3.4.2 Future Traffic Demand Forecast

1) Future Trip Generation

Trip generation in both DKI Jakarta and Botabek for the Year 2010 is estimated and shown in Table 3.4.

Table 3.4 Estimated Trip Generation in DKI Jakarta and Botabek, 2010

Unit : Thousand Person Trips

Trip Purpose	Income Level	DKI Jakarta	Botabek
To Work	High	746	387
	U. Middle	1,385	1,483
	L. Middle	1,474	2,762
	Low	976	2,364
	Sub-total	4,584	6,996
To School	High	116	229
	U. Middle	888	951
	L. Middle	984	1,841
	Low	545	1,320
	Sub-total	2,858	4,341
To Home	All	9,979	15,015
Business	All	1,123	1,595
Private	All	2,808	3,749
Shopping	All	1,425	2,236
Total		22,782	33,932

2) Year 2010 Person Trip OD Matrices

The 2010 inter-zonal person trip OD Matrices were developed using the Gravity Model. Intra trips, as per current procedure, were calculated externally and later combined with inter-zonal trips. The resulting person trip OD matrices, in the form of the flow is shown in the Fig. 3.17.

3) Modal Split and Conversion to Vehicle OD Matrices

Modal split analysis was done based on modal split model described in the previous section.

Number of person trips by mode of transport projected by the modal split modal is shown in Table 3.5. This modal share would vary depending on the transportation policy such as a traffic demand constraint policy in CBD.

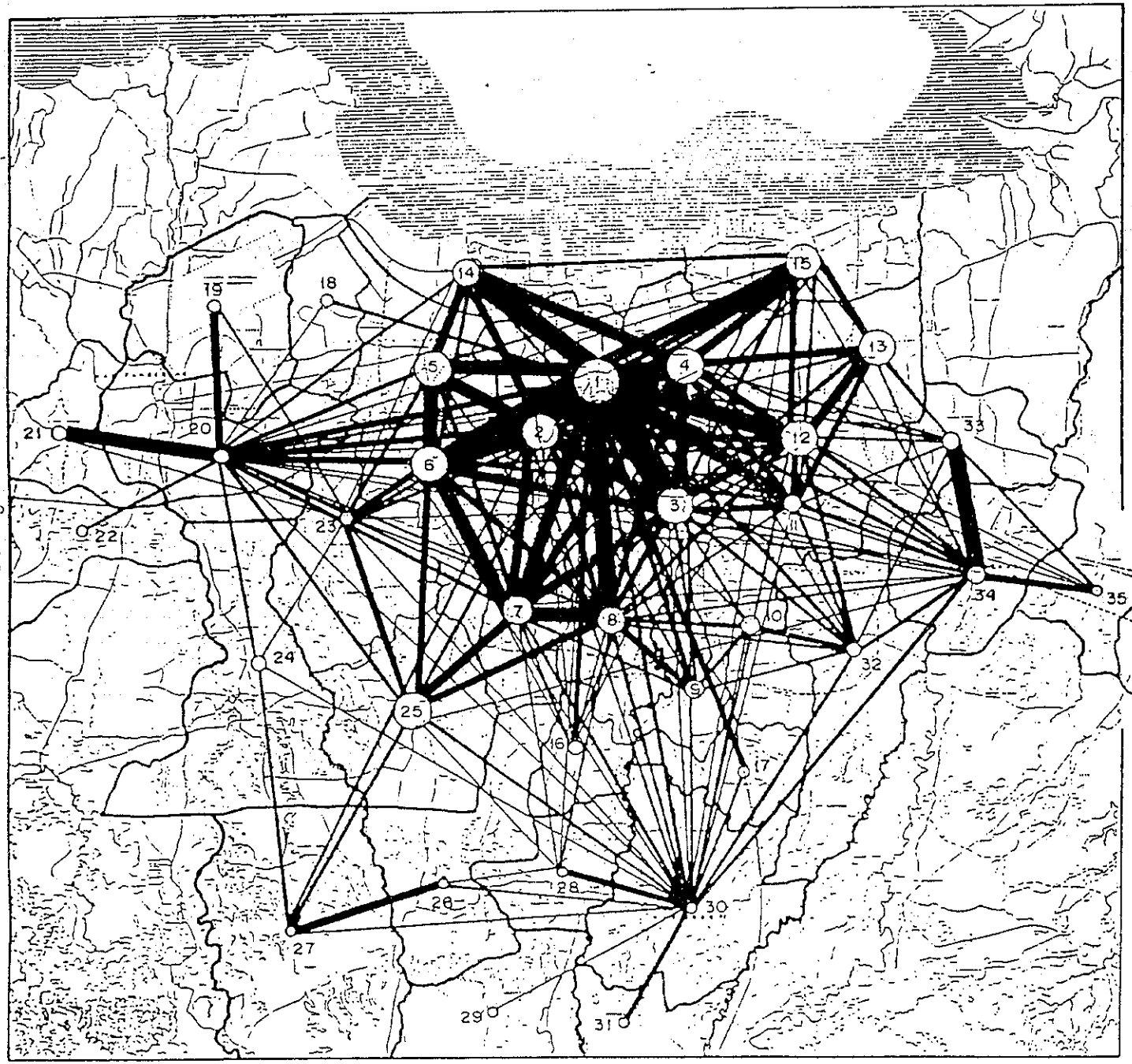

Fig. 3.17
PERSON TRIP FLOWS
IN JAKARTA METROPOLITAN AREA
YEAR 2010

PERSON TRIPS/DAY
500,000
200,000
100,000
0

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Table 3.5 Year 2010 Modal Split (by Purpose of Trip)

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

MODE	TRIP PURPOSE							
	WORK	SCHOOL	BUSINESS	HOME	PRIVATE	SHOPPING	TOTAL	COMP.
WALKING	305,098	902,454	138,505	3,399,073	719,831	714,192	6,179,154	
PUBLIC TRANSPORT	1,914,060	1,440,707	273,775	3,568,291	1,258,928	476,639	8,932,400	53.80%
MOTOR CYCLE	482,875	71,954	164,480	876,025	191,955	46,812	1,834,100	11.05%
PASSENGER CAR	1,731,093	390,343	495,332	2,266,850	721,193	231,689	5,836,500	35.15%
SUB.TOT MOTORIZED	4,128,028	1,903,004	933,587	6,711,166	2,172,076	755,140	16,603,000	
TOTAL	4,433,126	2,805,458	1,072,092	10,110,239	2,891,907	1,469,333	22,782,154	
SHARE	19.46%	12.31%	4.71%	44.38%	12.69%	6.45%		

Table 3.6 Change in Modal Composition (1993 - 2010)

		Year 1993		Year 2000		Year 2010	
		'000 trips	%	'000 trips	%	'000 trips	%
1. Total Generated Person Trip from DKI Jakarta		8,952	100.0	14,066	100.0	16,603	100.0
2. Modal Split	Public Transport	4,730	52.9	7,483	53.2	8,933	53.8
	Private Transport	4,222	47.1	6,583	46.8	7,670	46.2
3. Modal Share	Rail	242	3.0	1,685	12.0	3,819	23.0
	Road	8,710	97.0	12,381	88.0	12,784	77.0

4) Future Highway and Transit Network

In the traffic simulation analysis, the Jakarta-West Java tollway system, which consists of the Intra Urban Tollway System, the Outer Ring Road, and Regional Tollway, is assumed to be completed by the year 2000. Arterial road network for future years was coded based on the road development plan in DKI Jakarta, taking the recent progress of road development conducted by the local government into account. The project roads were added on this base road network in 2000 and 2010.

On the other hand, the transit network consists of bus network and railway network, that is, heavy rail network for the current year and new light rail network for the future years. The development schedule of mass rapid transit system follows the on-going study by the inter-department group.

Traffic simulation was executed based on these highway and transit networks.

5) Future Trip Assignment

Traffic assignments were carried out for several cases including :

- The base case; only committed network improvement, without NS axis tollway nor EW axis road
- With NS axis tollway only
- With EW axis only
- With both NS axis tollway and EW axis road.

Outputs from these assignments (especially those for the year 2010) were used to analyze, among others :

- identification of interchange locations
- profile of tollroad users
- preparation of traffic management measures in congested area
- design of interchanges

The year 2010 traffic volume snapshots on NS axis tollway and EW axis road are presented in Figure 3.18 and 3.19 respectively. With reference to Figure 3.6, the traffic volume incidence in major locations are summarized in Table 3.7.

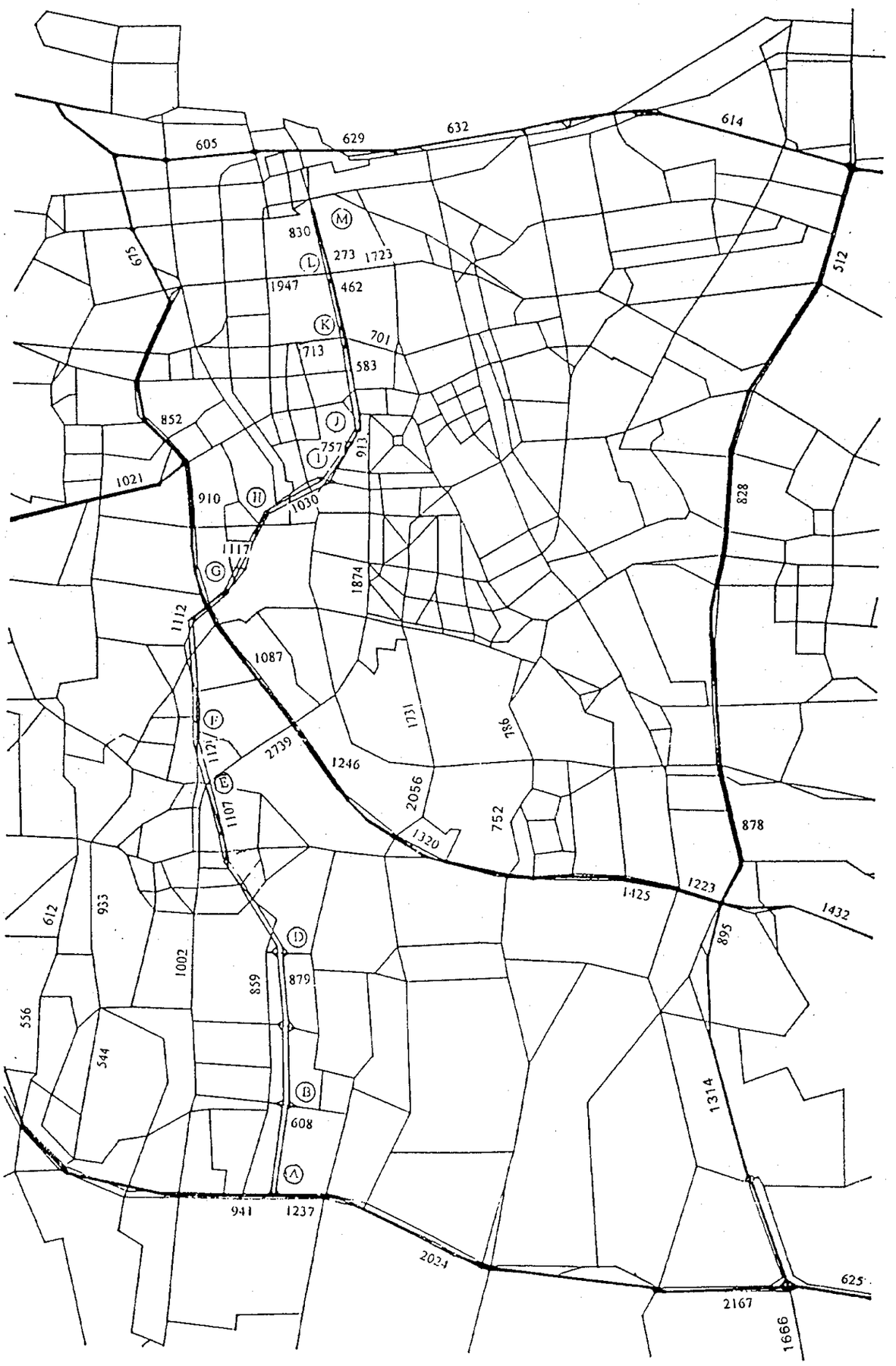

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Fig. 3.18 FORECASTED TRAFFIC VOLUME ON TOLLWAYS
YEAR 2010 (UNIT : 100 PCU / DAY)

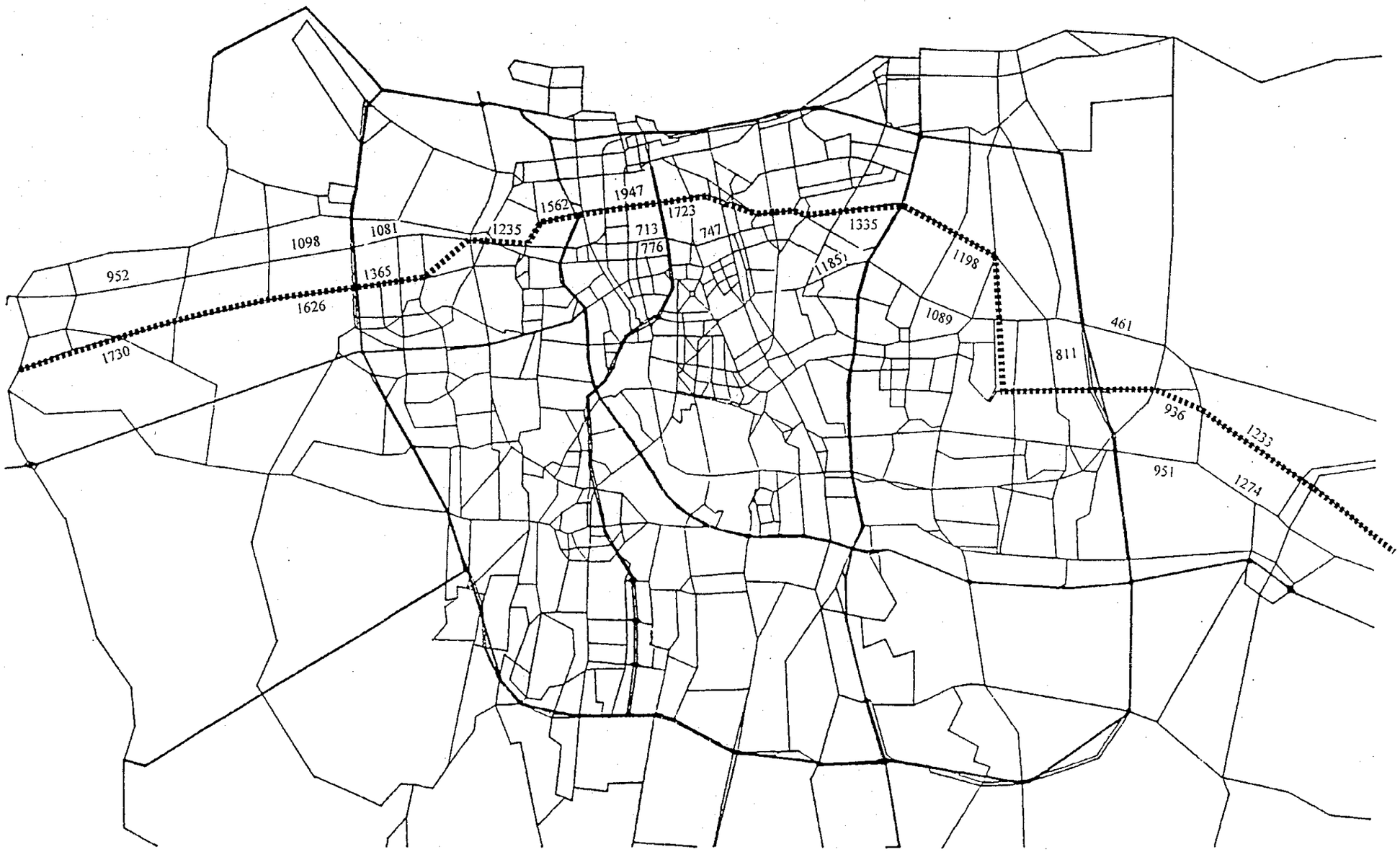

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Fig. 3.19 Estimated Traffic Volume on East-West Axis in Year 2010
(UNIT : 100 PCU / DAY)

The followings are the main findings from the traffic assignment cases;

(1) Modal Sharing of the North-South Corridor is as follows :

Table 3.7 Modal Split of Transport Demand in North-South Corridor 2010

Year 2010

Unit : Thousand Passenger/Day
( ) : Percentage

	Grand Total	Public Transport			Private Vehicle		
		Total	LRT	Bus	Total	Arterial	Tollway
Jl. Gajah Mada	373	223	155	68	150	89	61
	(100)	(60)	42	18	(40)	(24)	(16)
		(100)	(70)	(30)			
Jl. Majapahit	697	390	199	191	307	210	97
	(100)	(56)	29	27	(44)	(30)	(14)
		(100)	(51)	(46)			
Jl. Merdeka Barat	672	308	212	96	364	235	129
	(100)	(46)	32	14	(54)	(35)	(19)
		(100)	(69)	(31)			
Jl. M.H. Thamrin	958	569	249	320	389	260	129
	(100)	(59)	26	33	(41)	(27)	(13)
		(100)	(44)	(56)			
Jl. Sudirman (1)	1,127	627	324	303	500	338	162
	(100)	(56)	29	27	(44)	(30)	(14)
		(100)	(52)	(48)			
Jl. Sudirman (2)	1,151	657	289	368	494	422	72
	(100)	(57)	25	32	(43)	(37)	(6)
		(100)	(44)	(56)			
Jl. Sisingamangaraja	812	630	399	231	182	106	76
	(100)	(78)	49	29	(22)	(13)	(9)
		(100)	(63)	(37)			

Year 2000

Unit : Thousand Passenger/Day
( ) : Percentage

	Grand Total	Public Transport			Private Vehicle		
		Total	LRT	Bus	Total	Arterial	Tollway
Jl. Gajah Mada	229	103	70	33	126	96	30
	(100)	(45)			(55)		
Jl. Majapahit	311)	183	91	92	128	61	67
	(100)	(59)			(41)		
Jl. Merdeka Barat	306	186	92	94	120	53	67
	(100)	(61)			(39)		
Jl. M.H. Thamrin	485	165	82	83	320	231	89
	(100)	(34)			(66)		
Jl. Sudirman (1)	527	99	50	49	428	333	95
	(100)	(19)			(81)		
Jl. Sudirman (2)	520	48	25	23	472	375	97
	(100)	(9)			(91)		
Jl. Sisingamangaraja	315	48	25	23	267	169	98
	(100)	(15)			(85)		

(2) Comparison of average trip length of trips using North-South Axis (tollway) and those using the arterial road (Jl. Sudirman) :

The average trip lengths of North-South Axis users are 70% longer for passenger car and bus, 20% longer for truck than those of the paralleled arterial road users. This leads that the project tollway is rather functionable to divert the longer trip traffic or the semi regional traffic from the present arterial roads such as Jl. Thamrin and Jl. Sudirman to the proposed North-South Axis Tollway (see Table 3.8).

Table 3.8 Comparison of Average Trip Length between Jl. Sudirman and N-S Axis

Type of Vehicle	Jl. Sudirman			N.S. Axis		
	Link No. Node-Node	Traffic Volume (P.C.U.)	Average Trip Length (Km)	Link No. Node-Node	Traffic Volume (P.C.U.)	Average Trip Length (Km)
Private Passenger Car	2065-2070	98,336	12.5	8060-8066	41,944	21.2
	2070-2065	95,520	12.6	8065-8061	45,579	21.6
	Total	193,856		Total		
Truck	2065-2070	5,899	19.4	8060-8066	3,740	23.9
	2070-2065	6,057	20.6	8065-8061	3,886	25.0
	Total	11,956		Total		
Bus	2065-2070	17,828	12.7	8060-8066	7,690	21.3
	2070-2065	17,389	12.8	8065-8061	8,359	21.7
	Total	35,217		Total		

The comparison of the proposed East-West Axis and parallel arterial roads in the western area, the central area and the eastern area shows the following characteristics.

- Road users in the western area of Jakarta do not show a remarkable difference in trip length for the proposed road and pertaining arterial roads (Jl. Daan Mogot and Planned DKI road)

- Road users in the central area and the eastern area show 30% to 50% longer trips for the proposed East-West Axis, when compared with Jl. Perintis Kemerdekaan and Jl. Sukarjo.

- Truck trips show relatively longer average trip length than other vehicle types.

(4) North-South Axis Tollway Users :

The tollway users for Year 2000 and Year 2010 by toll rate are shown in Table 3.9.

Table 3.9 Number of Users per Day for North-South Axis (Tollway)

YEAR 2000

Toll Tariff (Gol. I)	Number of Trips (PCU/day)	Average Cross-Sectional Volume (PCU/day)	Average Trip Length on the Tollway (Km/trip)
Rp.2,000 per trip	75,100	44,600	11,9
Rp.3,000 per trip	66,600	40,700	12,2
Rp.4,000 per trip	63,000	39,300	12,5
Rp.5,000 per trip	58,100	38,100	13,1

YEAR 2010

Toll Tariff (Gol. I)	Number of Trips (PCU/day)	Average Cross-Sectional Volume (PCU/day)	Average Trip Length on the Tollway (Km/trip)
Rp.2,000 per trip	114,800	70,000	12,2
Rp.3,000 per trip	107,200	66,500	12,4
Rp.4,000 per trip	100,300	64,000	12,8
Rp.5,000 per trip	90,400	62,000	13,7

(5) LRT User Trip in Year 2010 :

Table 3.10 LRT User Trip Per Line (Year 2010)

Line	Trip	Trip-Km	Average Trip Length (Km)
1. Blok M-Kota with Casablanca Spur	677	4,736	7.0
2. Tangerang-Bekasi (with Spur)	937	9,067	9.7
3. Blok M-Cileduk	178	921	5.2
4. Kota-Serpong	701	4,602	6.6
5. Loop Line	665	3,280	4.9
Total	3,158	22,606	7.2

4. IMPLEMENTATION PLAN

4. IMPLEMENTATION PLAN

4.1 Construction Planning

1) Since the Project necessitates large scale construction work and a high level of investment, it may be desirable both economically and technically to stage the construction over a period of time. Development of the East-West Axis and North-South Axis in sections is therefore considered in order to optimize the investment schedule.

   The North-South Axis will be implemented as one section under one toll road investor but implementation of the East-West Axis will be staged according to priority and the time required for land acquisition procedures. To assist with preparation of the overall implementation schedule, construction planning of the East-West Axis is divided into the following sections as shown in Fig. 4.1.

   Section EW-1: West JORR IC - Latumeten IC
   (Sta. 0+500 - Sta. 9+200, L = 8.70 Km)
   Section EW-2: Latumeten IC - Mangga Basar IC
   (Sta. 9+200 - Sta. 11+700, L = 12.50 Km)
   Section EW-3: Mangga Basar IC - Sunter IC
   (Sta. 11+700 - Sta. 20+150, L = 8.45 Km)
   Section EW-4: Sunter IC - East JORR Junction
   (Sta. 20+150 - Sta. 31+250, L = 11.10 Km)

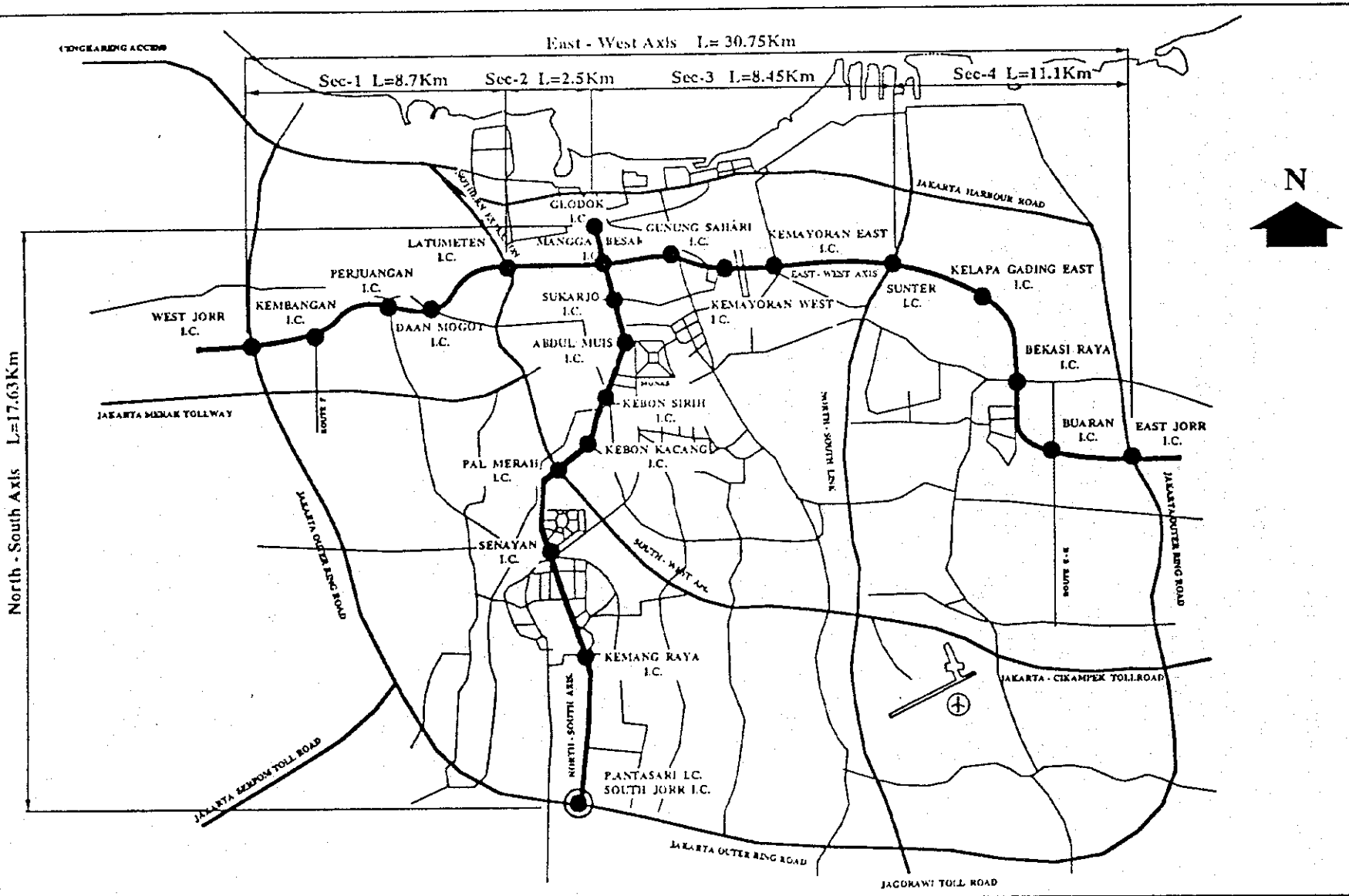
2) The estimated quantities of major structural items are shown in Table 4.1. Substantial quantities of materials are required but supply should not be a major problem considering the local construction industry in Jakarta. To a large extent major suppliers have already expanded their capabilities because of the large amount of roadworks now under construction in Jakarta and proposed for the near future.

3) The construction time schedule for the North-South Axis and for the four sub-sections of the East-West Axis have been prepared based on the assumptions described above. The schedules are shown in Figs. 4.2, 4.3, 4.4, 4.5 and 4.6 respectively.

4.2 Project Cost Estimates

1) General

   In order to envisage a preliminary project viability prior to studying an implementation plan of the project roads, rough cost estimates have been made for the North-South Axis and the East-West Axis respectively.



FEASIBILITY STUDY ON
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Fig. 4.1 Construction Sections

Table 4.1 Summary of Major Structural Material Requirements

Location	Length	Cast-in-situ Concrete					PC Girders			PC Piles		Steel Plate
		Cement	Aggregates		Reinforce-ment	Prestress Cable	I-Beam (30m)	U-Beam (30m)	I-Beam (Ped. 24m)	PC (45x45)	PC Spun (60 dia.)	
			Coarse	Fine								
	(km)	(tons)	(m3)	(m3)	(tons)	(kg)	(No.)		(No.)	(m)	(m)	(tons)
NORTH-SOUTH AXIS	17.63	176,669	340,828	294,194	48,611	614,742	1,799	1,638	0	12,496	368,230	58,344
EAST-WEST AXIS												
Section EW-1:	8.7	52,766	109,424	96,009	13,057	24,614	893	0	33	118,961	58,078	0
Section EW-2:	2.5	19,515	37,449	32,274	5,167	224,429	350	135	6	7,131	39,522	715
Section EW-3:	8.45	77,270	147,078	126,317	21,025	826,630	1,048	858	3	3,716	114,314	1,918
Section EW-4:	11.1	62,291	124,100	107,908	16,224	525,211	1,667	0	21	27,389	58,156	0
Total EW	30.75	211,841	418,050	362,508	55,473	1,600,884	3,958	993	63	157,197	270,070	2,633
GRAND TOTAL	48.38	388,510	758,878	656,702	104,084	2,215,626	5,757	2,631	63	172,324	638,300	60,977

Fig. 4.2 Construction Time Schedule - North-South Axis

STATION STA. +770 - STA. 18+400
LENGTH 17.630 km

	WORK ITEM	QUANTITY
1	MOBILISATION	
2	TEMPORARY TRAFFIC DIVERSIONS	
3	ROAD EARTHWORKS	Fill = 387,200 m3
4	DRAINAGE	Pipe = 30,112 m
5	ROAD PAVEMENT	Area = 390,300 m2
6	STRUCTURAL EXCAVATION	Vol. = 467,259 m3
7	PILING	Length = 380,726 m
8	CONCRETE PIERS & ABUTMENTS	Vol. = 304,754 m3
9	PRECAST BEAMS: a) FABRICATION b) ERECTION	No. = 3,437 beams
10	DECK FOR CONCRETE BRIDGES	Vol. = 100,968 m3
11	STEEL PIERS: a) FABRICATION b) ERECTION	Wt. = 10,826 t
12	STEEL GIRDERS: a) FABRICATION b) ERECTION	Wt. = 47,123 t
13	CONC. DECK FOR STEEL BRIDGES	Vol. = 43,839 m3
14	UTILITY DIVERSIONS	
15	MISCELLANEOUS	

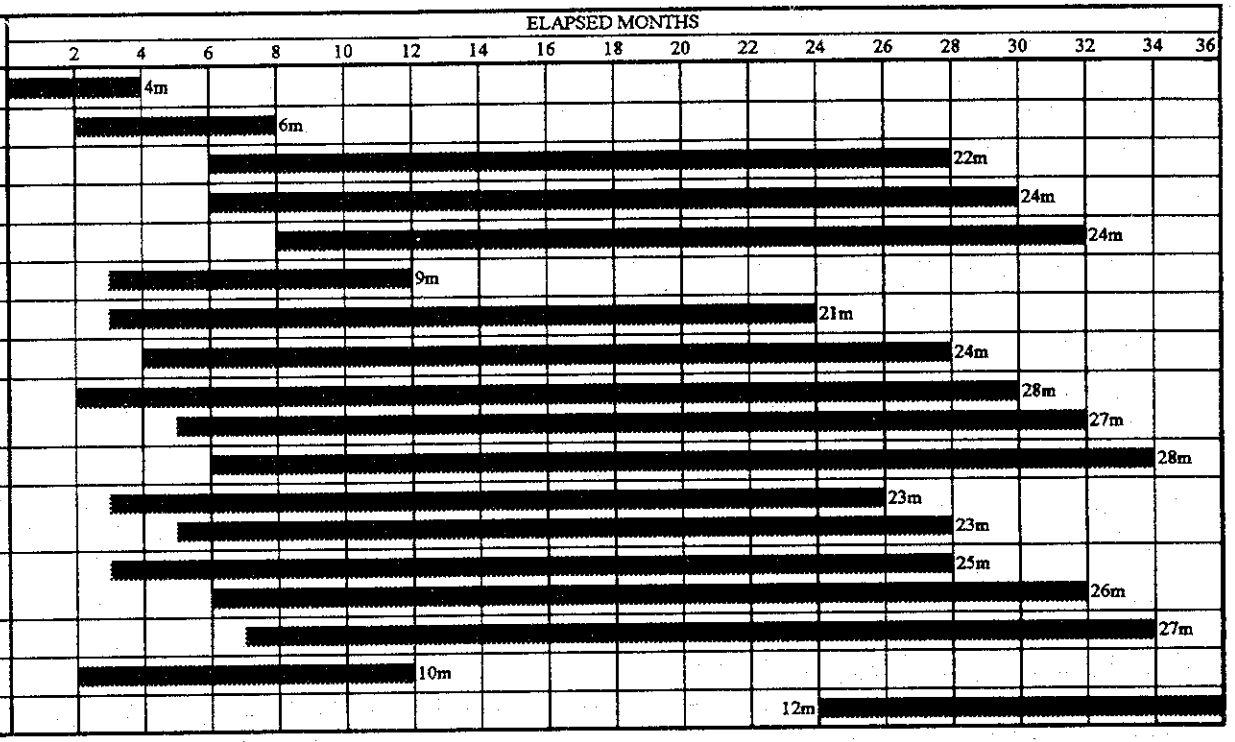

Fig. 4.3 Construction Time Schedule - East-West Axis - Section EW-1

STATION STA. 0+500 - STA. 9+200

LENGTH 8.700 km

	WORK ITEM	QUANTITY	ELAPSED MONTHS
1	MOBILISATION		4m
2	TEMPORARY TRAFFIC DIVERSIONS		4m
3	ROAD EARTHWORKS	Fill = 1,028,742 m3	14m
4	DRAINAGE	Pipe = 21,109 m	15m
5	ROAD PAVEMENT	Area = 477,672 m2	14m
6	STRUCTURAL EXCAVATION	Vol. = 145,955 m3	7m
7	PILING	Length = 177,039 m	11m
8	CONCRETE PIERS & ABUTMENTS	Vol. = 105,498 m3	12m
9	PRECAST BEAMS: a) FABRICATION b) ERECTION	No. = 926 beams	16m 15m
10	DECK FOR CONCRETE BRIDGES	Vol. = 36,241 m3	16m
11	UTILITY DIVERSIONS		6m
12	MISCELLANEOUS		8m

Fig. 4.4 Construction Time Schedule - East-West Axis - Section EW-2

STATION STA. 9+200 - STA. 11+700

LENGTH 2.500 km

	WORK ITEM	QUANTITY	ELAPSED MONTHS (2 4 6 8 10 12 14 16 18 20)
1	MOBILISATION		3m
2	TEMPORARY TRAFFIC DIVERSIONS		2m
3	ROAD EARTHWORKS	Fill = 73,845 m3	8m
4	DRAINAGE	Pipe = 2,678 m	10m
5	ROAD PAVEMENT	Area = 74,013 m2	8m
6	STRUCTURAL EXCAVATION	Vol. = 42,718 m3	5m
7	PILING	Length = 46,653 m	7m
8	CONCRETE PIERS & ABUTMENTS	Vol. = 33,333 m3	8m
9	PRECAST BEAMS: a) FABRICATION b) ERECTION	No. = 491 beams	12m 11m
10	DECK FOR CONCRETE BRIDGES	Vol. = 15,849 m3	12m
11	STEEL GIRDERS: a) FABRICATION b) ERECTION	Wt. = 1,098 t	4m 5m
12	CONC. DECK FOR STEEL BRIDGES	Vol. = 772 m3	5m
13	UTILITY DIVERSIONS		4m
14	MISCELLANEOUS		6m

Fig. 4.5 Construction Time Schedule - East-West Axis - Section EW-3

STATION STA. 11+700 - STA. 20+150
LENGTH 8.450 km

	WORK ITEM	QUANTITY	ELAPSED MONTHS
1	MOBILISATION		4m
2	TEMPORARY TRAFFIC DIVERSIONS		4m
3	ROAD EARTHWORKS	Fill = 149,509 m3	10m
4	DRAINAGE	Pipe = 5,022 m	12m
5	ROAD PAVEMENT	Area = 111,774 m2	10m
6	STRUCTURAL EXCAVATION	Vol. = 170,497 m3	8m
7	PILING	Length = 136,507 m	13m
8	CONCRETE PIERS & ABUTMENTS	Vol. = 133,525 m3	16m
9	PRECAST BEAMS: a) FABRICATION b) ERECTION	No. = 1,909 beams	20m 21m
10	DECK FOR CONCRETE BRIDGES	Vol. = 57,287 m3	22m
11	STEEL GIRDERS: a) FABRICATION b) ERECTION	Wt. = 1,918 t	5m 7m
12	CONC. DECK FOR STEEL BRIDGES	Vol. = 1,968 m3	7m
13	UTILITY DIVERSIONS		8m
14	MISCELLANEOUS		8m

Fig. 4.6 Construction Time Schedule - East-West Axis - Section EW-4

STATION STA. 20+150 - STA. 31+250

LENGTH 11.100 km

	WORK ITEM	QUANTITY	ELAPSED MONTHS (2 4 6 8 10 12 14 16 18 20 22 24)
1	MOBILISATION		4m
2	TEMPORARY TRAFFIC DIVERSIONS		4m
3	ROAD EARTHWORKS	Fill = 564,760 m3	12m
4	DRAINAGE	Pipe = 15,532 m	13m
5	ROAD PAVEMENT	Area = 365,293 m2	12m
6	STRUCTURAL EXCAVATION	Vol. = 165,554 m3	7m
7	PILING	Length = 85,545 m	9m
8	CONCRETE PIERS & ABUTMENTS	Vol. = 120,936 m3	12m
9	PRECAST BEAMS: a) FABRICATION b) ERECTION	No. = 1,688 beams	16m 15m
10	DECK FOR CONCRETE BRIDGES	Vol. = 37,803 m3	16m
11	UTILITY DIVERSIONS		6m
12	MISCELLANEOUS		8m

About seventy-five (75) work items associated with construction of the project roads are defined and quantities are taken off from each preliminary engineering designs to achieve necessary accuracy of cost estimates.

Unit costs associated with each work items are carefully established based on actual practices in Jakarta, considering an optimum construction method and period.

2) North-South Axis

The total construction cost of the North-South is given below at 1994 prices.

Billion Rupiah

1.	Direct Construction Cost	825.2
2.	VAT (10%)	82.5
	Sub-Total	907.7
3.	Land Acquisition & Compensation	79.4
4.	Physical Contingency	90.7
5.	Consulting Services	63.5
6.	Total	1,141.5

3) East-West Axis

The total construction cost of the East-West Axis is given below at 1994 prices.

Billion Rupiah

1.	Direct Construction Cost	687.7
2.	VAT (10%)	68.8
	Sub-Total	756.5
3.	Land Acquisition & Compensation	224.5
4.	Physical Contingency	75.6
5.	Consulting Services	53.0
6.	Total	1,109.6

4) The operation and maintenance costs (O & M costs) of the North-South Axis Toll road were estimated based on JASA MARGA's forecasts for O & M costs in 1993 on other toll roads.

The estimated O & M costs for the North-South Axis are shown in Table 4.2.

Table 4.2 Annual Operation and Maintenance Costs for North-South Axis

(Rp.million)

Item	NS-1	NS-2	Total NS
Booth Related O & M Costs (per booth)			
No. of Booths	12	31	43
Estimated O & M Cost per Booth	70	70	70
Total Booth Related O & M Cost	840.0	2,170.0	3,010.0
Other O & M Costs (per km)			
Length in km	4.79	12.84	17.63
Number of lanes	4	6	
Estimated O & M Cost per km	110	140	
Total Other O & M Costs	526.9	1,797.6	2,324.5
Grand Total Estimated O & M Cost	1,366.9	3,967.6	5,334.5

The cost of the overlay required after 12 years has been measured separately and is estimated (at 1994 prices) in Table 4.3 below.

Table 4.3 NS Axis Pavement Overlay Cost

DESCRIPTION	LENGTH (Km)	AREA OF SURFACING THR'WAY (m2)	AREA OF SURFACING RAMPWAY (m2)	AREA OF SURFACING TOTAL (m2)	TONS OF ASPH. SURF (ton)	UNIT RATE (Rp/t)	OVERLAY COST (Rp.mill)
North-South Axis							
Section NS-1	4.79	2,523	1,454	3,977	1,122	95,000	106.6
Section NS-2	12.84	5,886	8,509	14,395	4,060	95,000	385.7
TOTAL N-S	17.63	8,409	9,963	18,372	5,181	95,000	492.2

5) The estimated costs maintenance for the East-West Axis are shown in Table 4.4. The costs shown cover maintenance costs only and do not include DKI Jakarta and Bina Marga's salary/wage expenses for inspections and management of maintenance contractors, provision of an office, or office running costs.

Table 4.4 Annual Maintenance Costs for East-West Axis

(Rp.million)

Item	EW-1	EW-2	EW-3	EW-4	Total EW
Length in km	8.70	2.50	8.45	11.10	30.75
Estimated Maintenance Cost/km	75	75	75	75	75
Total Maintenance Cost	652.5	187.5	633.8	832.5	2306.3

The cost of the overlay required after 12 years has been measured separately and is estimated (at 1994 prices) in Table 4.5 below.

Table 4.5 EW Axis Pavement Overlay Cost

DESCRIPTION	LENGTH	AREA OF SURFACING			TONS OF	UNIT	OVERLAY
		THR'WAY	RAMPWAY	TOTAL	ASPH. SURF	RATE	COST
	(Km)	(m2)	(m2)	(m2)	(t)	(Rp/t)	(Rp.mill)
East West Axis							
Section EW-1	8.70	183,845	3,764	187,609	52,906	95,000	5,026.0
Section EW-2	2.50	22,710	1,136	23,846	6,725	95,000	638.8
Section EW-3	8.45	7,101	6,860	13,961	3,937	95,000	374.0
Section EW-4	11.10	155,982	1,455	157,437	44,397	95,000	4,217.7
TOTAL FOR EW	17.63	8,409	9,963	18,372	107,964	95,000	10,256.6

4.3 Implementation Plan

The implementation plan of the North-South Axis and the East-West Axis is proposed as shown in Fig. 4.7, based on the construction time requirements, Construction Planning and required costs.

Based on the implementation time schedule, annual required funds are tabulated in Table 4.6 and Table 4.7.

Fig. 4.7 Overall Implementation Program

Name of Link	Section	Activity	Cost (M.Rp)	YEAR 1 (1995)	2 (1996)	3 (1997)	4 (1998)	5 (1999)	6 (2000)	7 (2001)	8 (2002)	9 (2003)	10 (2004)	Recommended Executing Body
N-S AXIS		Engineering Services	27,232											BOT
		ROW Acquisition	79,400											
		Construction	998,516											
		Supervisory Services	36,310											
E-W AXIS	SEC-1	Engineering Services	6,332											GOI
		ROW Acquisition	94,118											
		Construction	232,157											
		Supervisory Services	8,442											
	SEC-2	Engineering Services	2,149											GOI
		ROW Acquisition	35,000											
		Construction	78,807											
		Supervisory Services	2,866											
	SEC-3	Engineering Services	7,621											GOI
		ROW Acquisition	30,120											
		Construction	279,451											
		Supervisory Services	10,162											
	SEC-4	Engineering Services	6,592											GOI
		ROW Acquisition	65,280											
		Construction	241,713											
		Supervisory Services	8,790											

Table 4.6 Annual Required Funds for the Development of the North-South Axis

Name of Link	Section	Activity	Cost (M.Rp)	YEAR										Total (M. Rp)
				1	2	3	4	5	6	7	8	9	10	
				1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	
N-S AXIS		Engineering Services	27,232	16,339	10,893									27,232
		ROW Acquisition	79,400		51,610	27,790								79,400
		Construction	998,516			149,777	349,481	349,481	149,777					998,516
		Supervisory Services	36,310			5,447	12,709	12,709	5,447					36,310
Total			1,141,458	16,339	62,503	183,014	362,189	362,189	155,224					1,141,458

Table 4.7 Annual Required Funds for the Development of the East-West Axis

Name of Link	Section	Activity	Cost (M.Rp)	YEAR										Total (M. Rp)
				1	2	3	4	5	6	7	8	9	10	
				1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	
E-W AXIS	SEC-1	Engineering Services	6,332		3,166	3,166								6,332
		ROW Acquisition	94,118			47,059	47,059							94,118
		Construction	232,157					116,079	116,079					232,157
		Supervisory Services	8,442					4,221	4,221					8,442
	SEC-2	Engineering Services	2,149						1,397	752				2,149
		ROW Acquisition	35,000							17,500	17,500			35,000
		Construction	78,807									47,284	31,523	78,807
		Supervisory Services	2,866									1,720	1,146	2,866
	SEC-3	Engineering Services	7,621		3,811	3,811								7,621
		ROW Acquisition	30,120			15,060	15,060							30,120
		Construction	279,451					111,780	111,780	55,890				279,451
		Supervisory Services	10,162					4,065	4,065	2,032				10,162
	SEC-4	Engineering Services	6,592				3,296	3,296						6,592
		ROW Acquisition	65,280					32,640	32,640					65,280
		Construction	241,713							120,857	120,857			241,713
		Supervisory Services	8,790							4,395	4,395			8,790
Total			1,109,600	0	6,977	69,096	65,415	272,081	270,182	201,426	142,752	49,004	32,669	1,109,600

5. ENVIRONMENT

5. ENVIRONMENT

5.1 ANDAL Study

The Central AMDAL (Analyze Mengenai Dampak Lingkungan : Environmental Impact Assessment) Commission suggested that the project requires an ANDAL Study.

1) An environmental impact study (ANDAL Study) which is prescribed in Regulation of "The Analysis of Environmental Impact" No. 29, 1986 as amended to Regulation No. 51, 1993, has the following objectives :

   - to identify the proposed project activities which may have significant impacts on the environment
   - to identify the existing environmental conditions which may be impacted by the proposed project
   - to estimate and evaluate the significant environmental impacts
   - to provide recommendations of environmental management and monitoring

   The Directorate General of Highways and the JICA Study Team submitted the Draft ANDAL Report to the Central AMDAL Commission. From an environmental point of view, the project was approved by the Central AMDAL Commission after discussing the ANDAL Study in July 1994.

2) The results of the ANDAL Study Report are summarized as follows:

   (1) Pre-Construction phase

   In the Pre-Construction Phase, the significant impacts will be in relation to the community, such as community unrest, resettlement and disagreement over compensation. These impacts can be caused by unclear and ambiguous information. It is estimated that 389 buildings for North-South Axis and 3,281 buildings for the East-West Axis will be affected by the project. From the viewpoints of environmental impacts of socio-economic and socio-culture, it is likely that the project will affect people and facilities within 200 m wide in the both sides of road. It is estimated that 18,318 units for the North-South Axis and 28,276 units for the East-West Axis are located in 400 m wide corridor. It accounts for 56,220 persons and 84,330 persons respectively who are not only residents but also commuters.

   (2) Construction phase

   The activities of the construction may not have a serious impact on the environment. However, pollution and traffic congestion caused by construction are critical issues. Residents will be affected by gas emission and noise generated by heavy equipment. The project proponent should pay attention to impact on residents.

(3) Operation and Maintenance Phase

In general, the existence of roads create better conditions in terms of decreasing transportation time, decreasing traffic accident, and growing economic activities. However, land use along the proposed road sides will be changed, which may be serious and significant problems for some people.

5.2 Environmental Considerations

1) The project will have not only negative impacts but also positive impacts. Possible environmental impact matrix is shown in Table 5.1.

It is concluded that applications of appropriate environmental considerations and measures enable to mitigate negative impacts up to present level.

2) Environmental impact matrix covers the possible impacts on environmental elements in Pre-Construction Phase, Construction Phase, Operation and Maintenance Phase. Major environmental impacts by the implementation of the project are as follows:

(1) Pre-Construction Phase

Land acquisition is a very important activity. The North-South Axis and East-West Axis will require resettlement, especially from Tanah Abang on the North-South Axis and Jelambar, Mangga Besar Extension and Sunter Jaya on East-West Axis, with large number of residents, being resettled.

The Project proponent should provide residents who have right holder or not with following assistance :

- enable to reconstruct a land-based or employment-based productive existence
- compensate for their losses at replacement cost
- assist with the more and during the transition period at the relocation site
- assist in their efforts to improve their living standards, income earning capacity and production levels, or at least to restore them.

Land readjustment will be required in Section 2 of the East-West Axis, where the area is residential with small shops and small workshops. The roads in this area are very narrow, complicated and congested with traffic. This area is far from being safe. At present, fire fighting is very difficult as a result. If land readjustment is carried out, multi-story apartment houses will be built for resettled residents in readjustment areas.

Table 5.1 Possible Environmental Impact Matrix of the Project

Environmental Elements / Project Activities	Physics and Chemistry															Biology		Social and Economic													
	Climate	Slope stabilities	Ground substance	Soil erosion	Soil contamination	Hydrology	Water quality	Groundwater use/quality	Water Resources	Air pollution	Noise	Vibration	Offensive odor	Disaster	Aesthetic	Flora	Fauna	Local Administration	Community Unrest	Split of communities	Resettlement	Land Use	Economic activities	Employment	Traffic	Infrastructures	Public Health	Archaeology/Cultural sites	Human Safety	Amenity
Pre-Construction Phase																															
1 Design and procurement														+				–												+
2 Site exploratory survey																			–						+					
3 Land acquisition / Property Compensation																		–	–		–				–		–			
4 Utility networks removal and installed																															
Construction Phase																															
1 Employment of Labor																						+	+								
2 Mobilization of heavy equipment and construction plants										–	–	–												–							
3 General Haulage										–	–	–												–					–		
4 Construction of site office							–			–	–	–														–					
5 Demolition of existing structures							–			–	–	–																			
6 Site preparation										–	–	–			–									–						–	
7 Construction of main structures										–	–	–			–					–					–						–
8 Road Excavation and Pavement										–	–	–			–					–					–						–
9 Construction of access roads										–	–	–			–					–					–						–
10 Construction of accessory structures										–	–	–			–					–					–						–
11 Installation of new drainage system						–	–			–	–																				
Operation and Maintenance Phase																															
1 Existence of road structures						–								+	+/-					–											
2 Travelling of traffic vehicles										+/-	–	–									+	+		+						+	
3 Maintenance																							+	+	+				+	+	

+ : Positive Environmental Impact

– : Negative Environmental Impact

(2) Construction Phase

i) Implementation of the project requires large workforce, such as road engineers, vehicle and heavy equipment operators, and laborers. Many workers gather at construction sites, and small service sectors eventually will find themselves in these sites. Employment of labor contributes local economy.

ii) Activities of construction may not cause serious impact on environment. However, pollution and traffic congestion caused by construction are critical issues. Residents will be affected by gas emission and noise generated by heavy equipment. The project proponent should pay attention to impact of residents.

For example, traffic volume also will increase on account of conveyance of labour, construction equipment, materials and waste. However, the period of transportation will not be long and some detours will be provided, so environmental impact caused by the construction is predicted to be not serious.

Soundproof equipment such as pile driver with soundproof covering should be used in residential areas offices, schools and hospitals. Pile driver with soundproof covering can reduce generating sound level to 70 dB at 30 m from noise source.

(3) Operation and Maintenance Phase

i) Many vehicles will shift to proposed roads from existing roads that are crowded with traffic, so that pollutants from traveling vehicles such as CO and NOx will decrease in wide areas.

ii) Traveling vehicles on proposed roads will raise air pollution and noise levels from background level. Protection of noise level from traveling vehicle is required around residential areas, schools and others. It is not expected that rising air pollution from traveling vehicles would be serious.

6. ECONOMIC AND FINANCIAL ANALYSES

6. ECONOMIC AND FINANCIAL ANALYSES

6.1 Economic Analysis

The main aim of the economic project analysis is to show the effect of the "Urban Arterial Road System Development Project in Jakarta Metropolitan Area" from the nation's economic well-being viewpoint and to estimate the expected economic internal rate of return of the resources invested. The evaluation is an assessment of the economic viability of the proposed arterial road system.

For the evaluation purpose, the net present value (NPV) and the benefit-cost ratio under certain discount rates are computed, as well the economic internal rate of return (EIRR).

6.1.1 Benefits

Benefits are classified into two; one is the direct benefit and the other is the indirect or intangible benefit. These direct benefits are calculated for the total road network comparing the 'with the project' and the 'without the project' situations.

1) Direct Benefits

The direct benefits which would be realized from implementation of the Project are defined as the savings in travel costs, composed of vehicle operating cost and vehicle time cost, when comparing the "With" and "Without" Project conditions for the whole network.

The cases are as follows :

a) When only the North-South Axis is constructed,
b) When only the East-West Axis is constructed, and
c) When both the North-South Axis and East-West Axis are constructed.

The calculations are made for Year 2000 and Year 2010 and extrapolated for a 25 year project life span.

In addition, especially for the North-South Axis, as this axis is to be operated as a tollway, the benefit to users is calculated to establish the range of possible toll rates.

(1) Vehicle Operating Costs Savings

The computed results of vehicle operating costs of the network by case and by vehicle category are shown in Table 6.2. From these figures, the vehicle operating costs savings are computed as shown in Table 6.3.

Table 6.1 Annual Vehicle Operating Costs of the Network in Economic Costs

(Million Rp./Year)

	Passenger Car	Pick-up	Truck	Bus	Total
1) Without Case					
Year 2000	9,200,960	837,820	373,570	1,700,830	12,113,180
Year 2010	14,723,390	1,345,220	828,260	2,884,030	19,780,900
2) North-South Axis only					
Year 2000	9,097,580	831,170	370,450	1,699,620	11,998,820
Year 2010	14,568,380	1,331,300	819,710	2,869,890	19,589,280
3) East-West Axis only					
Year 2000	9,069,380	825,060	370,360	1,715,340	11,980,140
Year 2010	14,474,020	1,322,750	804,800	2,868,960	19,470,530
4) North-South Axis and East-West Axis					
Year 2000	8,997,570	820,030	393,790	1,709,150	11,920,540
Year 2010	14,445,920	1,320,160	803,260	2,866,370	19,435,710

Table 6.2 Annual Economic Vehicle Operating Cost Saving in 1994 Prices

(Million Rp.)

	Year 2000	Year 2010
1) North-South Axis only	114,360	191,620
2) East-West Axis only	133,040	310,370
3) North-South Axis and East-West Axis	192,640	345,190

(2) Vehicle-Hours by Case

As with vehicle-kilometers, vehicle-hours by vehicle categories are computed by case as shown in Table 6.3. The annual savings of vehicle time costs are computed as shown in Table 6.4.

Table 6.3 Daily Vehicle Hours of the Network by Vehicle Category

(Veh-Hours/Day)

	Passenger Car	Pick-up	Truck	Bus	Total
1) Without Case :					
Year 2000	8,127,715	1,108,325	153,573	1,131,268	10,520,881
Year 2010	10,606,355	1,446,321	186,726	1,497,497	13,736,899
2) North-South Axis only					
Year 2000	8,013,459	1,098,390	150,032	1,113,555	10,375,436
Year 2010	10,521,384	1,434,734	181,016	1,483,769	13,620,904
3) East-West Axis only					
Year 2000	7,851,544	1,059,589	147,671	1,090,515	10,149,319
Year 2010	10,335,555	1,409,394	176,809	1,463,550	13,385,308
4) North-South Axis and East-West Axis					
Year 2000	7,746,863	1,056,390	146,195	1,086,960	10,036,408
Year 2010	10,313,610	1,406,401	174,370	1,462,027	13,356,408

Table 6.4 Annual Economic Vehicle Time Cost Saving

Cases	Vehicle-Hours Saving (Million Hours)		Time Cost Saving (Billion Rp.)	
	Year 2000	Year 2010	Year 2000	Year 2010
1) North-South Axis only	46.5	37.1	268.9	227.2
2) East-West Axis only	118.9	112.5	649.6	643.7
3) North-South Axis and East-West Axis	155.0	121.8	835.5	703.7

(3) Direct Benefit, by Case

By the above mentioned process, the direct benefits by case and by year of the project are shown in Table 6.5.

Table 6.5 Annual Economic Benefit in 1994 Prices

(Billion Rp.)

Case/Year	VOC Saving	Time Cost Saving	Total
1) North-South Axis only			
Year 2000	114.4	268.9	383.3
Year 2010	191.3	227.2	418.5
2) East-West Axis only			
Year 2000	133.0	649.6	782.6
Year 2010	310.4	643.7	954.1
3) East-West Axis and North-South Axis			
Year 2000	192.7	835.5	1,028.2
Year 2010	345.2	703.7	1,048.9

(4) Direct Benefits to the North-South Axis Tollway User

Limited to users of the tollway, the savings of vehicle operating costs and vehicle time costs from 'without the tollway' case are calculated as the users' benefits. The results for Year 2000 and for Year 2010 are as shown in Table 6.6.

Table 6.6 Tollway User's Benefit in 1994 Prices

(Rp./PCU-Trip)

	VOC Saving	Time Cost Saving	Total
Year 2000			
Financial	4,851	2,043	6,894
Economic	2,035	1,532	3,567
Year 2010			
Financial	4,974	2,094	7,068
Economic	2,232	1,571	3,803

2) Indirect Benefits

The realization of the East-West Axis will lead not only better and easier access to the central business district, but it will also induce new or renewal development with added values along the corridor. These added values were calculated for the indirect benefits.

6.1.2 Project Costs

The initial investment costs for engineering services, construction and land acquisition costs of the North-South Axis Tollway and East-West Axis are estimated in constant 1994 prices as shown in Table 6.7 (details are in Chapter 15

Table 6.7 Initial Investment Costs in 1994 Prices

(Billion Rp.)

	Financial Costs	Economic Costs
N-S Axis (including toll facilities)	1,141.5	828.0
E-W Axis (4 Sections)	1,109.6	800.9
Total	2,251.1	1,628.9

The economic costs for economic analysis purposes are calculated by subtracting transfer payments such as taxes and duties from the financial costs estimated in Chapter 15 and are allocated according to the implementation schedule in Chapter 13.

The 1994 present value of the economic project costs at discount rates of 12% p.a. and 15% p.a. are shown in Table 6.8.

Table 6.8 Year 1994 Present Value of Economic Project Costs

(Million Rp.)

		Discount Rate	
		12% P.A.	15% P.A.
1.	North-South Axis		
	1) Initial Investment Costs	459,345	401,473
	2) Maintenance & Operation costs	13,343	9,265
	Total	472,688	410,738
2.	East-West Axis		
	1) Initial Investment Costs	363,328	303,630
	2) Maintenance & Operation costs	6,003	3,920
	Total	369,331	307,550
3.	TOTAL (N-S Axis and E-W Axis)		
	1) Initial Investment Costs	822,674	705,103
	2) Maintenance & Operation costs	19,679	13,320
	Total	842,352	718,424

The annual operation and maintenance costs by year are shown in Table 6.9.

Table 6.9 Annual Operation and Maintenance Costs By Year in 1994 Prices

(Million Rp.)

Year	Financial Costs			Economic Costs		
	N-S Axis	E-W Axis	Total	N-S Axis	E-W Axis	Total
2000	2,422	-	2,422	1,768	-	1,768
2001	4,845	969	5,814	3,537	707	4,244
2002	4,845	1,283	6,128	3,537	936	4,473
2003	4,845	2,116	6,961	3,537	1,545	5,082
2004	4,845	2,116	6,961	3,537	1,545	5,082
2005	4,845	2,306	7,151	3,537	1,683	5,220
2006	4,845	2,306	7,151	3,537	1,683	5,220
2007	4,845	2,306	7,151	3,537	1,683	5,220
2008	4,845	2,306	7,151	3,537	1,683	5,220
2009	4,845	2,306	7,151	3,537	1,683	5,220
2010	4,845	2,306	7,151	3,537	1,683	5,220
2011	4,845	2,306	7,151	3,537	1,683	5,220
2012	5,337	2,306	7,643	3,896	1,683	5,579
2013	4,845	7,142	11,987	3,537	5,214	8,751
2014	4,845	2,490	7,335	3,537	1,818	5,355
2015	4,845	6,334	11,179	3,537	4,624	8,161
2016	4,845	2,306	7,151	3,537	1,683	5,220
2017	4,845	2,755	7,600	3,537	2,011	5,548
2018	4,845	2,306	7,151	3,537	1,683	5,220

6.1.3 Economic Evaluation

For project appraisal, the Government of Indonesia has been utilizing a 1.50 benefit-cost ratio at a 12% p.a. discount rate as the preliminary checking rate against project proposals for Java. As the project roads of the North-South Axis and East-West Axis are proposed in DKI Jakarta, a discount rate of 15% p.a. is applied for this project evaluation.

The benefit-cost ratio (B/C), the net present value (NPV) and the economic internal rate of return (EIRR) are computed for a 25 years project life span by cash-flow methodology.

The results are shown in the following Table 6.10, and lead to the conclusion that this project is economically feasible.

Table 6.10 Evaluation Results at Discount Rate of 15% P.A.

	North-South Axis only	East-West Axis only	N-S Axis and E-W Axis
B/C ratio	2.53	4.33	3.36
Net Present Value (NPV) (Billion Rp)	627.6	1,022.7	1,692.3
Economic Internal Rate of Return (EIRR)	31.9%	33.2%	40.3%

The results of sensitivity analysis are shown in Table 6.11.

Table 6.11 Results of Sensitivity Analysis

	Base Case	Costs +20%	Benefits -20%	Costs +20% and Benefits -20%	Costs -20%	Benefits +20%	Costs -20% and Benefits +20%
North-South Axis							
B/C Ratio	2.5	2.1	2.0	1.7	3.2	3.0	3.8
Net Present Value (15%) Billion Rupiah	627.6	545.4	419.9	337.8	709.8	835.3	917.4
Economic Internal Rate of Return (%)	31.9%	27.8%	27.0%	23.4%	37.3%	36.3%	42.3%
East-West Axis							
B/C Ratio	4.3	3.6	3.5	2.9	5.4	5.2	6.5
Net Present Value (15%) Billion Rupiah	1,022.7	961.2	756.7	695.1	1,084.2	1,288.8	1,350.3
Economic Internal Rate of Return (%)	33.2%	30.5%	29.9%	27.4%	36.7%	36.0%	39.6%
North-South Axis and East-West Axis							
B/C Ratio	3.4	2.8	2.7	2.2	4.2	4.0	5.0
Net Present Value (15%) Billion Rupiah	1,692.3	1,548.6	1,210.2	1,066.5	1,836.0	2,174.5	2,318.2
Economic Internal Rate of Return (%)	40.2%	35.2%	34.1%	29.7%	47.0%	45.7%	53.2%

6.2 Financial Analysis

The main objective of the financial project analysis is to evaluate the financial viability of the implementation of the construction and operation of the North-South Axis Tollway.

Based on the certain estimations and assumptions, the profit/loss statement and the cash flow were tabulated, and the first year of continuous annual surplus and continuous accumulated surplus were examined. As the evaluation indicators of financial viability, the financial internal rate of return (FIRR) and net present value (NPV) were calculated according to the discounted cash flow methodology.

6.2.1 Toll Rate and Revenue

Within the user's benefit, the toll rate for the financial evaluation is set at Rp.3,000 per PCU trip in 1994 price as a flat tariff.

The toll rates of tollways operated in Indonesia are as follows : Jakarta Intra Urban Tollway is Rp.170/trip-Km and Cengkareng Airport Access is Rp.300/trip-Km, while the North-South Axis Tollway is approximately Rp.240/trip-Km for the case of Rp.3,000 per trip in flat tariff. The revenue is estimated as follows :

Year	Toll Rates per KM	Average Trip Length on the Tollway (Km/trip)	Toll Rates per trip-Km	Revenue (Billion Rp/Year)
Year 2000	Rp.170	12.2	Rp.246	72.9
Year 2010	Rp.170	12.4	Rp.242	117.3

6.2.2 Financial Project Costs

Total initial investment costs is Rp.1,141.5 billion in 1994 prices, covering engineering services, ROW acquisition, construction and taxes.

The direct construction costs are categorized as follows :

Total Direct Construction Costs	:	Rp.825,220 (Million)
1) Throughway/Ramp		Rp.762,366 (Million) (92.4%)
including Toll Related Facilities	:	Rp. 39,606 (Million)
2) Frontage Road/Others	:	Rp. 62,854 (Million) (7.6%)

The ROW costs are estimated to be Rp.79,400 (Million)

The operation and maintenance costs were previously shown in Table 16.3.3.

The project costs (initial investment costs) in current prices is computed according to the proposed implementation schedule with a 7% p.a. escalation rate. The project cost is estimated to be Rp.1,528 billion in current prices.

6.2.3 Financial Evaluation

1) Investment Ceiling

Under the following conditions, an investment ceiling against the toll rate level of Rp.3,000 per PCU trip is computed to be Rp.1,079 billion in 1994 prices.

- 12% p.a. discount rate,
- Revenues for 25 years period,
- Toll Rate escalated by 7% p.a.,
- 5% of revenue for the operation and maintenance costs and 5% for other expenses.

2) Financial Rate of Return (FIRR) and Net Present Value (NPV)

The following assumptions are made to compute the FIRRs and NPV;

(1) Project Life Span is 25 years after opening;

(2) Construction starts in 1997 for 3 years after completion of the Engineering Services and the ROW acquisition; (refer to Chapter 13).

(3) Operation and management is to be carried out by a company with BOT scheme;

(4) For FIRR and NPV calculation, two prices are used,
- Constant 1994 prices
- Current prices with 7% p.a. escalation (for both costs and toll rate). (Assumptions for Cash-flow analysis)

(5) As a sensitivity analysis, construction of frontage road and ROW acquisition being carried out by the Government is examined.

The results are as follows :

Cost	1994 Constant Price		Current Price	
	FIRR (%)	NPV (billion Rp.)	FIRR (%)	NPV (billion Rp.)
Cost Case 1	7.3	-243	14.8	312
Cost Case 2	8.8	-146	16.4	433

Cost Case 2 : When the construction of frontage road and land acquisition are made by the government.

3) Cash-Flow Analysis

The assumed conditions for the cash flow analysis are as follows, including the conditions to examine the sensitivity :

- Equity Ratio : 20% and 30%
- Long term loan : interest rate of 11% p.a. with the grace period during construction period and 15 years equal capital repayment
- Short term loan : 18% p.a. interest rate.
- Cost Case : 1) 100% of Project costs by the tollway operator,
  2) Less frontage road and related improvement construction costs, as well as land acquisition costs
- Management costs (including dividend) : two alternatives for the 30% of Equity case; 10% of revenue, and 10% of equity annually.
- A conservative assumption of no revenue in partial opening in year 2000 was applied for the cash flow analysis.

The results for the base cases are shown in Table 6.12, and the results for alternative cases are shown in Table 6.13.

Table 6.12 Financial Evaluation (Base Cases)

	Cost Case 1		Cost Case 2	
	Equity Ratio		Equity Ratio	
	20 %	30 %	20 %	30 %
	Case 1	Case 2	Case 3	Case 4
1) Interest During Construction (IDC) (bil. Rp.)	398	348	326	285
2) Year of Single Year Surplus	2013	2010	2009	2007
3) Year of Accumulated Surplus	2019	2015	2015	2012
4) Year of Maximum Short-term Loan and Amount (bil. Rp.)	2012 (1,155)	2009 (484)	2008 (402)	2006 (114)
5) Total Tax Paid up (bil. Rp.)	2,397	2,865	2,964	3,132

Note : Cost Case 1) 100% of Project costs by the tollway operator,
Cost Case 2) Less frontage road and related improvement construction costs, as well as land acquisition costs

Table 6.13 Financial Evaluation (Alternative Cases)

	Cost Case 1		Cost Case 2	
	Management Cost		Management Cost	
	10% of Revenue	10% of Equity	10% of Revenue	10% of Equity
	Case 5	Case 6	Case 7	Case 8
1) Interest During Construction (IDC) (bil. Rp.)	348	348	285	285
2) Year of Single Year Surplus	2011	2014	2008	2010
3) Year of Accumulated Surplus	2017	2021	2013	2016
4) Year of Maximum Short-term Loan and Amount (bil. Rp.)	2010 (673	2013 (1,477)	2007 (204)	2009 (539)
5) Total Tax Paid up (bil. Rp.)	2,558	2,207	2,894	2,930

Note : Equity ratio is 30%.
Cost Case 1) 100% of Project costs by the tollway operator,
Cost Case 2) Less frontage road and related improvement construction costs, as well as land acquisition costs

Through evaluation of the above results, including the sensitivity to the management expense, this tollway under the toll rate of Rp.3,000 per trip in 1994 price is financially evaluated as being viable.

7. CONCLUSIONS AND RECOMMENDATIONS

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7.1 Conclusions

1) Basic Road Development Concept

The basic road development concept in Jakarta metropolitan area which is formulated based on Jakarta 2005, the master plan of road development in Jakarta city , the recommended scheme of JMDPR and the study results delineates the functional road network targeted in the year 2010.

The targeted roles and functions of project roads are to be designated on the assumption that the development concept would be realized, while the development concept stimulates development potential to sustain forecasted traffic demand in the project area, and ascertains the anticipated benefits resulting from the project.

2) Necessity and Urgency of the Project

Present chronic traffic congestion on major arterial roads necessitates the promotion of the development of a functional road network in Jakarta metropolitan area as soon as possible. This pertains especially to an alternative route of north-southward thoroughfares and a new east-west thoroughfare in conjunction with on-going tollway development and arterial road improvement.

It is predicted that delays in improvement of transport sector infrastructures, including development of a high standard road network and introduction of a mass transit system, will impede enhancement of the regional economy and will stifle the development of a desirable urban structure.

Only if the project roads are realized to increase traffic capacity, integrated effects of urban development along major arterial roads such as a great number of public institutions and business facilities, modernization of urban landscapes and housing complex with high living standard will be secured.

3) Feasibility of the North - South Axis

(1) Technical Feasibility

Taking into account severe physical constraints such as limited ROW, elevated roads, high-rise buildings and monumental statue, the North - South Axis can manage to connect Kota to JORR in Cilandak by an elevated road on viaduct in the whole stretch utilizing public spaces above roads and rivers with special structures of double deck with racket piers. Resultantly, additional land acquisition is minimized and it is limited to at localized areas.

(2) Economic Feasibility

High economic returns are expected in all economic parameters such as B/C of 2.5 in case of 15% discounted rate and EIRR of 31.9% even though construction cost is considerably high.

(3) Financial Feasibility

The implementation of the North - South Axis by a BOT scheme is financially feasible on the assumption that the toll is 3,000 Rp/trip with the escalation of toll rate by 7% per annum, the equity share is 30%, and the interest rates of the long-term loans are less than 11%.

4) Feasibility of the East - West Axis

(1) Technical Feasibility

The proposed route location coincides in principle with city planning roads. To secure technical feasibility, a 40 m ROW scheme is adopted in developed area, while a 70 m ROW scheme is proposed in undeveloped areas as well as in urban redevelopment areas. It is indispensable to introduce a land readjustment technique to the urban redevelopment areas to avert resettlement problems.

(2) Economic Feasibility

All of the economic parameters show a high economic feasibility, even when only direct benefits are taken into consideration. That is B/C is 4.3 in case of 15% discounted rate and EIRR is 33.2%. Indirect benefits such as development impacts along the East - West Axis would further enhance the economic feasibility of the project.

5) Environmental Impacts

The Central AMDAL commission has already issued the recommendation to the Minister for the approval of the ANDAL report for the project, which concluded that the expected negative impacts can be mitigated up to present level by applications of appropriate environmental considerations and measures. The Minister issued the approval of the ANDAL report in due procedure.

6) Overall Evaluation

The project roads in the priority sections are evaluated, considering that the targeted role and function of the North - South Axis are to strengthen the exiting north-south thoroughfare, while that of the East - West Axis is to stimulate the development of planned east and west primary centers, to enhance the road capacity in the housing development area and to support through traffic in the central urban area.

The road configurations of the East - West Axis are to have elevated road on viaduct in built-up area and to have wide ROW with multi lanes. It is likely possible to keep good urban environment along road because potential high-rise buildings will work as a buffer for noise and air pollution.

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

Though the construction of the East - West Axis requires huge investment, the economic feasibility is enough high, considering direct benefits only. Annual required fund during construction is estimated 270 billion Rupiah at peak, and it accounts for 6 % of total development budget in transport and tourism sector. However, it is likely possible to implement the project, taking into considerations the development of Jakarta Intra Urban Tollway in assistance with official development aides for a long span of time.

The North - South Axis is designed as a full access controlled road to pass built-up area in its entire stretch. In order to make it practical and realistic, the route is selected to pass in public spaces such as the spaces above roads and rivers. Even steel structure of double deck with racket type pier, which it requires rather high technique and is possible to fabricate in Indonesia, is adopted where severe land conditions are found. Through the construction of the North - South Axis requires huge investment, the project is evaluated enough feasible economically and financially.

7.2 Recommendations

1) Land Acquisition for the Project Roads

It is indispensable to succeed a road project to freeze landuse, to control development and to acquire land along the proposed routes. Well begun is half done. Once the ROW acquisition problems are solved in an early stage it may be said that the urban road development is successfully completed in its major parts. It is strongly recommended that the exact future ROW should be determined at an earliest day possible based on a detailed design. Simultaneously, it is necessary to freeze landuse and to control development along the proposed routes based on this study.

2) Administrative Measures to incorporate the Scheme of Project Roads

The scheme of project roads still necessitates some modification of preceding projects or further considerations taken in planning along the proposed routes. The followings are pointed out to require administrative measures as of now;

North - South Axis

1) Modification design on Jakarta Outer Ring Road (JORR)
2) On/Off ramps at Pejompongan
3) Viaduct on Jl. Jati Baru
4) Utilization of space above the Kali Ciliwung

East - West Axis

1) Modification designs of both the western and the eastern sections of JORR
2) Future expansion of Taman Permata Buana housing estate
3) Urban betterment in Kec. Tambora and Kec. Grogol Petamburan

3) Implementing Body of the Project

(1) North - South Axis
Private investors in joint-venture with PT. Jasa Marga are recommended as the implementing body of the development of the North - South Axis.

(2) East - West Axis
DKI Jakarta is recommended as the implementing body of the development of Sections 1, 2 and 4 of the East - West Axis, while Bina Marga is recommended as the implementing body of the development of Section 3 of the East - West Axis, taking into account a strategic value in the national interest.

4) Improvement Plans of Related Facilities

The development of the toll road necessitates the improvement of parallel arterial streets and adjacent at-grade intersections to On/Off ramps. The development of the East - West Axis on existing roads also necessitates the improvement of existing roads as frontage road and adjacent at-grade intersections to On/Off ramps. To develop a functional road network and to stimulate the diversion of medium to long trip traffic from existing north-south thoroughfares, the following administrative measures are necessary:

(a) Imposing an exclusive bus lane on existing north-south thoroughfares
(b) Relieving prohibition of right-turn at intersections
(c) Improving channelization of intersection and crossing roads
(d) Reviewing truck lanes, especially for crossing roads adjacent to On/Off ramps

On the other hand, the development of the toll road also necessitates establishment of parking space allocation wherever buildings will be developed in the urban area.
It is recommended that Bina Marga should initiate due procedures to promote these measures by agencies concerned under its jurisdiction.

5) Implementation of Basic Road Development Concept

It is indispensable to develop the East - West Axis in the entire stretch. Accordingly a feasibility study on the remaining should be carried out sections of Tangerang to the western section of JORR and Bekasi to the eastern section of JORR. Furthermore, the proposed Botabek Ring Road in conjunction with the remaining sections should be studied as soon as possible.

6) Urban Betterment by Land Readjustment

Urban betterment designated by the masterplan of Jakarta 2005 requires considerable public spaces in the high destiny, low income housing area in Kota. To carry out such urban betterment successfully, it is necessary to introduce land readjustment techniques to avert resettlement problems. It is recommended that the development of the East - West Axis in Kecamatan Grogol Petamburan and Kecamatan Tambora will be implemented under such a scheme as a pilot project.

7) Land Acquisition and Property Compensation

The conventional land acquisition method of purchasing land with money is still available in the case that the local government can settle the negotiation with affected land owners and inhabitants regarding prices and other conditions. It is recommended that sufficient time and compensation which ascertain not only land but also living at a relocated place should be granted to affected inhabitants to resettle.

8) Improvement of Public Transportation

High urban activity can be sustained only if proper modal splits are achieved. High standard roads including toll roads will mainly undertake the mobility of trip purposes of business and commodity, while commuter trips should be undertaken by public transport such as mass transit system and buses. It is recommended that public transport as well as high standard roads should be developed simultaneously to sustain each others.

9) Legislative Measures to Capture Development Gains

It is sure that high development impacts pertain to the project, but it is hard to capture development gains by the present taxation system. Special legislative measures such as contribution of land, sharing costs and revenue of certain local tax should be consider to capture development gains to sustain relevant development and to stimulate similar projects.

10) Intensive Utilization of the Space under Viaduct

The project will create many spaces under viaduct, which may become very lucrative land tenure. In Japan, for example, spaces under viaduct sometimes are utilized as parking lots, office and business purposes and play grounds. It is recommended that intensive utilization of space under viaduct should be studied.