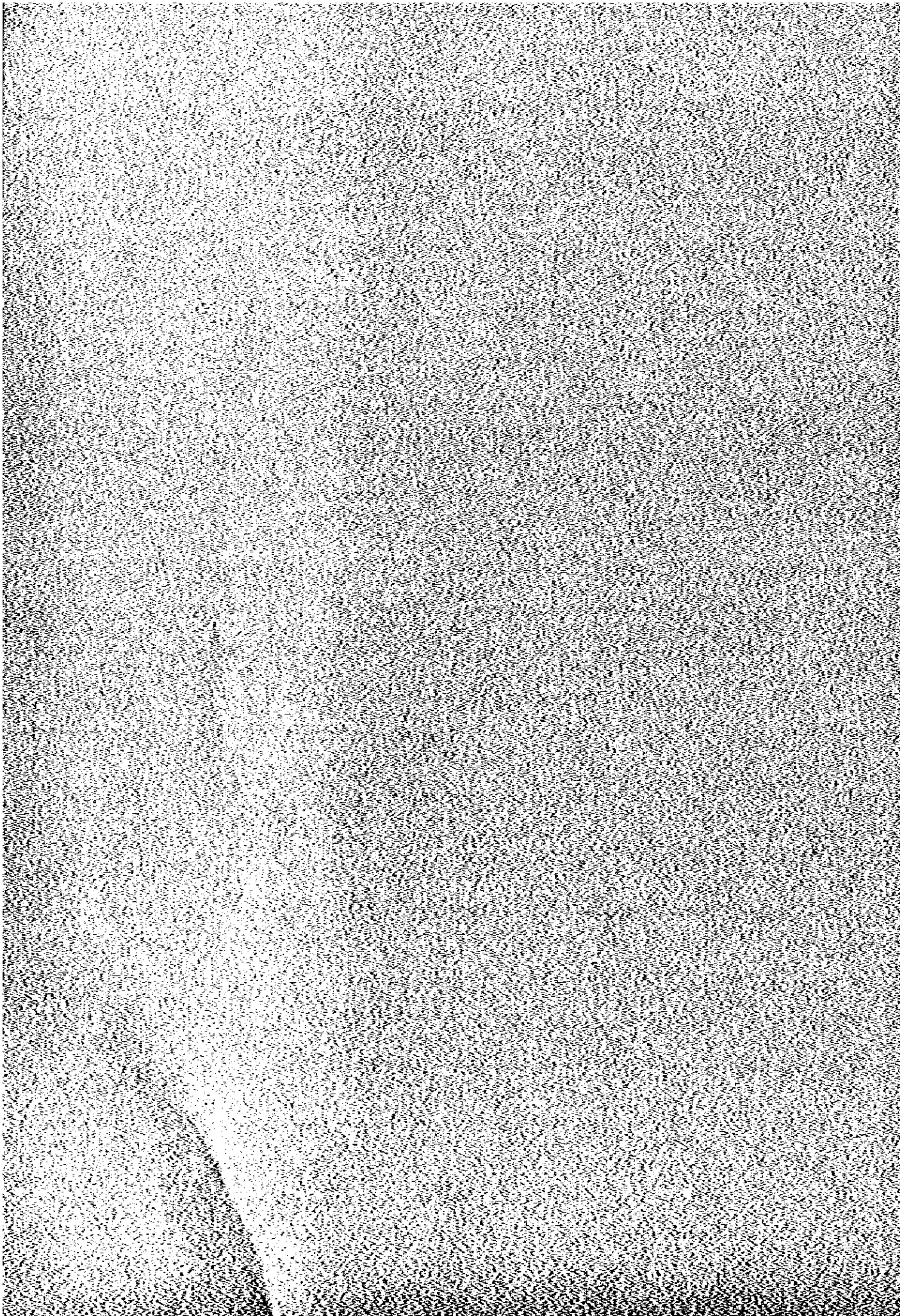


**Chapter 9**

**FINANCIAL ANALYSIS**



## Chapter 9. FINANCIAL ANALYSIS

### 9.1 General

The financial analyses of Short Term Improvements in "Medan Area Transportation Study" are divided into the followings.

- i) Financial analysis of general public works;
- ii) Revenue and expenditure analysis

As for Financial analysis of general public works, it is necessary to consider which governmental agencies are responsible for the financial costs of those improvement alternative plans. In this chapter, a comparison is made between those financial costs of the plans and a part of expenditure for public works in Medan Municipal Government, and responsibility of State Railway on railway investment.

On the other hand, the following categories are analyzed in their revenues and expenditures.

- Railway passenger service to be re-opened between Medan and Belawan;
- Bus loop service to be opened.

However, as the number of daily passengers in 1985 is estimated as small as 3,600 in the railway passenger service between Medan and Belawan, this plan should be reconsidered after finalizing Long Term Master Plan of railway transport. Therefore, financial analysis has not been carried out on the railway passenger service due to the assumption that such a plan mentioned here will be taken into consideration in the study for after 1985 A.D., and only the bus loop route service is analyzed as is described in the following section.

### 9.2 Public Works

#### (1) Financial Analysis on Medan Municipal Government

The present situation of revenues and expenditures of Medan Municipal Government is shown in Table 9.2.1.

Attention should be given to items 2.1 and 2.2 in Table 9.2.1.1 for the analysis, namely "2.1" indicates the expenditures for heavy repairs and maintenance of roads, bridges and irrigations while "2.2" shows that of new construction of roads, bridges and irrigations. How much are the average annual growth rates of those items is the key point on this analysis. In this analysis, 10% of real annual growth rate is adopted judging from the average annual growth rates for North Sumatra Province.

Table 9.2.1.1 Annual Revenues Medan Municipal Government  
(1975/1976)

		(Unit: Rp x 10 <sup>3</sup> )
Item	Amount	
<u>Total Amount</u>		<u>4,772</u>
<u>1. Current Receipts</u>		<u>2,866</u>
1. 1 Local Tax		1,253
1. 2 Receipt for Services		581
1. 3 From Official Service		322
1. 4 Current Transfer		522
1. 5 Loans		-
1. 6 Rental Receipt		-
1. 7 Regional Development Contribution		-
1. 8 Local Government Enterprises		-
1. 9 Sales of Secondhand Goods		-
1.10 Others		158
<u>2. Development Receipts</u>		<u>1,906</u>
2.1 Previous Year Surplus		53
2.2 From Central Government		445
2.3 First Stage Regional Government		-
2.4 Regional Development Contribution		216
2.5 Local Funds		1,120
2.6 Others		72

Table 9.2.1.2 Annual Expenditures, Medan Municipal Government  
(1975/1976)

		(Unit: Rp x 10 <sup>3</sup> )
Item	Amount	
<u>Total Amount</u>		<u>4,934</u>
<u>1. Current Expenditures</u>		<u>3,029</u>
1.1 Personnel Expenditures		763
1.2 Material Expenditures		239
1.3 Transfer Grants		7
1.4 Debt & Interest Repayment		-
1.5 Rental Payment		-
1.6 Positive Repair & Maintenance		180
1.7 Others		1,840
<u>2. Development Expenditures</u>		<u>1,904</u>
2.1 Heavy Repair & Maintenance of Roads		381
2.2 Construction of New Roads		341
2.3 Capital Expenditures on Equipment Vehicles & Machines		202
2.4 Capital Transfer to Lower Regions		2
2.5 Others		97

Source: "STATISTIK KEUANGAN PEMERINTAH DAERAH"  
DAERAH TINGKAT II (Kabupaten/Kotamadya) 1975/1976

The results are tabulated in Table 9.2.2

Table 9.2.2 Estimates of Construction Maintenance Expenditures  
(1980/81 - 1985/86)

	(Unit: Rp x 10 <sup>3</sup> )						1980-85 Total
	1975/76	80/81	81/82	82/83	83/84	84/85	
Heavy Repair & Maintenance of Roads & Irrigation	381	614	675	742	817	898	3746
Construction of Roads & Irrigation	341	549	604	665	731	804	3694
<b>Total</b>	<b>722</b>	<b>1163</b>	<b>1279</b>	<b>1407</b>	<b>1548</b>	<b>1702</b>	<b>7440</b>

Note: Estimates are in the price level of 1980.

One more thing to be considered is how to allocate such estimates into the improvements of road facilities.

Judging from the past experiences in Medan Municipality, more than 70 percent is assumed to be allocated to road facilities.

Table 9.2.3 shows the estimates of financial cost of the road improvement plans including that of traffic control systems in short-term.

Table 9.2.3 Estimates of Financial Costs of Road Improvement Plans  
(1980/1981 - 1985/1986)

Item	Capital			Maintenance & Operations (Annual)
	Foreign	Local	Total	
Roads & Bridges*	4,17.7	5806.8	10,224.5	150.4
Traffic Control Devices**	492.7	22.3	515.0	63.7
<b>Total</b>	<b>4910.4</b>	<b>5829.1</b>	<b>10,739.5</b>	<b>214.1</b>

Note: \* Jl. Peinbalagian  
 " Prof. Yamin  
 " Cajah Mada  
 " Peruda  
 Sanbu Terminal  
 Intersection (Jl. Gotot - Celugur)  
 " (Jl. Jati - Yamin)  
 Jl. Wani

\*\* Partial Improvement of one-way  
 Route Coordinated Traffic Signal System

The following priorities of implementation are established only based on the result of cost-benefit calculations judging from the assumptions mentioned above.

Priority	Category
1st:	Localized Change of Signal Control
2nd:	Route-Coordinated Signal Control System
3rd:	Improvement of Jl. Pemuda, and Jl. Yani
4th:	Improvement of Jl. Cajah Mada, Zainul Arifin

However, cost-benefit analysis is not always the best way to judge the implementation priority. In some cases, some qualitative judgement seems to be necessary. According to the evaluations on the present transport facilities in Medan city, traffic jam in Pasar Sambu area is considered to be serious and it seems to be impossible to define that cost-benefit analysis can evaluate this condition exactly.

Due to these facts, it is proposed that the improvement of Jl. Cajah Mada and Zainul Arifin should be replaced by the improvement of Pasar Sambu Bus Terminal. Table 9.2.4 shows the results of financial cost of proposed improvement plans on roads, bridges including traffic control systems.

Table 9.2.4 Selected Improvement Plans of High Priority

	(Unit: Rp × 10 <sup>3</sup> )	
	Capital	Annual Maint. Costs & Operation
(i) Localized change of One-Way System	293.1	34.0
(ii) Route-Coordinated Signal Control	132.6*	29.7
(iii) Improvement of Jl. Pemuda, Jl. Yani	1,025.6	18.9
(iv) Improvement of Pasar Sambu Bus Terminal	1,180.5	37.9
<b>Total</b>	<b>2,631.8</b>	<b>120.5</b>

\* Additional Finance

The improvement plans tabulated above are mainly ranked based on their cost-benefit analyses. However, some other improvement plans seem to have rather high priority. For instance, Jl. Prof. Yamin has to be opened by 1985 as an access road to the center of Medan City in conjunction with the construction of Belawa-Medan-Tg. Morawa Highway which is expected to be opened in 1983 or 1984. As is mentioned here, some difficulty in the financial aspect of Medan Municipality can be anticipated. Judging from those financial amounts of improvements it is necessary to be discussed deliberately among governmental agencies concerned on the financial costs to solve the prevailing traffic congestion.

## (2) Financial Cost of Other Improvement Plans

Table 9.2.5 shows the financial cost and the annual operating and maintenance costs of each improvement plan. With regard to the Route-Coordinated Signal System, only some supplemental cost is to be added to Localized Change of One-Way System.

Table 9.2.5 Summary of Financial Costs of Improvement Plans  
(In Value of January, 1980)

No.	Improvement Plan	Financial Cost	(Unit: Rp x 10 <sup>3</sup> )
			Annual Operat. & Maint. Cost
1	Improvement of Railway Crossing Facilities	358,496	12,154
2	Reopening Commuter Service between Belawan & Medan	3,226,432	147,363
3	Reconstruction of Deck & Resurfacing of Pedestrian Bridge in Medan Station	13,676	294
4	Opening Eastside Gate of Medan Station	860,328	6,503
5	Localized Change of One-Way Traffic Control	293,050	34,040
6	Installation of Route-Coordinated Signal System	221,930	29,670
7	Improvement of Jl. Pembalagian	2,209,000	28,200
8	Improvement of Jl. Prof. Yamin	2,636,400	23,500
9	Improvement of Jl. Gajah Mada & Others	1,512,500	22,100
10	Improvement of Jl. Pemuda & Jl. A. Yani	1,025,600	18,900
11	Improvement of Pasar Sanbu Bus Terminal	1,180,489	37,860
12	Improvement of Intersection (Jl. Gatot Subroto & Jl. Gelgur Bypass)	371,880	6,585
13	Improvement of Intersection (Jl. Jati & Jl. Yanin)	239,186	2,539
14	Opening of a Circulating Bus Route	140,000	62,600
15	Improvement of Jl. Wami	911,600	10,991

### **9.3 Railway Facilities**

The capital and maintenance financial plan for PJKA-SU is shown in Table 9.3.1 and 9.3.2. The costs of the following alternative plans related to the railway is to be included in this financial plans.



Table 9.3.1 Total Capital Expenditure Plan for PJKA-ESU (1979-1988)

Category	1979-1983			1984-1988		
	FC	LC	Total	FC	LC	Total
	(Unit: Rp x 10 <sup>3</sup> )					
(i) Track renewal	6,083.5	3,488.0	9,571.5	6,083.5	3,488.0	9,571.5
(ii) Signaled Comm. renewal	9,150.3	3,073.0	11,223.3	-	-	-
(iii) Machinery & tools	1,317.0	230.0	1,547.0	250.0	-	250.0
Total	15,550.8	6,791.0	22,341.8	6,333.5	3,488.0	9,821.5

Source: "A Five and Ten year Development Plan 1979 - 1988", Indonesian State Railway, Bandung, 1978.

Table 9.3.2 Total Maintenance Expenditure Plan for PJKA-ESU (1979-1988)

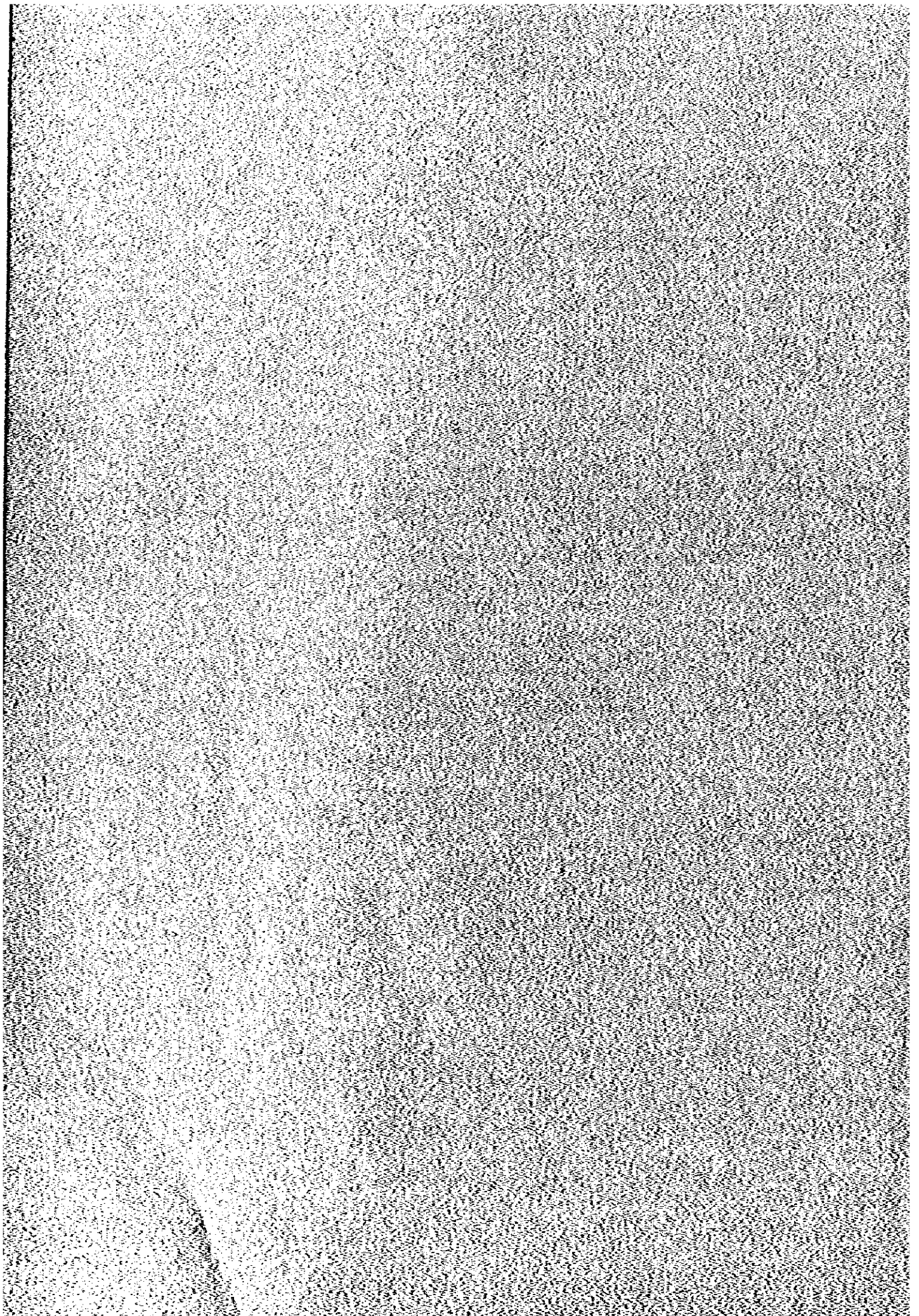
Category	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
	(Unit: Rp x 10 <sup>3</sup> )									
(i) Tracks	1,787.3	1,696.2	1,595.2	1,489.0	1,382.5	1,281.7	1,176.5	1,162.5	1,149.0	1,135.2
(ii) Bridges	173.9	173.9	173.9	173.9	205.4	205.4	172.5	172.5	172.5	172.5
(iii) Buildings	110.3	119.8	127.1	135.1	144.0	153.8	164.5	164.5	164.5	164.5
(vi) Others	343.7	349.6	355.2	361.1	367.1	373.1	373.1	373.1	373.1	373.5
Total	2,415.2	2,380.5	2,251.4	2,159.4	2,099.0	2,014.0	1,886.6	1,872.8	1,859.1	1,845.3
FC	397.8	382.8	369.1	353.9	338.1	323.6	308.7	308.7	308.7	308.7
LC	2,017.4	1,956.7	1,882.3	1,805.2	1,760.9	1,690.4	1,577.9	1,564.1	1,550.4	1,536.6
Total	2,415.2	2,339.5	2,251.4	2,159.1	2,099.0	2,014.0	1,886.6	1,872.8	1,859.1	1,845.3

Source: "A Five and Ten year Development Plan 1979-1988", Indonesian State Railway, Bandung, 1978.



**Chapter 10.**

**IMPLEMENTATION PROGRAM**



## Chapter 10 IMPLEMENTATION PROGRAM

Table 10.1 is the summary of all proposed improvements for the short-term which are already fully described in previous chapters. In the Table the original capital investment costs are results of calculations based on the price level of January 1980, and they are distributed to the proposed fiscal years. Then, the allowance of 10% per annum due to price escalation are applied to them according to every corresponding years.

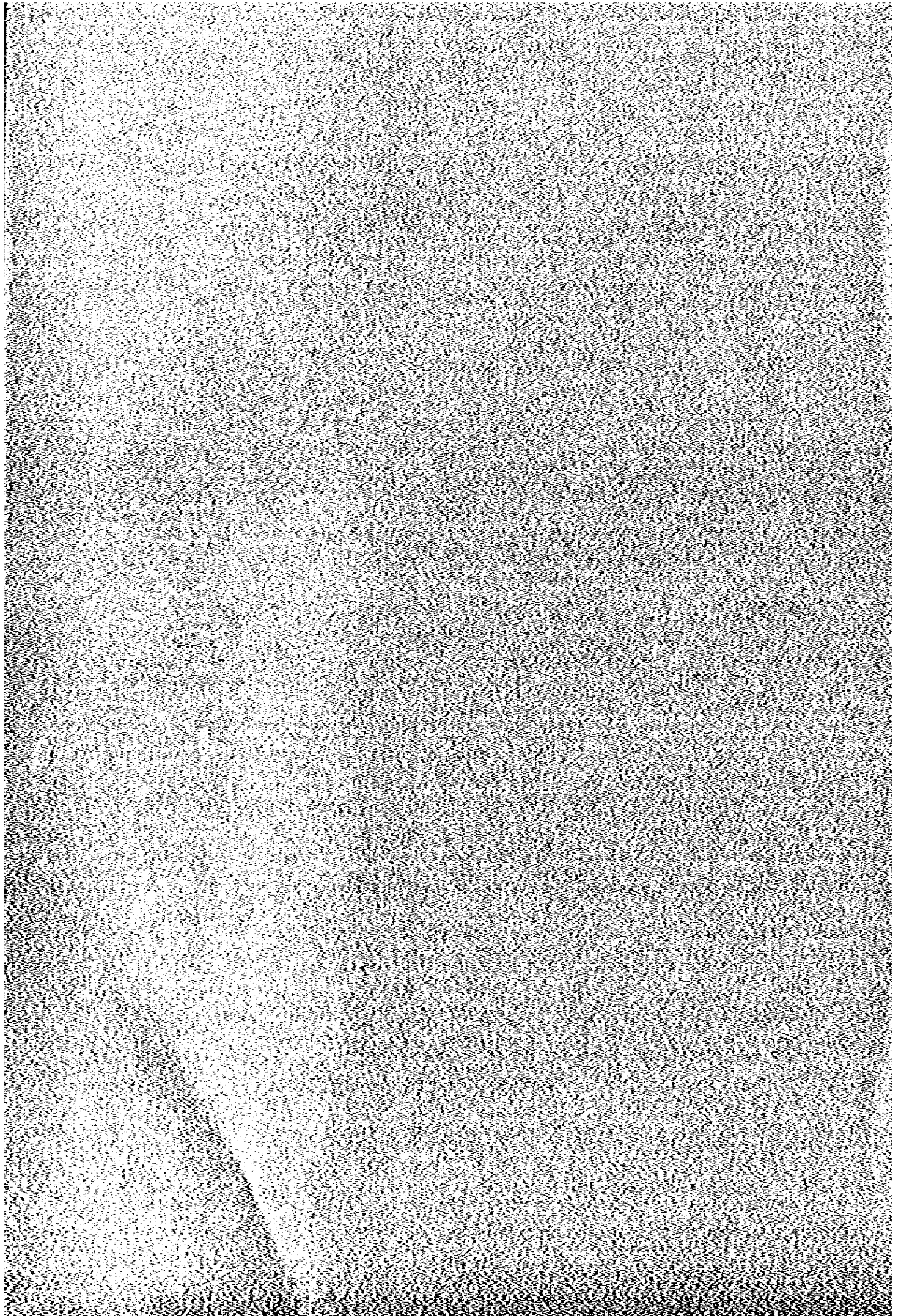
Table 10.1 Implementation Programme of All Proposed Improvement Plans

Category	Project No.	Improvement Plans	Capital investment cost in the value of January, 1980 Rp.x10 <sup>6</sup>	Quantity	Priority	Implementation (Unit Rp.x10 <sup>6</sup> )						
						1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	TOTAL
Railway	1	Improvement Railway Crossing Facilities	358.5	10 locations	First priority		394.4	-	-	-	-	394.4
	2	Reopening Passenger Service between Belawan and Medan	3,226.4	20 km, 12 diesel Cars	Scheduled to reopen in 1980/81	3,226.4	-	-	-	-	-	3,226.4
	3	Reconstruction of Deck of Pedestrian Bridge in Medan Station	13.7	240 sq. m	Second priority	-	-	16.6	-	-	-	16.6
	4	Opening Back Side Gate of Medan Station	860.3	-	To be considered in long term	-	-	-	-	-	-	-
Traffic Control Device	5	Partial improvement of One way Traffic Control	293.1	26 places	First priority	-	322.4	-	-	-	-	322.4
	6	Installation of Route coordinated signal system	132.6	15 places	First priority	-	145.9	-	-	-	-	145.9
Road	7	Improvement Jl. Pembalagian	2,209.0	3.8 km	Second priority	-	-	534.6	1,176.2	1,293.7	-	3,004.4
	8	" Jl. Prof. Yamin SH	2,636.4	3.7 km	Second priority	-	-	638.0	1,403.5	1,543.9	-	3,585.4
	9	" Jl. Cahaj Madah	1,512.5	0.6 km	Second priority	-	-	-	-	664.4	1,705.0	2,369.4
	10	" Jl. Pemuda, Jl. J. A. Yari	1,025.6	1.7 km	First priority	-	564.1	620.5	-	-	-	1,184.6
	15	" Jl. Wani	911.6	0.9 km	Second priority	-	-	330.9	849.3	-	-	1,180.2
Inter-Section	12	Improvement of Inter-section	371.9	1 location	Third priority	-	-	-	-	-	598.9	598.9
	13	"	239.2	1 location	Third priority	-	-	-	-	-	385.2	385.2
Bus Facilities	11	Improvement of Pasar Sumbu Bus Terminal	1,180.5	1 location	First priority	-	649.3	714.3	-	-	-	1,363.6
	14	Bus Loop Route Service	140.0	7 buses	Second priority	-	-	169.4	-	-	-	169.4
Administration and Others	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL:			15,111.3			3,226.4	2,076.1	3,024.3	3,428.9	3,502.0	2,689.1	17,946.8

Notes (1) " Marked figure means an additional cost for project No. 5

(2) The escalation allowance of 10 percent per annum are applied to distributed costs according to their fiscal years.

**APPENDICES**





APPENDIX 1GLOSSARY OF TERMS & ABBREVIATIONS

AASHO	:	American Association of State Highway Officials
A.D.	:	Anno Domini (Latin). In the Year of Our Lord
ADB	:	Asian Development Bank
ADT	:	Average Daily Traffic
APB	:	Administrator Pelabuhan Belawan Belawan Port Authority
Area Coordinated Signal System	:	A traffic control system to utilize a wide-area road network most effectively for traffic demand, varying hourly by route as well as by zone. In this system a group of individual traffic signal installations at all intersections in the said area are mutually-related through an electronic computer. Another name is Area Full-Traffic Actuated Control System.
BAPPENAS	:	National Planning Board of Indonesia
BAPPEDA - SU	:	Planning Board of Province of North Sumatra
B/C	:	Benefit/Cost Ratio
BCEOM	:	Bureau Central par des Equipement d'Outre-Mer. French Consulting Firm which is conducting North Sumatra Transport Study Project'
Becak	:	Three-wheeled pedalled bicycle carrying a passenger or commodities in an attached side-car.
Becak-Mesin	:	Three-wheeled motorized bicycle carrying one or two passengers in an attached side-car
Bemo	:	Three-wheeled small bus capable of carrying 6 - 9 passengers plus a driver
Bina Marga	:	Directorate General of Highways, Ministry of Public Works
CBD	:	Central Business District
c.c.	:	Cubic Centimeter
Central Core District	:	The area covering zones #1 - #8 and 14 - 15, which is the most intensely populated area in the City and is smaller than that of the so-called CBD
Centroid Connector	:	An imaginary link connecting the zone centroid to the network. In case of a road network, such a link would represent the access or local roads.
CIF	:	Cost, Insurance & Freight. Terms of sale of commodities including transport to foreign port. Seller assumes freight charges etc. to foreign port.
CIPTA KARYA	:	Directorate General of Housing Building Planning and Urban & Regional Development, Ministry of Public Works

Cordon Line	:	An imaginary line which completely encloses a given area and at which traffic counts and interviews are taken for control purposes
CBR	:	California Bearing Ratio. Unit to be used to express bearing power of soils
Daihatsu	:	Micro-bus converted from pick-up truck carrying 8 - 11 passengers plus a driver. Oplet is its another name.
DACREA	:	Indonesian Consultants Firm participating in MUDS
DAMRI	:	P.N. DAMRI State-Owned Bus Company of Indonesia
DLAJR-SU	:	Dinas Lalu Lintas Dan Angkutan Jaya Raya Provinsi Daerah Tk. I. Sumatera Utara Office of Road Transport, Province of North Sumatra
DME	:	Distance Measuring Equipment Radar for Aircraft for the use at airport
DKI Jakarta	:	Daerah Khusus Ibukota Jakarta Area of the Capital Jakarta, also Province of Jakarta
DPUP-SU	:	Dinas Pekerjaan Umum Propinsi Sumatera Utara Public Works Office, Province of North Sumatra
DPU-Tk. II Medan	:	Dinas Pekerjaan Umum Tingkat II, Medan Public Works Office, Medan Municipal Government
DWT	:	Dead Weight (Tonnage). Maximum carrying capacity of ship including fuel, stores etc.
Engineering Science	:	American Consulting Firm conducting Medan Urban Development, Housing, Water Supply and Sanitation Project as the prime consultant of a Joint Venture with Sinotech
Exterior Study Area	:	Surrounding areas of Medan City to be covered in a radius of about 20 km from the center of the CBD It contains zones #58 - #69.
F.C.	:	Foreign Currency Portion
FOB	:	Free on Board. Exporter/Shipper responsible for loading costs of commodities onto ship
GDP	:	Gross Domestic Products
GH	:	Green hour of traffic signal indication
GRDP	:	Gross Regional Domestic Products
ha	:	Hectare or 10,000 m <sup>2</sup> in area
HCM	:	Highway Capacity Manual
H.P.	:	Horse Power
IBRD	:	International Bank of Reconstruction and Development
Internal Study Area	:	The city area of Medan inside of the city boundaries before 1973, covering 4 Kecamatan which include zones #1 - #46.

Intermediate Study Area	:	The area between the boundary of the Internal Study Area and that of the present city boundary, covering zones #47 - #57.
I.R.R.	:	Internal Rate of Return
Jl.	:	Jalan; Street
JICA	:	Japan International Cooperation Agency
JTC	:	Japan Transportation Consultants Company, Tokyo
Kab.	:	Kabupaten. Regency Province of North Sumatra is divided into 3 Kotamadyas and 14 Kabupatens.
Kp.	:	Kampung. Kabupatens are further divided into the smallest administrative unit of Kampung.
Kecamatan	:	Kabupaten and Kotamadya are divided into Kecamatan. For example, Kot. Medan is divided into 11 Kecamatan.
KIP	:	Kampung Improvement Programme
Kot.	:	Kotamadya. Administrative unit of Urbanized area, such as city and town.
Kot. Medan	:	Office of Medan Municipal Government
KPH	:	Kilometer per hour. Unit to express speeds.
L.C.	:	Local Currency Portion
LCN	:	Load Classification Number System for airport pavement
Legibility	:	Traffic sign's legibility consists of two qualities; pause legibility and glance legibility. The former is the distance at which a traffic sign can be read in an unlimited time, while the latter is the distance at which a traffic sign can be read at a glance (usually 0.5 to 1.4 sec. with a glance area in a 3-deg. cone, which is a cone of approximately 1.25 diameter at 25 m distance).
LI	:	Liquid Index
Link	:	An element in a network which connects two nodes
Modal Split	:	The proportions of trips using various modes of transport
MPH	:	High Level of Motorization
MPL	:	Low Level of Motorization
MUDS	:	Medan Urban Development Study
O - D	:	Origin - Destination
Offset	:	The number of seconds or percent of the time cycle that the green indication of traffic signal appears at a given control signal after a certain instant used as a reference.

Outer Study Area	:	The area includes Kab. D. Serdang, Kab. Langkat and Kot. T. Tinggi, covering zones #67 - #69.
PADCO	:	Indonesian Consultant Firm Participating in MUUS.
Pasar	:	Market Place
P. Batu	:	Pancur Batu, a small town situating south-west of Medan City in a distance of about 17 km from the center of Medan City and the end of P. Batu Line of the railway which is not in use presently.
PC	:	Pre-stressed concrete
PCI	:	Pacific Consultants International, Tokyo
PCU	:	Passenger Car Unit to express traffic volume
Pelita III	:	The Third 5-Year Development Plan
PHBD	:	Direktorat Jenderal Perhubungan Darat Directorate General of Land Transport and Inland Waterways
PJKA	:	Perusahaan Jawatan Kereta Api Indonesian State Railway
PJKA-ESU	:	Indonesian State Railway North Sumatra Regional Office
PERTAMINA	:	Indonesian State-Owned Company of Petroleum
PERMUNAS	:	Indonesian National Urban Housing Board
PLN	:	Indonesian National Electricity Company
Priority Value	:	Quality which results in a traffic sign being consistently read first in preference to all other traffic signs in a group
R 2 Rail	:	European Rail standard having 25 kg/m in weight and capable of 9 tons of axle loading.
R 14 Rail	:	European rail standard having 50 kg/m in weight and capable of 18 tons of axle loading.
RBO - II	:	Regional Betterment Office - Region II, Bina Marga
RC	:	Reinforced concrete
Recognition	:	Recognition of a traffic sign is achieved by a combination of standardization (including size, shape, color) and overall design.
Route Coordinated Signal System	:	Progressive Signal System. A signal system consist of two or more individual signal installations operated in coordination, i.e., having a fixed time-relationship to each other. To maintain such a fixed time-relationship, the total cycle length at all installations normally must be equal. In unusual cases, one installation might operate at double or half the cycle length of the system or, in the case of an actuated signal with a variable cycle, only its start of one phase is in a fixed-time relationship with other instalations.

Rp	:	Rupiah
Rp x 10 <sup>3</sup>	:	Million Rupiahs
Rp x 10 <sup>6</sup>	:	Billion Rupiahs
Running Speed	:	The speed of traffic between intersections, excluding intersection delay
SAUTI	:	Italian Consulting Firm which conducted the feasibility study of Medan - Padang Highway Project and also that of Belawan - Medan - T. Morawa Highway
Screen Line	:	An imaginary line drawn across part of a study area. The total number of movements of any particular type observed crossing the screen line is compared with the estimated present-day volumes obtained from the traffic model, and the comparison used to assess the ability of the traffic model to forecast the present-day patterns of movement.
SD	:	Primary School
SINOTECH	:	Taiwanese Consulting Firm participating in MUDS as a member of a Joint Venture with Engineering Science
SLP	:	Secondary School, Junior High School
SLA	:	Senior High School
Study Area	:	The area including 4 administrative areas of Medan City, Kot. T. Tinggi, Kot. Binjai, Kab. D. Serdang and Kab. Langkat. The area is also divided into Internal Study Area, Intermediate Study Area, Exterior Study Area and Outer Study Area for study purpose. The total of those study areas excluding Outer Study Area is covered in an circular area of a radius of 20 km from the center of Medan City.
Target Value	:	Characteristic that makes a traffic sign as a group of traffic signs stand out from the background and surrounding objects.
Tk. II	:	Tingkat II The Second Stage
T. Morawa	:	Tanjung Morawa, a town in Kab Deli Serdang, situating immediately outside of the city border of Medan's south-east corner. at a distance of 16 km from the center of Medan City.
T. Tinggi	:	Tebing Tinggi, a town in Kab. Deli Serdang, situating in the south-east direction of Medan City at a distance of 79 km from the center of Medan.
Traffic zones	:	A basic unit for travel analysis, drawn up on the basis of the transport system, major barriers to traffic flow and land-use characteristics.

Transport model	:	The series of models including the trip end model, distribution model, modal split model and assignment model
Travel Speed	:	The speed of traffic including running speeds and intersection delay
Trip ends	:	The origin or destination of a trip
Trip Matrix	:	An arrangement of values in the form of a table for transport planning, the values often arranged are intrazonal and interzonal trips in the form of a trip matrix
Through Band	:	The time in seconds elapsed between the passing of the first and the last possible vehicle in a group of vehicles moving in accordance with the designed speed of a route coordinated signal system.
U-Ditch	:	U-shaped concrete ditch
UNDP	:	United Nations Development Programme
US-AID	:	United States Agency for International Development
Walikotamadya	:	Mayor's Office
Weight Bridge	:	Scaling Station to weight truck weight together with pay loads. The station is operated by DLAJR.
Wilajah	:	District. Province of North Sumatra is divided into Wilajah I, Wilajah II and Wilajah III. Wilajah I consists of Kab. Langkat, Kab. Deli Serdang, Kab. Bedagei, Kab. Karo, Kab. Dairi
Zone centroid	:	A point which represents a traffic zone for the purposes of traffic analysis.

APPENDIX 2

Currency equivalents

Rp. 625 = US\$ 1.00 = ¥240

In all figures, decimal is indicated with a dot; and thousand, million and billion are marked off with comma.

Fiscal Year

April 1

-

March 31

### APPENDIX 3

#### References :

1. Highway Capacity Manual 1965, Highway Research Board, Special Report No. 87
2. Traffic Engineering Handbook, Institute of Traffic Engineering, Washington D.C., 1965.
3. Highway Traffic Data Book, Japan Institute of Traffic Engineering Research, Tokyo, 1976.
4. Channelization, The Design of Highway Intersections at Grade, Highway Research Board Special Report No. 74, 1962, Washington D.C.
5. A Policy on Design of Urban Highways and Arterial Streets, 1973, American Association of State Highway and Transportation Officials, Washington, D.C.
6. Manual on Uniform Traffic Control Devices, for Streets and Highways U.S. Department of Transportation, Federal Highway Administration 1971.
7. Traffic Capacity Analysis of Road Intersections, Public Roads, Vol. 34, NO. 9 & 10, Bureau of Public Roads, Department of Commerce, Washington, D.C.
8. Road User Benefit Analysis for Highway, A.A.S.H.O. Committee on Planning and Design Policies, 1960.
9. Quantification of Road User Savings, by Jan De Welle, World Bank Staff Occasional Papers No. 2, 1967.
10. Economic Analysis for Highways, Prof. R. Winfrey, International Textbook Co., Scranton, Pa. 1969.
11. Toll Financing of Highways : Economic and Finacial Considerations. By Nail Cergiz Yu cel Bank Staff Working Paper No. 187





JICA