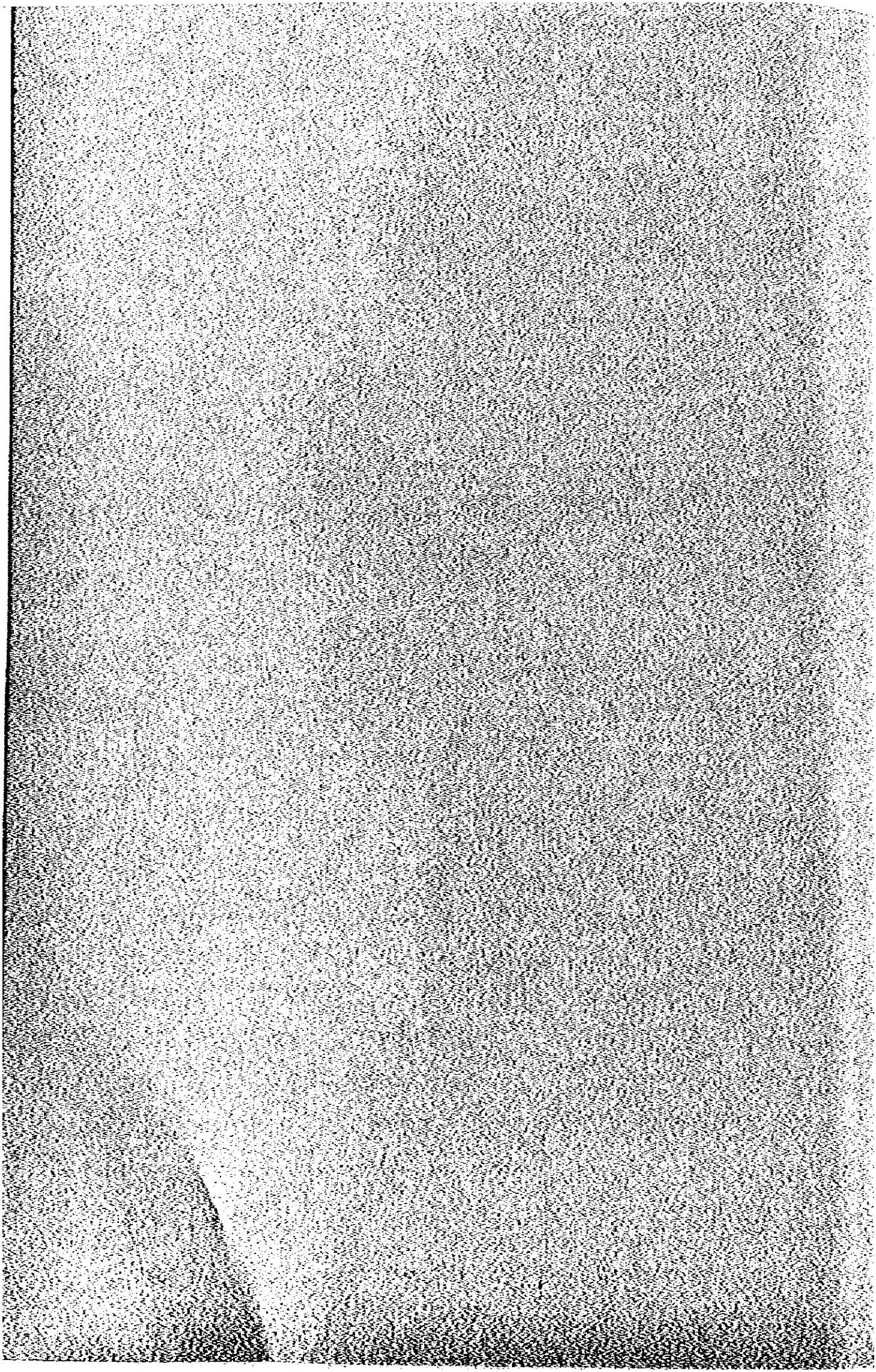
Chapter 5.

RELEVANT DEVELOPMENT PROJECTS AND STUDIES



Chapter 5. RELEVANT DEVELOPMENT PROJECTS AND STUDIES

In this chapter concerning relevant development projects under study or implementation, which seem to give some impact and framework for the Medan Area Transportation Study, will be given brief explanations of their characteristics in the following several sections.

5.1 Province-Wide Projects

5.1.1 Asahan Hydro-Power Plant and Alminum Smelter Project

Asahan Hydro-Power Plant & Alminum Smelter Project is the largest in North Sumatra as a comprehensive development project of water resources, industrial and transportational sectors. Major feasures of the project are the construction of a series of hydro-power stations, an aluminum smelter, port facilities of Kuala Tanjung, a new town and related roads. The locations of power station along Asahan River of 150 km long, discharging 3,400 x 10^6 m^3 annually, the outlet of Lake Toba, are 106.4 km upstream from the lower regulating dam and 29.1 km upstream from the upper regulating dam which is still 14.5 km down-stream from Lake Toba.

The power to be generated is to be transmitted to an aluminum smelter to be built at Kuala Tanjung which is 20 km east of Tebing Tinggi or 100 km south-east of Medan City, on a transmission line of 275 kv in capacity covering a distance of 125*km. Port of Kuala Tanjung is close to the smelter which occupies a land of 200 ha facing on the beach. The main features of port facilities are a 2.5 km long pier, and also A,B,C and temporary berths accommodating vessels of 16,000 DWT at A and B berths respectively and 1,000 DWT at C berth and 500 DWT at the temporary berth. The total generating capacity of the power stations when they are completed is 600 Mega Watts, enabling the smelter to produce 225,000 tons of alminum ingot annually by using this power, which is to be exported. A new town of about 200 ha in area is to accommodate 60,000 persons directly related to the project plants and their related facilities.

The total investment for the project is in excess of US$2 billions in 1976 price level.

The whole project is under construction under the direction of BAPPENAS and also under the direct responsibility of P.T. INDONESIA ASAHAN ALUMINIUM.

The expected schedule for the completion of the whole project is as follows:

Stage	Estimated Annual Production of Aluminum
First	75,000 tons (early 1982)
Second	150,000 tons (early 1983)
Third	225,000 tons (early 1984)

including infrastructures such as port facilities at Kuala Tanjung, the road from Tebing Tinggi to Kuala Tanjung, and housing with its affiliated facilities in the new town.

It is expected that this project will be able to induce three groups of industries to be established in this area; they are, aluminum affiliated industries, electric-power consuming typed industries and plantation related industries in Asahan Kabupaten.

The potential impacts from this project on Medan area are expected to be as follows:

(a) Increased demand for supporting services in banking, trading, industrial training and education, and administrative services; consequently, enhancing the existing status of Medan City more strongly as the regional business center;

(b) Migration from Medan Area to Asahan Kabupaten, particularly of industrial and construction workers. Present situation is such that the manpower required is approximately 8,900 workers in construction, while when the production is commenced 2,100 workers will be required for the operation of the smelter.

(c) Accelerated development along Medan-Tebing Tinggi Road may take place due to the increased interaction of the project's industrial production and Medan's service center.

(d) All aluminum products from the smelter and some types of agricultural product of Asahan Kabupaten except palm oil will be exported from Port of Kuala Tanjung.

This project is the most ambitious undertaking in Province of North Sumatra. The impacts of this project at regional level will include increased industrial production and stimulation of economic growth and will change the existing distribution pattern of industrial population as well as urban settlement.

Upon the completion of this project the authority of the project has presently no plan to supply power to Medan area where the power aspect after 1985 is expected still not to be favorable.

Source: P.T. Indonesia Asahan Aluminium

Note : Concerning the item (d), refer to "North Sumatra Transport Study" by BCEOM, Interim Report, Chap. 5, September 1979.

5.1.2 North Sumatra Transport Study Project

Upon the request of Indonesian State Railway, Ministry of Communication and under the financial aid by IBRD, a French consulting firm called BCEOM commenced the study called "North Sumatra Transport Study" in May 1979, in which the consultant is assigned to survey the existing transport facilities including railway, roads and marine port in North Sumatra to survey their past and present traffic handled and their operations, to forecast their future traffic and to propose the improvement of their operations and the necessary improvement of facilities.

Table 5-1-1 Estimated Tonnage of Production by Commodity and Their Annual Growth Rates in North Sumatra

Type of Product	Production(in 1,000 tons)			Growth rate per year (%)		
	1978	1983	1993	1978/83	1983/93	1978/93
Crude Palm Oil*	514	865	1,153	11	3	6
Palm Kernels *	100	150	200	9	3	5
Dry Rubber *	290	350	490	4	3	4
Latex	60	71	103	3	4	4
Tea	19	24	36	5	4	4
Tobacco	2.5	2.6	3	1	1	1
Cocoa	0.8	5	10	-	7	18
Sugar cane	-	12	20	-	5	-
Copra	57	60	81	1	3	2
Coffee	7	9	13	5	4	4
Rice	1,690	2,055	3,042	4	4	4
Other products**	425	490	650	3	3	3
Total	3,166	4,094	5,803	5.3	3.6	4

Note 1) * mark means including Langsa hinterland and production in Aceh.
2) ** mark means cassava, sweet potato and maize.

Table 5-1-2 Estimated Yearly Growth Rates of Capital, Intermediate and Consuming Commodities in North Sumatra (1978-1983 & 1983-1993)

Type of Commodity	Import in 1978 (in 1,000 tons)	Yearly Rate of Growth of Demand (%)	
		1978-1983	1983-1993
Foodstuffs (including rice)	465	8	7
Fertilizer	292	8	4
Mineral Oils	827	9	7.5
Cement	354	15	12
Industrial Products	482	13	12

Table 5-1-3 Estimated Shipments by Sea from North Sumatra (1980, 1983 & 1993)

(Unit: 1,000 tons)

Type of Product	1980	1983	1993
Olein domestic shipments	60	75	100
Crude palm kernel oil domestic shipments	207	284	900
Crude palm oil domestic shipments	54	90	90
Stearin and fatty acid domestic shipments	303	336	-
Crude palm oil overseas shipments			
Total shipment	687	896	1,156

The Interim Report, which was submitted in October 1979, includes descriptions on characteristics of existing transport facilities and the present traffic, the forecasts of the future traffic demand up to the year 1993, the present means of transport and the present and possible outlets of future traffic and to propose a set of solutions, to be studied from economic points of view. In the report the emphasis is placed on the railway freight transport and no description is made on the responsibility of railway in urban passenger transport service in Medan area.

The study is presently still underway, but the followings are their findings on the matters in the present stage of study.

(a) Forecasts of Future Traffic Demand

In the freight transportation the forecasts of future traffic was made based on the possible increase in production by type of product at each plantation estate, taking into account the future aspects of demand and supply in the world, domestic and local markets as well.

From those figures estimated in the above tables it is important to note that rice is noticeable in production but all are to be consumed locally, that palm oil production between 1980 and 1983 is large in growth rate which will become smaller after then and that the overseas shipment of palm oil will become nil after 1990 due to the estimat increase in its domestic demand.

Table 5-1-4 Potential Traffic by Mode of Transport (1978, 1983 & 1993)

Freight Transportation		1978	1983	1993
Rail	(Tonnage in 10^3)	620	1,050	1,490
	(Ton-km in 10^6)	102.4	174.3	255.0
Road	(Tonnage in 10^3)			
	(Ton-km in 10^6)	461.0	693.3	1,887.9
Passenger Transportation				
Rail	(Passengers in 10^3)	763	1,600	2,050
	(Pass km in 10^6)	102.8	224.5	287.4
Road	(Passengers in 10^3)			
	(Pass-km in 10^6)	461.0	93.3	1,887.9

Note: Figures are based not on economic grounds but on potentialities according to the characteristics of the present traffic and of the future demand.

(b) Other Possible Outlets for Shipments

Following ports are considered to be possible outlets other than Belawan in future for shipments of some types of products:

- Kuala Langsa, where is planned to allow the passage of barges up to 10,000 DWT.

- Kuala Tanjung, which is under construction as the port for Asahan Project and is expected to be used after 1984 for vessels up to 16,000 DWT.

- Asahan River, which estuary will allow the passage of barges up to 3,500 DWT without dredging at Teluk Nibung or at Bagan Asahan.

The study proposes:

- To centralize all the overseas exports in Port of Belawan to ensure an easier forwarding procedure;

- To let the domestic shipments transit through the different outlets and to send them directly to Java by barge because of their present bar depth restricts the passage of ocean tankers.

Even in this case Belawan will not be able to handle, for the time being till the first phase of the Port Expansion Program is completed, the total exports and domestic shipments of palm oil alongside Ujung Baru Qauy because the quay is commonly used for handling general cargo, bunkers and passengers beside palm oil. The solution for 1985/1993 is as follow:

- To keep a floating tanker off-shore, if required to load deep draft tankers at Belawan;

- At Kuala Langsa to ship the exports of those products from hinterlands of Kuala Langsa and Asahan by Barge to a floating storage offshore at Belawan.

Table 5-1-5 Estimated Shipment Tonnage of Palm Oil through Possible Outlets from the Respective Hinterlands (1980 & 1983)

(Unit: 1,000 tons)

Possible Outlets	1980		1983	
	Export	Domestic	Export	Domestic
Kuala Langsa Port	17	11	27	23
Belawan Port	150	280	148	399
Asahan Port	124	84	151	126
Panai River	12	8	10	9
Total:	303	383	336	557

Table 5-1-6 Possible Utilization of Ports and Necessary Investment for Shipment of Palm Oil

Shipment scheme	Tonnage in 1983	Type of investment required for Transient period (1985-1993)
Belawan Port		
Storage Off-Shore	415,000	- One floating storage (20,000 tons)
Alongside Quay	329,000	- One shuttle barge (3,500 tons)
Kuala Langsa Port		
Export via Off-Shore to Belawan	27,000	- One shuttle barge (1,500 tons)
Domestic shipments to Java	23,000	
Asahan Port		
Export via off-shore to Belawan	151,000	- One shuttle barge (3,500 tons)
Domestic shipments	126,000	- two shuttle barges (3,500 tons)
Panai River	19,000	- Deliver their productions to off-shore Belawan (No investment)

Note: The loading solutions in Asahan estuary are:

- Either to load at Teluk Nibung from rail car, truck or pipe line into barges;
- Or to load at Barga Asahan from a connecting pipe coming from a buffer tank located in Kisaran/Sentang and gathering oil coming on the one side from Kisaran - Rantau Prapat railway section, and on the other side from Pasir Mandoge and Sungei Silau by pipe.

The choice will depend on the economic comparison between pipe and road/rail.

(c) Proposals of Improvement in Railway Organization and Facilities

Due to the present poor conditions of track and signal situation and also inefficient operating conditions and inadequate conditions of rolling stock to cope with the estimated future traffic the report proposed that the existing railway be strengthen with such additional investments as an conservative solution as follow:

- Establishing a district central office consisting of a traffic controller group, an operating and locomotive group, a freight car distribution group and a study group, operating 24 hours a day;
- Improving the transport plan, particularly with formation of block trains for transport of palm oil which constituted of 57% of the total ton-km in 1978;

- Improving railway yard condition in Belawan area. It is proposed to use Pulau Brayan station as a shunting yard for Port of Belawan, receiving complete palm oil block trains and to despatch freight cars to Belawan at the request of palm oil tank-farm operators;

- The number of shunting locomotive presently available are not sufficient in Belawan Area. Two shunters in addition to the existing 3 shunters normally planned for the area and also 7 to 9 line locomotives are to be added.

- Replacement of a part of existing rails with R2 rails in 17,300 tons in a total to strengthen the track for the purpose of speeding up the operation and the operation of heavier locomotives and freight cars;

- About 240 to 340 new freight cars, including tankers, of bogie type with 11 tons axle load are considered necessary including replacement.

- In two other alternative solutions the report proposes to increase the present axle load of 11 ton up to 14 tons or 18 tons, in which solutions the number of freight cars and locomotives to be added are less than those of the conservative solution, but the solution of using 18 ton axle load needs 30,000 tons of rail replacement in stead of 17,300 tons.

(d) Proposals of Improvement in Storage and Handling Facilities

- The Central Marketing Board would take more strong role by purchasing the palm oil on an ex-estate basis and the transport to ports should be arranged by the Board and the palm oil will be transferred on a standard quality basis. The selling of the oil for export should be changed from F.O.B. basis to C.I.F. basis. The Board should install oil tanks in Jakarta and Surabaya where palm crude oils could then be sold to the consumers in Java on an ex-tank basis. Any further development of refining oils should be done nearer the customers rather than in Sumatra.

- Sufficient storage capacity of palm oil at Belawan is necessary to cope with the delays and hold up in ships arrivals, while the seasonal variation in the factory productions should be handled with the storage facilities at the factories.

- 6 percent of the total yearly palm oil tonnage would be sufficient as its storing capacity at Port of Belawan with the controlled arrival of ships and the existing storing capacity in Belawan will be sufficient until 1990; after then new storing facilities should be added in Belawan area. In addition to the already planned tank of 8,300 tons in 1979 and an additional 9,500 tons between 1979 and 1983 and 12,500 tons by 1983 are considered necessary.

- Palm kernels would be shipped from the factories to the rail by truck and then to the port with special hopper cars.

- As for rubber, when factories have their own railway sidings it is proposed to load dry rubbers into containers. Experiments are now underway to transport latex in containers using a bag to contain the liquid. This would reduce the congestion at the Port.

5.1.3 Project to change Railway Track-Guage in Aceh

During the Third 5-Year Plan period (1979-1983) the railway in Aceh Province will be widened from 0.750m up to the guage of 1.067m, becoming same as that in Province of North Sumatra. The existing narrow guaged railway in Aceh Province severely hinders its transporting capacity. This project forms also a part of those measures implementing ASEAN fertilizer project at Lohk Seumawe. Port of Belawan is presently the major port to import fertilizer and Medan is the re-distribution center of imported fertilizer to plantation estates in hinterland. This track-guage changing project will substantially reduce costs of transportation and improve the flow of freight movement between Aceh Province and North Sumatra Province, and also enhance the role of Medan City as the center of a regional transportation network which extends to Banda Aceh.

5.1.4 Road Betterment Projects in North Sumatra

Province of North Sumatra has presently a road network consisting of 793.4 km of national roads and 2,427.9 km of provincial roads in 1979, including 1,296 bridges (total length of 13,770 m) and 451 bridges (total length of 6,175 m) respectively. Despite the maintenance efforts exerted in the Second 5-years Plan period by DPUP-SU including rehabilitation and routine maintenance those roads are generally still not in favorable concitions due to an excessive volume of traffic and insufficient maintenance budget.

Within the study area which covers Medan City and its surrounding areas to be covered by a radius of approximately 20 km in length from Medan City's center, the following length of those national and provincial roads are existing as of 1979 as shown in Table 5-1-7.

The followings are the major road betterment projects under financing by IBRD in Province of North Sumatra under implementation and/or scheduled in the Third 5-Year Plan period (1979/80 - 1983/84) under the responsibility of Medan Road Betterment Projects Office (RBO-II) of Bina Marga(Refer to Fig.5-1-1)

(a) Padang-Medan Road Project

The betterment of this road will necessarily increase the role of Medan City as administrative, commercial, industrial and educational centers of Province of North Sumatra. Locating industries of various sizes along this road will improve accessibility to Port of Belawan, Medan City and also deep agricultural hinterland in the Province. It is expected that the acceleration of corridor development of industrial and urban settlement is expected to take place along this road, particularly in the section between Medan and Tebing Tinggi.

Fig. 5-1-1
ROAD BETTERMENT PROJECTS IN ACEH, NORTH SUMATRA & RIAU

Medan Area Transport Study

LEGEND
- Under Implementation financed by IBRD
- Planned to be bettered, financed by IBRD
- Planned to be bettered, financed by Canada

Betterments under Implementation (1979/80)

Tebing Tinggi	–	Rantau Prapat
Aek Nauli	–	Tarutung
Padang Sidempuan	–	Jembatan Merah
Pal Xi	–	Gunung Tua
Rao	–	Bonjol
Padang	–	Sanah Tambang

BANDA ACEH, Birueun, Takengon, Meulaboh, Blangkejeren, Tapaktuan, ACEH, SUM-UT, K. Cane, MEDAN, Belawan, T. Morawa, T. Tinggi, Brastagi, Kb. Jahe, J. Butuh, Merek, P. Siantar, Kisaran, Sd. Kalang, A. Nauli, Parapat, RIAU, Siborong2, Tarutung, Rt. Ptapat, Siboiga, Sipirok, Pal Xi, Gn. Tua, P. Sidempuang, Sibuhuan, Pasir Pangarayan, J. Merah, Rao, Dumai, Buatan, Parit, PAKAN BARU, R. Berangin, Bangkinang, L. Sikaping, Bonjol, Baso, Tembilahan, Bk. Tinggi, Air Molek, Rengat, Sofok, S. Lunto, M. Kieban, PADANG, Trans-Sumatra Highway, SUM-BAR, JAMBI, to La's

95°B-T, 97°30' B-T, 100°B-T, 102°30' B-T, 105°B-T, 5°L-U, 2°30' L-U, 0°00', 2°30' L-S

Source: Regional Betterment Office, Region-I (RBO-I, Bina Marga)

Table 5-1-7 Length of National & Provincial Roads in Study Area (1979)

Category	Class	Pavement Width (m)	Length maintained by DPUP-SU (m)	Medan City (m)	Total (m)
National Roads:					
Medan-Binjei Rd.	II	7.0	1,500	4,200	5,700
Medan-T. Morawa Rd.	II	6.0	7,700	8,300	16,000
Total:			9,200	12,500	21,700
Provincial Roads:					
Medan-Belawan Rd.	II	8.0	17,300	8,700	26,000
Medan-Pancur Batu Rd.	II	5.0	8,200	8,800	17,000
Medan-Deli Tua Rd.	III	5.0	7,200	4,800	12,000
Total:			32,700	22,300	55,000
Grand Total:			41,900	34,700	76,700

Source: DPUP-SU

i) Aek Nauli - Tarutung Section (117 km)

The betterment of this section was commenced in March 1978 and is expected to be completed in the fiscal year 1982/83. The estimated total budget is Rp. $6,435 \times 10^6$.

ii) Padang Sidempuang - Jambaten Merah & Pal XI - Gunung Tua (130 km)

The betterment of this section was commenced in 1979 and is expected to be completed in the fiscal year 1982/83. The estimated total budget is Rp. $6,010 \times 10^6$.

The existing road of those sections, which is presently 4.5 m in width of penetration macadam, is to be widened up to 6.0 m wide of asphalt-concrete paved carriageway with shoulders of 2.0 m wide each.

The Office has also a betterment plan of the following sections in the Third 5-Year Plan Period (1979/80 - 1983/84):

iii) Tanjung Morawa - Tebing Tinggi Section (60.5 km)

This section, which is presently of 6.0 m wide pavement, is to be widened up to 7.0 m wide carriageway with shoulders of 2.0 wide each. The betterment is expected to be commenced in January 1980 and to be completed in the fiscal year 1980/81.

iv) Tarutung - Padang Sidempuang Section (110 km)

This is the continuing section of the section (i). The betterment is expected to be commenced in April 1980 and to be completed in the fiscal Year 1983/84. The total construction cost is estimated at Rp. $3,255 \times 10^6$.

v) Jambatan Merah - Rao Section (75 km)

This is the continuing section of the section (ii). The betterment is expected to be commenced in April 1981 and to be completed in the fiscal year 1983/84.

Upon the completion of those sections mentioned above the road links with the Trans-Sumatra Highway in Central and South Sumatra provinces through Padang.

(b) Tebing Tinggi - Rantau Prapat Road

This road, which is approximately 209 km in length, is an important feeder road of Padang - Medan Road and runs almost parallel with the railway in this portion, connecting towns of Rantau Prapat, Simpang Kawat and Lima Puluh with Tebing Tinggi and accordingly to Medan, thus linking deep agricultural hinterland with Port of Belawan. This road, after completion, will become of the carriage-way of 6.0 m in width of asphalt concrete pavement with shoulders of 1.0 m in width. The estimated budget of this section during the Third 5-year plan is Rp. 11,533 x 10^6.

The betterment of this road was commenced in the fiscal year 1977/78 under the financing by IBRD and was originally expected to be completed by the end of the fiscal year 1979/80, but presently the completed portion of the road as of October 1979 reaches only up to 45 percent of the total length.

5.2 Projects in Medan Area

5.2.1 Expansion Project of Port of Belawan

In 1975, upon the request of Ministry of Communication, Directorate General of Sea Communication, British Consultant Sir William Halcrow & Partners in association with a group of Specialists conducted "Indonesian Ports Study (Surabaya - Belawan - Panjang)" under the financial aid by UNDP and ADB. The consultant reported on Port of Belawan in Report Volume 5, Part 1-6, in which the development plan for this port was recommended for the forecasted trade and traffic through the Port for the period of 1975 - 1998 as follow:

Table 5-2-1 Forecasts of Total Freight Tonnage through Port of Belawan (1975-1998)

(Unit: 1,000 tons)

Type of Freight	1975	1983	1988	1993	1998
General freight	1,998	3,303	5,040	6,777	8,518
Dry bulk freight	-	455	1,052	1,649	2,250
Liquid bulk freight	856	1,745	2,825	3,835	4,982
Total	2,854	5,503	8,917	12,261	15,750

Source: Indonesian Port Study, Vol. 5, Part 3.

According to this report the shares of those traffic by rail and by road during the period 1975-1983 were estimated as follow:

Table 5-2-2 Estimated Freight Tonnage by Mode of Transport (1975-1983)

(Unit: 1,000 tons)

	1975	1978	1980	1983
From the Port				
by road	1,824 (97)	2,461 (92)	2,602 (89)	3,134 (88)
by rail	57 (3)	202 (8)	321 (11)	417 (12)
Total	1,881(100)	2,663(100)	2,923(100)	3,551(100)
To the port				
by road	560 (58)	623 (49)	735 (49)	1,000 (51)
by rail	413 (42)	642 (51)	756 (51)	952 (49)
Total	973(100)	1,265(100)	1,491(100)	1,952(100)

Source: "Indonesian Ports Study", Vol. 5, Part 3
Note : Figures in parenthesis are indicated in percentage.

Basically, this port expansion project is to stimulate plantation projects in hinterland and other efforts of the Government to encourage the development of agricultural export. The basic function of this port is to handle primary products of those plantation estates in North Sumatra and Aceh for export and to import fertilizer, rice and cement to be needed for urban areas as well as plantation estates in hinterland.

In this expansion project it was planned to cope with those estimated traffic and the total berth requirements in 1998 as follow, accompanied by affiliated facilities such as sheds and warehouses, cargo handling equipment, and road and railway facilities:

Ocean-going quay ..... 6 berths
Inter-island quay ..... 46 berths
Container quay ..... 3 berths
Lash barge quay ..... 5 berths

In this project extensive dredging of the main channels to keep the water depth of 9 m is required, the dredged materials are to be used for reclamation of swamp areas of 350 ha, of which 270 ha will be for industrial and warehousing uses and 80 ha for residential use to accommodate households to be related by this project.

The responsibility of the development of the Port is shared by Port Administration Authority of Belawan and Directorate General of Sea Communication; on the other hand, the former and Medan City are jointly responsible for land development above-mentioned. The total cost of the first stage to cope with the forecasted traffic of 1985 was estimated in 1978 at US$100.48 x 10^6, of which US$66.84 x 10^6 is the foreign currency component, while US$33.64 x 10^6 is the local currency component. The former component includes a US$26.3 x 10^6 loan from ADB and the remaining

portion was borrowed from West German Bank. The latter component will be jointly financed by Port Authority with its revenues, local financing firms and Government of Indonesia.

The construction of the first stage was commenced in 1979 and is expected to be completed in 1984. This is a part of 25 years program planned in Belawan Port Development Master Plan.

In the expansion program of Port it is expected to solve the problems mentioned in 3.2.3 (p.3-29) by late 1983 by using the new berths for general cargo and reserving Ujung Baru quay for bunkers, liquid bulks and passengers.

The positive impact of the Expansion Project of Port of Belawan which might be expected is to give an opportunity to formulate a comprehensive re-organization of railway network in Medan Area because the port area is not spaceous enough to provide an ample space of railway switch yard necessary for the efficient port operation; accordingly, its location has to be selected somewhere outside of the port area which is not so far away from the port.

On the other hand, one of the negative impacts is the effect of increase in number of freight trians to cope with the increase in railway freight traffic, which will worsen the existing road traffic congestion in the central area of Medan City due to increase in the closing time of railway crossings.

On the other hand, because of the scarecity of land available for residential use in Belawan and its surrounding areas, more employment and residential needs will probably result in unplanned sqatter settlements developed in swamp areas adjacent to the port, mainly by low income workers and their families. It is also estimated that some 7,000 port workers have to be accommodated somewhere outside of Belawan urban area.

Those problems should be studied simultaneously in the Medan Area Transportation Study, the solution of which will probably include relocation of some portions of existing railway network in Medan area and affiliated railway facilities such as switch yard, warehouses, etc. and also investment in public transport to facilitate commuting traffic of such workers and improve the conflicts between railway and road traffic.

5.2.2 Medan Urban Development Study Project

Since February 1979, upon the request of Directorate General of Housing, Building and Urban Development (CIPTA KARYA), Ministry of Public Works, a consultant group Engineering Science Inc. - Sinotech Engineering, Inc., in association with PADCO and P.T. DACREA, has conducted the study called Medan Urban Development, Housing, Water Supply and Sanitation Project under financing by US-AID. The group has already submitted the followings for information and review:

- Technical Memorandum series (No.1 to No.23), February - October 1979.

- Interim Strategic Plan and Feasibility Report for Urban Development, Housing, Water Supply and Sanitation, July 1979.

The group, who is continuing the study presently, commented on Medan City Master Plan and proposed modification of land use and is formulating Master Plans for Housing, Water Supply and Sanitation system, such as waste water disposal and drainage, and solid waste disposal.

The followings are their important comments on Medan City Master Plan and their recommendations in the present stage which will be concerned to Medan Area Urban Transport Study.

(a) Reasons of Modification in Land Use

i) Existing standards in Medan City Master Plan for residential development encircled with green belt, which will cost some 23 billion Rupiah altogether, are beyond the affordability of majority households of Medan, but "Planned Unit Development" concept should be used in new housing;

ii) The low-lying land in the elevation of less than 5m above sea level including swampy areas situating between Medan and Belawan, a part of which was designated to be main residential areas in Master Plan, are considered to be unsuitable for residential purpose due to serious floods taking place usually in 5-year interval. Consequently, a modification of land use to be away from such flood prone area is considered necessary.

(b) Modification of Land Use

Consequently, new residential development should be stimulated in the south of Medan Johor and east of Medan Denai immediately outside of the present city boundaries. Development in Medan Tungtungan should be coordinated with the construction of Outer Ring Road and improvements along the down stream of Deli River.

(c) Employment Location

Beside the reinforcement of industrial development along main corridors to Belawan, Tebing Tinggi and Binjei, and the industrial estate project in the north of Medan and in Port of Belawan, an additional small industrial development is expected to locate around interchanges which would be constructed along the By-pass portion of Belawan-Medan-Tanjung Morawa Tollway when the tollway is completed due to their close proximity to major low income residential areas.

(d) Transportation System

The relocation of obsolute transportation facilities existing in the central part of the city, for instance, warehouses occupying 35 ha in total area, railway switch yards and wholesale markets, etc. is recommended. The warehousing activities would be relocated on the perimeter of the city at junctions of rail and road transport.

The development of the proposed Outer-Ring Road with width to be widened up progressively according to growth of traffic to relieve Medan's CBD from traffic congestion and to open-up new land for development.

Strengthening the public transport system is essential to increase the accessibility of commuting population to their employment centers and to stiumlate the development of new areas. The urban train program will give a significant impact on land use pattern in a regional metropolitan contex after 1985.

(e) Forecast of Land Use

The group forecasted the population and the land need as follow under the assumption that the population growth rate is expected to drop from 3.5% in 1977 down to 2.5% in 2000 A.D.:

Table 5-2-3 Forecasts of Population & Land Needs in Medan City

(Unit: ha)

	Existing in 1976	Forecasts 1985	Forecasts 2000
Residential	9,090	9,718	11,337
Industrial	289	408	634
Commercial	341	426	619
Institutional	430	641	738
Open Space/Park	-	87	283
Total:	10,149	11,180	13,611
Estimated Population (in 10^3)	1,079	1,340	1,900

The group proposed 11 possible land sites for development covering more than 3,500 ha within and outside of the existing city boundaries in order to cover the shortage of land due to the modification of existing land use in Master Plan, to be further investigated.

(f) Short-Term Strategy

The short-term strategy, based on the Third 5-Year Plan period starting in the fiscal year 1979/80, placed stress on the following categories:

- Changes in Land Use;
- Kampung Improvement;
- Health and Educational Facilities
- Transportation
- Water Supply and Sanitation

Those categories are herewith briefly introduced in the following except Kampung Improvement and Health and Educational Facilities.

i) Change in Land Use

The study recommended the land use strategy for the Third 5-Years Plan period (1979/80 ∿ 1983/84) as follow:

- Immediate residential development in the southern districts of Medan Johor immediately outside of the city boundary;

- Residential development consisting of a wide range of densities to permit mixed income development and opportunity for internal cross subsidies;

- Additional land surrounding Medan III housing site and other housing sites should be purchased;

- Medan III housing estate should also acquire additional 20 ha. for a small manufacturing zone and industrial training center. Industrial land should also be purchased by Perumnas together with residential land in an anticipation of selling it either to the public land development corporation or directly to industrial investors;

- Housing in-fill sites should be stimulated to develop an orderly pattern in the existing urbanized areas through early planning and construction of infrastructure by Municipal Government. It is expected that predominantly permanent housing would be developed in Medan Sunggal, while semi-permanent and some temporary housing may be constructed in the peripheral areas of Medan Timur, Medan Denai and Medan Johor.

- Railway switch yard and warehousing around Medan Railway Station should be removed and the site should be re-developed for commercial use. Sites potentially suitable for warehousing relocation are around interchanges of the by-pass portion of Tollway;

- Measures should be investigated for flood control for residential development on sites adjacent to Medan Industrial Estate;

- Municipal Government and Directorate General of Air Communication should jointly investigate by the feasibility study of providing the existing site of Polonia Airport (900 ha.) as a land bank for the future of the city and for financing a portion of the relocation cost of airport.

ii) Transportation

In the field of transportation the study recommended the strategy for the Third 5-Years Plan Period, for the purpose to develop an effective road network serving all parts of the city and to relieve traffic congestion in the central area as follow:

- Actions should be undertaken by Bina Marga to assure that Belawan-Medan-T.Morawa Highway functions as an access limited tollway, especially along the by-pass portion, while the decision about the implementation of the eastern portion of Outer-Ring Road is pending;

- Immediate action should be undertaken by Municipal Government for upgrading existing road condition, especially primary and secondary roads in the city;

- The following major road projects should be undertaken by Municipal Government, Province of North Sumatra and National Government;

  - Southern Intermediate Ring Road;
  - Gelugur Intermediate Ring Road;
  - Connector Roads to Tollway; and
  - Southern Outer Ring Road.

- An effective traffic management program should be immediately formulated and undertaken by Municipal Government with technical assistance to be provided from foreign and/or Indonesian Consultants. The emphasis of the program should be the improvement of the traffic control system and car parking policy, especially in the central area, and public transport service.

- A financial feasibility study should be initiated by Municipal Government and/or the State Railway to re-develop the existing railway switch yard and warehousing site into an area for business premises and for financing construction of a new switch yard and warehousing area. The feasibility study should also include investigation of freight train schedules to stop from passing through the central area of the city during the traffic peak hours.

iii) Water Supply and Sanitation

The study recommends the strategy for the short-term in water supply as follow to be immediately implemented by Dutch aid:

- The expansion in quantity of the water supply through increasing the treatment capacity of Sunggal Plant and through expanded ground water exploration;

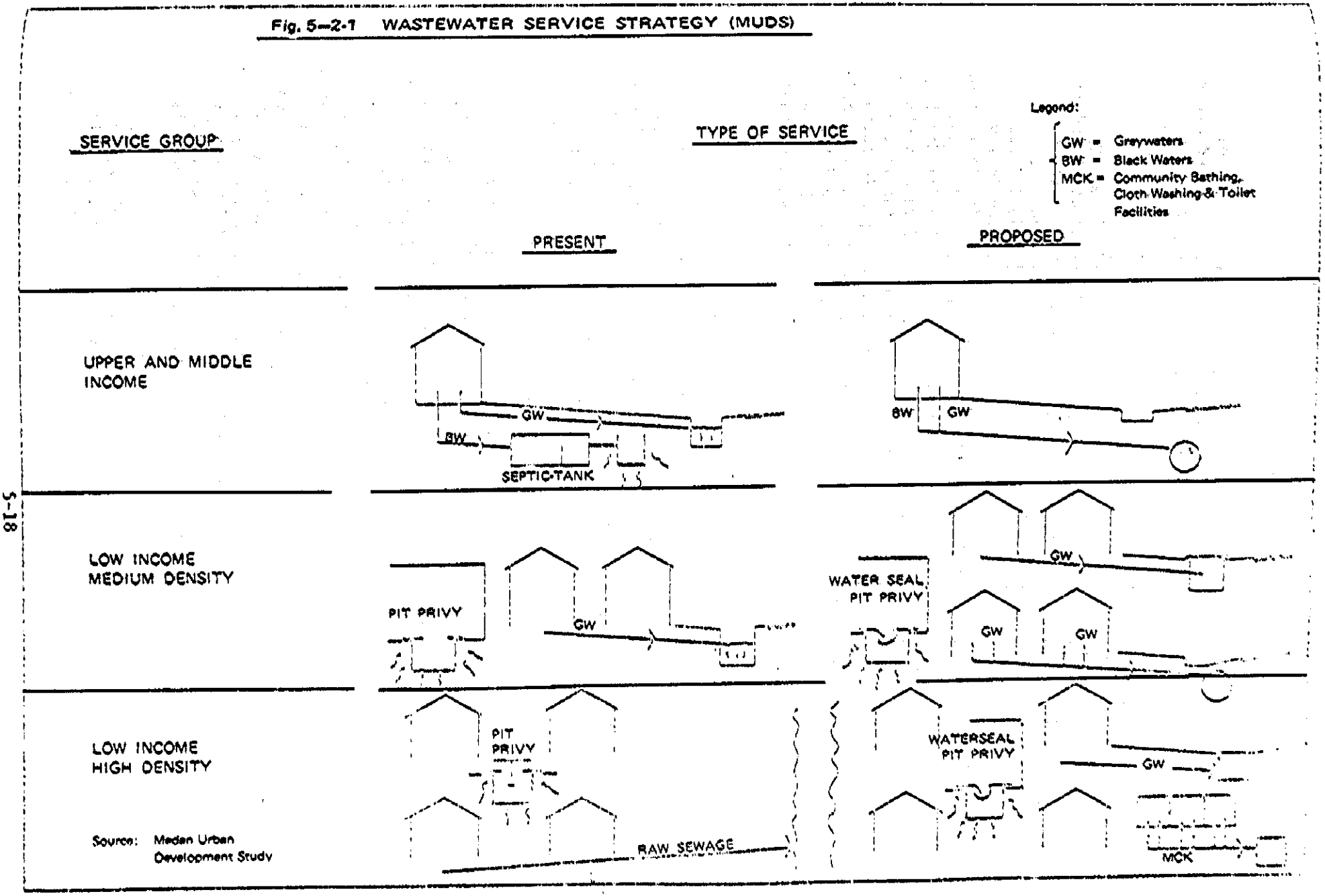
- The improvement of the functioning of the existing distribution system in the eastern portion of Medan.

Expansion of the number of service connections in the major populated areas is to be achieved in two stages, to allow Tirtanadi Plant to gradually increase its operational capacity.

For the drainage improvement is to clear drainage channels and prepare for the long term improvements such as monitoring water levels of the major rivers.

For solid waste collection the study recommended to reinforce and intensify solid waste collection services which will need massive investment. For the short-term strategy for sewerage improvement immediate improvement in individual household latrines, as shown in Fig. 5-2-1, especially in Kampungs selected for Kampung Improvement Plan. Presently, the household waste water is partly discharged into side ditches and partly directly to drainage channels and latrine waste water penetrates into the ground after passing septic tanks or directly into the ground. The study recommends that all household waste water together with latrine waste water be discharged into covered

Fig. 5-2-1 WASTEWATER SERVICE STRATEGY (MUDS)



Source: Medan Urban Development Study

side ditches or storm water conduits and some portions of latrine waste water remains to be discharged into ground after passing septic tanks. (Refer to Fig. 5-2-1)

iv) Private Investment

In the short-term the public investment should aim at upgrading the existing physical and social infrastructure and at providing opportunities for private sector investments; on the other hand, it is the role of the private investment to supplement public investment. The sectors recommended for private investment are housing projects and housing improvement projects in Kampung Improvement Plan areas, development of of infill sites, industrial development in Medan Industrial Estate and in small-scale industry site near Medan III Housing Estate Site. In those areas it is proposed to develop a city sub-center as proposed in Medan Master Plan. In initiating and promoting private investment in such areas, public actions such as facilitating changes in land use designation by Agraria Department of Municipal Government and credit for land for housing and industrial development from commercial banks are essential if private investments is going to play an important role in City's growth.

(g) Long-Term Strategy

The study estimated that Medan's population will expand up to 1.90 million by the year 2000 A.D. and that such a expansion of population will need approximately 3,500 ha of land for new urbanization. It was assumed that it will be in interests of the private sector and individual households who will be the main developers in response to opportunities to be created by public sector investment although the government will retain certain powers for land use control through regulation.

As Medan and its surrounding towns, including Binjei, Pancur Batu, Deli Tua, Tanjung Morawa and Tebing Tinggi, forms already a certain related urban system along regional transportation corridors, Medan as its center, the study recommends the strategy for Medan to consider such broader urban areas for the long-term. Specific strategy is not yet defined in this study, awaiting further analysis.

As the corridor patterns of development take place and the transportation between the center city and the existing small towns above mentioned is improved, the more rapid urbanization will probably take place in those towns. It is anticipated that the combination of corridor developments and Medan, a metropolis, as their growth center will be the most realistic and natural growth trend for the long-term strategy; consequently, their plannings and developments should be of concern in order to anticipate possible needs for service level and to permit their expansion in an orderly and planned manner.

The new and convenient transportation to be developed along those corridors will encourage the relocation of those facilities which are serving region-wide but do not need to be in a center city and

many obsolute facilities existing in downtown area, such as regional serving warehouses, railway switch yards and locomotive depot, and perhaps crowded higher educational facilities, which will result, in turn, in facilitating the natural urban renewal process in the center city. This process depends upon the development of region-serving transport facilities to create an attractive environment for major private sector initiative in development.

5.2.3 Housing Estate Projects in Medan City

As proposed in Medan city Master Plan there exist presently the following new housing projects to be implemented by Perumnas (National Housing Board) under the direction of CITA KARYA for the purpose to increase the supply of basic housing for low-income groups of citizens:

- Medan I Housing Estate Project (Medan Helvetia Housing Project);
- Medan II Housing Estate Project (Medan Denai Housing Project);
- Medan III Housing Estate Project.

Medan I Housing Estate Project which covers approximately 100 ha of land, situating in Kampung Perladangang Helvetia of Sungal Kecamatan and accomodating about 5,000 lots of residences, which was just completed.

The impact of this project will be to stimulate hereafter urbanization of the north western peripheral area of the city. All lots are already occupied and the Estate is presently served by bus and bemo as well from the CBD, and will be served by railway diesel car service, if a station is built nearby on the Medan-Binjei Line. Outer Ring Road of this portion along its northern perimeter has been commenced to construct in the fiscal year 1979/80 by the City.

Medan II Housing Estate Project is presently under implementation in Kampung Mandala, Deli Serdang Kabupatan, immediately outside of the city's eastern boundary. The Estate site has a convenient access to Medan's CBD, Belawan and T. Tinggi, particularly will be so after the completion of Belawan-Medan-Tanjung Morava Highway, which is to traverse the Estate site from north to south with an interchange at its south corner and is expected to be completed in the fiscal year 1982/83. The Estate which is 178 ha in area and accomodates 9,400 lots of land with utility services and also core units of houses. The development was commenced in the fiscal year 1979/80, and the construction of first 47 ha was already completed in July 1979, and the rest of project is expected to be completed by fiscal year 1982/83 with the total estimated cost of Rp. 2,857.9 x 10^6 in 1979 cost level. Inspite of its location outside of city boundary, infrastructure and social facilities are to be provided by Medan city and is to be integrated into the city's system. The main impact of this project will be to stimulate urbanization in this eastern peripheral area. The Estate is surrounded on its three sides by Medan Denai Kecamatan, which has been the most rapidly growing area of the city since 1973. On the other hand, within 1.5 km of the Estate, Kampung Tengal Sari, Tengal Sari I and II are among the worst

residential areas physically. The development of this Estate will, therefore, relieve the City from housing serious demand and further sprawling in these Kampungs. The commuting traffic from the Estate to/from Medan's CBD would be served by railway by opening short-distance diesel-car service because the Medan-T. Tinggi Line passes by its northside perimeter, if the State Railway adopts such policy and opens a commuters' station near this Estate between Medan Passar and Bandar Chalipah stations.

Medan III Housing Estate Project of 10,000 lots is under planning. The possible site will be one of the development sites proposed in Medan Urban Development Study along the southern portion of Outer Ring Road and will be implemented in the Third 5 -Year Plan period.

5.2.4 Medan Industrial Estate Project

P.T. Medan Industrial Estate, a state owned developing agency, is presently developing a land of 80 ha as the first stage of Medan Industrial Estate Project (200 ha) for the purpose of encouraging and accelerating the investment and growth of manufacturing industries in Medan Area. The location of the Estate is situated approximately 8.7 km from Medan's City center on Medan-Belawan Road, where has been designated for such land use in Medan City Master Plan of 1974. The selection of the site was much affected by its accessibility to both Port of Belawan and Medan's CBD. It is proposed to provide a space for 45 factories in each stage of the construction and is planned to meet individual business requirements. Physical infrastructure required for industrial establishments will be fully provided in the Estate. Railway sidings can be planned in the Estate to meet the needs of some of specific industries. The connection of railway sidings with the railway network should be considered in Medan Area Urban Transport Sutdy. An industrial training center, test laboratory and administration office and affiliated facilities will also be provided in the Estate. A duty-free, bonded industrial area of 30 ha in the Estate is intended to attract foreign investment. The developing agency is a legal organization with equity jointly owned by the Government agencies with the share of equity as 60% by Government of Indonesia, 30% by Provincial Government and 10% by Medan Municipal Government, of the initial total cost in equivalent of US$2 million. The total estimated cost of construction and the expected completion target year by stage is shown in the following:

Table 5.2.4 Estimated Costs of Industrial Estate Projects by Stage

Stage (Area)	Estimated Cost in 1975 Price Level (US$ Million)	Target Year of Completion
First Stage (80ha)	7.5	1982
Second Stage(60ha)	5.2	1985
Third Stage (60ha)	3.6	Unknown
Total: (200ha)	16.3 Million	

Due to the high cost of land development due to flood prone terrain resulted from overflow of Deli River, the developing agency is proposing

to subsidize land to provide stronger incentive to industrial investment. The project, if successful, could give the following impacts:

(a) Providing new employment opportunities for industrial workers after the completion of the First Stage and turning the existing unemployment situation better:

(b) The industrial development along Belawan corridor, where more than 50% of existing industrial establishments, particularly large and medium-scale assembly plants in Medan area are distributed, will generate an excessive commuter traffic during rush hours and will cause housing development demand. The transportation of additional commuting traffic to be generated by this industrial Estate Project should be studied in the urban transport study, partly by the short-distance diesel car service by the State Railway and partly by bus service between Belawan and Medan.

5.2.5 Railway Diesel Rail-Car Service Project

Although substantially no urban passenger traffic of Medan is presently transported by railway, the State Railway is under consideration of commencing urban rail-service in the Third 5-Year Plan period as a mean of general up-grading of passenger service in North Sumatra, connecting Medan Station with several sattelite towns by means of diesel-car service. But this plan does not appear materially in "A Five and Ten Year Development Plan 1979-1989" prepared by the State Railway in August 1978.

The conditions of Belawan-Medan, Binjei-Medan, Tebing Tinggi-Medan sections of those lines are operational, but the lines Medan-Pancur Batu and Medan-Batu have not been in use for years, which will need partly reconstruction and partly rehabilitation of existing tracks, bridges, station buildings, signal and tele-communication systems for the purpose of re-opening those lines for service.

The main costs of this plan will be for the procurement of rolling stock and reconstruction/rehabilitation of two lines of approximately 19.4 km and 14.3 km respectively with all affiliated facilities. Funds for procurement is expected through a loan from Asian Development Bank.

Upon the completion of this program it will not only facilitate the mass transport between Medan and those towns in Deli Serdang Kabupaten and Binjei area but also pave the way for the urban development of Medan City and its surrounding areas for the long-term, particularly in such corroridor along those lines.

A negative impact resulting from this program is the increase in frequency of train service, which train length is much shorter than that of usual long-distance trains, will increase the total closing time of gates at railway crossings, particularly, at four important crossings existing between Jl. Jati and Jl. Jend. Sudirman, where the total road traffic reaches approximately 300,000 daily at present. Such situation will necessarily reduce the traffic capacity of those important roads and worsen the traffic congestion, particularly, in the central area of the city.

5.2.6 Road Construction and Betterment Projects in Medan Area

(a) Belawan - Medan - Tanjung Morawa Highway Project

This highway project was announced by Bina Marga after Master Plan of Medan City was officially authorized by Medan Municipal Government. The planned highway is of 4-lanes with a median and 34.6 km long, and functions as a full access-controlled tollway, linking Port of Belawan, Medan urban area and Tanjung Morawa. The main purpose of this Highway is to provide a new speedy access to Port of Belawan and also to relieve the existing traffic congestion within the CBD of Medan Urban Area by by-passing the central city area. The Highway is divided into the following three sections:

Section A

The route, starting from Belawan, runs approximately parallel with the east side of the existing Belawan-Medan Road down to Deli Zone, covering a distance of 15 km.

Section B

The route by-passes the congested urban area of Medan City, detouring approximately along the outside of Outer Ring Road planned in Medan City Master Plan which is on the perimeter of approximately 5 km from the center of CBD, covering a distance of 14 km. When this Highway is implemented on an alignment as planned Bina Marga has an intention to eliminate the construction of Outer Ring Road along this section avoiding duplication of investment of similar nature.

Section C

The route links with the town of Tanjung Morawa on the route of Medan-Tebing Tinggi Road at the location of 16 km from Medan, covering a distance of 6.6 km.

The Highway is to be easy access of Medan City's road nework through an entrance in Belawan and five interchanges, one in Labuhan Zone, one in Deli Zone, two in Denai Zone and one in Kp. Binjei Zone.

Its feasibility study, First Phase, was conducted by the consultant group SAUTI - Renardet - ICE in 1977 and its study was re-evaluated by the same group in September 1978. (Refer to "Padang-Medan Highway" Annex 2 "Impact/Toll Study for Belawan - Medan and Medan Eastern Area" September 1978.

Bina Marga is responsible for implementing this project and its total construction cost was estimated at Rp. $24,437 \times 10^6$ in October 1978. The fund for this project would be borrowed partly from Kuwait Government. The project presently is under the final engineering as of November 1979 by the consultant group and its construction is to be commenced in April 1980 and is expected to be completed in the fiscal year 1982/83.

It is expected that one of the important effects of this Highway Project on the development of Medan Urban Area will be to open up new areas suitable for relocating warehouses existing in the CBD which occupies an accumulated area of 35 hectares in the heart of Medan City, hampering the healthy development of the Central area. The suitable relocation sites of warehouses are in the vicinity of three interchanges to be built along the Highway in the east side of the City where are easily accessible from all main roads entering the City by way of Outer Ring Road and Tollway. Such locations may also be developed simultaneously as the possible locations of truck terminals and distribution centers to be planned in the future not only for Medan City but also for the whole Province of North Sumatra as well. Relocation of warehouses and affiliated facilities will contribute in transferring the generating centers of truck traffic from the CBD to the exterior area of the City, resulting in relieving the CBD from the present traffic congestion indirectly.

(b) Ring Road Projects and Others

In Master Plan of Medan City authorized in 1974 a schedule of road construction was outlined, which is presented already in this report, (Refer to Sec. 2.3.2)

But the actual present implementing situation of those programs are described in the following paragraphs.

i) Outer Ring Road Project

Outer Ring Road, which was planned in Master Plan of Medan City and is 33.6 km long to be located on a perimeter of approximately 5 km from the center of CBD for the purpose to integrate major urban activities, to improve regional traffic and commodity movings by-passing the CBD and to open up new areas of more than 1,500 hectars for housing and commercial development particularly in kecamatan Medan Sunggal and Kecamatan Medan Tungtungan.

Outer Ring Road is divided into the following four sections:

Section 1: The stretch of 6.4 km long between Jl. Yos Sudarso and Jl. Binjei.

Section 2: The stretch of 7.0 km long between Jl. Binjei and Jl. Brastagi.

Section 3: The stretch of 6.5 km long between Jl. Brastagi and Jl. Siganangarja.

Section 4: The stretch of 13.7 km long between Jl. Siganangaraja and Jl. Yos Sudarso.

The construction cost for each section is estimated in 1979 as follows:

Table 5.2.5 Estimated Cost of Construction of Ring Road Projects & Others

Section 1	Rp.	864×10^6
Section 2	Rp.	$1,614 \times 10^6$
Section 3	Rp.	903.5×10^6
Section 4	Rp.	$1,894 \times 10^6$
Total:	Rp.	$5,275.5 \times 10^6$

In Section 1 the construction was already commenced by Medan City on Jl. Helvetia in the fiscal year 1979/80 as a road of 7.0 m wide carriageway with shoulders of 3.5 m wide in newly constructed section and 2.0 m wide in the widening section of the existing road. This Section is expected to be completed within the Third 5-years Plan period.

The construction of the remaining three sections are not yet committed by any government agencies. Bina Marga proposes Section 2 and Section 3 to be the regional arteries, while Section 4 to be as a local artery. In the relation with Belawan-Medan-T. Morawa Tollway Project which was announced by Bina Marga after Medan Master Plan was authorized and is now under the final engineering stage, the construction of Section 4 of Outer Ring Road is expected to be eliminated from the project to avoid duplication of investment of similar nature. When those sections are implemented it is expected that Section 2 and Section 3 will be constructed by Bina Marga under Medan City's financing.

ii) Betterment of Medan-Artery and Medan-Belawan Road

In the fiscal year 1979/80 Medan City commenced the betterment of Medan-Artery and Medan-Belawan Road, in which project are included overlaying on existing 7.0 m wide carriageway of Medan-Belawan Road with asphalt concrete from Sta. 0+000 to Sta. 21+830 and also widening the existing carriageway of 2-lanes up to 18.00 and 12.00 from curb to curb and their overlaying with asphalt concrete on the existing Medan-Belawan Road. The sources of fund for those betterments are presently such that cutting existing houses facing on Medan-aretry to be widened is under the responsibility of Medan City and the construction of widened part and overall overlaying are under that of Bina Marga.

iii) Improvement of Street Intersections

In the fiscal year 1979/80 Medan City commenced the improvement of street intersections at the following 8 locations to make traffic flows more smoothly:

- Jl. Gelugur By-pass & Jl. Yos Sudarso;
- Jl. Gaharu & New Road;
- Jl. Jati & Jl. Jawa;
- Jl. Ir. Juanda & New Road;
- Jl. Mankam & Jl. Brigjen Katamso;
- Jl. Singamangaraja & Jl. Marhkamah;
- Jl. Singamangaraja & Jl. Rahmadsyah; and
- Jl. Singamangaraja & Jl. Armada.

iv) Others

In addition to the limited amount of new road investment planned for the Third 5-Year Plan period following new construction, up-grading and maintenance of existing roads are planned to implement by Medan City in the same period.

- New road construction of Jl. Gang Warni and Jl. Sei Batanhari.
- Upgrading existing roads including widening Jl. Asia and Jl. Sutrisno and overlaying with asphalt concrete on existing 28 roads of 35.3 km in total length covering 391,300 m^2 in area.
- Maintenance program to improve the present situation of existing roads of 521 km in total length, in which 20.19% is in good condition, 61.25% in fair condition and 19.06% in bad condition as of April 1979/80, into such condition in the end of 1983/84 as 40% in good condition, 60% in fair condition and nil in bad condition.

5.2.7 Improvement and Relocation Projects of Polonia Airport

Polonia Airport, which is the only airport existing in North Sumatra, is conveniently located in Kecamatan Medan Baru at 4 km distant from city center, occupying a tract land of approximately 900 ha, so valuable and vast land in the vicinity of CBD. Actually the city center is presently situated just beneath the approach path of aircrafts reaching to the airport. The airport presently operates domestic and international flight services connecting Medan with other major cities of the country as well as overseas cities such as Penang and Singapore, and in the near future to Bangkok.

On the other hand, for the future expansion due to the rapid growth of air transport the increase of larger aircrafts, and noise abatement problem which is expected to take place sooner or later, Directorate General of Air Communication has applied to Asian Development Bank for a loan for the purpose of airport relocation study, preparation of master plan and detailed design for the first stage development to be undertaken in the period of the Third 5-Year Plan.

The relocation of the airport should be seriously studied much in advance of actual needs from the following points of views:

- Redevelopment of the released land for new land use and its positive impacts on the communities;
- Safe operation of arriving and departing aircrafts;
- Noise abatement in surrounding communities;
- To relieve the CBD from Traffic congestion;
- Convenient access from the new airport to the CBD and employment centers.

In Medan Master Plan the existing airport site is designated for a regional park which stretches to the hilly area in Brastagi. However, this valuable urban land is considered suitable for multiple uses in addition to recreation purpose.

The relocation of the existing airport will relieve constraints in urban development due to approach path of aircrafts and those due to land use.

The application for the study of airport relocation was approved by Asian Development Bank in September 1978 as Domestic Airport Projects (Loan No. 353-IND.) But the results of study has not come out yet. Anyway, the airport is a major transport facility of the region; consequently, the new location will inevitably somewhat affect on urban settlement pattern in long run by attaching airport related industries.

But it is proposed that no consideration be paid for airport relocation problem in Medan Transportation Study and the area be reserved for land bank to be redeveloped for more efficient urban land use in future.

5.2.8 Pulau Sicanang Power Station Project

The location of this power station project is situated at approximately 5 km in south-west of Belawan, Occupying a land of approximately 47 hectars. Presently, two sets of generators with a capacity of 65 Mega, Watts are being installed. The construction is scheduled to be completed in 1984. When this project is completed the total generating capacity will become 130 Mega Watts. The project is implemented under the responsibility of PLN, State Electricity Co., Limited.

In Medan Area PLN has granted consumers the right to generate their own electric power particularly to large and medium-scale industries because the power demand in Medan Area was not satisfied by the existing power supply in the past. Presently, the power supply is still limited to central four kecamatans. Furtner, additional generating capacity is to be still needed after Pulau Sicanang Power Station is completed, when Medan Industrial Estate and Belawan Industrial District should be in operation. PLN is planning to construct another power station in the city to meet the anticipated power shortage because Asahan Hydro-Power Project, the planned capacity of which is 600 Mega Watts, has no plan to supply power as far as to Medan Area. This power station will benefit those household industries presently not linked with power service, and benefit those industries which have to supply their own power for their own production. An impact of this project on Medan urban transport system is minor number of tank-lorries daily carrying fuel oil from PERTAMINA's pier in Port of Belawan to the station.

5.2.9 Bohorok Cement Plant Project

There is a plan to construct a cement manufacturing plant close to a limestone quarry located at Bohorok, approximately 76 km east of Medan. The capacity is anticipated to be 2,400 tons per day in the first stage which will produce approximately 800,000 tons of cement annually. The plant layout is possible to double the initial capacity later. The full capacity of the plant will be realized by the final year of the Third 5-Years Plan period, and will be able to supply in that stage the whole local demand and allow Province of North Sumatra to export a part of its production. In relation to Asahan Hydro-Power Plant and Aluminum Smelter Project, the forecasted demand of cement is assumed to increase

at a rate of 15 percent per year up to 1983 and then the rate will go down to a more conservative rate of 12 percent per year after 1983, giving the following estimated provincial consumption of cement:

1979	407,000 tons
1983	712,000 tons
1987	1,120,000 tons
1990	1,574,000 tons
1993	2,211,000 tons

The need will be met by imports until the completion of the plant which will meet the demand after the year of 1984.

It is foreseen in North Sumatra that the import of cement will continue to remain unless an extension of production capacity of the plant is realized. The Plant is planned to cope with the whole cement demand of North Sumatra by 1990/1991.

According to North Sumatra Transport Study the flow of cement by destination are estimated as follow on the assumption that the cement consumption share will be in proportional to the following rates which were based on the population in 1977 and number of industrial establishments in each area in 1976.

Table 5.2.6 Estimated Distribution of Cement by Region (1983 & 1993)

(Unit: 1,000 tons)

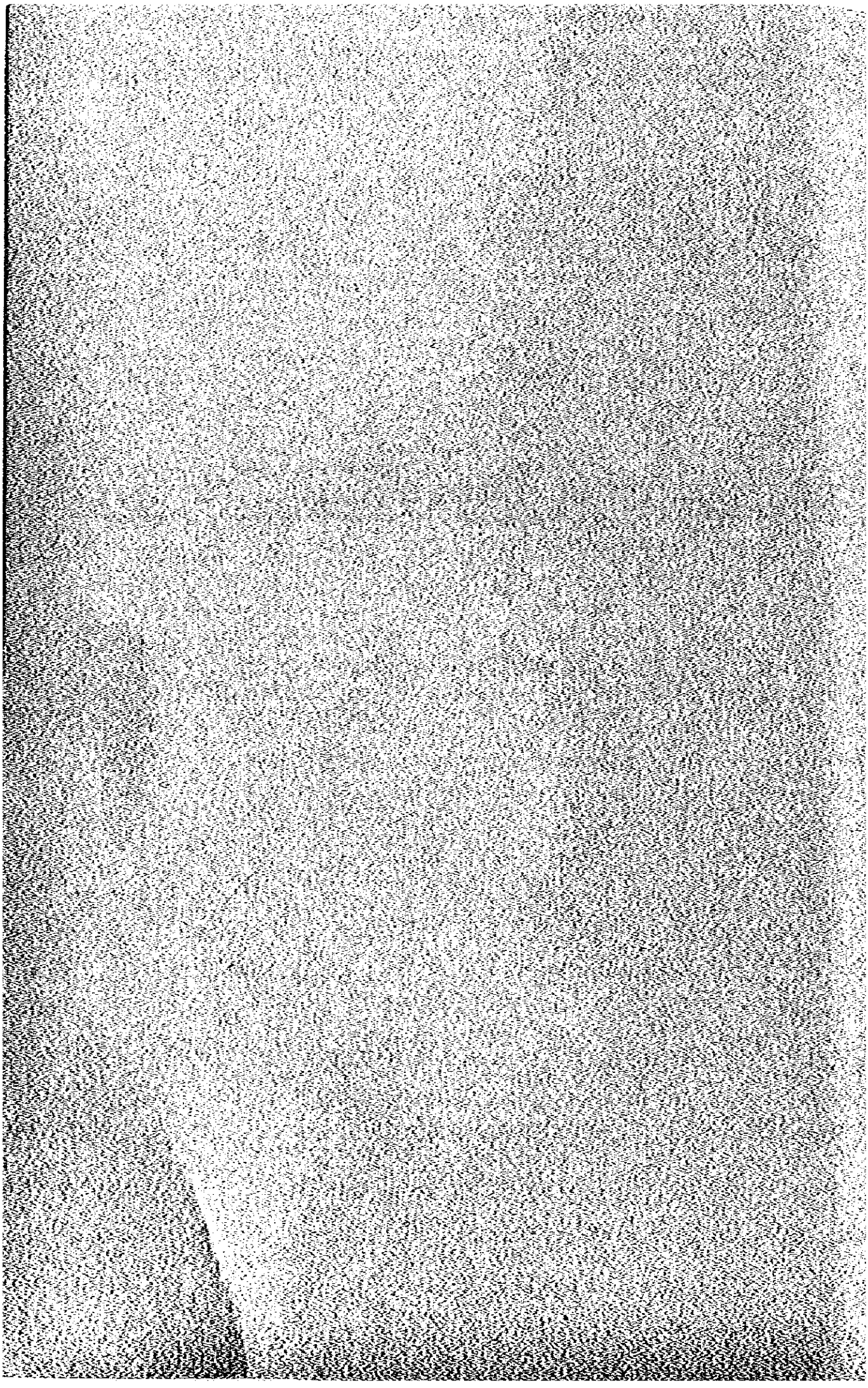
	%	1983	1993
Medan/Deli Serdang	45	320	1,000
Binjei/Langkat	15	105	330
P. Siantar/Simalungun	15	105	330
T. Tinggi/Asahan	10	70	220
Labuhan Batu	15	112	331
Total	100	712	2,211

Source: North Sumatra Transport Study

Owing to the scattered locations of warehouse, transport of cement is anticipated to be all by road.

Chapter 6.

EVALUATION ON THE PRESENT TRANSPORTATION SYSTEM



Chapter 6. EVALUATION ON THE PRESENT TRANSPORTATION SYSTEM

6.1 General

The condition and situation of existing transport facilities and systems have been described in the preceding chapter. In this chapter, the present transport system is evaluated as a first step to solve the present traffic problems existing in Medan Area.

It can be said that the present traffic condition in Medan City is just like the beginning stage of motorization era. The traffic problem taking place presently is not the matter of passenger-vehicle traffic which has been observed in general case but the matter of Becak, motorcycle and bus systems inappropriately developed. Generally, the direct reason of present traffic congestion seems to be due to the fact that the road network system and affiliated facilities have not been able to correspond to the rapid growth of urban traffic volume. Although the fundamental solution might depend on the land use modification and on the street lay-out for a long-term improvements. It seems to be necessary for short-term to utilize the existing transport facilities effectively, responding as much as possible to the present urgent traffic needs in Medan Area.

In the short-term improvements, although they are described in details in Sec. 7.1: Planning Policy, the solutions are sought out for the following four categories:

- A balance between traffic demands and the transport supplies;
- Citizens' accessibility to any part of the city;
- Maintaining the convenient commuter services available for the majority of citizens;
- Securing traffic safety of citizens.

From such points of view the existing transport facilities are evaluated, being based on the following items shown in Table 6.1.1 in order to identify the current urgent transport problems.

The description on those items are presented in the following sections.

(a) Balance between Traffic Demands and Transport Supplies

Viewing the existing transport facilities from the viewpoint of balance between traffic demands and transport supplies, first of all, it is necessary to evaluate macromatically whether the spaces occupied by the existing road network in Medan City has reached the appropriate level of road space rate to cope with the present size of the urbanized area and its urban traffic flows. The rest items are the problems to be expressed generally in the rate of congestion, which are important problems in the urban transport planning. But in the case of railway passenger transport this item presents the problems of its relation with railway freight transportation and of

Table 6.1.1 Items to be evaluated on Transport Facilities

Planning Policy Item	Items of Evaluation
a) Balance between traffic demands and transport supplies	i) Improvement level of road network;
	ii) Network structure and congestion rate of street sections;
	iii) Congestion rate at street intersections;
	iv) Balance between railway commuter demands and railway transport supply;
	v) Vehicle parking spaces;
	vi) Administrative actions to be taken.
b) Accessibility	i) Railway crossings;
	ii) Travel time (or travel speed);
	iii) Convenience of transferring between modes of transport;
	iv) One-way traffic system;
	v) Administrative actions to be taken.
c) Maintaining convenient commuter service	i) Bus transport and bus terminals;
	ii) Railway commuter service and railway facilities;
	iii) Fare structure of public transport.
d) Securing traffic safety	i) Railway crossings;
	ii) Traffic controlling devices including traffic signals;
	iii) Safety consideration to pedestrians;
	iv) Administrative actions to be taken.

balance between the total revenues and expenditures.

In cases of airport and marine port the evaluations are made on the relation between the present traffic demands and the present level of capacities due to expansion; consequently, the evaluations are made in macromatic way.

(b) Traffic Accessibility

This evaluating item is much concerned on the railway main lines traversing through the CBD, separating the CBD into the east and west side portions; and railway crossings, their closing time and the volume of crossing road traffic etc., are the main problems to be evaluated.

On the other hand, the one-way traffic, which is presently applied widely in the CBD, is one of the important evaluation item.

This problem has worsened the accessibility in the CBD, enforcing the traffic in the CBD to detour over a considerable distance in trips between points of both sides of the railway.

Inconvenience at transferring points between modes of transport takes place at transport nodes. The problems of bus terminals and Medan Railway Station, both of which concern on maintaining convenient commuter services available to the majority of citizens, are also the main transport nodes in the city. Transferring between bus and Bemo presents also another problem of the same kind.

(c) Maintaining Transport Services

Maintaining convenient transport services to the majority of citizens having no private transport measure presents the problem how the public transport system should be in Medan Area and also the problem of its fare structures. Of course, this item of evaluation includes the problem of an integrated commuter service system of bus, Bemo and railway, and that of service level at terminals as the transport nodes.

(d) Securing Traffic Safety

This evaluation item concerns on railway crossings, the one-way traffic system and also intersections without traffic signals.

(e) Others

Appropriate legislative and administrative actions are essential steps to be taken in order to realize the expected effects timely and effectively besides solving those problems physically and financially.

But in the practical procedure of evaluating those traffic transport problems of Medan Area according to the following items shown in Table 6.1.1., some duplications in evaluation will take place in mode and contents. Concequently, the detailed evaluations follow the policy items and evaluation items by mode of transport.

6.2 Road Network and Related Traffic Services

6.2.1 Region-wide Road Network

As far as inter-city roads are concerned, there exist 5 main corridors stretching out from Medan City and actually they are arterial roads in region-wide area. Inside of Medan City a clear grid pattern of road layout can be seen in the east side which is different from that of the west side of the railway although both are framed by arterial roads likewise. Only poor feeder roads laterally connecting those arterial roads can be seen in region-wide area. Although some improvement plans seems to be necessary. It might be a matter to be studied later in the Long-Term Master Plan according to the study schedule.

6.2.2 Traffic Functions of Road Network

In evaluating the present road network it is important to make a clear classification of the existing roads according to their functions assigned to them. Roads in the urban area are generally classified into the following four classes based on their functions:

i) Principal arterial roads;

ii) Minor arterial roads;

iii) Collector roads; and

iv) Local roads.

But in this study of Medan Area the evaluation is made only upper three classes of roads, excluding local roads because of its localized function.

Generally speaking, there exist several ways of classifying the functions of road, but the classification in this study is made in the relation between the volume of traffic and vehicle-km. Fig. 6.2.1 shows such evaluation of urban roads of Medan Area, in which vehicle-km is expressed along the vertical axis, while the traffic volume is expressed along the horizontal axis. Fig. 6.2.2 shows the present Traffic Flow Diagram in Medan City in 1979.

Notes: Vehicle-km means Numbers of Vehicle multiplied by Trip Distance (km) on certain link of trip.

According to Fig. 6.2.1 every class of road is expressed by its area occupied as follow :

Area Occupied in Fig. 6.2.1.	Urban Road Classification
①	Principal arterial roads
②	Minor arterial roads
③	Collector roads

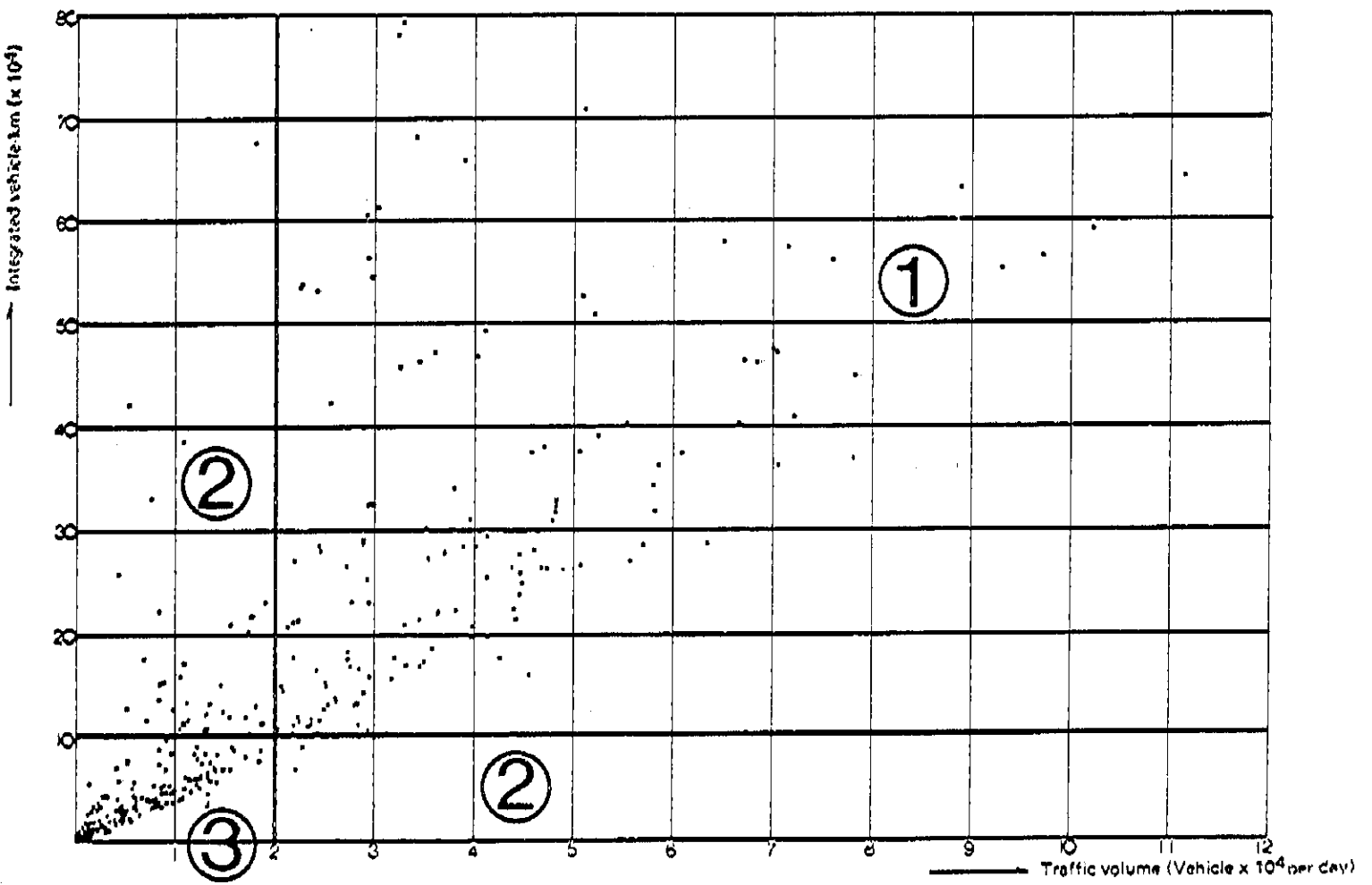


Fig. 6.2.1 Functional Classification of Roads in Medan City (1979)

Legend:

① — Principal arterial roads
② — Arterial roads
③ — Collector roads

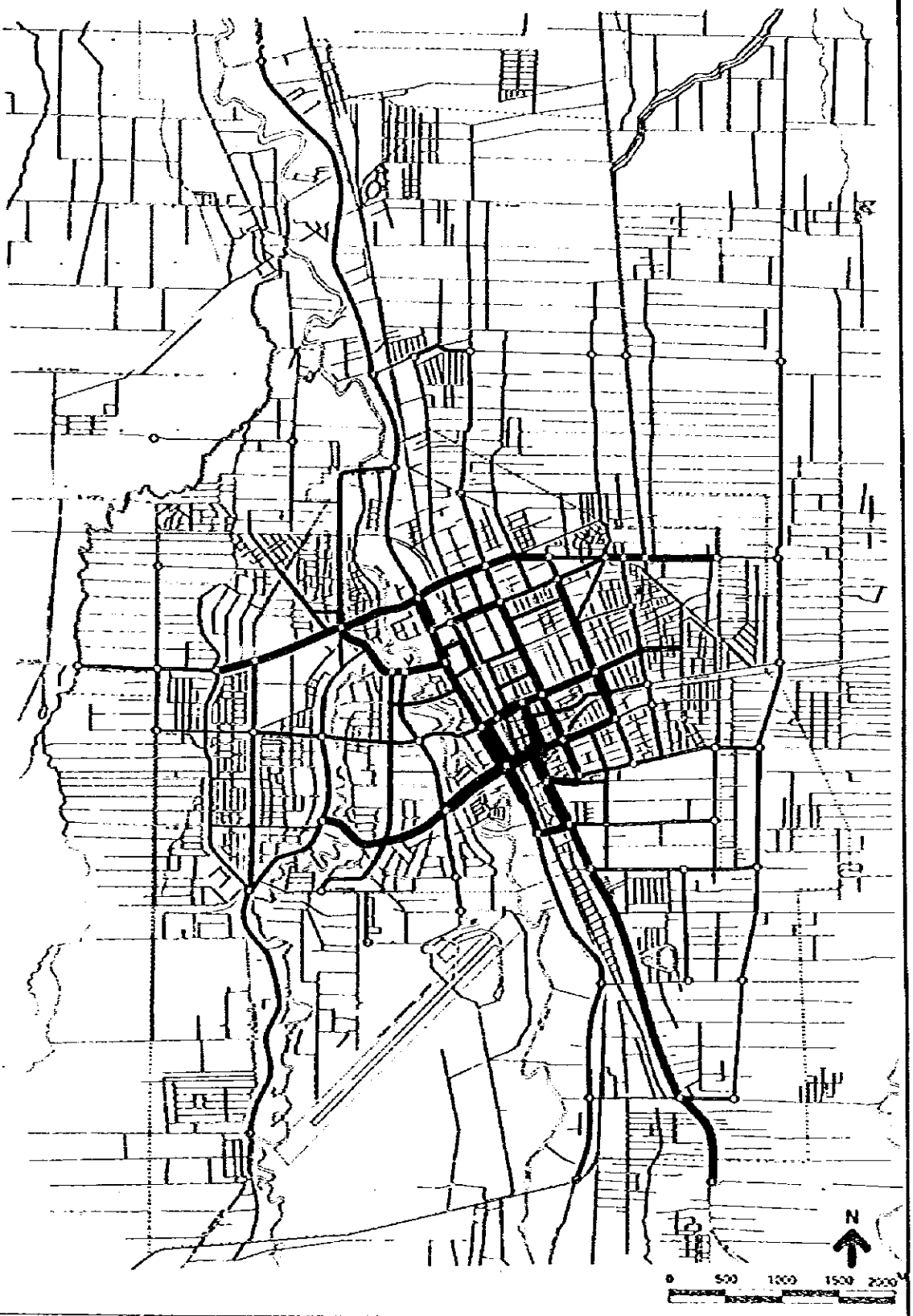


Fig. 6.2.2
Present Traffic Flow Diagram,
Medan City (1979)

Medan Area Transportation Study

Legend:

Vehicle/day	
0 ~	5000
5000 ~	10000
10000 ~	30000
30000 ~	60000
60000 ~	90000
90000 ~	

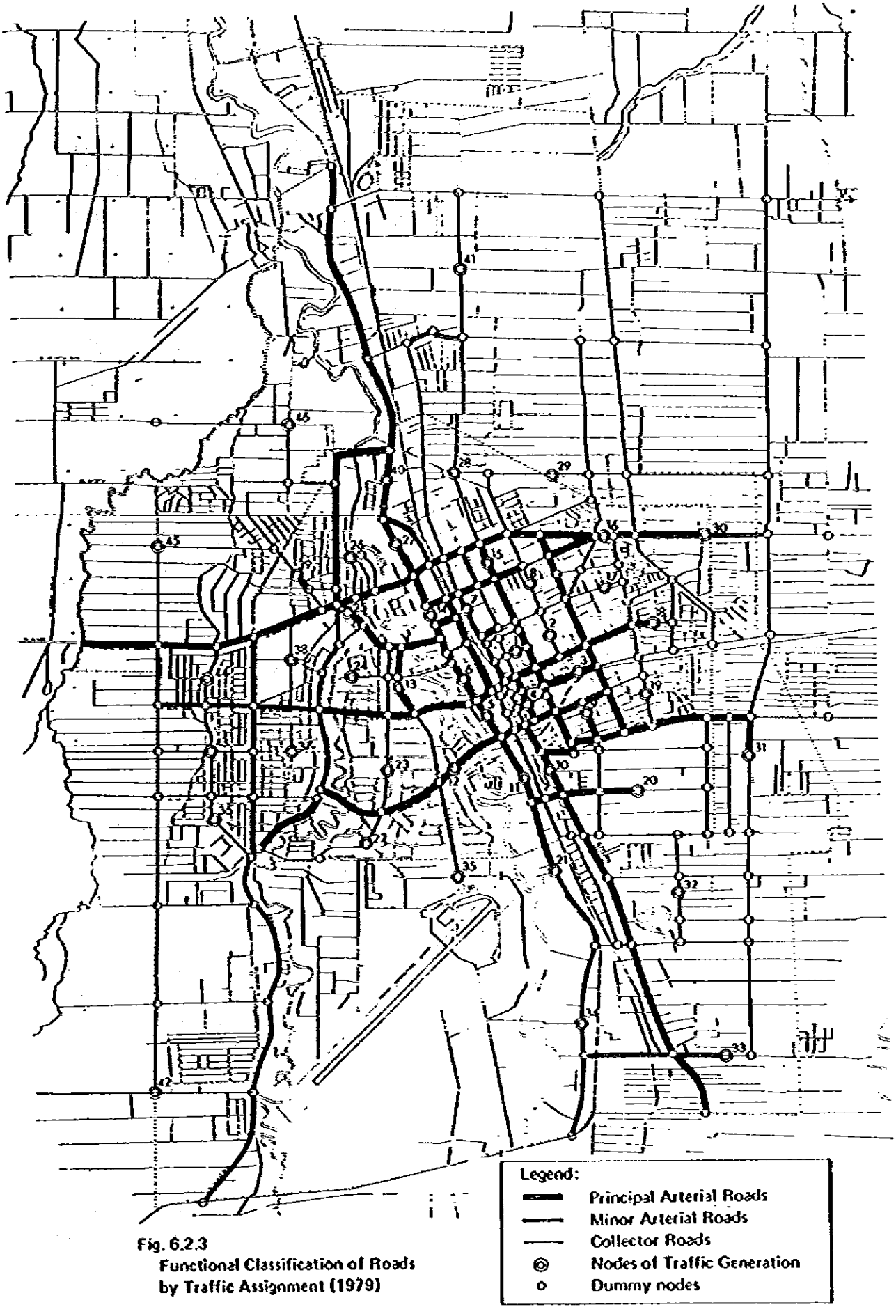


Fig. 6.2.3
Functional Classification of Roads
by Traffic Assignment (1979)

Although such an expression is relatively real, but Fig. 6.2.1 is applicable only to the case of Medan City.

Fig. 6.2.3 shows the function of each road in the CBD according to areas occupied in Fig. 6.2.1. The function of urban roads shown in Fig. 6.2.3 shows the fact that a main circulating one-way traffic route existing in the east and west sides of the railway, and a circulating one-way route linking both main circulating routes laterally across the railway constitutes the principal arterial road network of the CBD, and their outward extensions together with the existing five corridor roads radiating from the CBD constitutes the principal arterial road network of the city.

In view of the short-term solutions of the present traffic problems of the city from their present function of roads the key solution is the way how to utilize such principal arterial road network of the city for the urban transport purpose as much effective as possible.

6.2.3 Road Spaces

Road spaces in the urban area are generally considered to possess the following functions beside their functions as channels for traffic:

(a) Public spaces of the city; and

(b) Spaces for emergency in case of fires or urban disasters.

Public spaces of the city are those for the purpose of urban appearance and also spare spaces for psychological effect, in which road spaces share their major responsibilities. Road spaces embrace spaces underneath for such public facilities as main pipings for city water and sanitary works, communication wiring ducts, city gas main pipings and power lines.

Spaces for emergency purpose means for fire-fighting activities and for fleeing citizens in case of disasters. Such needs could not be realized at peace time but are felt badly needy in other cities which had such bitter experiences before.

Viewing the present situation of road spaces of Medan City from such points of view one could really feel the shortage of appropriate road spaces from the fact that the rate of road spaces to the zonal area in the CBD of the city is presently as low as 8.0%. which is much lower than that of Jakarta. In improvements of transport facilities of Medan City it should be seriously considered to increase the rate of road spaces, particulary along principal and minor arterial roads.

6.2.4 Vehicle Parking Spaces

As far as vehicle parking spaces are concerned, it seems necessary to provide sufficient open spaces for vehicle parking purpose and to discourage to use road side spaces for such purpose, and by so doing it will attain the maximum utilization of road spaces more effectively for traffic purpose.

6.2.5 Traffic Control System

Relating to this category the following two items are considered in this study, namely, traffic control by signal and one-way traffic system. Problems concerning street intersections are considered in other category.

Those two items constitutes a main problem of traffic control devices in Medan City. Increasing traffic control by installing traffic signal should be considered first of all because the present numbers of locations of existing traffic signals is not sufficient. The presently existing signals at intersections and those planned to be installed are all of indivisually functioning type, but it is necessary to install signals under the plan of inter-related controlling type which is possible to be centrally controlled in order to cope with the future increase of urban traffic.

On the other hand, the one-way traffic system in such an urban size and such a volume of urban traffic as in Medan City presents a problem of detouring by the majority of vehicles, and inconvenience in accessibility. But the present situation of the CBD is such that it is difficult to change it drastically into two-way traffic system due to narrowness of streets and the existence of large number of slow moving vehicles such as Becak. Based on such a background it is considered necessary to induce two-way traffic system only on wide roads in the extent of increasing the efficiency of the total road network, and consequently, to improve the accessibility in the present road network.

6.2.6 Rate of Congestion

The rate of congestion of the existing road network of the City is shown in Fig. 7.3.8 in which it is clear that the rate is higher on roads in the CBD and is lower on roads in peripheral areas. The short-term solutions should lower the rate of congestion in the CBD. Besides those roads in the CBD considerable high rate of congestion are observed on five corridor roads even in the peripheral areas. A short term solution is required to improve the bottle neck of high priority in conjunction with the function of those roads, the same concept can be applied to the case of improvement of street intersections.

6.3 Public Road Transport

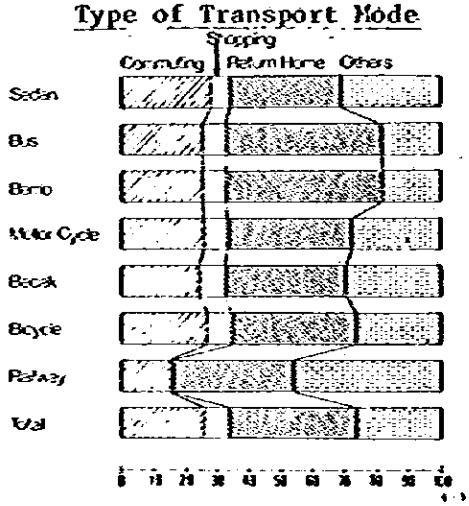
The present public road transport system in Medan City consists of four types of mode such as bus, Bemo, Taxi and Becak. Judging from the existing conditions, the taxi seems presently to be out of consideration because of its present little demand by users.

6.3.1 Balance between Trip Demands and Supply of Bus Service

The existing public transport facilities of Medan City consist of bus,

Bemo, taxicab, Becak and railway, and the current trip data of taxicab are not available because of its small fleet; consequently, taxicab is excluded from the study. It was found through the analysis of the current traffic situation that the rest modes of transport currently occupy approximately 42% of the total trip demands of the city. Such percentage seems to remain in the range of average rate of this kind from the viewpoint of its urban size and its rate of registered number of vehicles, in which motor-cycles are included in the case of Medan City. Out of this percentage the share by bus and Bemo is large and that by railway is nil at present.

Fig. 6.3.1 Purpose Composition of Trip Ends by Type of Transport Mode



In order to clarify the utilizing situation of bus and Bemo in Medan City in contrast with those in other typical cities of similar urban size throughout the world, Table 6.3.1 shows the relation between residential population and population of bus fleet.

Table 6.3.1 Relation Between Residential Population Versus Population of Bus Fleet In Typical Cities In The World

City	Population (in 1000)	Number of Bus/Population (in 1000 Persons)	Remarks
Singapore	2,110	1.3	
Kuala Lumpur	755	1.0	
San Jose	435	1.0	
Casablanca	1,505	0.4	
Lagos	1,448	1.0	
Kinshasa	1,134	0.4	
Caracas	2,277	0.6	
Medan	1,200	0.28	Bus only
Medan	1,200	0.81	Bus + Bemo/4

Source : Urban Transport Sector Policy Paper, IBRD, 1975.
Data of Medan are of 1979, while those of other cities are of 1970.

In the Table 6.3.1 the figures of Medan City varies according to how Bemo is calculated into the equivalent number of bus. In this case Bemo is considered about 1/4 of bus in its seating capacity. In comparison with those figures of other cities the figure of Medan which includes 1/4 of the number of Bemo is added will be comparable. Even such a figure of Medan seems smaller than those of other developed cities except for special inappropriate cases.

On the other hand from the macromatic reviewing of such a figure, the service level of bus and Bemo in Medan City can be said insufficient because a balance is not kept between the demands and the service supplies due to its high peak rate.

Consequently, strengthening of the bus fleet is strongly required even at present, but it is simultaneously necessary to improve the road facilities and but terminals so as the bus fleet to function efficiently.

6.3.2. Bus Service Network

In this section the service networks of bus and Bemo are described. The service networks are divided into two categories, namely, Inter-City network and Intra-City network. There exists presently no particular problem in respect of Inter-City bus service network to be taken up as one of the short-term solutions for the urban transport problem because an appropriate balance seems to be kept presently between its service demand and its service supply rendered by the hand of private enterprises.

The problem in Medan Area is rather the service network of Intra-City buses, which routes have been opened already almost all passable roads stretching out from the center of CBD, reaching to major zones of the city, the average rate of coverage by service network seems to be kept in the range of some appropriate level with an integrated service network of bus and Bemo. But the problem is the localized delay of strengthening the road network particularly in zones of #12, #22, #23, #24, #25, #37 and #38 where have not been covered by any bus service network yet, depending presently only upon the Bemo service network. It is considered efficient to cover such zones with a bus service network if their service demands reach at a certain level. From such a point of view it is reasonable to study the bus service network in the frame of short-term solutions, being combined with the improvement of road network.

6.3.3 Terminal Facilities for Public Transport

In the categories of terminal facilities for public transport in Medan Area the major features are presently bus terminals and Station Plaza in relation of Medan Railway Station.

The bus terminals are one of the main objectives to be improved as public transport facilities. Particularly, Pasar Sambu Bus Station situated in the CBD has a serious problem in the following aspects:

(a) The way of Bemo parking;

(b) The limited space of the bus terminal area;

(c) Emerging truck traffic to be generated in surrounding warehouse area ; and

(d) The high peak ratio of terminal congestion.

Considering those items, the limited space of the terminal area seems to be the direct cause of congestion. This is because most of the city bus routes originates or terminates there. Judging from such conditions it is necessary to improve Pasar Sambu Bus Terminal adopting the following procedures :

(a) To pave the road surface completely;

(b) To separate the bus passengers from bus lane space; and

(c) To arrange bus berths separately from those for Beno.

By such improvements it is expected that the operating capacity of the bus terminal will be increased noticeably.

6.3.4 Frequency of Services

In the Inter-City bus service network, although there exist some differences among bus routes, an appropriate level of service frequency is seems to be kept in every route judging from their present operating diagrams. In the Intra-City bus service network their present operating diagrams are formulated so as to keep the level of 5 minutes interval in peak hours, keeping sufficient units of bus as a total of all bus operating companies in the city. But in their actual operations the punctuality of their operations can not be maintained because of the daily congestion taking place at Pasar Sambu Bus Terminal. From such point of view some improvement should be made operationally at Pasar Sambu terminal such as adjustment of bus operating diagrams of two separate companies operating simultaneously on the same routes and also the improvement of the terminal facilities so as to facilite the efficient bus flows at the terminal.

6.3.5 Coordination Among Modes of Public Transport

Classifying modes of public transport of Medan City railway and roads are the main features. Presently the railway has no share of public transport and consequently it has no problem to be coordinated with other modes of transport, but it should inevitably to share in future the urban public transport of Medan City anyway.

In the road transportation as the main feature of public transport in Medan City bus and Beno are herewith described excluding taxicab and Becak in this section. In the relation between bus and Beno in Medan City both modes are assigned considerably clearly to users of different trip distances as mentioned already in Sec. 4.1. Traffic Characteristics. In other words, both modes supplement one another or mutually coordinated.

The ideal target road public transport of Medan Area in future depends solely upon how Bemo service will supplement what bus service lacks in its service in the frame of bus transportation progressing together with the appropriate and timely improvement related of road facilities.

6.3.6 Fare Structures of Public Transport

Public transport modes including railway exist generally for the sake of citizens having no private transport measure of their own; consequently their fare structures are finally determined in a balance of decision due to policy and its economic feasibility. It is difficult to determine an appropriate fare structures theoretically because the decision due to policy are related on the matter; consequently, its final decision should be made legislatively upon the draft based on the its economic feasibility. The following categories are further discussed on this matter:

(a) Passenger Railway Fare

The passenger fare structure of railway has not a close relation with that of bus because the railway presently depends on passengers of medium and long distances. But if the railway will share commuter service in future its fare for short distance, which is Rp.50.- per side at present, should be made as low as Rp.30.- as same as that of bus.

(b) Bus Fare

The present standard bus fare in North Sumatra is Rp.4.-/km, which is considered to be determined mainly based on the financial balance of private bus operating companies, without any decision by the Government from the policy point of view.

In the case of Intra-City bus service the present standard fare is Rp.30.- per ride which seems to maintain approximately a financial balance of operating companies except in the case of DAMRI which has shown a slight deficit of 2 to 3% annually.

In general, it is a usual case that public transport service performed by private enterprises does not show high profitability. From such a point of view the trend of public transport of Medan City in future is expected to need strengthening the operation by public sector, such as DAMRI in which it is also required to exert its endeavor to respond to the national policy of saving energy and also in establishing a reasonable fare structure economical enough to its users.

6.4 Traffic Accidents

Although statistics on traffic accidents of Medan City are available those could not clarify in what grade the present traffic accidents are in comparison with those of other cities because the way of compilation

of statistics is somewhat different from that of other cities. But the rate of current road traffic accidents of the city seems to be comparatively high because of variety of its existing transport modes and wide range of their operating speeds. Consequently, in order to cope with such a current traffic situation it is considered necessary to strengthen vehicle-driver's eduation to observe traffic regulations, enforcing complete traffic law and regulations including appropriate guidances and the installation of more additional traffic signals so as to reduce traffic accidents in future.

On the other hand, as for the railway accidents considerable large accidents took place in past due to the insufficient safety devices of railway crossings, for which it is proposed to improve at least barrier gates of existing crossings and to install devices to warn automatically gate-men well as road users the approaching trains.

6.5 Railway Transport

6.5.1 Share of Railway in Urban Transport

The volume of passenger traffic carried by railway in North Sumatra has been on a decreasing trend year by year since 1968 dut to the lack of fund and quality and quantity of facilities as internal problem. Especially the number of passenger of short distance has dropped extremely in recent years. The existing railway system does not presently share the transportation of urban traffic in Medan Area, but is only confined to inter-city passenger traffic and long-distance freight traffic (Refer to paragraph 3.3.2.). Therefore the Medan - Pancur Batu Line and the Medan - Batu Line have been closed since 1970. The decrease of railway passengers in urban traffic in Medan Area has been caused by development of raod transport. The diversion of passengers from railway to road is due to the handicap in fare, frequency of service, travel speeds, elasticity in service and network. The existing train diagram has not been appropriate to the demand of urban traffic. The number of local passenger trains on the section between Medan and Perbaungan, Medan and Binjei, and Medan and Belawan are only one, two and nil respectively in each direction per day. Therefore, both Medan and Medan Pasar stations have not been utilized at all in recent years for the urban transport of Medan Area in spite of their advantageous locations in the city.

6.5.2 Current Problems of Existing Facilities

There exist such weak points of railway facilities to serve for the urban traffic of Medan Area as follows:

i) Number of Stations

The number of railway stations presently existing in Medan Area are a few as shown in Fig. 3.4.2, so that the distance between adjacent stations is too long to be utilized for the urban transport service.

ii) Location of Medan station

The Medan station is situated in the city center, having an advantageous location for the urban traffic if it is used for the purpose. However, the railway occupies a large tract of land in the city's central area, which hinders the urban development of the central area. Besides, Medan Station has an entrance and an exit for passengers only for the west side of its track. It brings about a disadvantage for the access from the east side of the station, the most populated area of the city.

iii) Tracks Condition

The railway tracks in Medan Area are presently of lower class and grade as shown in Table 3.4.6 and Fig. 3.4.5. The maximum allowable speed on the Medan-Belawan Line and the Eastern Line is 59 Km/h, while it is 45 Km/h on the Western Line. Furthermore, the speeds on those lines are partically reduced substantially less than the above-mentioned speeds due to their present condition of track. They need to be rehabilitated in order to increase the present operating speeds on their lines.

iv) Railway Crossings

All railway crossings existing in Medan Area are at grade. Although barrier bars are equipped and operated by gate-men, there is no device to inform to gate-men as well as road users approaching of trains. Therefore engine drivers use to reduce their train speeds for the sake of safety when the trains approach crossings. Consequently, the reduction of train speed brings about train delays and the increases of closing time of crossings.

v) Signal and Telecommunication Systems

Presently, the train blocking system depends on the telephone system, which sends only the information on train arrival from adjoining stations. It causes the longer stopping time of trains at station, and lower safety for train operation. All railway stations in Medan area except for Medan, Pulu Berayan, Belawan and Medan Pasar are presently not equipped with any railway telephone which can be exclusively used for the train operation control. In case when it is needed to increase the train speed, such present communication system has to be improved.

vi) Rolling Stock

There is no diesel rail-car unit in North Sumatra at present, although diesel rail-cars are more preferable for the purposer of urban commuter service; the present train units are hauled by diesel locomotives. Because of high acceleration, elasticity in service, easy shuttle service, diesel saile cars are to be assigned for if the railway has to share a part of the urban transport.

Fig. 6.5.1 Railway Passenger Desire Lines by Station in Medan City (October 1979)

6.6 Marine and Air Transport

(1) Marine Port

Port of Belawan is presently the sole marine port in this study area. The role of port is dominantly depending on the commercial role of Medan City. The more the population of Medan City increases, the more Port of Belawan increases its importance.

The loaded and unloaded freight tonnages have increased so far and an expansion project is now under implementation. Therefore any problems on the part of port facilities cannot be presently observed except a narrow railway shunting yard in the port area. Although its yearly tonnage of freight to be handled is anticipated to increase further some problems are considered on the transportation system for its hinterland. On such a point of view a contain coordination in transportation between the railway and the road seems to be indispensable. As far as the road system is concerned the toll road of Belawa-Medan-Tg. Morawa has been planned, which will give a great impact on the transportation to and from its hinterland after its completion. However, how to manage the port traffic during the transient period before the completion of short-term improvements of the port will be the most important problem because of the temporary shortage of its operating capacity.

(2) Airport

Plonia Airport is the sole international airport in North Sumatra. A part of its improvement has been just finished recently and the DC-10 class aircrafts are able to land on and take off at this airport as far as runway, taxiway and ramp area are concerned.

According to the air transport statistics, the number of aircrafts and of air-passengers have been increasing with a rapid annual growth rate of 24% in an average since 1970 and it will be estimated to continue such a trend for years to come. This is because Medan City is substancially growing into a metropolitan city of Sumatra Island in future.

Considering those facts, further expansion of the airport facilities seems to be necessary in the near future.

6.7 Total Evaluations

The evaluations on the present transport facilities and traffic situation existing in Medan City already made in several preceding sections separately can be briefly summarized as follows:

(a) Balance between traffic demands and transport supplies:

i) Shortage of present urban road spaces;

ii) High rate of congestion on certain arterial roads in the CBD as well as on five corridor roads radiating from the center of the CBD;

iii) Insufficient traffic capacity of certain arterial roads in the CBD due to the present roadside parking system; and

iv) Insufficient railway service for commuting traffic despite of its present surplus track capacity.

(b) Accessibility

i) Frequent interruptions of the east-west road traffic across the railway at crossings in the CBD;

ii) Inappropriate access from the center of CBD existing on the east side to zones on the west side of railway; and

iii) Inappropriate access from Medan Station to the center of the CBD in the east side of railway.

(c) Maintaining Urban Transport Service fro Citizens

i) Shortage of appropriate intra-city bus service in some portions of the City is strongly felt;

ii) Urgent necessity to improve Pasar Samba Bus Terminal; is needed;

iii) Railway's essential responsibility is called to share the urban transport service of Medan City in the direction of urban transport planning for its future; and

vi) Balance between fare structures of railway and bus in short-distance transport service should be established.

(d) Safety

i) Vehicle-drivers' eduation to observe traffic regulations, and perfection of the traffic regulating structure is essential;

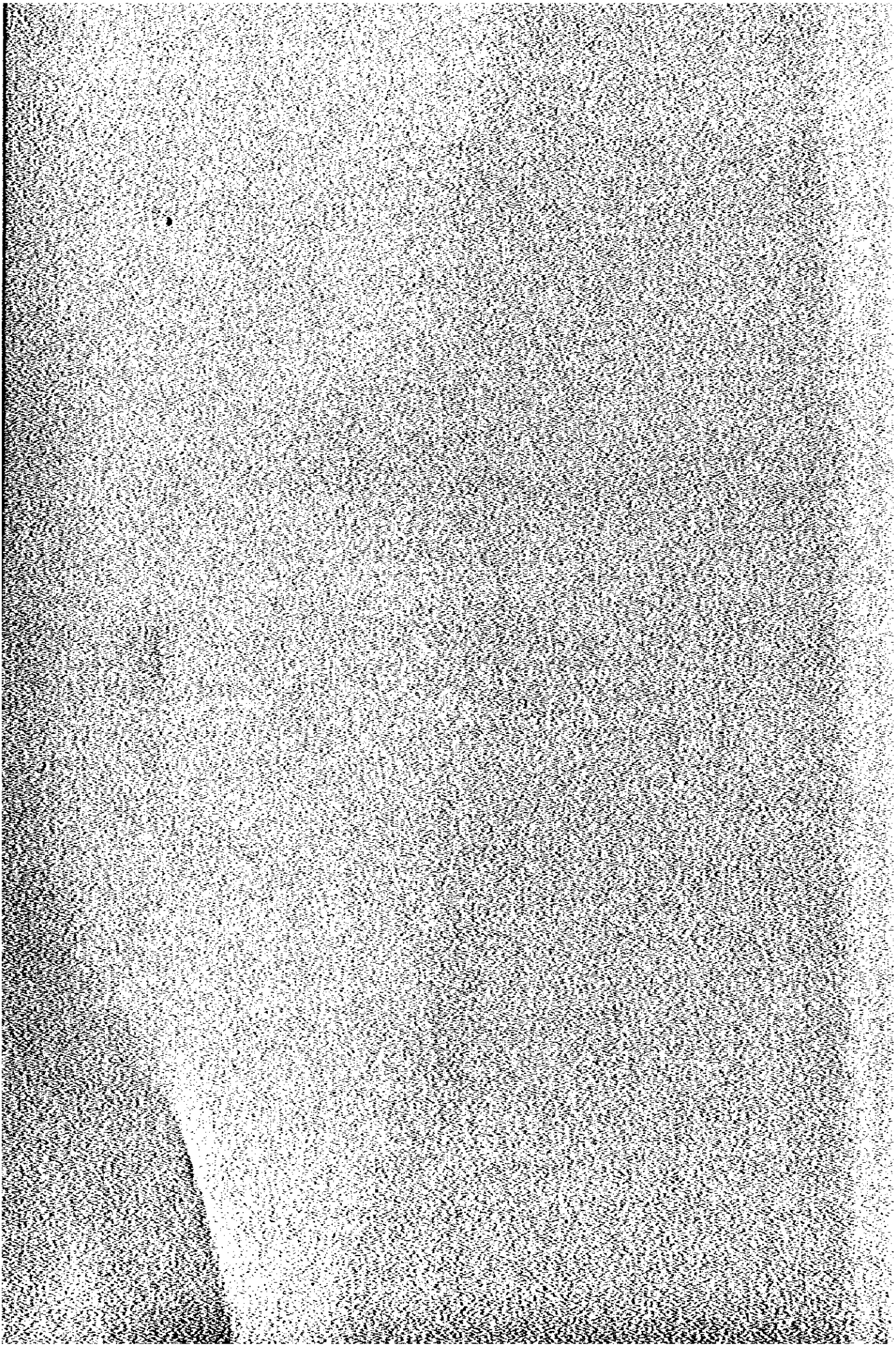
ii) Necessity to facilitate street traffic flows by drastic introduction of road traffic signals is strongly needed;

iii) Improvement of safety devices at railway crossings is necessary; and

vi) Improvement and/or installation of sidewalks for pedestrians is needed.

Chapter 7

SHORT TERM IMPROVEMENT PLANS



Chapter 7. SHORT TERM IMPROVEMENT PLANS

7.1 Planning Policy for Short-Term Solutions

Prior to considering short-term solutions for Medan area urban transport problems, which are to be implemented by the fiscal year 1984/85, it is firstly necessary to classify the situations in order to identify the existing problems, to define how solutions should be, through which the mutual relation between short-term and long-term solutions should be clearly defined.

7.1.1 General

In planning such solutions for the present urban transport problems for Medan area the basic objectives to be attained might be classified as follow despite whether they are for short-term of long-term.

(a) Securing Urban Functions

Under the premise that Medan City, which has presently a population of 1.2 million and is estimated to grow up to a metropolis of 2.3 millions in population in 2000 A.D. as a political, administrative, economic and educational center not only of Province of North Sumatra but also of Sumatra Island, an aim of this category in planning is to make legislative and economic activities well functional, which need various intra-city transportation, while another aim is to secure a safe and convenient urban transport network necessary for citizens' needs in their daily lives.

(b) Preservation of Balanced Urban Environment

One of the solution of this category is the improvement of urban transport facilities paying keen attentions to public nuissances particularly the abatement of noises and smoke, and waste gases and the prevention of accidents; on the other hand, it is to preserve favorable urban environmental conditions by restricting the population density at an appropriate grade. This is the general philosophy of land use planning.

(c) Securing Abundant Public Spaces

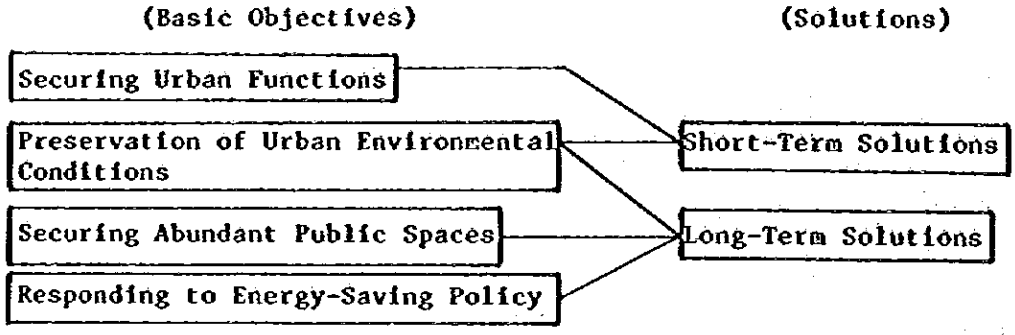
This category means to preserve an abundant public spaces, including spaces for public roads, for possible facilities of municipal water and sanitation works, (and for recreational parks and green areas), essential for the healthy development of the urban area. This should be done much in advance of the actual city development.

(d) Responding to Energy Saving Policy

As it is widely discussed presently in many other countries, it is to respond to the national policy to save petroleum resources in planning urban transport system and select the modes of transport enabling to realize such objective as much as possible.

7.1.2 Relation between Short-Term and Long-Term Solutions

Such four objectives in urban transport planning mentioned above could be applied to those solutions in Medan area as follow:



As it is shown in the above combination short-term solutions should aim at securing urban functions. The rest catetories are those objectives which could not be solved without conducting an comprehensive study of integrated urban transport network; consequently, they should be handled in the long-term solutions.

7.1.3 Definite Measures in Short-Term Solutions

When considering short-term solutions, in which securing urban functions as its central objective, its definite contents could be classified as follow:

(a) Balance between Transport Demand and Supply

The transport demand by users could be generally satisfied with the well-balanced supply of transport of qualified service level. Actually, a problem could be usually solved by restricting the rate of congestion at an appropriate grade.

(b) Accessibility to Transport Facilities

This category means to consider the solutions which enable citizens to move conveniently from where they are to wherever they want to go with the least trip distance and the least travel time.

(c) Securing Transport Facilities

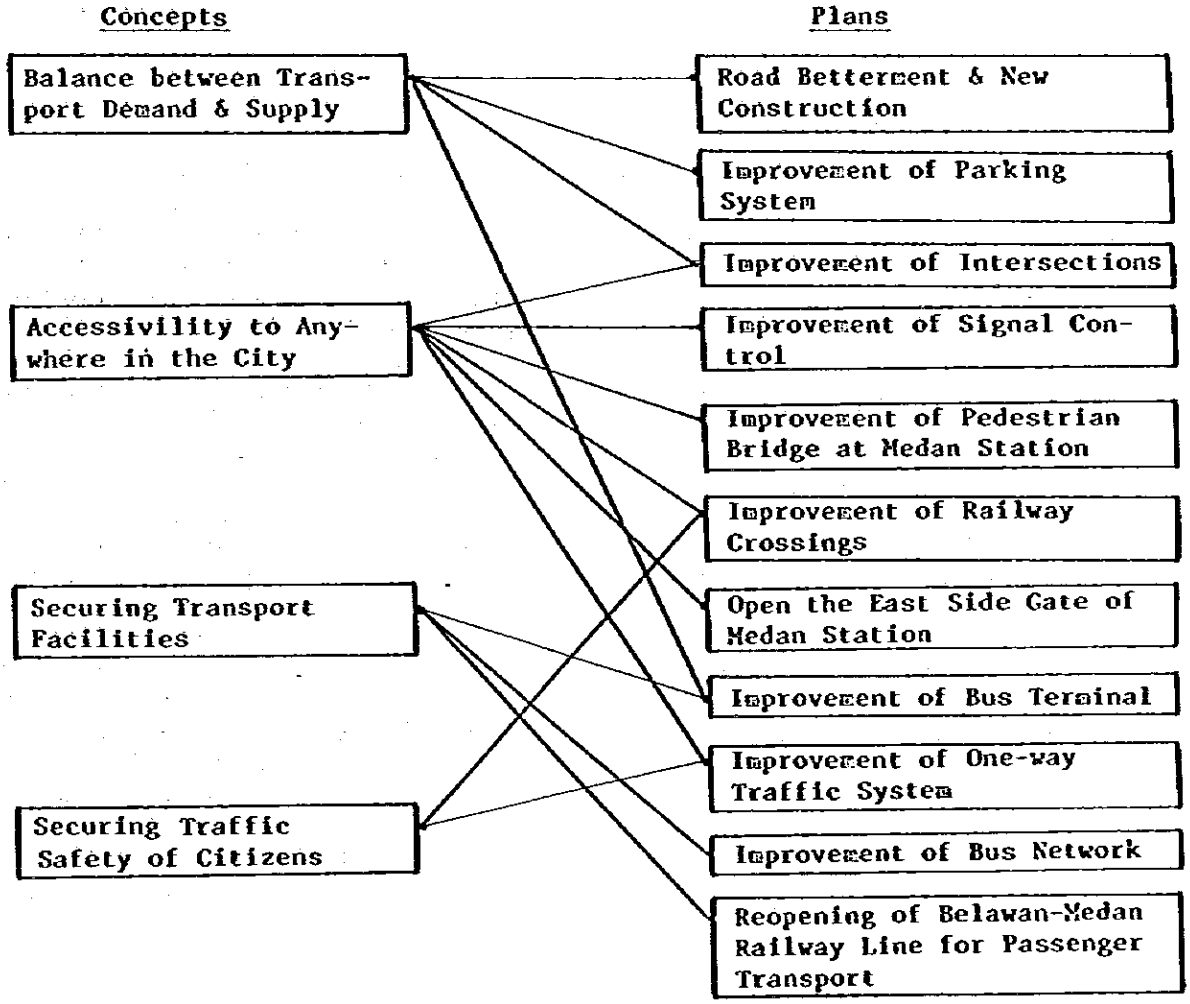
This category is to improve whole transport facilities in wider sense, but it is also to improve the public transport system in narrower sense. In other words, it is the problem to secure transport facilities conveniently enough for low and low-middle income groups who can not afford to own their own vehicles nor motor-cycles.

(d) Securing Safety of Citizens

Wide variety of measures could be considered in this respect, including preventing traffic accidents, not hindering fire-fighting

activities, etc. Those measures should secure safety of road users, including drivers as well as pedestrians.

On the other hand, some appropriate legislative measures should be timely taken effectively in order to attain the maximum benefits from those solutions when they are actually implemented.



7.2 Road Affiliated Facilities and Traffic Control Devices

7.2.1 Road Affiliated Facilities

Road affiliated facilities are greatly related to the principal road elements such as road classification, design speed, traffic capacity, components of cross section and alignment. Fully-installed road facilities can constantly keep its potential performance without being affected by weather and other conditions. Moreover, it ensures traffic safety and confortability of road users.

(1) Drainage System

Road drainage system aims primarily at providing favorable conditions on road surface and preventing the surface from inflow of the surface water from adjacent areas when it rains. Simultaneously, it is intended to prevent traffic stagnation due to surface flooding. Such a drainage system is considered basically over-designed and should not be allowed from the economic point of view if it is intended to drain the surface water completely without delay even in the case of anticipated maximum rainfalls take place. Consequently, the draining capacity required for roads to ensure their safety from the maintenance point of view must be determined by taking into account the road classification and their environmental condition along the route. In addition, each road drainage facility must be provided with adequate dimensions according to the purpose of drainage and the anticipated extent affecting on the surrounding areas in case of strong rainfalls in excess of the planned intensity.

As for drainage system in a flat areas like in Medan City it is difficult to provide slope steep enough to keep a necessary flowing velocity of draining water in ditches; consequently, drainage structures are apt to become larger in size than they are really necessary. Fig. 7.2.1. is a proposed drainage system for urban streets where it is difficult to keep a necessary draining velocity by using U-shaped ditches. It is proposed to install pipe culverts as shown in Fig. 7.2.2 for the drainage of commercial and domestic waste water as proposed in Medan Urban Development Study as shown in Fig. 5.2.1: Waste Water Service Strategy.

(2) Street Lighting

Some of the benefit from street lighting are:

- To facilitate drivers' operations at intersections;
- To improve alignment delineation and evidence of decision points;
- To attain greater comfort in driving, particularly in unfavorable weather;
- To facilitate police action;
- To increase visibility;
- To attain possibly a slight increase in traffic capacity; and
- To make possibly a greater use of the street during night;

While the traffic accident reducting effect by using continuous street lighting is probably not large because of the numberous other factors

Fig 7-2-1 Drainage system , using U-ditch

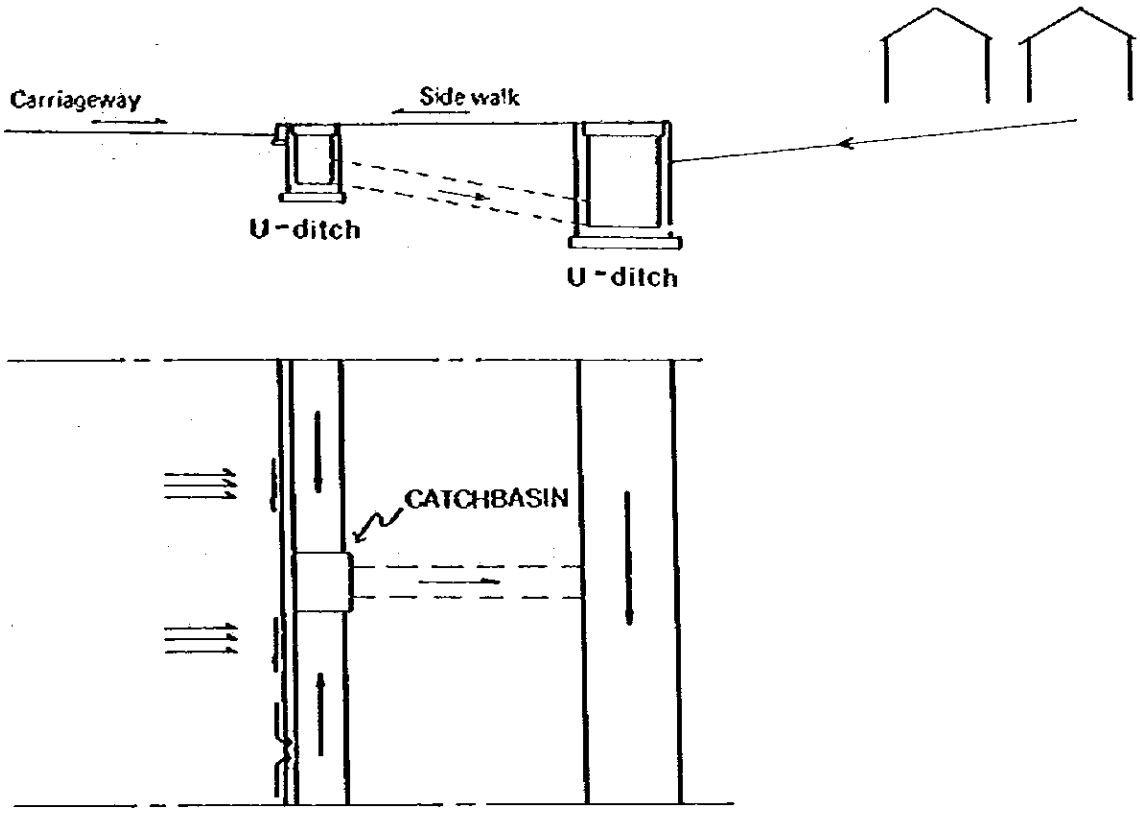
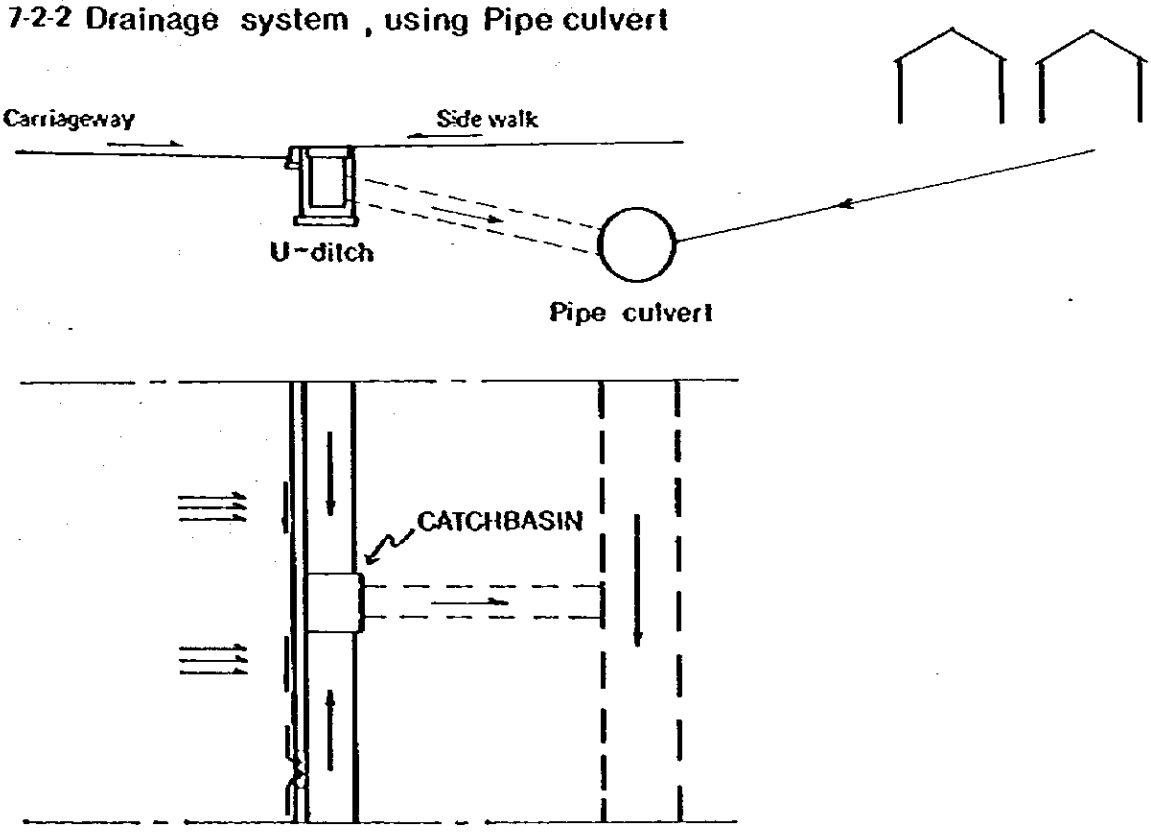


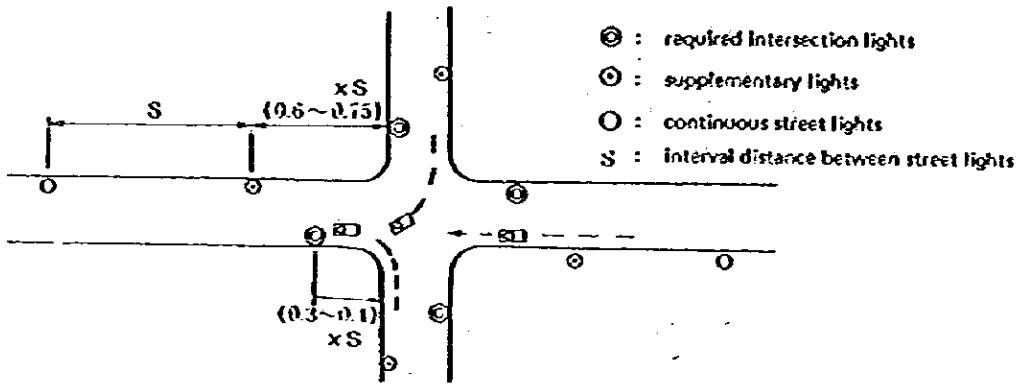
Fig 7-2-2 Drainage system , using Pipe culvert



contribute to night-time accidents, and consequently, the benefits of partial street lighting are stressed in numberous studies. Lighting at intersections, railway grade crossings, pedestrian crossings, sharp curves, narrow bridges etc. can produce substantial reduction in night accident rates, and are particularly effective in reducing pedestrian accidents.

A typical installation of strest lighting at interesection is shown in Fig. 7.2.3.

Fig. 7.2.3 Typical Installation of Street Lighting at Intersection



At signalized intersections, it sometimes happens that the position of light is too near to recognize a signal. In such a case, the height of light had better to changed in order to avoid dizzy signals when drivers look at them.

(3) Planting

Planting should not be considered as a decorative measure to be applied to roads after the construction phase is completed. The appearance of streets and its impact on the environment must be constantly kept in mind throughout the design process. Planting should be accomplished as rapidly as construction activities will permit.

Low growing vines and ground cover may be used to considerable advantage on narrow separating islands and on approach noses and merging ends. Such greenbelts offers definite contrast with the pavement and curbs, and tends to close-up traffic lanes both day and night. Shrubs and small trees may be used in medians to screen headlight glares. Also, planting, if properly designed, can be used to soften the rather hash appearance of continuous median barriers.

Planting shrubs assist in traffic safety by delimiting the approach ends of separating roadways and by making obvious the changes in roadway line and grade.

(4) Road Reflectors

Road reflectors shall be installed at intersections where visibility is poor due to narrow road crossings and insufficient corner sight. On designing an intersection a sufficient corner space must be secured so as to offer good visibility to drivers without depending upon road reflectors. However, road reflectors may be installed tentatively at intersections where it is difficult to improve soon and it is hard for drivers to keep sufficient visibility on turning. It is expected that drivers can judge adequately at those intersections. Two examples of road reflector installation are shown in Fig. 7.2.4

Fig. 7.2.4 Example of Road Reflector Installation