Office Boy	0.844	0.067	1.244	0.000	0.067	0.111	2.333
Farmer	1.738	0.024	0.333	0.024	0.071	0.048	2.238
Security Guard	1.814	0.047	0.070	0.000	0.035	0.116	2.081

Source: ARSDS-GKS Home Interview Survey, 1996

Table 6.5.3 Trip Production Rate by School Type

Type of School	Home-Based Work	Home-Based School	Home-Based Other	Non-home Based Business	Non-home Based Other	Unknown	Total
Kindergarten	0.098	1.829	0.061	0.000	0.000	0.024	2.012
Elementary School	0.055	1.809	0.111	0.000	0.045	0.038	2.057
Junior High School	0.046	1.825	0.123	0.000	0.037	0.031	2.062
Senior High School	0.069	1.801	0.243	0.004	0.051	0.058	2.225
University, College	0.101	1.781	0.298	0.000	0.096	0.079	2.354

Source: ARSDS-GKS Home Interview Survey, 1996

6.5.2 Trip Production and Attraction Models

Trip production models for Home-Based Work and Home-Based School were based on trip production rate. Explanatory variables for trip production models are population, employed population by industrial section at residence, number of students/pupils at residence, whereas number of jobs by industrial sector at work place and number of students/pupils at school place are the major two explanatory variables of trip attraction models.

Table 6.5.4 Explanatory Variables for Trip Production/Attraction Models

Trip Production / Trip Attraction	Trip Purpose	Variables
Trip Production	Home-Based Work	Employed Population by Industrial Sector at Residence
	Home-Based School	Number of students/pupils by school type at Residence
	Home-Based Other	Population
	Non-Home-Based Business	Number of Jobs by Industrial Sector at Work Place
	Non-Home-Based Other	Number of Jobs by Industrial Sector at Work Place
Trip Attraction	Home-Based Work	Number of Jobs by Industrial Sector at Work Place
	Home-Based School	Number of Students/Pupils by School type at School Place
	Home-Based Other	Number of Jobs by Industrial Sector at Work Place
	Non-Home-Based Business	Number of Jobs by Industrial Sector at Work Place
	Non-Home-Based Other	Number of Jobs by Industrial Sector at Work Place

Since information pertaining to trip attraction is not sufficient for developing Non-Home-Based Business and Other Purpose trip production models as well as trip attraction models, the trip attraction model created in the SITNP study was adopted for Non-Home-Based Business and Other purpose trips.

6.5.3 Trip Distribution Model

(1) Trip Length Distribution

1) Home-Based Work Trips by Occupation

Trip length of Home-Based Work trips of farmers are remarkably short since most of their trips are local travel in a rural area, as depicted in Figure 6.5.1. More than half of farmers have their farms, as their work places, within a two kilometer distance from home. Although trip production rate of farmers, 1.738, is not very low compared with other occupations, trips made by them would not be a heavy burden on an arterial road network. Trip length of manufacturing laborers is relatively longer than that of farmers, and shows almost the same distribution curve as other occupations. This result was not expected since it can be seen that many manufacturing laborers locate themselves nearby the manufacturing factories. Probably this result was caused by the fact that the survey did not cover the whole study

area and the fact that manufacturing laborers of home-industry have similar travel characteristics as other jobs in the metropolitan area.

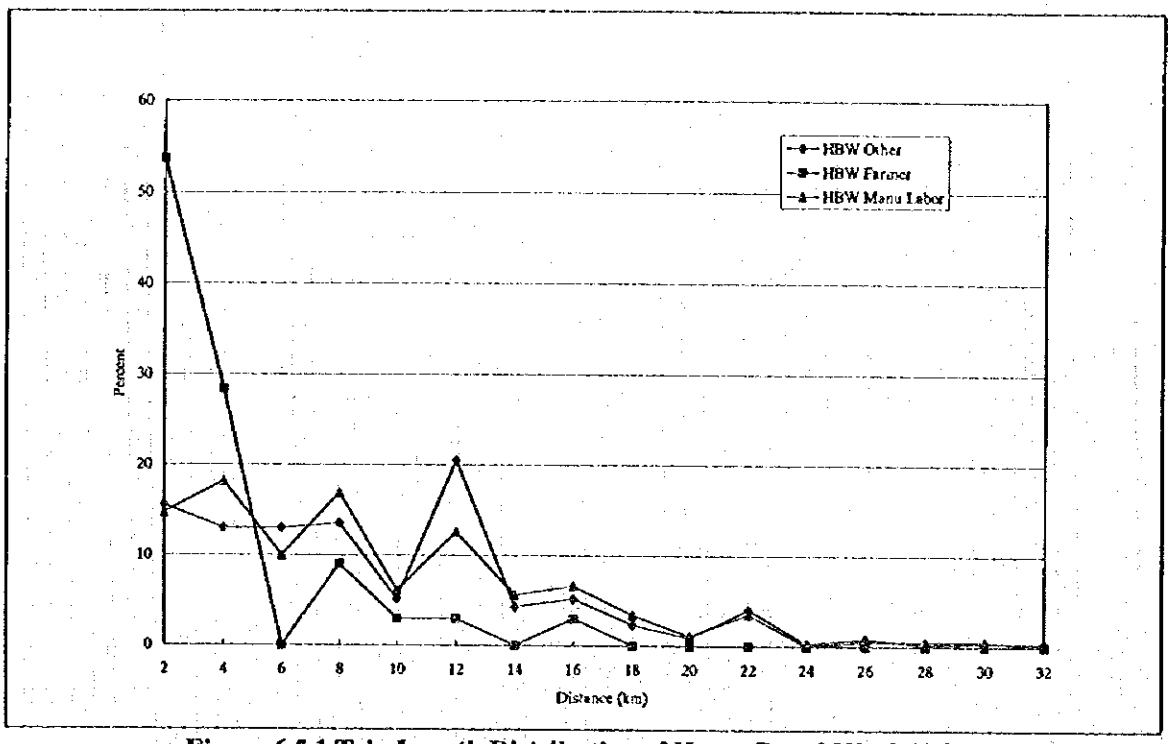


Figure 6.5.1 Trip Length Distribution of Home-Based Work Trips

2) Home-Based School Trips by School Type

Children in kindergarten and elementary school have relatively short trips because a number of these lower educational facilities are located closer to their residence compared with other higher educational institutions. As the grade of school increases, trip length from home to school increases gradually. The trip length distribution of university/college students indicates a peak around the range between 8 and 12 kilometers, reflecting the limited locations of the institutions.

The facts mentioned above imply that:

(a) Children in kindergarten or elementary school will not have to go far for their education, if local government can afford to build the lower level of educational facilities in newly developed areas as the urban area expands. In other words, trip length distribution of these pupils would not change much.

(b) On the contrary, trip length of university students could be longer as the residential area expands outwards, if the majority of these universities do not relocate or universities are newly built in the suburban area in the future.

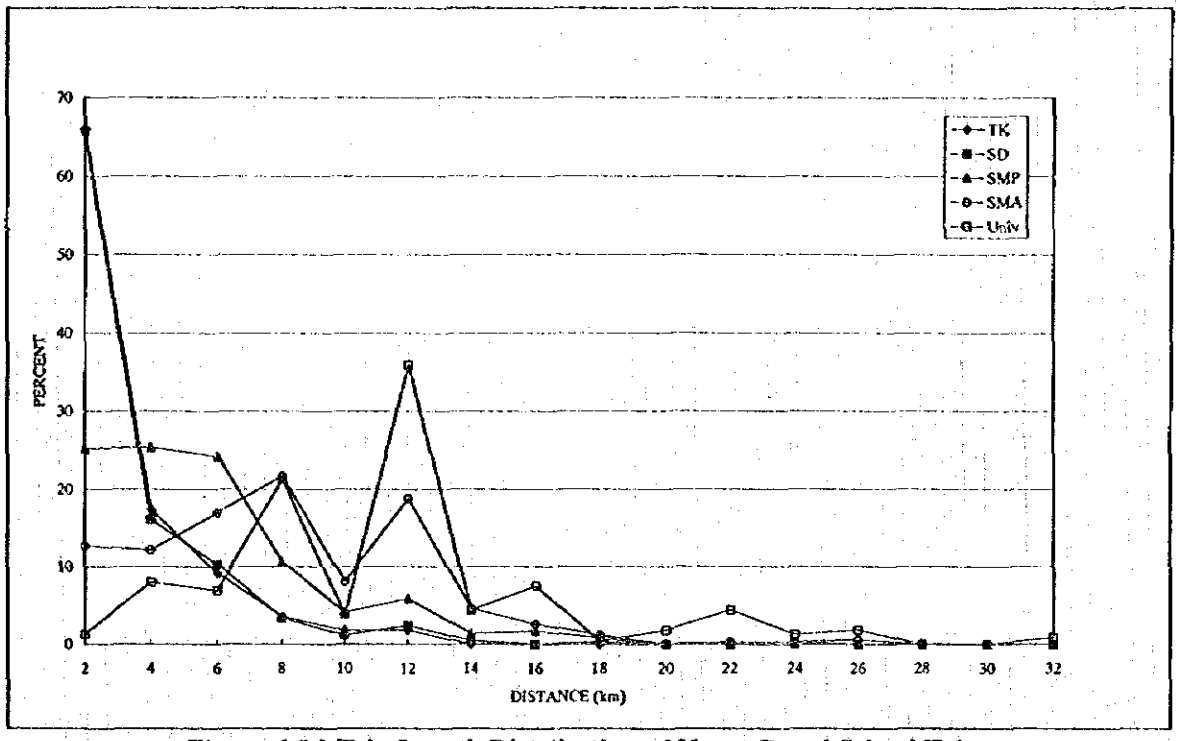


Figure 6.5.2 Trip Length Distribution of Home-Based School Trips

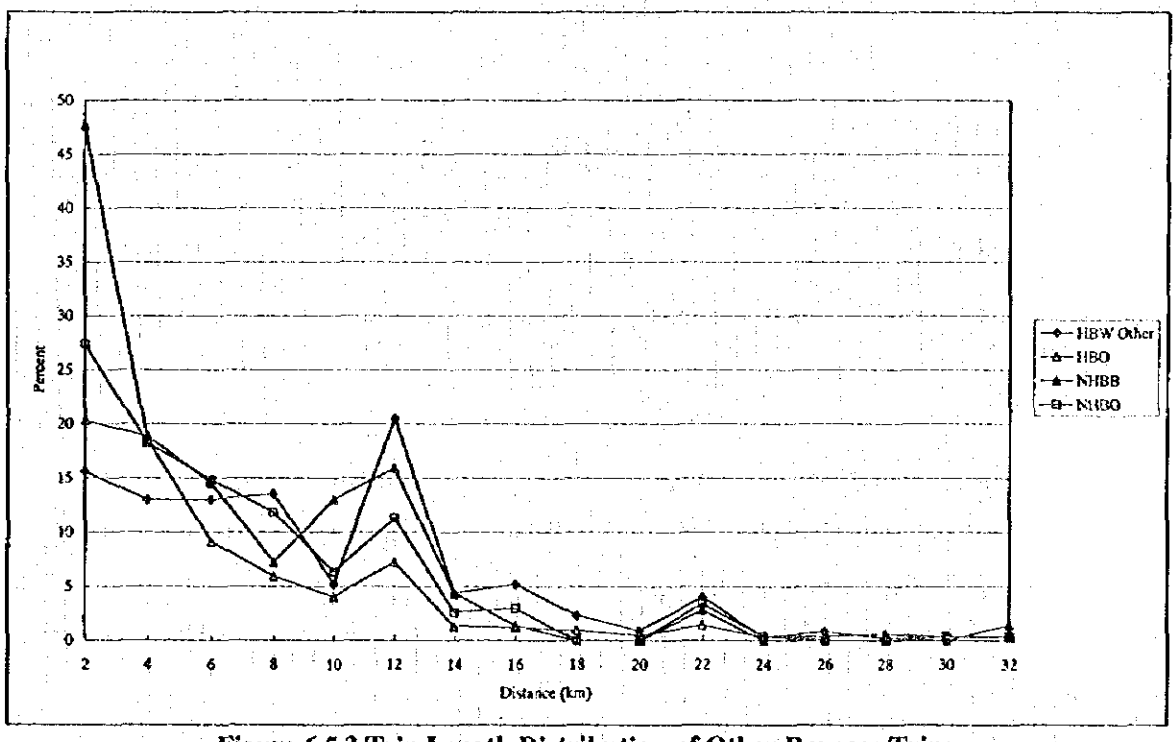


Figure 6.5.3 Trip Length Distribution of Other Purpose Trips

(2) Gravity Model

Trip distribution, the technique by which trips produced in each traffic analysis zone are linked with all other zones accessible through the road network, is accomplished with the use of the Gravity Model. This model reflects the level of service of the road network in the travel

deterrence function, and is sensitive to changes in trip distribution patterns catalyzed by road system modifications and/or improvements.

The Gravity Model employed in the study is of the double-constrained type with the following formulation.

$$T_{ij} = \frac{P_i A_j F_{t,ij}}{\sum_i \sum_j P_i A_j F_{t,j}}$$

where T_{ij} : Trips from zone i to zone j
P_i : Trips produced in zone I
A_j : Trips attracted to zone j
$F_{t,ij}$: Empirically derived friction factor for time t between zone i and j

The Gravity Model was developed based on the HIS data. Required inputs to the Gravity Model calibration procedure are;

1. Origin-destination pair trip data
2. *Trip length distribution by trip purpose from HIS data*
3. Travel impedance in the form of minimum inter-zonal distance from the 1996 road network

The self-calibrating gravity model program contained in the TRANPLAN program was used for calibration. The program makes repeated changes, adjusting the Friction-Factor curves such that the synthesized trip frequency distribution replicates that from the observed O-D data. The calibration program fits the estimated F-Factor curves using a polynominal function. Within each F-Factor adjustment, the program also balances modeled trips to the observed trips. Adjustment of the program continues until convergence to user-specified criteria is obtained.

6.5.4 Modal Split

(1) Modal Choice by Vehicle Availability

Vehicle availability influences significantly on choice of transport mode. As shown in Table 6.5.5, 91.6 percent of people who can use a car for themselves use private passenger cars for their travel needs. Similarly as much as 96.7 percent of people who can utilize a motorcycle do so for commuting. This implies that under the present level of service of the transportation system, people who can afford to utilize a private mode of transport prefer to use their own modes. Very few people consider the use of the public mode of transport. In other words, the availability of the private mode of transport determines the choice of mode at present.

As the real income of households increases and the number of households which can afford to have private cars or motorcycles increases, people will shift to private modes. The shift to private modes will result in heavier traffic congestion and deterioration of the environment in the urban area.

In the study modal choice model has been developed using household income as a factor in order to reflect the influence of vehicle availability.

Table 6.5.5 Mode of Transport Utilized for Commuting by Vehicle Availability

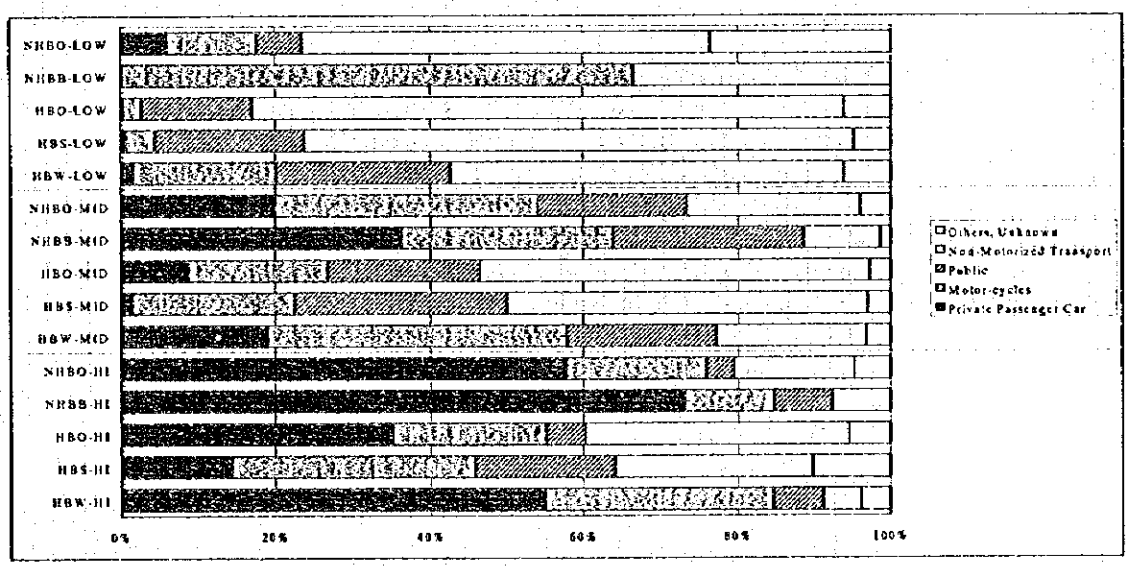
Vehicle Availability	Private Passenger Car	Office Car	Motor-cycle	Bicycle	Taxi	Public Trans-port	Others	Total
Car Available for Self-use	91.6	3.7	3.0	0.0	0.0	1.0	0.7	100.0
Car shared with Others	67.5	24.2	2.5	0.0	0.0	1.7	4.2	100.0
M.Cycle Available for Self-use	0.5	0.5	96.7	1.0	0.0	1.0	0.5	100.0
M.Cycle shared with Others	3.5	0.0	84.4	2.8	0.7	2.8	5.7	100.0
Not available	0.3	2.9	2.5	17.1	0.6	41.9	34.7	100.0
TOTAL	12.0	2.8	27.4	14.5	0.3	21.5	21.5	100.0

Source : ARSDS-GKS HIS Survey 1996

(2) Modal Composition by Trip Purpose and by Income Level

Modal composition varies by trip purpose and income level of the trip makers.

As observed in other countries, modal composition varies according to trip purpose of the trip maker. Non-Home-Based Business trips mostly rely on private mode of transport, followed by Home-Based Work trips and Non-Home-Based Other trips.(Figure 6.5.4) Private mode of transport is less utilized for Home-Based Other and Home-Based School trips. When modal composition was examined further by income level, income level seems a more significant factor for mode choice. The high income group heavily utilizes private passenger cars, while the low income group relies on non-motorized modes of transport.



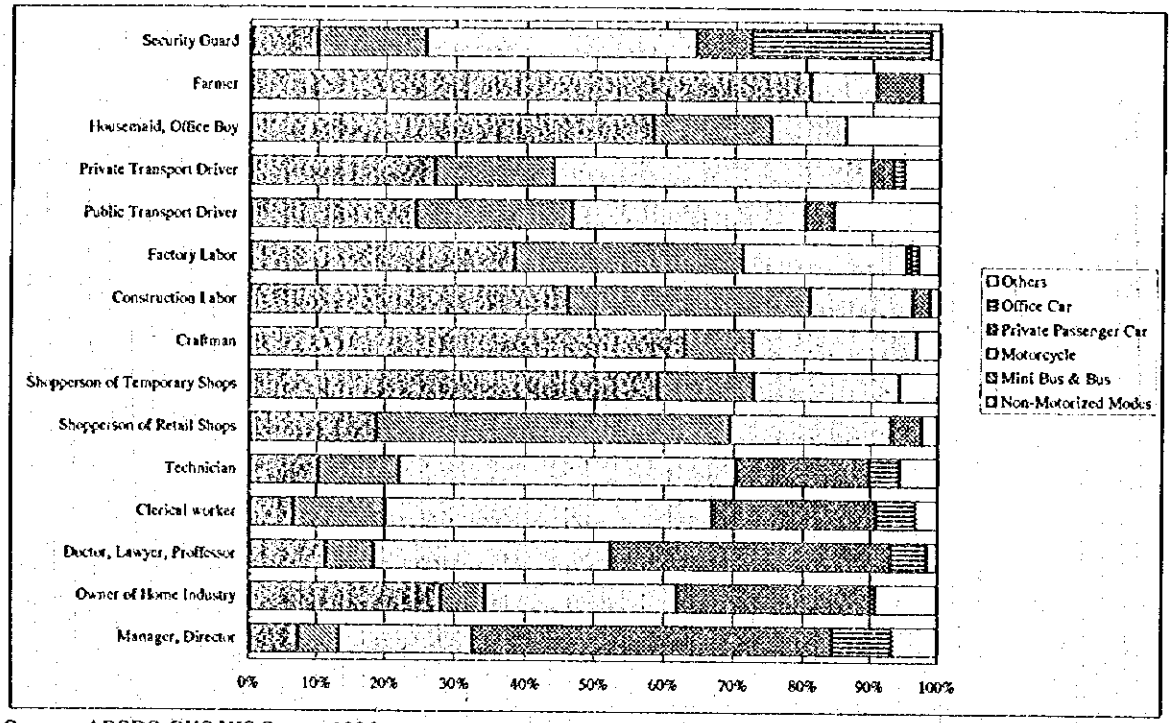
Note : Private passenger car includes Company Car, Taxi, and Angguna.
Public mode of Transport includes Angkot, Bus, Railway, Ferry.
Income level classification is based on housing type.
Source : ARSDS-GKS HIS Survey 1996

Figure 6.5.4 Modal Composition by Trip Purpose and Income Level

(3) Modal Composition of Home-Based Work Trips by Occupation

Modal composition of Home-Based Work trips varies also by occupation. Similar to the modal composition by income group, highly paid occupations such as manager, director, lawyer, and doctor indicate a preference to use private passenger cars. Farmers usually have their work place near home, so that more than 80 percent of persons can commute by non-motorized mode

of transport. Low-income occupations such as housemaid, office boys and craftsmen fulfil their travel needs by non-motorized modes.



Source : ARSDS-GKS HIS Survey 1996

Figure 6.5.5 Modal Composition of Home-Based Work Trips by Occupation

(4) Modal Composition of Home-Based School trips by School Type

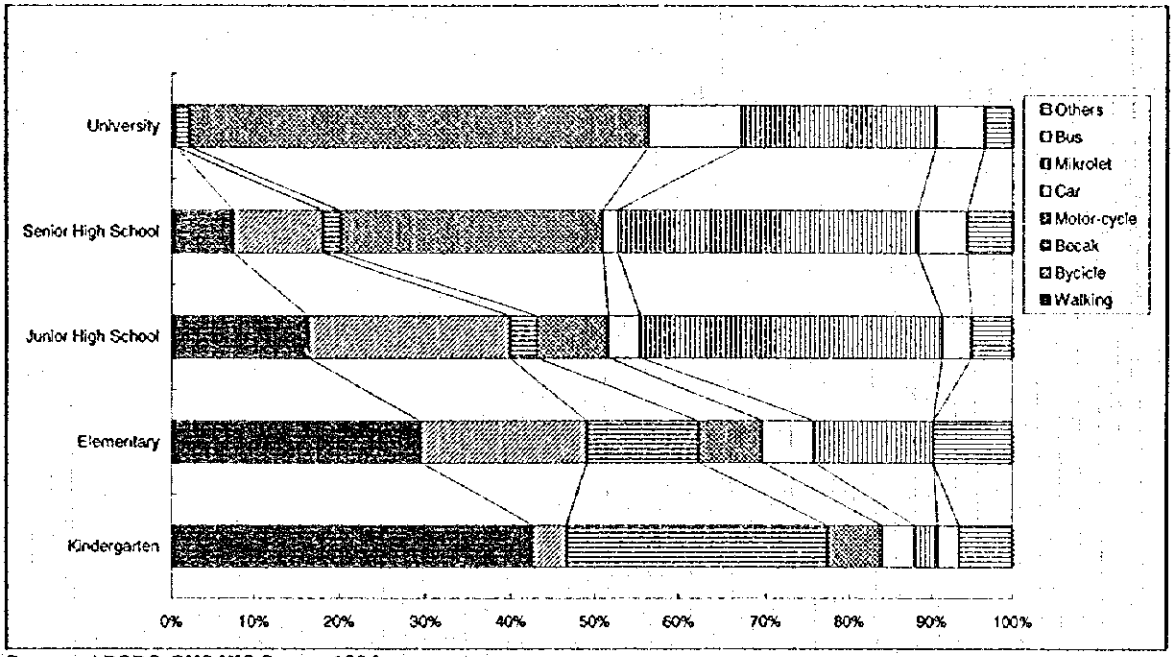
As described in Section 6.5.3, trip lengths for lower educational facilities are relatively short thus pupils in kindergarten and elementary schools use non-motorized mode of transport such as walking, bicycle, or becak. As educational level increases, usage of motorized mode of transport increases. More than half university students utilizes motorcycles.

Table 6.5.6 Mode of Transport for Home-Based School Trips by School Type

Unit : %

School Type	Mode of Transport								
	Walking	Bicycle	Becak	Motor-cycle	Car	Mikrolet	Bus	Others	Total
Kindergarten	42.7	4.0	30.7	6.7	4.0	2.7	2.7	6.7	100.0
Elementary	29.4	19.6	13.2	7.4	6.1	14.4	0.0	9.8	100.0
Junior High School	16.4	23.5	3.3	8.4	3.8	35.8	3.6	5.1	100.0
Senior High School	7.6	10.5	2.0	30.9	1.7	35.6	6.1	5.5	100.0
University	0.4	0.0	1.7	54.3	10.8	23.3	6.0	3.4	100.0
TOTAL	16.0	14.3	6.6	21.5	5.0	26.7	3.7	6.1	100.0

Source : ARSDS-GKS HIS Survey 1996



Source : ARSDS-GKS HIS Survey 1996

Figure 6.5.6 Modal Composition of Home-Based School Trips by School Type

6.5.5 Traffic Assignment

Taking the prohibition of motorcycles on toll roads into account, assignment of future vehicular traffic demand on the road network was carried out by the following two steps;

Step 1: Assignment of non-eligible vehicles on toll road

First, non-toll road vehicles, such as motorcycles were loaded onto the arterial road network, exempting them from using toll roads. Assignments were performed in an incremental basis where the impedance is subsequently adjusted according to the specified capacity restraint function.

Step 2: Assignment of eligible vehicles on toll road

With the non-toll road vehicles on the arterial road network, other types of vehicles were loaded onto both arterial and toll road roads. Assignments were performed using the equilibrium algorithm. Equilibrium assignment consists of a repeatedly changing series of all-or-nothing traffic assignments with adjustment of travel times reflecting delays encountered in the associated changes which is continued until no trip can be added by an alternate path without increasing the total travel time of all trips in the network.

Outputs of the traffic assignments were used to evaluate the proposed road network configuration.

6.6 Projected Future Traffic Demand

Future traffic demands projected through the process mentioned above are illustrated in Figures 6.6.1 and 6.6.2. In the CBD traffic demand will increase due to the higher density of land use. However a very large expansion of road capacity in the built-up area will not be achieved, so that heavier traffic congestion is expected. Traffic congestion problems can not be solved merely by the expansion of road capacity due to the limitation of funds and difficulties in land acquisition.

Consequently a public transportation system as well as the introduction of a traffic demand restriction policy are required to tackle the expected traffic congestion.

Corresponding to the estimated traffic demand, a required number of traffic lanes was estimated as presented in Figure 6.6.3.

6.7 Arterial Road Development Master Plan

Based on the future traffic demand, the capacities of arterial road links were examined and the number of lanes were determined in terms of sufficiency. Number of lanes by link have been determined not merely by traffic demand but also by continuity of routes. Figure 6.7.1 shows the proposed arterial road network with network configuration in GKS, while Figure 6.7.2 depicts the road network in SMA.

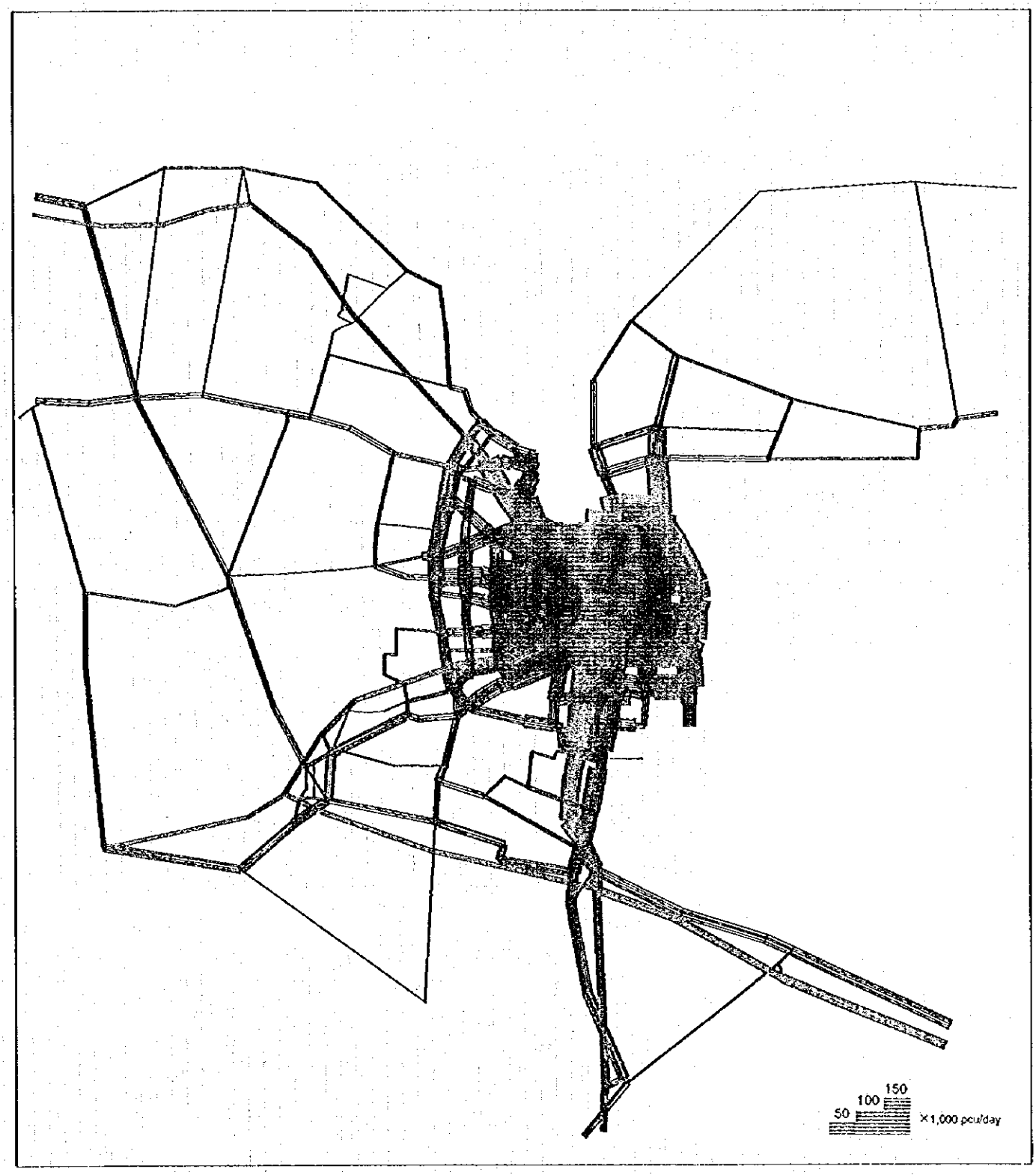


Figure 6.6.1 Future Traffic Demand in GKS 2018

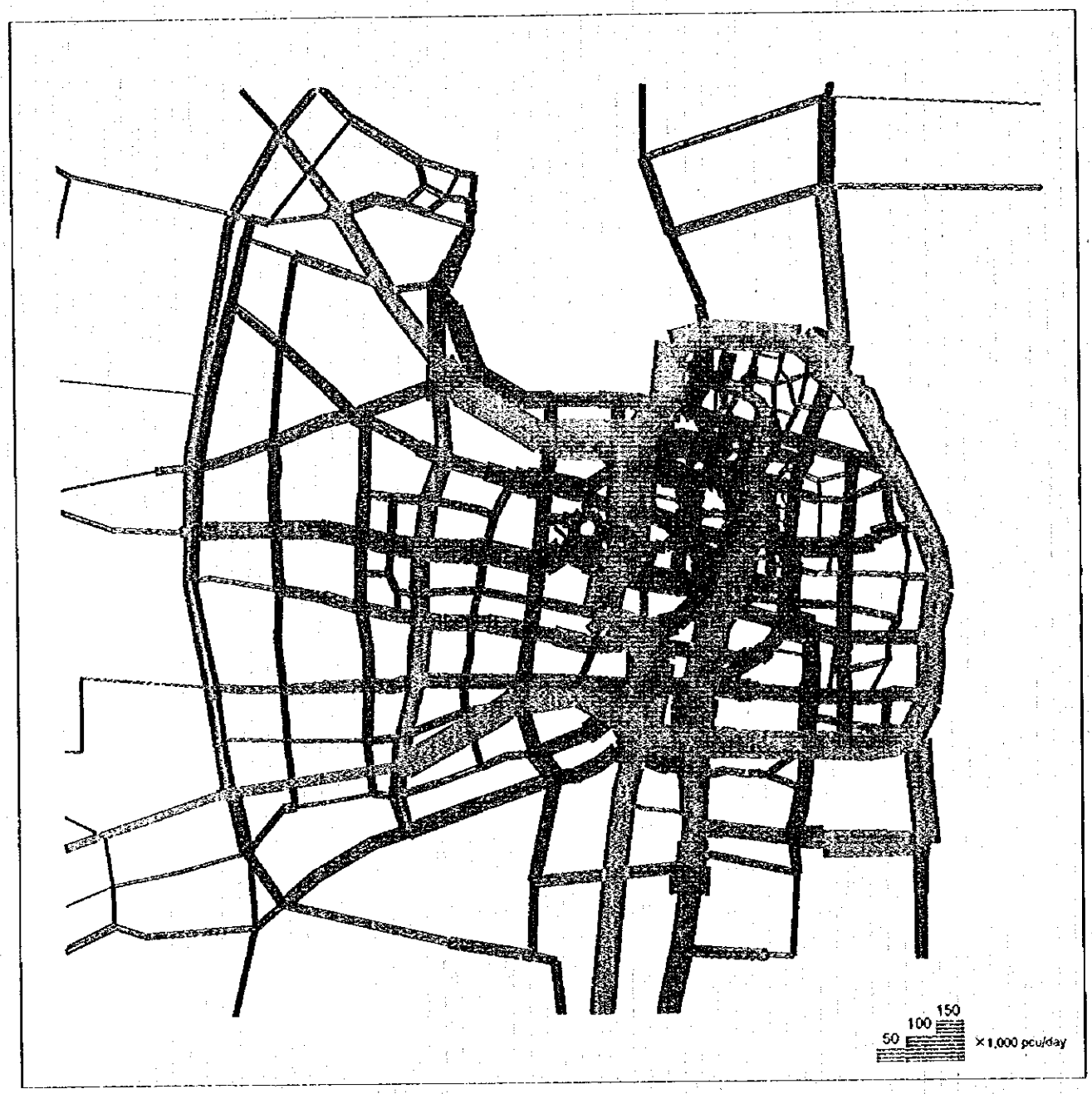


Figure 6.6.2 Future Traffic Demand in SMA 2018

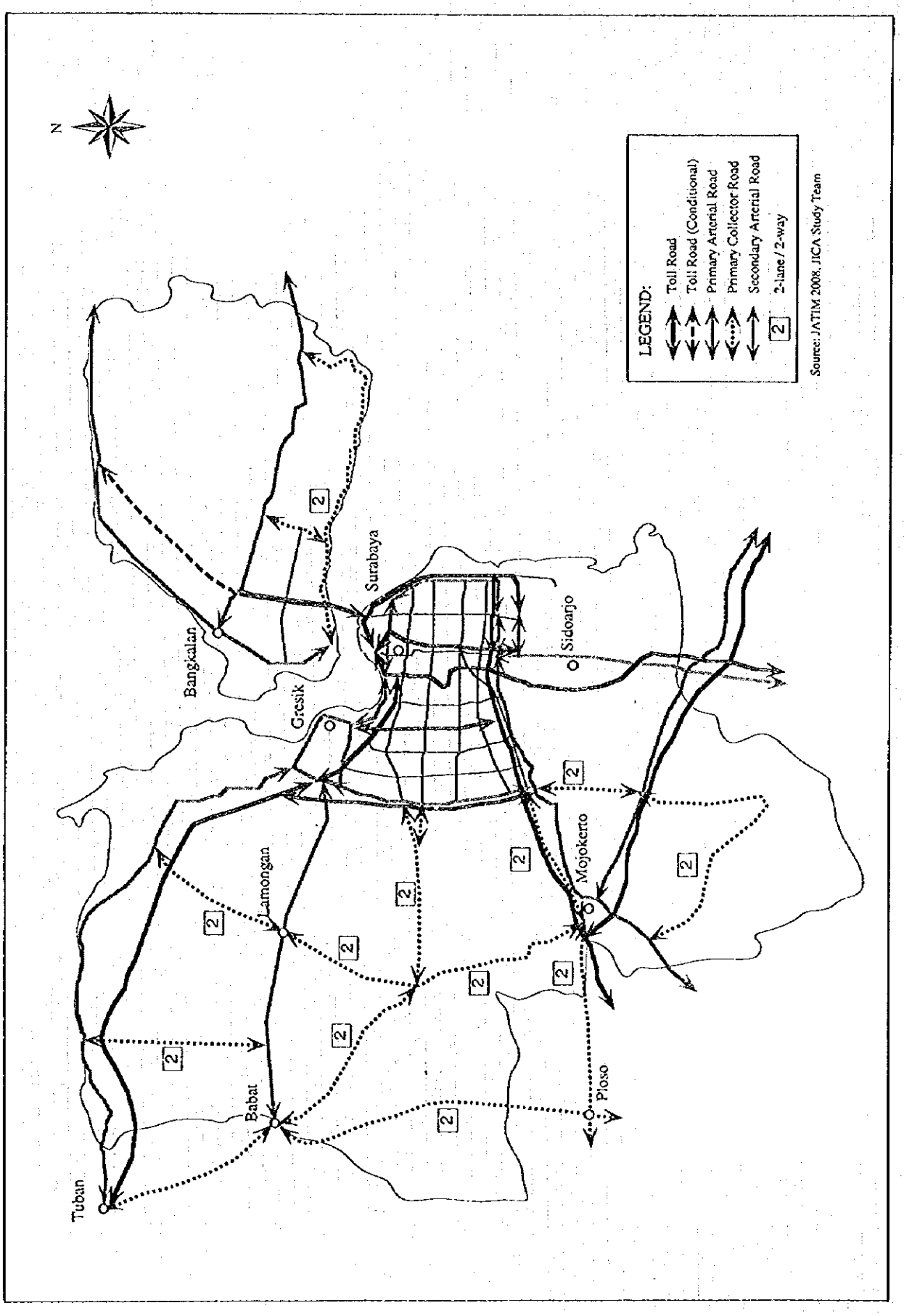


Figure 6.7.1 Arterial Road Development Master Plan in GKS

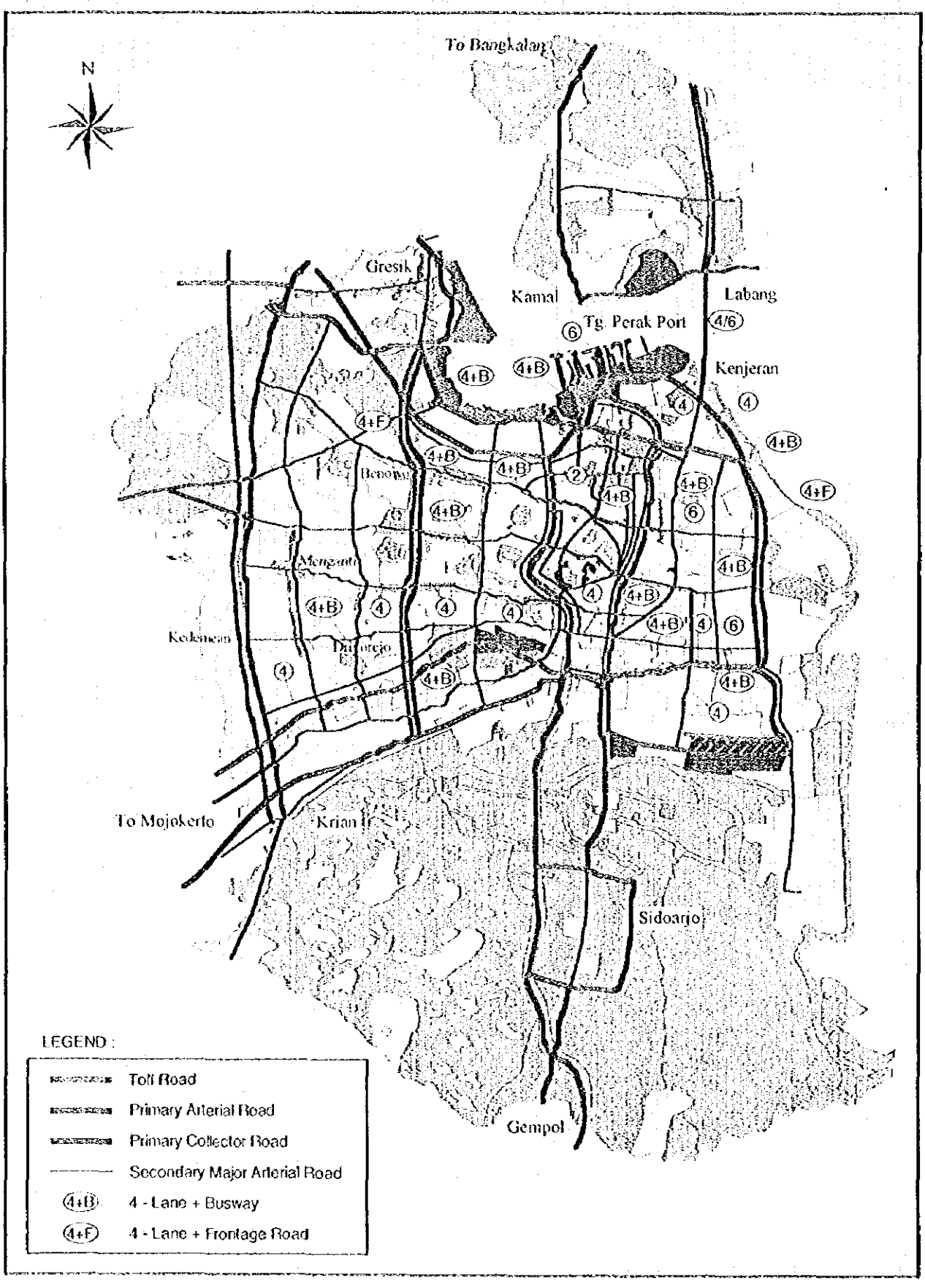


Figure 6.7.2 Arterial Road Development Master Plan in SMA

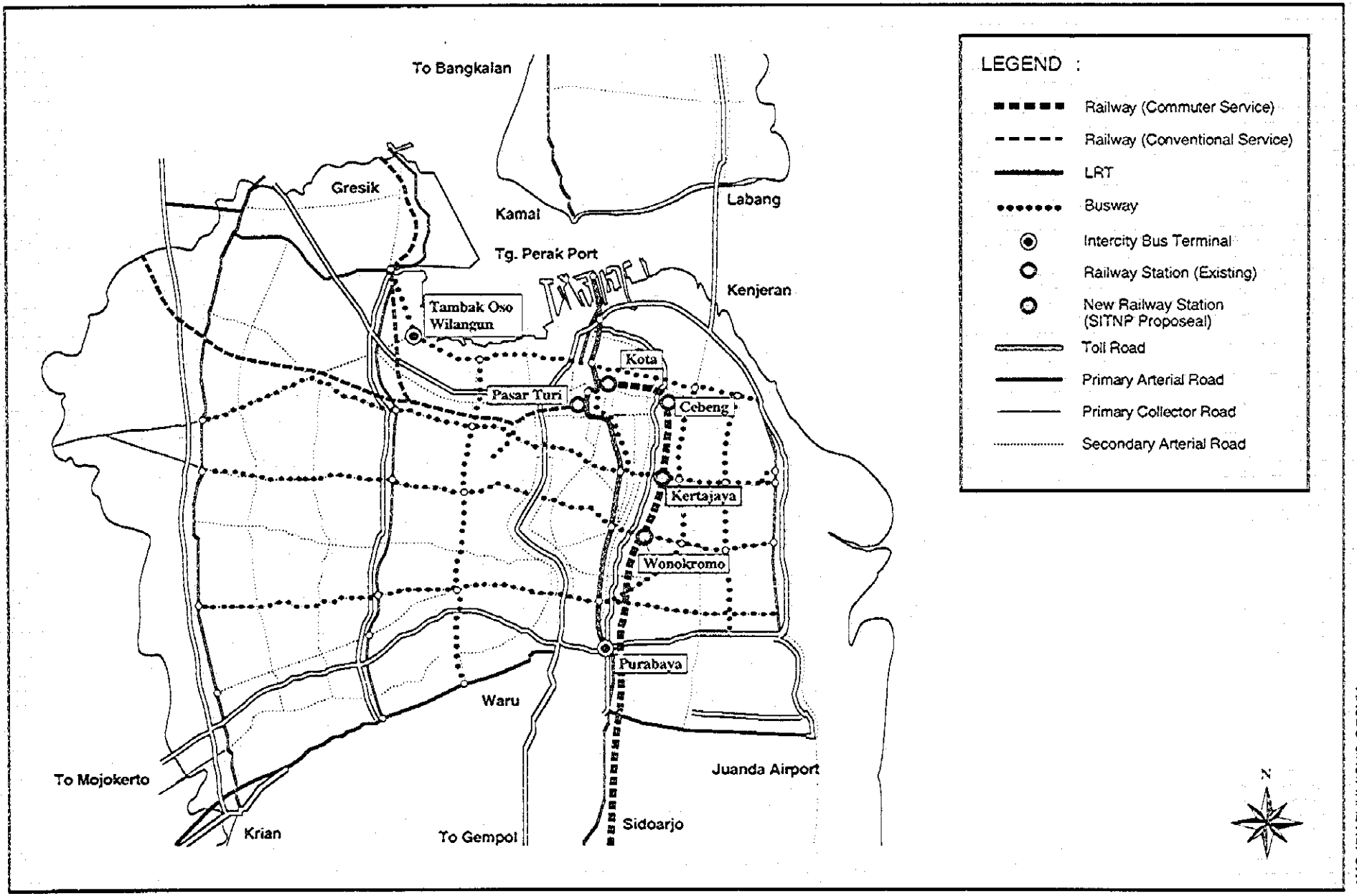


Figure 6.7.3 Public Transport Network

CHAPTER 7 PRELIMINARY PROJECT COST AND PRIORITY ANALYSIS

CHAPTER 7

PRELIMINARY PROJECT COST AND PRIORITY ANALYSIS

7.1 Design Standards and Project Cost Estimates

This section describes the design standards and project cost estimates for the projects identified in section 6.3.2 to determine project priority and implementation program.

7.1.1 Geometric Design Standard

This section discusses the geometric design standards to be applied for the project roads identified in section 6.3.2.

The Government's standards are used to a maximum extent where available. The American and Japanese standards are referred to for items not covered in the Government's standards.

(1) Geometric Design Standard

The following two Government standards relate to the design of highways.

- Spesifikasi Standar untuk Perencanaan Geometrik Jalan Luar Kota (Geometric Design Standard for Rural Roads) : December 1990 (BINA MARGA)
- Standard Specifications for Geometric Design of Urban Roads : March 1992 (BINA MARGA)

The former standard coves the design of rural roads to provide general design criteria and controls for new construction or improvement projects of Arterial, Collector and Local Roads which are in rural areas (inter-city roads : Primary Roads) and are not access-controlled (expressways are excluded).

The latter standard covers the design standards which shall be applied to new construction or improvement projects of urban roads including access controlled and non access controlled roads.

The geometric design standard used shall be the latter standard due to the Study area being basically on urban area.

1) Design Classification

Type I (Full Access Control) and Type II (Partial or Non Access Control) roads are

classified into two classes and four classes respectively according to their functional classification and design traffic volume. The design class for the relation of access control and functional classification is shown in Table 7.1.1.

Table 7.1.1 Design Class

Type	Function		DTV(pcu/day)	Class
I (Full Access Control)	Primary	Arterial	-	I
		Collector	-	II
	Secondary	Arterial	-	II
II (Partial or No Access Control)	Primary	Arterial	-	I
		Collector	10,000 or more	I
			less than 10,000	II
	Secondary	Arterial	20,000 or more	I
			less than 20,000	II
		Collector	6,000 or more	II
			less than 6,000	III
		Local	500 or more	III
			less than 500	IV

Note : In calculating design traffic volume (DTV) for determining the highway design classification, un-motorised vehicles (including bicycle/becak) are not taken into consideration.

The design class of Type I, Class I and Type II, Class I and/or Class II shall be used for the Study Roads because the design roads consists of Primary Arterial, Primary Collector and Secondary Arterial Roads.

A description of the design classifications is as follows:

Type I	Class I	The highest standard roads to serve inter-region or inter-city high speed traffic with full access control.
Type II	Class I	The highest standard streets of four or more lanes to serve inter-city or intra-city, high speed, through traffic with partial access control.
Type II	Class II	High standard streets of two or more lanes to serve inter/intra-city, (intra-district), high speed, mainly through traffic with/without partial access control.

2) Design Speed

Design speed of urban roads shall be the value enumerated in Table 7.1.2 according to the road type and class by Geometric Standard.

Table 7.1.2 Design Speed

(Unit : Km /hr)

Type	Class	Design Standard	Recommendation
I	I	100 or 80	100
II	I	60	60
II	II	60 or 50	60

3) Geometric Design Standard for Throughway

The recommended geometric design standard for throughway of the identified roads is shown in Table 7.1.3. The major points are briefly discussed in the following paragraphs.

a. Left Shoulder Width for Type II Road

A 1.5 m left shoulder is to be adopted for the with frontage road and a 2.0 m left shoulder is to be adopted for the without frontage road to maintain the capacity of the roads and to provide parking space.

b. Busway

A $2 \times 3.5 = 7.0$ m busway width is recommended based on a design vehicle width of 2.5 m.

c. Frontage Road

A frontage road shall be provided along the Primary Arterial Road (Type II, Class I) to operate partial access control and a 2.5 m left shoulder is recommended to provide a parking lane.

Table 7.1.3 Geometric Design Standard for Throughway of the Identified Roads

Item	Unit	Design Standard				Recommendation			
Design Classification	-	Type I Class I	Type II Class I	Type II Class II	Busway	Type I Class I	Type II Class I	Type II Class II	Busway
Design Speed	km/hr	100	60	60	-	100	60	60	60
Cross Section Element									
Lane Width	m	3.50	3.50	3.25	-	3.50	3.50	3.25	3.50
Median									
Standard Minimum	m	2.50	2.00	1.50	-	5.00	5.00	2.00	-
Exceptional Minimum	m	2.50	1.00	1.00	-	-	-	-	-
Right Shoulder Width									
Standard Minimum	m	1.00	0.50	0.50	-	1.00	0.50	0.50	-
Exceptional Minimum	m	0.75	0.50	0.25	-	-	-	-	-
Left Shoulder Width									
Desirable Width	m	3.25	2.50	2.50	-	3.25	-	-	-
Standard Minimum	m	2.00	2.00	2.00	-		2.00	2.00	-
Exceptional Minimum	m	1.75	1.50	1.50	-	-	-	-	-
With Sidewalk	m	-	0.50	0.50	-	-	-	-	0.50
Parking Lane (with out frontage road)									
Standard Minimum	m	-	2.50	2.50	-	-	-	-	-
Exceptional Minimum	m	-	2.00	2.00	-	-	2.00	2.00	-
Sidewalk									
Standard Minimum	m	-	3.00	3.00	-	-	3.00	3.00	-
Exceptional Minimum	m	-	1.50	1.50	-	-	-	-	-
Crossfall of Traveled Way	%	Refer to Table 6.4			-	Refer to Table 6.4			
Super Elevation Runoff									
2-Lane 2-Way	-	1/225	1/175	1/175	-	1/225	1/175	1/175	1/175
3-Lane 2-Way	-	1/270	1/210	1/210	-	1/270	1/210	1/210	1/210
Maximum Super Elevation	%	10.00	6.00	6.00	-	10.00	6.00	6.00	6.00
Crossfall of Right Shoulder	%	Same as Traveled Way			-	Same as Traveled Way			
Crossfall of Left Shoulder	%	-	-	-	-	4.00	Same as Traveled Way		
Vertical Clearance	m	5.10	5.10	5.10	-	5.10	5.10	5.10	5.10
Minimum Stopping Sight Distance	m	160	75	75	-	160	75	75	75
Horizontal Alignment									
Minimum Radii	m	380	150	150	-	380	150	150	150
Desirable Minimum Radii	m	700	200	200	-	700	200	200	200
Min. Radii for Normal Crossfall	m	5,000	220	220	-	5,000	220	220	220
Minimum Curve Length									
Standard Minimum	m	1,200/ θ	700/ θ	700/ θ	-	1,200/ θ	700/ θ	700/ θ	700/ θ
Exceptional Minimum	m	170	100	100	-	170	100	100	100
Min. Transition Curve Length	m	85	50	50	-	85	50	50	50
Min. Radius Without Transition Curve	m	1,500	600	600	-	1,500	600	600	600
Vertical Alignment									
Maximum Grade	%	3.00	5.00	5.00	-	3.00	5.00	5.00	5.00
Maximum Vertical Curve Radii									
Crest	m	6,500	1,400	1,400	-	6,500	1,400	1,400	1,400
Sag	m	3,000	1,000	1,000	-	3,000	1,000	1,000	1,000
Desirable Vertical Curve Radii									
Crest	m	10,000	2,000	2,000	-	10,000	2,000	2,000	2,000
Sag	m	4,500	1,500	1,500	-	4,500	1,500	1,500	1,500
Minimum Vertical Curve Length	m	85	50	50	-	85	50	50	50

Note : θ shows intersect angle (degree), when θ is less than 2 degree, $\theta = 2$ shall be used for the calculation.
Source: Standard Specifications for Geometric Design of Urban Roads 1992

Table 7.1.4 Superelevation over Range of Curves

Superelevation (%)	Curve Radius (R m)		
	100 km/hr	60 km/hr	30 km/hr
10	380 ≧ R > 430	-	-
9	430 ≧ R > 480	-	-
8	480 ≧ R > 550	-	-
7	550 ≧ R > 640	-	-
6	640 ≧ R > 760	-	30 ≧ R > 35
5	760 ≧ R > 930	-	35 ≧ R > 37
4	930 ≧ R > 1,210	150 ≧ R > 160	37 ≧ R > 40
3	1,210 ≧ R > 1,700	160 ≧ R > 165	40 ≧ R > 42
2	1,700 ≧ R > 5,000	165 ≧ R > 220	42 ≧ R > 55

Source: Standard Specifications for Geometric Design of Urban Roads 1992

Typical cross sections are shown in Figure 7.1.1 to Figure 7.1.3 based on the ROW situation of Kotamadya Surabaya.

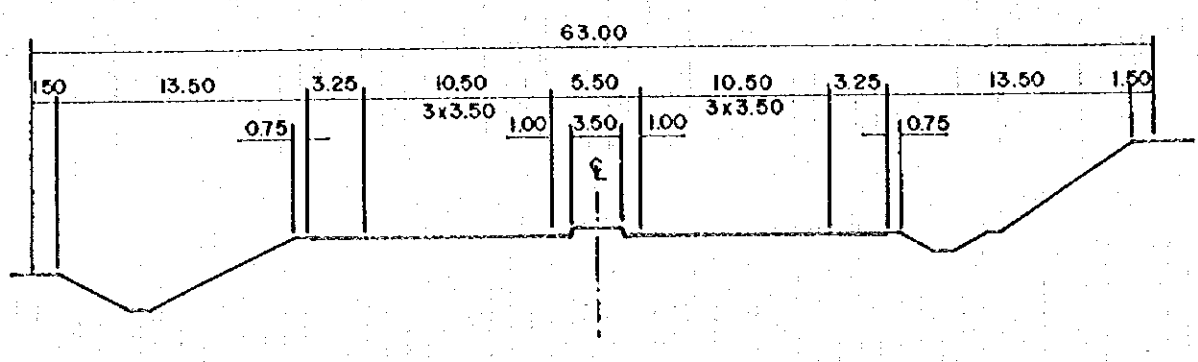


Figure 7.1.1 Typical Cross Section for Toll Road (Type I/Class I)

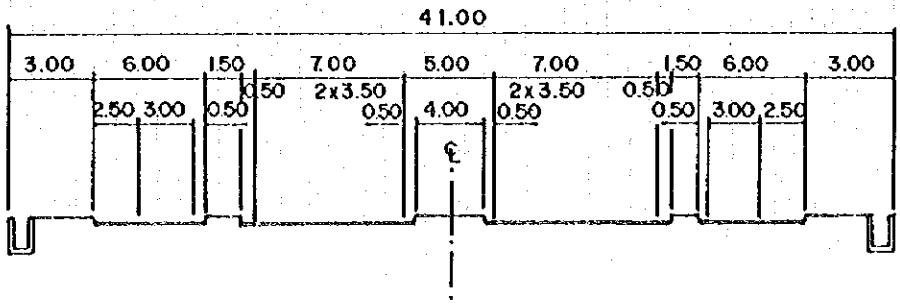


Figure 7.1.2 Typical Cross Section for Primary Arterial Road & Secondary Major Arterial Road (Type II, Class I)

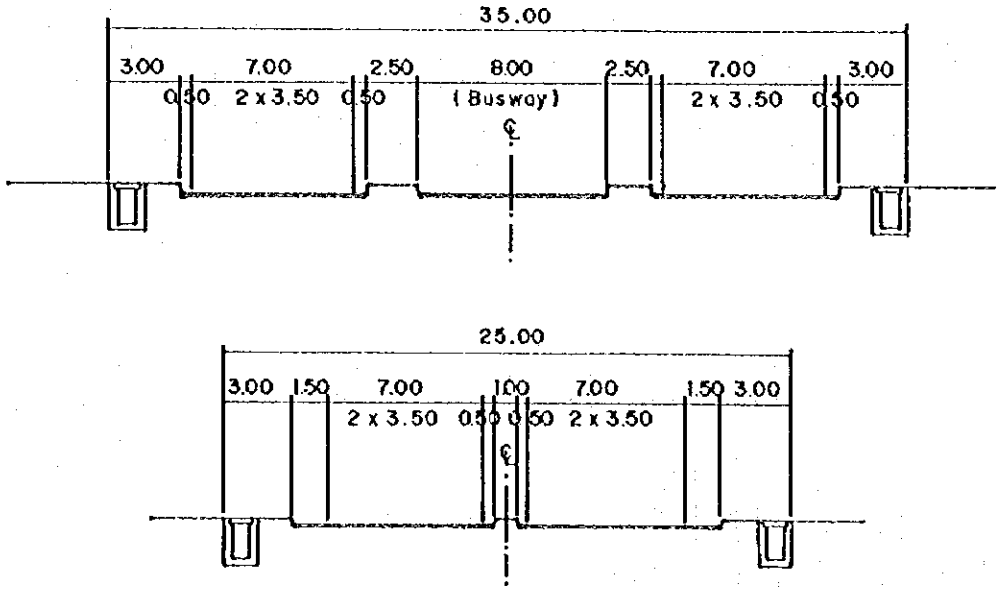


Figure 7.1.3 Typical Cross Section for Secondary Major Arterial Road (Type II/ Class II)

7.1.2 Preliminary Project Cost Estimates

The preliminary project cost estimate for the identified project roads consists of the following items.

- Construction cost
- Land acquisition and compensation cost
- Engineering cost and Contingency cost

The basic premises in estimating the project cost are as follows:

- All the construction works will be executed by contractor(s) to be employed by a joint venture company for development of the project roads.
- The unit price of each cost component was determined based on the economic conditions prevailing in August 1996 and a reference to current similar project costs.
- For the construction works, Indonesian taxes and duties on import equipment and materials will be imposed. Indonesian value added tax (10%) will be also imposed on the contractor.
- Engineering cost was assumed to be 10% of construction cost.
- Physical contingency was estimated to be 15% of the total of construction cost, land acquisition and compensation cost, and engineering cost.

A summary of the estimated project costs is shown in Table 7.1.5.

Table 7.1.5 Preliminary Project Cost Estimates

Sub-Code No.	Road Function	Road Type		Length (km)	Construction Cost (Million Rp.)		Land Acquisition Cost		Total (Million Rp.)	Contingency 15% of Total	Grand Total (Million Rp.)
		Number of Lanes	ROW (m)		Unit Cost per km	Amount	Unit Cost per m^2 (1,000 Rp.)	Amount (Million Rp.)			
Non Toll Road											
1	P.A	4 + Frontage	50	54.0	12,950	699,286	200	270,000	969,286	145,393	1,114,679
2	P.C	2	20	42.0	4,742	199,181	200	84,000	283,181	42,477	325,658
3	P.A	4 + Frontage	50	26.5	12,950	343,168	250	165,625	508,793	76,319	585,112
4	P.A	4 + Frontage	50	50.8	12,950	657,847	200	254,000	911,847	136,777	1,048,624
5	P.A	4 + Frontage	50	13.8	12,950	178,706	250	86,250	264,956	39,743	304,700
6	P.A	Under Construction by SUDP/OECF									
8	S.A	4	25	6.5	6,750	43,877	300	24,375	68,252	10,238	78,490
9	S.A	4	25	11.0	6,750	74,253	250	34,375	108,628	16,294	124,922
10	P.C	2	20	21.5	4,742	101,961	200	43,000	144,961	21,744	166,706
11	S.A	4	25	13.8	6,750	93,154	250	43,125	136,279	20,442	156,721
12	S.A	4	25	5.5	6,750	37,127	300	20,625	57,752	8,663	66,414
13	S.A	4	25	2.7	6,750	18,226	300	10,125	28,351	4,253	32,603
14	S.A	4	25	6.3	6,750	42,527	300	23,625	66,152	9,923	76,074
15	P.C	2	20	3.1	4,742	14,701	200	6,200	20,901	3,135	24,037
16	S.A	4 + Busway	35	8.5	10,072	85,609	250	37,188	122,797	18,420	141,216
17	S.A	4 + Busway	35	5.4	10,072	54,387	300	28,350	82,737	12,411	95,148
18	S.A	4 + Busway	35	6.6	10,072	66,473	300	34,650	101,123	15,168	116,292
19	S.A	4 + Busway	35	7.2	10,072	72,516	300	37,800	110,316	16,547	126,864
20	S.A	4	25	17.3	6,750	116,780	300	64,875	181,655	27,248	208,903
21	S.A	4	25	4.2	6,750	28,351	300	15,750	44,101	6,615	50,716
22	S.A	4 + Busway	35	11.1	10,072	111,796	250	48,563	160,358	24,054	184,412
23	S.A	4 + Busway	35	11.2	10,072	112,803	300	58,800	171,603	25,740	197,343
24	S.A	4	25	5.4	6,750	36,451	300	20,250	56,701	8,505	65,207
25	S.A	4	25	2.4	6,750	16,201	250	7,500	23,701	3,555	27,256
26	S.A	4	35	11.3	10,072	113,810	250	49,438	163,248	24,487	187,735
27	P.A	D/D Completed, Land acquisition is on going, SUDP/OECF									
29	S.A	4	25	33.7	6,750	227,484	300	126,375	353,859	53,079	406,938
30	P.C	2	20	15.5	4,742	73,507	200	31,000	104,507	15,676	120,183
31	P.A	4 + Frontage	50	68.1	12,950	881,878	200	340,500	1,222,378	183,357	1,405,734
32	P.A	Completed									
33	P.A	4 + Frontage	50	78.1	12,950	1,011,375	200	390,500	1,401,875	210,281	1,612,156
36	P.A	4 + Frontage	50	26.9	12,950	348,348	200	134,500	482,848	72,427	555,275
37	P.C	2	20	12.7	4,742	60,228	200	25,400	85,628	12,844	98,473
38	S.A	4	25	14.7	6,750	99,229	250	45,938	145,167	21,775	166,941
39	S.A	4	25	14.6	6,750	98,554	250	45,625	144,179	21,627	165,806
41	S.A	4 + Frontage	35	20.6	10,072	207,477	250	90,125	297,602	44,640	342,242
42	S.A	Completed SUDP/OECF									
43	S.A	4 + Busway	35	2.9	10,072	29,208	300	15,225	44,433	6,665	51,098
44	S.A	4 + Busway	35	2.8	10,072	28,201	300	14,700	42,901	6,435	49,336
45	S.A	4 + Busway	35	6.6	10,072	66,473	300	34,650	101,123	15,168	116,292
47	S.A	2 + 2	20 + 20	16.5	9,485	156,499	300	99,000	255,499	38,325	293,824
48	P.A	4 + Frontage	50	83.0	12,950	1,074,829	200	415,000	1,489,829	223,474	1,713,303
49	S.A	Maintenance									

Table 7.1.5 Preliminary Project Cost Estimates (Continued)

Sub-Code No.	Road Function	Road Type		Length (km)	Construction Cost (Million Rp.)		Land Acquisition Cost		Total (Million Rp.)	Contingency 15% of Total	Grand Total (Million Rp.)
		Number of Lanes	ROW (m)		Unit Cost per km	Amount	Unit Cost per m^2 (1,000 Rp.)	Amount (Million Rp.)			
50	S.A	Maintenance									
51	S.A	Maintenance									
52	P.A	Completed									
54	S.A	4 + Busway	35	15.2	10,072	153,090	300	79,800	232,890	34,933	267,823
56	S.A	4	25	9.5	6,750	64,128	300	35,625	99,753	14,963	114,715
57	S.A	Under construction SUDP/OECF									
59	P.A	4 + Frontage	50	13.9	12,950	180,001	300	104,250	284,251	42,638	326,889
60	P.A	4 + Frontage	50	7.9	12,950	102,303	250	49,375	151,678	22,752	174,430
61	P.C	2	20	28.0	4,742	132,787	200	56,000	188,787	28,318	217,105
62	P.A	4 + Frontage	50	32.0	12,950	414,392	200	160,000	574,392	86,159	660,551
64	P.C	2	20	46.3	4,742	219,573	200	92,600	312,173	46,826	358,999
65	P.C	2	20	64.9	4,742	307,781	200	129,800	437,581	65,637	503,219
66	P.C	2	20	33.6	4,742	159,344	200	67,200	226,544	33,982	260,526
67	S.A	4	25	13.5	6,750	91,129	200	33,750	124,879	18,732	143,610
68	P.C	2	20	21.6	4,742	102,436	200	43,200	145,636	21,845	167,481
69	P.C	2	20	28.2	4,742	133,735	200	56,400	190,135	28,520	218,656
70	S.A	Maintenance									
71	S.A	Maintenance									
72	S.A	Maintenance									
73	S.A	Maintenance									
74	S.A	Maintenance									
75	S.A	4	25	13.5	6,750	91,129	200	33,750	124,879	18,732	143,610
76	S.A	4	25	3.8	6,750	25,651	300	14,250	39,901	5,985	45,886
77	S.A	4	25	3.0	6,750	20,251	300	11,250	31,501	4,725	36,226
78	S.A	4	25	10.0	6,750	67,503	200	25,000	92,503	13,875	106,378
79	S.A	4	25	9.0	6,750	60,752	200	22,500	83,252	12,488	95,740
Total of P.A				455.0		5,892,134		2,370,000	8,262,134	1,239,320	9,501,454
Total of P.C				317.4		1,505,236		634,800	2,140,036	321,005	2,461,041
Total of S.A				317.3		2,611,097		1,286,975	3,898,072	584,711	4,482,782
Total of Non Toll Road				1,089.7		10,008,467		4,291,775	14,300,242	2,145,036	16,445,278
Toll Road											
7	P.A	Completed									
28	P.A	D/D Completed by the private investor									
34	P.A	Under planning by the private investor									
35	P.A	6	60	42.0	16,950	711,920	200	252,000	963,920	144,588	1,108508
40	P.A	6	60	20.6	16,950	349,180	250	154,500	503,680	75,552	579,232
46	P.A	Completed, Widening D/D will start 1997									
53	P.A	Under P/D by private investor									
55	P.A	Under planning by private investor									
58	P.A	Under planning by private investor									
63	P.A	6	60	32.0	16,950	542,415	200	192,000	734,415	110,162	844,577
Total of Toll Road				94.6		1,603,514		598500	2,202,014	330,302	2,532,316
Grand Total				1,184.3		11,611,981		4,890,275	16,502,256	2,475,338	18,977,594

Source: JICA Study Team

7.2 Priority of Project Implementation

7.2.1 Establishment of Priority Factors

The road projects identified in the previous section 6.3 are prioritized for the scheduling of their implementation by the target year 2018. There are several factors to determine the project priority. These factors were selected to minimize overlapping of their effects and to reflect the rationale of the project priority and the scheduling.

The factors selected for the project prioritization are "Land Availability and Social Impact", "Conformity with National, Regional and Urban Development Policies pertaining to the Study Area", "Necessity and Urgency of Implementation" and "Efficiency of Costs", of which significant factors are described below:

1. "Land Availability and Social Impact" is an important factor to evaluate project priority for scheduling, and which explicitly relates to the number of citizens who will be affected by the project implementation. The negative impact incurred by the project is given more significance than the positive impact. This eventually results in a project implementation policy in which priority is given to a less densely populated area. This policy will enhance suburban development potentials and will induce the relocation of urban facilities to outside the City Center. As a consequence, urban renewal in the central urban area, which essentially involves road network improvement, will become practicable in the future.
2. "Conformity with National, Regional and Urban Policies" implies encouraging industrial development in the northern coastal area of Gresik and Lamongan, and discouraging urbanization and land use change of the fertile agricultural land in Sidoarjo.
3. The urban policy provides for promotion of the planned urbanization in both the eastern and western parts of Surabaya Metropolitan Area including the sub-center development in Surabaya City, and to connect these sub-centers. However road capacity as well as a network in the north-south direction in the central urban area of Surabaya are lacking, and these are required to be developed to receive east-west traffic and to provide access to the central urban area.
4. Space for mass transit development should be preserved on selected arterial roads, and a higher priority should be given to accommodate urban transport services in such a large urbanized area as Surabaya Metropolitan Area. The development of new roads or widening projects in the urban area face severe land acquisition problems, and can not catch up with the growth of vehicle ownership and the vehicular traffic demand. Therefore, it is of paramount importance to promote modal shifting from private to public modes of transport so as to best utilize the limited public space and to diversify public transport services. In this sense, road sections in which can be planned an exclusive space for public transport should be improved with high priority. Planned mass transit such as Light Rail Transit and Busway Systems in Surabaya should be duly considered as a priority in implementation of the arterial road network development.
5. "Necessity and Urgency" implies selecting road projects with a large traffic demand and a high vehicle congestion ratio, or a bottleneck section that significantly obstructs the traffic flow and eventually incurs loss to the economy.
6. "Cost Efficiency" implies cost performance that can be indicated by the daily traffic volume and the average construction cost per kilometer.

7.2.2 Criteria for Ranking System

A ranking system was employed to determine the project priority, and the following criteria were

based on ranking the projects with the respective factors shown below:

1. "Land Availability and Social Impact":

Very Good:	45=<Point
Good:	40=<Point<45
Fair:	30=<Point<40
Poor:	15=<Point<30
Very Poor:	Point<15

Where Point is calculated by the following formula:

$$Point = 0 \times d1 + 10 \times d2 + 30 \times d3 + 50 \times d4$$

Where, d1: % length of route passing through Central Urban Area
d2: % length of route passing through Urbanized Area
d3: % length of route passing through Suburban Area
d4: % length of route passing through Rural Area

2. "Conformity with National, Regional and Urban Development Policies":

Very Good:

(1) Roads which directly contribute to the industrial development along the northern coastal area of GKS region, (2) East-West Mass Transit Corridor (Light Rail Transit/Busway) in Surabaya Metropolitan Area, (3) North-South Mass Transit Corridor (Light Rail Transit/ Busway) in the Central Urban Area of Surabaya.

Good:

(1) East-West Corridor in Surabaya Metropolitan Area, (2) North-South Corridor in Surabaya Metropolitan Area, (3) Roads to formulate industrial development corridor, (4) Roads to supplement the function of "Very Good" road projects.

Fair:

(1) Roads of which priority are subject to another critical project such as Sura-Madu Bridge, (2) Widening is required mainly due to the increase in normal traffic, (3) Roads to supplement the function of "Good" road projects.

Poor:

Roads that should not induce an effect on land use change along the corridor, such as arterial roads passing through fertile agricultural land in Sidoarjo.

"Necessity and Urgency"(Traffic Demand in 2018):

Very Good:	50,000 veh. /day =<Traffic Volume
Good:	20,000=<Traffic Volume <50,000 veh. /day
Fair:	10,000=<Traffic Volume < 20,000 veh. /day
Poor:	5,000=<Traffic Volume < 10,000 veh. /day
Very Poor:	Traffic Volume < 5,000 veh./day

"Cost Efficiency" indicator is based upon the average daily traffic volume and the average construction cost per kilometer (million Rupiah):

Good:	2.0=<CE
Fair:	1.0=<CE<2.0
Poor:	0.5=<CE<1.0
Very Poor:	CE<0.5

Based on the above criteria, the respective projects were ranked by "Very Good", "Good", "Fair", "Poor" and "Very Poor" for each factor as shown in Table 7.2.1.

7.2.3 Project Priority List

A comprehensive evaluation of the project was undertaken by using the rating system, i.e. each ranking is given the rate of 5, 4, 3, 2 and 1 for "Very Good", "Good", "Fair", "Poor" and "Very Poor", respectively. As the consequence, projects are arranged in descending order of the comprehensive evaluation rates (priority) as shown in Table 7.2.2.

Table 7.2.1 Evaluation of Projects

Code No.	Sub-Code No.	Road Length (km)	Project Route	(1) Land Availability and Social Impact	(2) Conformity with Development Policies	Indicative Evaluation Result				
						(1) Land Availability and Social Impact	(2) Development Policies	(3) Traffic Demand	(4) Cost Efficiency	Comprehensive Evaluation
(1) Toll Road										
1-1)	46	43.8	Surabaya-Gempol Tollway	Land required for the 6-lane widening has been already acquired at the initial construction stage(4-lane) and properly preserved.	This Project will strengthen the capacity of north-south corridor to connect Tg. Perak Port and southern area of East Java, and will alleviate traffic congestion on the existing tollway	Very Good	Good	Very Good	Good	Very Good (18)
1-2)	7	20.7	Surabaya-Gresik Tollway	Land for future widening is assured at the initial construction stage, so that additional land acquisition is not required	This Project will facilitate access to either Tg. Perak Port or Gresik Port, and will further extend the service to the planned industrialization along the northern coastal area	Very Good	Good	Poor	Poor	Fair (13)
1-3)	28	33.8	Surabaya-Mojokerto Tollway	Detailed design is completed	This Project is the eastern most section of Jakarta-Surabaya Tollway Network and construction will soon start by private investor	Very Good	Fair	Good	Good	Very Good (16)
1-4)	58	30.9	Eastern Middle Ring Road (Tollway)	The feasibility study has been completed and the R.O.W. set for the detailed design and land acquisition. A private investor has been decided but the detailed design has not commence yet.	This Project constitutes the eastern part of both the Middle and Outer Ring Roads and contributes to ease the existing traffic congestion which prevails on the north-south connections in Surabaya City.	Good	Good	Good	Good	Very Good (16)
1-5)	53	20.2	Perak-Waru Tollway	Basically, PURUMKA's (State Owned Railway Company)land is used. If the tollway is elevated on the existing rail track traffic congestion at the railway crossing will become worse.	It is essential to a develop local road network around the planned interchange locations.	Poor	Fair	Very Good	Good	Good (14)
1-6)	55		Surabaya Madura Toll Bridge	On both sides of the Bridge, the area plan has been prepared for private real estate development and the access road is planned therein.	It has been assumed as a national policy that the Bridge will be realized by the end of PELITA VII (2003/04). This will largely contribute to the development of industrialization to the north of Kab. Bangkalan.	Good	Very Good	Good	Very Poor	Good (14)
1-7)	34	75.0	Gresik-Tuban Tollway	The route of the planned tollway will lie to the south of the existing national road and mostly pass through rural and hilly areas.	As industrial development proceeds with good progress along the northern coastal area, a tollway will be required to assure the mobility and safety of goods transport.	Good	Very Good	Poor	Very Poor	Fair (12)
1-8)	40	20.6	Gresik-Driyorejo Tollway	A 60m ROW has been set, and additional ROW (up to 100m) seems to be available, according to BAPPDA Gresik.	This Project will enhance the use of the planned Gresik Port, and formulates western part of Middle Ring Road, and connects SBY-Gresik Tollway and SBY-Mojokerto Tollway.	Fair	Very Good	Good	Good	Very Good (16)

Table 7.2.1 Evaluation of Projects (Continued)

Code No.	Sub-Code No.	Road Length (km)	Project Route	(1) Land Availability and Social Impact	(2) Conformity with Development Policies	Indicative Evaluation Result				
						(1) Land Availability and Social Impact	(2) Development Policies	(3) Traffic Demand	(4) Cost Efficiency	Comprehensive Evaluation
1-9)	35	59.0	Outer Ring Road (Tollway)	The route is mostly located in the rural area of the southern part of Gresik. Many housing development permits have been issued in this area, but it is possible to set the ROW, according to BAPPDA Gresik.	This tollway is planned to control the spontaneous urbanization of the Surabaya Metropolitan Area to further west.	Very Good	Good	Very Poor	Poor	Fair (12)
1-10)	63	32.0	Mojokerto-Gempol Tollway	The route lies to the south of the existing road and passes mostly in rural areas.	This tollway is not included in the Java Tollway Network Plan, but it will become necessary in the distant future to bypass Surabaya City and to directly connect the east and west of East Java Province.	Good	Good	Very Poor	Very Poor	Poor (10)
(2)	**Primary Arterial Road**									
2-1)	1	54.0	Bangkalan-Torjun	The standard design as the primary arterial road will require additional land acquisition for widening.There will bw little difficulty, as the land development in this area has been under preparation.	This road is now defined as a primary collector and proposed to be upgraded as a primary artery, as Madura development is realized by construction of Sura-Madu Bridge.	Good	Fair	Poor	Poor	Poor (11)
2-2)	48	83.0	Kamal -Bangkalan Ring Road-Ketapang	In the Kamal area, houses are built close to the roadside but the route, as a whole, mostly lies in rural areas. However, earlier setting of the R.O.W. is desirable, before development progress along the road.	Northern end of Sura-Madu Bridge is planned to lie at Labang about 5km east from Kamal. If a new road from Labang to the north is constructed, the function of Kamal-Bangkalan may change to a minor artery.	Good	Good	Fair	Fair	Good (14)
2-3)	3	26.5	Gresik Ring Road	Eastern part of the Ring Road passes through urbanized area. Earlier action will be required to assure land acquisition in this area, before the Gresik Point Port improvement is completed.	Gresik City has been developing as an industrial city. The Project is essential to avoid conflict with urban traffic, and to support coastal industrial development and to provide access to Gresik port.	Fair	Good	Fair	Poor	Fair (12)
2-4)	33	78.1	Gresik Ring Road-Tuban	Improvement of the existing road to the standard design as a primary arterial road may require some additional land acquisition, but the route lies mostly in rural areas.	It is imperative to develop this route as an initial step to induce industrial development along the northern coastal area.	Good	Very Good	Fair	Fair	Good (15)
2-5)	4	50.8	Gresik-Lamongan-Babat	A 4-lane widening is to start soon using ADB Loan 1428.	This Project is to strengthen the existing national road extending from Gresik to Babat through Lamongan. This route has been long used for long distance transport such as Surabaya-Semarang, and -Jakarta.	Good	Fair	Fair	Fair	Fair (13)
2-6)	5	13.8	Surabaya(Jl. Gresik)-Gresik	Eastern part(Jl. Gresik) has been widened already. Houses are built densely in parts along Jl. Kali Anak. The roadside of Jl.Tambak Oso Wilangon is thinly inhabited and mostly swampy.	This route is a most promising candidate for the Heavy Loaded Road Improvement Program by OECF. Inter-city bus terminal is located near the Gresik boundary on this road and SITNP proposes a busway on the route.	Fair	Very Good	Good	Fair	Good (15)

Table 7.2.1 Evaluation of Projects (Continued)

Code No.	Sub-Code No.	Road Length (km)	Project Route	(1) Land Availability and Social Impact	(2) Conformity with Development Policies	Indicative Evaluation Result				
						(1) Land Availability and Social Impact	(2) Develop-ment Policies	(3) Traffic Demand	(4) Cost Efficiency	Compre-hensive Evaluation
2-7)	6	8.5	Jl. Rajawali-Jl. Kenjeran	There is difficulty in land acquisition in the urbanized area.	A 4-lane widening of this route is now underway by SUDP program. SUDP proposes a busway on this route to connect the East and West of the northern part of Surabaya.	Poor	Good	Good	Good	Good (14)
2-8)	59	13.9	Frontage Road of Eastern Middle Ring Road(Tollway)	At present, the area is swampy, but urbanization is certainly in progress in this area. Earlier setting of R.O.W. is desirable together with the preparation of the planned tollway.	This is an arterial road planned parallel with the Tollway to assure the north-south connection and to promote urban development in the East of Surabaya.	Good	Good	Fair	Fair	Good (14)
2-9)	27	6.4	Eastern Middle Ring Road(Arterial Road), Stage 1	The land acquisition is now underway by SUDP Program, after the detailed design of a 4-lane new road construction.	This route is the arterial part of Eastern Middle Ring Road(Tollway) and is located to the south of Surabaya City.	Good	Good	Good	Fair	Good (15)
2-10)	31	68.1	Waru-Kerian Bypass-Mojokerto-Jombang	This road functions as a primary artery, and the roadside is thickly inhabited. The road width varies 6 to14m. A 4-lane widening will face difficulty in land acquisition but is indispensable to assure the road function.	The route is one of the most promising candidates in the Heavy Loaded Road Program, though a tollway parallel to this section will soon the constructed(Surabaya-Mojokerto Tollway).	Poor	Fair	Fair	Fair	Poor (11)
2-11)	36	26.9	Gresik-Legundi-Kerian	The area is still rural and mostly dry field. However, many housing development permits were requested by private investors and are issued already. Earlier setting of R.O.W. will avoid land acquisition difficulty.	This is an arterial part of the Outer Ring Road which is planned to control spontaneous urban expansion further west of SMA. This road is not necessarily planned to run closely to the Outer Ring Road (Tollway).	Good	Fair	Poor	Poor	Poor (11)
2-12)	32	5.2	Access to Juanda Air Port	A widening construction is now partly underway.	In order to secure enough access capacity to Juanda Int'l Airport, which is planned to expand in the near future, the existing road has been widened accordingly.	Good	Good	Fair	Good	Good (15)
2-13)	52	41.6	Waru-Sidoarjo Ring Road-Gempol	Highway Sector Loan 3712 is provided by IBRD to widen this section.	Traffic demand between Surabaya and the southern part of East Java has been increasing. Besides the Tollway(Surabaya-Gempol) widening plan, a 4-lane primary artery is required.	Fair	Good	Good	Good	Good (15)
2-14)	62	32.0	Mojokerto-Gempol	The route lies mostly in rural and partly military areas. It seems relatively easy to acquire additional land for the widening plan.	The industrial development in Pasuruan and Probolinggo will require an arterial distribution network for the transport of the products. This route will work for distribution in the west direction in the future.	Good	Fair	Poor	Poor	Poor (11)
(3) Primary Collector Road										

Table 7.2.1 Evaluation of Projects (Continued)

Code No.	Sub-Code No.	Road Length (km)	Project Route	(1) Land Availability and Social Impact	(2) Conformity with Development Policies	Indicative Evaluation Result				
						(1) Land Availability and Social Impact	(2) Development Policies	(3) Traffic Demand	(4) Cost Efficiency	Comprehensive Evaluation
3-1)	2	42.0	Socah-Labang-Belega	The route lies in rural areas. Since the road is newly planned in conjunction with Labang Area Development Plan the R.O.W. is not set yet. Socah-Labang section will be given higher priority.	It is considered that Bangkalan development, after the completion of Sura-Madu Bridge, will begin with urbanization in the southern area and will shift to the northern coast industrial development.	Good	Fair	Poor	Poor	Poor (11)
3-2)	10	21.5	Mantup-South of Cerme (Outer Ring Road)	The R.O.W. of this route is set already and the route is dominantly rural area. Widening of the existing road will have little difficulty in land acquisition.	This route connect the western part of GKS with SMA, and it is expected that the route will stimulate rural or regional sub-center development in the west part of GKS.	Good	Good	Poor	Very Poor	Poor (11)
3-3)	15	3.1	Benjeng-Further South of Cerme (Outer Ring Road)	The route is in an area which is rural at present.	This is a branch of the above route extending from Mantup to the east. This branch connects to Jl. Raya Prada Indah and Jl. M. J. Sungkono which constitutes one of the important East-West linkages in SBY.	Good	Good	Poor	Very Poor	Poor (11)
3-4)	30	15.5	Legundi-Mlirip	This is the western part of the Provincial road Wonokromo-Mojokerto, and is defined as a primary collector. The route lies mostly in technically irrigated agricultural area.	Urbanization is less developed compared to the eastern part of the Wonokrokmo-Mojokerto road(Wonokromo-Legundi section). This route supplements the existing national road of Waru-Mojokerto.	Fair	Fair	Fair	Fair	Fair (12)
3-5)	37	12.7	Krian-Mojosari	Generally, the route lies in the technically irrigated area of Kab. Sidoarjo and Kab. Mojokerto. Land acquisition will be difficult in the urbanized area of Mojosari and in particular in Krian.	This is the only route of primary system that crosses the Brantas Delta of Sidoarjo. Urban development along this route should not be encouraged to preserve the existing agricultural land.	Fair	Poor	Fair	Fair	Poor (11)
3-6)	61	28.0	Babat-Mantup	The route is newly proposed and the R.O.W. is not set yet. The route area is mostly dry fields, so that land acquisition will have little difficulty.	This route is planned to connect the industrial zones in Tuban, Pasuruan and Probolinggo, and further to promote the development of the backward area between Jl. Gresik-Babat and Jl. Krian-Ploso.	Good	Good	Poor	Very Poor	Poor (11)
3-7)	64	46.3	Lamongan-Mojokerto	This route lies mostly in rural areas, but housing development is taking place at present in the area near Mojokerto City.	This route connects Kabupaten/Kotamadya capital cities, though the present linkage is not so strong as the linkage with Surabaya City.	Good	Fair	Poor	Fair	Fair (12)
3-8)	65	64.9	Babat-Ploso-Gedeg	The route generally passes through rural areas. The area near Gedeg is partly urbanized as an influence area of Mojokerto City.	This route is located near the western boundary of GKS region, and it connects SWP Centers of Tuban and Kediri through Babat and Jombang.	Good	Fair	Poor	Poor	Poor (11)
3-9)	66	33.6	Mojosari-Pacet-Gemekan	This route lies in the mountainous area around Pacet and the agricultural area to Mojosari and Gemekan.	This route is a provincial road divided into two sections. One is Mojosari-Pacet, and the other is Pacet-Gemekan. Pacet is a local center of the mountainous area of southern Mojokerto.	Fair	Fair	Poor	Poor	Poor (10)

Table 7.2.1 Evaluation of Projects (Continued)

Code No.	Sub-Code No.	Road Length (km)	Project Route	(1) Land Availability and Social Impact	(2) Conformity with Development Policies	Indicative Evaluation Result				
						(1) Land Availability and Social Impact	(2) Development Policies	(3) Traffic Demand	(4) Cost Efficiency	Comprehensive Evaluation
3-10)	68	21.6	Deket-Karang Binagang	The route area is rural and hilly.	As industrial development proceeds in the northern coastal area, connectors will become necessary between the two primary arterial roads, i.e. Gresik-Brondong-Tuban road and Gresik-Lamongan-Babat road.	Good	Fair	Poor	Poor	Poor (11)
3-11)	69	28.2	Pucuk-Brondong	The route area is rural and hilly.	As industrial development proceeds in the northern coastal area, connectors will become necessary between the two primary arterial roads, i.e. Gresik-Brondong-Tuban road and Gresik-Lamongan-Babat road.	Good	Fair	Poor	Poor	Poor (11)
3-12)	79	9.0	East Fringe of Labang	The route passes through agriculture land.	This roads passes through the fringe of the planned Labang Residential and Industrial Development.	Good	Fair	Poor	Poor	Poor (11)
(4)	**Secondary Artery Road**									
4-1)	67	13.5	Labang-Burneh	A new road is proposed in this section. The route is in a rural area. This arterial section is included in the Labang Development Plan which is now under the process of permit by Bangkalan BAPPEDA.	This route is a north-south axis of Labang Development, and it extends to the planned deep sea port at Tanjung Bumi and the nearby industrial zone. It depends on realization of Sura-Madu Bridge.	Good	Fair	Fair	Fair	Fair (13)
4-2)	8	6.5	Jl. Dupak-Jl. Kapas Krampung	A 25m R.O.W. has been set, but the route lies in the busiest area of Surabaya City, i.e. Jl. Tembaan near the Provincial Office of East Java. Land acquisition will take a relatively long time.	The western section of this route is Jl. Dupak and it is the only arterial road that connects with the Dupak Junction where Surabaya-Gempol Tollway and Surabaya-Gresik Tollway meet in the northern part of SBY.	Poor	Good	Good	Fair	Fair (13)
4-3)	9	11.0	Benowo-A. A. Watangrejo (Gresik)	The route lies in the north-west of Surabaya and extends to Kab. Gresik to reach the existing national road of Gresik-Lamongan section.	This is a road section diversified from Jl. Kandangan to the north-west direction to provide arterial service in the swamp area between Kec. Benowo and Kec. Tandes.	Good	Fair	Poor	Poor	Poor (11)
4-4)	11,12, 13 & 14	13.8	O.R.R.(near Cerme)-Raya Tandes-Banyu Urip-Pandegiling-Kertajaya	Jl. Raya Tandes and Jl. Pandegiling and Jl. Sulawesi-Jl. Raya Kertajaya sections have 25m R.O.Ws. and the detailed design under SUDP program has been finished. However, land acquisition is staked in these areas.	This is one of the major East-West axis through the central area of Surabaya City. SITNP has prepared a plan to provide on this route an exclusive busway between Kota Satelit and SBY Institute of Technology.	Very Poor	Very Good	Good	Fair	Fair (13)
4-5)	16, 17, 18 & 19	27.7	O.R.R.(near Cerme)-Raya Darmo Permai-Sunkono-Wonokromo-Raya Panjang Jiwo-Eastern Sub-center	Jl. Mohammad is now widened in a 35m ROW and further west will be built by real estate investor. Jl.Sunkono/Jagir Wonokromo have enough road width but Wonokromo area. Widening is par-ticularly required at the eastern end.	It is planned to connect Eastern and Western sub-centers with a busway through the traffic nodal point of Wonokromo, which area is the most critical part to realize a throughway connection, and it needs a special local network plan.	Fair	Very Good	Good	Fair	Good (15)

Table 7.2.1 Evaluation of Projects (Continued)

Code No.	Sub-Code No.	Road Length (km)	Project Route	(1) Land Availability and Social Impact	(2) Conformity with Development Policies	Indicative Evaluation Result				
						(1) Land Availability and Social Impact	(2) Development Policies	(3) Traffic Demand	(4) Cost Efficiency	Comprehensive Evaluation
4-6)	20 & 21	21.5	Menganti-Jajar Tunggal-Margorejo	Jl.Raya Meganti has a 40m ROW and road improvement has been underway by IBRD loan with a 2-lane rural road standard. Jajar Tunggal-Margorejo section has a 25m ROW, but land acq. will be most difficult.	The real estate development in the western part of SBY relies much on this route. Traffic congestion at Gunung Sari Intersection will be degraded unless this route is realized.	Poor	Good	Good	Fair	Fair (13)
4-7)	22 & 23	25.6	Kedamean-Sumur Welut-Jemur Sari-Prapen	The route has a 35m ROW and its western part before Jemur Sari can align itself the previous route of SBY-Mojokerto Tollway. Land acquisition in this part is relatively easier than for other east-west axis.	The western part of this route passes low-cost housing area(Permunas) in Driyorejo and leads to the Eastern Sub-center with a busway plan crossing some north-south connectors, i.e. Jl.Mastrip-Wonokromo, SBY-Waru Tollway and Jl. R.J. Ahmad Yani.	Fair	Very Good	Good	Good	Very Good (16)
4-8)	24 & 25	7.8	Jl. Jemur Andayani-Jl. Rungkut Industri-Eastern Middle Ring Road Stage 2	A 25m ROW is prepared for this route. Land acquisition in the eastern half of this route is required for widening/new road construction up to Eastern Middle Ring Road where urbanization is in progress recently.	A new access to Tg.Perak Port and Jl. Ahmad Yani can be realized through this route and the Eastern Middle Ring Road. This route also contributes to urban development in Eastern SBY.	Poor	Very Good	Good	Fair	Good (14)
4-9)	26	11.3	Banjaran-Sumur Welt	This route lies in the southern part of Kab. Gresik where many private investors plan to develop housing estates. Land acquisition in this area, therefore, will be relatively easy in cooperation with those investors.	This route constitutes the east-west section of the planned grid network in the southern part of Kab. Gresik. This route will support the Driyorejo low-cost housing development.	Good	Good	Fair	Fair	Good (14)
4-10)	29	33.7	Wonokromo-Gunung Sari-Jl. Mastrip (Outer Ring Road)	The north side of this route is densely occupied by houses and factories, and the south isde faces Surabaya River. Therefore, land acq. for widening seems quite hard to realize, though a 25m ROW has been set for the improvement.	Urban settlement including houses, factories and shops have been developed along this route. Traffic congestion is getting worse. Widening is not the only solution but a network approach is required, as the urbanization proceed as along the route.	Poor	Fair	Good	Fair	Fair (12)
4-11)	38	14.7	Pengalangan-Tanjungan	Housing development permits have been already issued to many private investors in the route area. It is relatively easy to set a ROW in cooperation with those investors.	The route passes in the north-south direction a future housing area and Kedamean regional sub-center. The route provides access to Gresik City, Krian and the industrial zone along Wonokromo-Krian corridor.	Good	Good	Poor	Very Poor	Poor (11)
4-12)	39	14.6	Gempolkurung-Supmut	Housing development permits have been already issued to many private investors in the route area. It is relatively easy to acquire land in cooperation with those investors but a southern end of the route.	The route constitutes a major arterial section in the north-south direction of the grid network in the western part of Surabaya Metropolitan Area.	Good	Good	Poor	Very Poor	Poor (11)
4-13)	41	20.6	Gresik-Driyorejo	The route lies in on-going housing areas of private investor and PERMUNAS. Land acquisition in about 100m width seems possible as the result of sounding to the investor. Further clarification is necessary.	This is a major arterial road with a busway cross-section parallel to the planned Gresik-Driyorejo Tollway, and it connects the primary arterial roads in the north and south of SBY City. It also provides access to Gresik and Driyorejo sub-centers.	Good	Very Good	Fair	Fair	Good (15)
4-14)	42, 43, 44 & 45	15.7	Jl. Margomulyo-Jl.Mastrip	Northern section(Jl. Margomulyo) has been already constructed by SUDP program, and part of the middle section is built by a housing investor. Missing sections lie in the developed area, though 35m ROW has been set already for this route.	This is a north-south connector with a busway plan. Housing development has been occurring in this area but appropriate access to the city center is lacking. The route functions to distribute radial traffic to the city center. Pre-F/S has been completed.	Fair	Good	Good	Fair	Good (14)

Table 7.2.1 Evaluation of Projects (Continued)

Code No.	Sub-Code No.	Road Length (km)	Project Route	(1) Land Availability and Social Impact	(2) Conformity with Development Policies	Indicative Evaluation Result				
						(1) Land Availability and Social Impact	(2) Development Policies	(3) Traffic Demand	(4) Cost Efficiency	Comprehensive Evaluation
4-15)	47	15.5	Jl. Kali Anak-Waru	A 20m ROW is prepared on each side of SBY-Waru Tollway. Land acq. may face difficulty in the northern section, but generally possible as the result of hearing from Surabaya City.	There is a lack of an arterial road in the north-south direction in this area divided east and west by the Tollway. This will provide diversified alternatives to access to the city center.	Good	Good	Good	Good	Very Good (16)
4-16)	49	10.9	Jl. Diponegoro-Jl. Demak		Proper maintenance is required to keep the designated road function in the central area of Surabaya City.	n.a.	n.a.	n.a.	n.a.	n.a.
4-17)	70		Jl. Kedungdoro-Jl. Bubutan		Proper maintenance is required to keep the designated road function in the central area of Surabaya City.	n.a.	n.a.	n.a.	n.a.	n.a.
4-18)	71		Jl. Raya Darmo-Jl. Tidar		Proper maintenance is required to keep the designated road function in the central area of Surabaya City.	n.a.	n.a.	n.a.	n.a.	n.a.
4-19)	72		Jl. Pemuda-Jl. Jembatan Merah		Proper maintenance is required to keep the designated road function in the central area of Surabaya City.	n.a.	n.a.	n.a.	n.a.	n.a.
4-20)	73		Jl. Darmokali-Jl. Kayun		A proper maintenance is required to keep the designated road function in the central area of Surabaya City.	n.a.	n.a.	n.a.	n.a.	n.a.
4-21)	50	14.2	Jl. ST. Wonokromo-Jl. Kapasari		A proper maintenance is required to keep the designated road function in the central area of Surabaya City.	n.a.	n.a.	n.a.	n.a.	n.a.
4-22)	74		Jl. Tg. Perak-Jl. Simokerto		A proper maintenance is required to keep the designated road function in the central area of Surabaya City.	n.a.	n.a.	n.a.	n.a.	n.a.
4-23)	51	5.4	Jl. Raya Wonokromo-Waru		A proper maintenance is required to keep the designated road function in the central area of Surabaya City.	n.a.	n.a.	n.a.	n.a.	n.a.

Table 7.2.1 Evaluation of Projects (Continued)

Code No.	Sub-Code No.	Road Length (km)	Project Route	(1) Land Availability and Social Impact	(2) Conformity with Development Policies	Indicative Evaluation Result				
						(1) Land Availability and Social Impact	(2) Development Policies	(3) Traffic Demand	(4) Cost Efficiency	Comprehensive Evaluation
4-24)	54	11.9	Jl.Raya Nginden-Sura/Madu Bridge IC	Additional land acquisition is required for widening, though a 35m ROW is set for this route. Since the roadside is densely populated, land acquisition requires time for negotiation.	This route provides the arterial service in north-south direction in the eastern part of SBY. This route is designated as a truck route at present but should be changed to Secondary Artery with busway function.	Very Poor	Very Good	Good	Fair	Fair (13)
4-25)	56	9.5	Jl. Raya Rungkut-Jl. J. Suprapto-Juanda Airport	A 25m ROW is set in Surabaya section. Sidoarjo section is narrow and the alignment is not appropriate at present. The roadside is densely developed and the land acquisition will take time for negotiation.	This route can be used as an alternative to diversify the traffic in Jl. Ahmad Yani which include the commuter and freight traffic to Rungkut Ind. Estate. The route provides an alternative access to Juanda Airport as well.	Poor	Very Good	Good	Fair	Good (14)
4-26)	57	11.1	Eastern Middle Ring Road(Arterial Road), Stage 2	Land acquisition has already started under SUDP program, which is the 2nd stage of arterial Eastern Middle Ring Road.	This is a straight line artery planned and executed by SUDP program. The route will contribute the urban development in the Surabaya East with a proposed busway cross-section in this JICA Study.	Good	Good	Good	Fair	Good (15)
4-27)	75	13.5	Airport Access	Land acquisition for the route is relatively easy, since the area has not been developed.	This street will provide access to the airport from the expected East Sub-City Development and Marina City.	Good	Fair	Fair	Fair	Fair (13)
4-28)	76	3.8	Jl.Girilaya - Jl. Raya Dukuh Kupang	The route passes through the built-up area. Thus land acquisition seems difficult.	Addition of the route will augment the road capacity in CBD and provide new access to CBD from southern-east part of Surabaya. Development of the route alleviate the traffic congestion due to the concentration of traffic flows into Wonokromo district.	Poor	Good	Good	Fair	Fair (13)
4-29)	77	3.0	Jl. Tanjung Sari - Jl. Kali Butuh	The route passes through a built-up area.	The route will connect CBD with western part of Surabaya. This street would enhance urban development in the east-west direction in Surabaya.	Poor	Good	Fair	Fair	Fair (12)
4-30)	78	10.0	Socah - East Labang	The road will be developed with new city development of Labang, consequently land acquisition would not be a problem.	The road will play a significant role as a major arterial street in the New City.	Good	Good	Poor	Fair	Fair (13)

Table 7.2.2 Project Priority List

Code No.	Sub-Code No.	Road Length (km)	Project Route	Compre-hensive Evaluation	Current Project Status
1-1)	46	43.8	Surabaya-Gempol Toll Road	Very Good (18)	Widening of Existing Toll Road, D/D will start Jan. 1997.
1-3)	28	33.8	*Surabaya-Mojokerto Toll Road*	*Very Good (16)*	*Private Investor (Toll Road), D/D* Completed
1-4)	58	30.9	Eastern Middle Ring Road (Toll Road)	Very Good (16)	Private Investor(Toll Road)
1-8)	40	20.6	Gresik-Driyorejo Toll Road	Very Good (16)	**<< Road Proposed for Feasibility Study>>**
4-7)	22 & 23	25.6	Kedamen-Sumur Welut-Jemur Sari-Prapen	Very Good (16)	**<< Road Proposed for Feasibility Study>>**
4-15)	47	15.5	Jl. Kali Anak-Waru	Very Good (16)	**<< Road Proposed for Feasibility Study>>**
2-4)	33	78.1	Gresik Ring Road-Tuban	Good (15)	Sector Loan 3712 Phase 3/IBRD, Processing for Tender
2-6)	5	13.8	Surabaya(Jl. Gresik)-Gresik	Good (15)	Heavy Loaded Road Project/OECF, Busway proposed by SITNP
2-9)	27	6.4	Eastern Middle Ring Road(Arterial Road), Stage 1	Good (15)	SUDP/OECF, D/D completed
2-12)	32	5.2	Access to Juanda Air Port	Good (15)	Under road improvement(widening)
2-13)	52	41.6	Waru-Sidoarjo Ring Road-Gempol	Good (15)	Sector Loan 3712 Phase 2/IBRD, to be completed in Sep. '97
4-5)	16, 17, 18 & 19	27.7	O.R.R.(near Cerme)-Raya Darmo Permai-Sunkono-Wonokromo-Raya Panjang Jiwo-Eastern Sub-center	Good (15)	**<< Road Proposed for Feasibility Study>>**
4-13)	41	20.6	Gresik-Driyorejo	Good (15)	**<< Road Proposed for Feasibility Study>>**
4-26)	57	11.1	Eastern Middle Ring Road(Arterial Road), Stage 2	Good (15)	Land for road development is being acquired. SUDP/OECF
1-5)	53	20.2	Perak-Waru Toll Road	Good (14)	Private Investor(Toll Road), Preliminary Design Stage
1-6)	55	-	*Surabaya Madura Toll Bridge*	*Good (14)*	*Private Investor(Toll Bridge), complete* within 7th 5-year plan
2-2)	48	83.0	Kamal -Bangkalan Ring Road-Ketapang	Good (14)	Sector Loan 3712 Phase 3/IBRD, Processing for Tender
2-7)	6	8.5	Jl. Rajawali-Jl. Kenjeran	Good (14)	To be improved by SUDP/OECF
2-8)	59	13.9	Frontage Road of Eastern Middle Ring Road(Toll Road)	Good (14)	
4-8)	24 & 25	7.8	Jl. Jemur Andayani-Jl. Rungkut Industri-Eastern Middle Ring Road Stage 2	Good (14)	
4-9)	26	11.3	Banjaran-Sumur Welt	Good (14)	
4-14)	42, 43, 44 & 45	15.7	Jl. Margomulyo-Jl.Mastrip	Good (14)	Pre-FS completed as Western Middle Ring Road
4-25)	56	9.5	Jl. Raya Rungkut-Jl. J. Suprapto-Juanda Airport	Good (14)	**<< Road Proposed for Feasibility Study>> Proposed by Steering Committee**
1-2)	7	20.7	Surabaya-Gresik Toll Road	Fair (13)	Private Investor (Toll Road), Already open to the public
2-5)	4	50.8	Gresik-Lamongan-Babat	Fair (13)	ADB Loan 1428, Tender is on going. Construction work will start in Jan.'97.
4-1)	67	13.5	Labang-Burneh	Fair (13)	
4-2)	8	6.5	Jl. Dupak-Jl. Kapas Kampung	Fair (13)	
4-4)	11,12,13 & 14	13.8	O.R.R.(near Cerme)-Raya Tandes-Banyu Urip-Pandegiling-Kertajaya	Fair (13)	
4-6)	20 & 21	21.5	Menganti-Jajar Tunggal-Margorejo	Fair (13)	Rural Road/IBRD
4-24)	54	11.9	Jl.Raya Nginden-Sura/Madu Bridge IC	Fair (13)	SUDP/IBRD
4-27)	75	13.5	Airport Access	Fair (13)	
4-28)	76	2.4	Jl.Girilaya - Jl. Raya Dukuh Kupang	Fair (13)	
4-30)	78	15.0	Socah - East Labang	Fair (13)	

Table 7.2.2 Project Priority List (Continued)

Code No.	Sub-Code No.	Road Length (km)	Project Route	Compre-hensive Evaluation	Current Project Status
1-7)	34	75.0	Gresik-Tuban Toll Road	Fair (12)	Private Investor(Toll Road)
1-9)	35	59.0	Outer Ring Road (Toll Road)	Fair (12)	Private Investor(Toll Road)
2-3)	3	26.5	Gresik Ring Road	Fair (12)	Planned by Kab. Gresik, partly completed
3-4)	30	15.5	Legundi-Mliriip	Fair (12)	
3-7)	64	46.3	Lamongan-Mojokerto	Fair (12)	
4-10)	29	33.7	Wonokromo-Gunung Sari-Jl. Mastrip (Outer Ring Road)	Fair (12)	
4-29)	77	4.4	Jl. Tanjung Sari - Jl. Kali Butuh	Fair (12)	
2-1)	1	54.0	Bangkalan-Torjun	Poor (11)	
2-10)	31	68.1	Waru-Krian Bypass-Mojokerto-Jombang	Poor (11)	Heavy Loaded/ OECF(Candidates)
2-11)	36	26.9	Gresik-Legundi-Krian	Poor (11)	Planned by Kab. Gresik
2-14)	62	32.0	Mojokerto-Gempol	Poor (11)	Sector Loan 3712 Phase 2/IBRD, Sep. '97 Complete
3-1)	2	42.0	Kamal-Labang-Blega	Poor (11)	
3-2)	10	21.5	Mantup-South of Cerme (Outer Ring Road)	Poor (11)	
3-3)	15	3.1	Benjeng-Further South of Cerme (Outer Ring Road)	Poor (11)	
3-5)	37	12.7	Krian-Mojosari	Poor (11)	
3-6)	61	28.0	Babat-Mantup	Poor (11)	
3-8)	65	64.9	Babat-Ploso-Gedeg	Poor (11)	
3-10)	68	21.6	Deket-Karang Binagang	Poor (11)	
3-11)	69	28.2	Pucuk-Brondong	Poor (11)	
3-12)	79	9.0	East Fringe of Labang	Poor (11)	
4-3)	9	11.0	Benowo-A. A. Watangrejo(Gresik)	Poor (11)	
4-11)	38	14.7	Pengalengan-Tanjungan	Poor (11)	
4-12)	39	14.6	Gempolkurung-Supmut	Poor (11)	
1-10)	63	32.0	Mojokerto-Gempol Toll Road	Poor (10)	Toll Road
3-9)	66	33.6	Mojosari-Pacet-Gemekan	Poor (10)	

7.3 Project Selected for Feasibility Study

7.3.1 Selected Priority Projects

Among the priority road projects, those of which the feasibility has not yet been or is not going to be studied were selected through a series of discussions with the Technical Committee, the Steering Committee in Indonesia and the JICA Advisory Committee in Japan. As a consequence, it was agreed to undertake feasibility studies of the following 5 road projects as shown in Figure 7.3.1.

1. Gresik-Driyorejo Toll Road cum parallel Arterial Roads (Code No. 1-8 and No. 4-13);
2. Kedamean-Sumur Welut- Jemur Sari-Prapen Road (Code No. 4-7);
3. Jl. Kali Anak-Waru Road (Code No. 4-15);
4. Near Cerme-Raya Darmo Permai-Sunkono-Wonokromo-Raya Panjang Jiwo-Eastern Sub-Center (Code No. 4-5); and
5. Jl. Raya Rungkut-Jl. J. Suprapto (Code No. 4-25).

7.3.2 Description of Project Roads

The location of the project roads is shown in Figure 7.3.1.

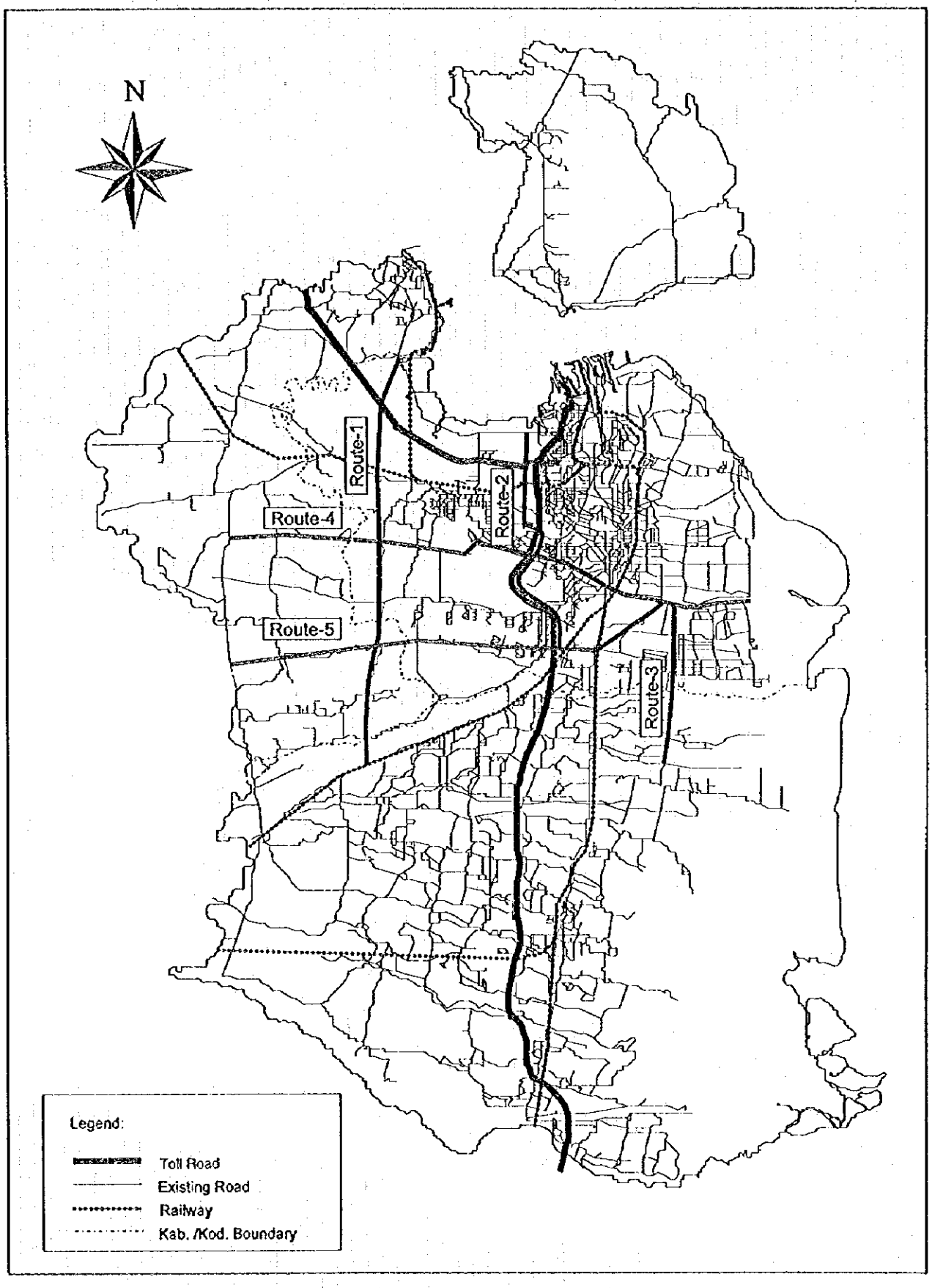


Figure 7.3.1 Location of the Project Roads

(1) Route No. 1 Gresik - Driyorejo Toll Road and Frontage Road

This is a new proposed toll road network by this study between Gresik and Driyorejo connecting Surabaya-Gresik Toll Road and Surabaya-Mojokerto Toll Road. Length is 20.6 kilometers with 6 lanes/2 ways and frontage roads on both west and east sides. This road will support "the New Port Development in Gresik point and Kali Lamong Site", "Driyorejo Development by PERMUNAS" and "the Industrial and Warehouse Development in Tandes Area".

(2) Route No. 2 Frontage Road of Surabaya-Gempol Toll Road

This is a new proposal by the study from Jl. Kali Anak to Waru as a frontage road on both sides of the existing Surabaya-Gempol Toll Road. The existing road will be partly utilized depending on the condition on the site.

(3) Route No. 3 Jl. Raya Rungkut - Jl. J. Suprapto

This road serves Rungkut Industrial Estate which is on the southern border of Surabaya connecting Rungkut Industrial Estate to primary arterial roads i.e. frontage road of eastern middle ring road and access road to Juanda airport. Within the city of Surabaya, 25 meters ROW is available but within Kab. Sidoarjo, widening of the existing narrow road is necessary.

(4) Route No. 4 South of Cerme - Jl. R. Darmo Permai - Wonokromo - Jl. Jagir Wonokromo - Jl. R. P. Jiwo - New Road

This is a road connecting east and west city sub-centers through Wonokromo where many trunk roads, railways, rivers, planned toll road and planned LRT line are passing. The study team proposes to include a busway on this route for public transport. Some parts of the route have already been strengthen or are under construction. However it is necessary to extend or widen more to form an effective grid pattern road network to support West Surabaya or south Gresik development.

(5) Route No. 5 Kedamean - Jl. Jemur Sari

This is a new proposal by the study to support Gresik south, Surabaya west and Driyorejo development. The road partly uses the ROW of Ex-Surabaya-Mojokerto Toll Road just on the south side of the planned Kedurus water reservoir. On this route the study proposes a busway for public transport connecting the west and east of Surabaya combined with Jl. Jemur Sari and Jl. Jagir Wonokromo. At the crossing point of Jl. A. Yani a fly over will be studied.