

(4) Financial Analysis and its Result

a. Method

The financial analysis consists of the cash flow analysis for measuring the inflow and outflow of cash and the fund profit and loss statement analysis based on the assumed financial conditions.

Each case is evaluated based on various indexes, but the principal indexes are as follows:

1. FIRR (Financial Internal Rate of Return)
2. Number of years required for generating profit after depreciation for single business year.
3. Number of years required for generating profit after depreciation by offsetting the accumulated deficit.
4. The largest balance of outstanding liabilities and corresponding year.

b. Financial conditions and estimate of fares

b-1 Financial conditions

The conditions of each financial source were examined, and the conditions for raising the fund for covering the project cost were set as follows:

Table S-1 LOAN CONDITIONS BY FINANCIAL SOURCES

Sources of the funds	Local currency portion cost (35% of the total)			Foreign currency portion cost (65% of the total)	
	* Ecuadorian Government	Banco de Desarrollo del Ecuador	Foreign private banks	Foreign Government	Foreign private banks
Assumed loan conditions					
1. Annual interest rate	-	12%	9%	4.75%	9%
2. Period (incl. deferment years)	-	15(3) years	12(3)	15(7)	12(3)
3. Method of redemption	-	12 years (equal installment principal & interest for 12 years)	9	18	9
Composition of funds	10% of total project	10% of the total	15% of the total	** Max. amount in foreign portion: 8,600 mil. Sucres	Remainder of foreign portion

* : Payment of interest and redemption of principal for the fund from the Ecuadorian Government are supposed to be not required.

** : Amount of the fund is dependent on negotiations with foreign governments concerned, but it was assumed to be 8,600 mil. Sucres (= 15,000 mil. Japanese yen) at a maximum as an example in this Study.

b-2 Fare

Since the MRT demand was estimated based on the assumption of the average fare of 25 Sucres, the same fare is used for this financial analysis. However, the case where the average fare is assumed to decrease to 20 Sucres with the MRT demand left unchanged is also examined.

c. Result of financial analysis.

Case	FIRR (%)	No. of years after commencement (Year)		Maximum cumulative long and short term loan (mil. Sucres) (year)	Total project investment (mil. Sucres)
		Yearly net profit turns to positive	Accumulated surplus turns to positive		
Basic Case	12.79	5	6	23,600 (1989)	31,300
Case A-1	12.33	6	11	26,400 (1992)	31,600
Case A-2	12.41	7	7	20,800 (1995)	31,700
Case B-1	13.26	5	5	23,600 (1992)	31,600
Case C-1	11.05	-	-	30,300 (2020)	32,900
Case C-2	10.53	25	-	27,900 (1999)	33,000
Case D-1	11.43	16	25	28,700 (1992)	32,900
Case E	7.94	-	-	76,900 (2020)	13,800
Case F	10.75	8	14	15,600 (1989)	19,700
Case G	6.41	-	-	307,500 (2020)	18,400

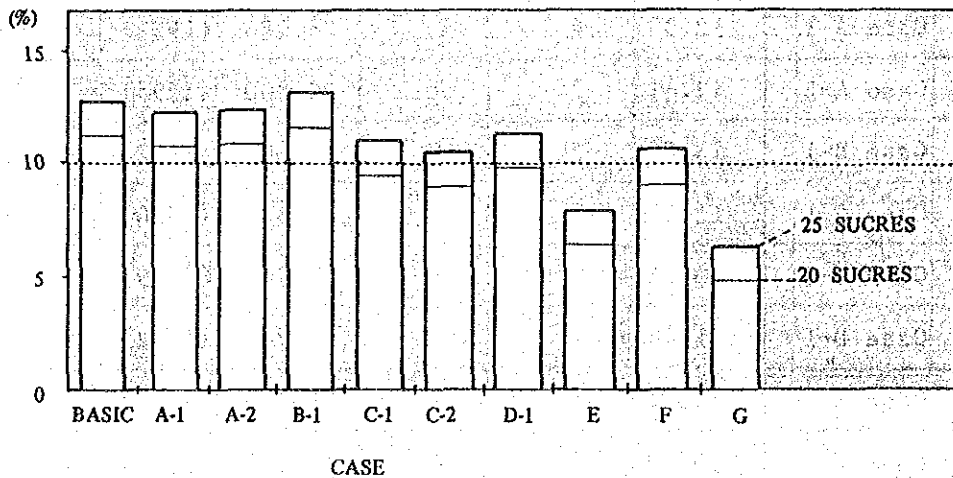
(-) denotes the cases where the operating result will not turn positive during the 30 years' life of the project (by 2020).

d. Observation

d-1 Financial Internal Rate of Return (FIRR) of the project

The cases considered to have high profitabilities are the Basic Case, Case A-1, Case A-2 and Case B-1, and these are the cases for commencing the service by the whole line at a time or for commencing the service from the northern end of the line (Terminal Terrestre), whereas the profitability falls in those cases for commencing the service from the southern end of the line (Guasmo).

The largest of FIRR is 13.26% in Case B-1, and this is the best in the financial terms, and this indicates that the profitability in Case B-1 is by 1.6%/year higher over 30 years of the project life than the best (Case D-1: 11.43%) of cases in commencing the service from the south.

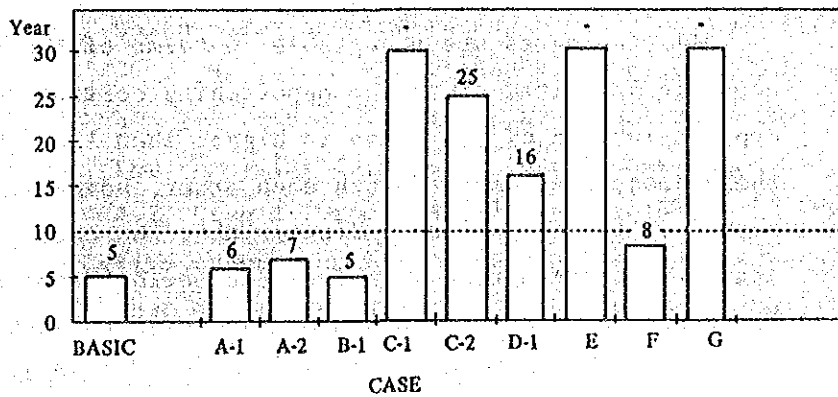


COMPARISON OF FINANCIAL INTERNAL RATE OF RETURN BY TEST CASE

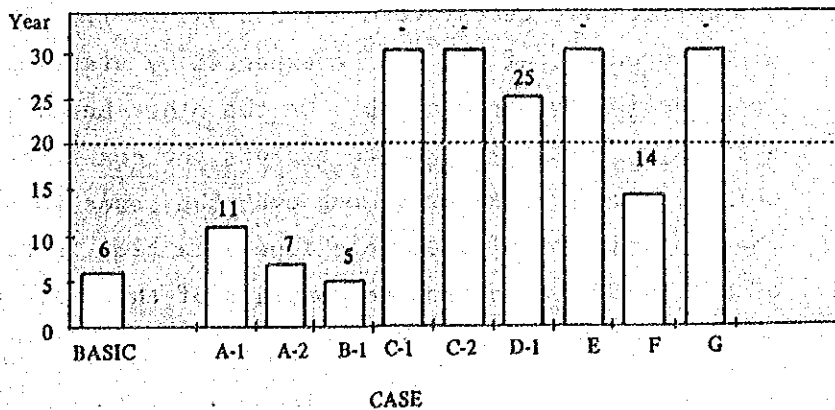
d-2 Number of years required for yearly net operating result and accumulated surplus to turn positive

This number of years indicates the condition of the cash flow following the commencement of the service, and the advantages and disadvantages among cases have the tendencies almost similar to those discussed in d-1. The best case is Case B-1, and this is followed by the Basic Case, Case A-1 and Case A-2. These cases are very sound as far as the conditions for the operation of the business are concerned.

Of three cases assuming the commencement of service by only a section of the line and assuming no further extension of the line, Case F has the highest feasibility, and the result of the study indicates that this case is better than the cases assuming the start of the construction work from Guasmo, the south end of the line.



No. of Year
When Yearly
net profit
turns to
positive



No. of Year
When Accumulated
Surplus turns
to positive

d-3 Total balance of accumulated outstanding liabilities

Judging from the tendency of the changes in the balance of the accumulated liabilities, the cases where the liabilities would not be able to be cleared within the project life (from 1990 to 2020) are the Cases C-1, C-2, E and G. These cases are considered to require additional financial aids from the public organizations.

(5) Comprehensive Evaluation

In order to select the best case, the results of the economic and financial analysis and the several important matters to be considered on implementing the MRT project are comprehensively discussed below;

a. Result of economic evaluation

All the cases are acceptable in terms of the economic benefits, since the opportunity cost of the capital in each of the cases is higher than 12%. When these cases are compared with each other, however, the result of the comparison indicates that the cases to start the construction work from the north (Terminal Terrestre) are advantageous over the cases to start the same from the south (Guasmo) in terms of all of EIRR, NPV and B/C ratio (The comparison was made between the two contrastive cases, Case A-1 and Case C-1). Thus, a higher economic effect can be expected by starting the construction from the north. On the other hand, it is also known that the cases to execute the construction work by stages is advantageous over the cases to start the construction of the whole line at a time in terms of all the three indexes (comparison of the Basic Case and Case A-2).

From the foregoing discussion, the cases to execute the construction of the MRT by stages from the north are more advantageous than others.

b. Result of financial evaluation

In terms of the financial profitability judged by FIRR, the cases to start the construction from the north are also advantageous over the cases to start from the south and the cases to construct only a section of the proposed line and make no further extension of the line.

In terms of the operating revenue and the potentiality for the redemption of the loans under a certain financial conditions, the Cases C-1, C-2 and D-1 to start the construction from the south and the Cases E and G with no further extension of the line are disadvantageous due to the longer operating period through which the MRT is supposed to be run at loss, which makes the redemption of the loans more difficult.

Thus, from the financial point of view, the aforementioned five cases are least recommendable, and the remaining five cases (Basic Case, Case A-1, Case A-2, Case B-1 and Case F) are feasible. Of the latter five cases, the Case F is a little less advantageous than other four cases from the economic and financial viewpoints, but this is only one case which is feasible among the cases with no further extension of the line.

c. Other points to be considered

The four cases except the five cases being not feasible on their financial aspect and Case F being not

extended in future though it would be feasible, will be discussed further in the following as to other points to be considered.

C-1 Amount of fund to be raised initially

The major portion of the fund for this project is sought in various foreign loans. Thus, in order to increase the potentiality for raising the fund, it is desirable to reduce the initial investment as far as possible. Also, it is easier for the project to raise the necessary fund if the line will be extended by stages while taking adequate care for not permitting the balance of outstanding liabilities to increase excessively.

c-2 Technical implementation capability

This project is intended for the construction of the first rapid transportation system in Ecuador. Thus, in order to make this project successful, it is necessary for the project not only to ensure the technical capability (engineering capability in planning and designing over the whole system, construction work capability, schedule control for completing the project, procurement of the construction materials and machines, etc.), but also to complete all the necessary preparations (establishment of the new MRT corporation, employment and training of the staff, preparation and application of rules/regulation required, etc.) within a shortest possible period of time from now.

Therefore, the feasibility of this project will be higher if the initial investment is reduced to a minimum so that the investment can be increased by stages.

c-3 Control of traffic at intermediate station to serve as a temporary terminal

In the case proposing to execute the construction work by stages, during a certain period of time before completing the construction of the whole line the station located in the middle of the proposed line will be required to serve as the terminal station where the heavy traffic of passengers will concentrate, and so some extra space will be necessary around such temporary terminal station in order to cope with such situation.

In the Cases A-1 and A-2, 9 de Octubre station is expected to serve as the first temporary terminal station, so that several bus stops will be provided near that station. Thus, the traffic congestion may occur on the streets near the station, so that the traffic control will be necessary for the time being before the extension of the line is completed. On the other hand, in the Case B-1, Centro Civico station has an ample extra space, and so no special measures for the traffic control will be required near this station.

c-4 Convenience for passengers

- i) Access to the central area of the city (Casco Central)

The central area of Guayaquil ranges about 2 km east to west and north to south respectively, so that the Case B-1 to construct the line up to Centro Civico station passing the central area will provide better access to the central than the Case A-1 and A-2 to finish the construction work of the first stage at 9 de Octubre station situated at the entrance to the central area.

At present, Centro Civico station is situated at the nodal point of the bus routes leading to the western area and Av. Quito, so that this station is conveniently situated for the transfer from the bus routes to the MRT and vice versa. Besides, the Case B-1 is also advantageous in that the number of buses going into the central area will be able to be reduced considerably.

ii) Substitute for the existing bus route between Terminal Terrestre and Centro Civico

At present, frequent bus services are available from Terminal Terrestre to Centro Civico along the proposed line of the MRT. Its passenger flow is heavy between Terminal Terrestre and 9 de Octubre, while some number of passengers decrease gradually before arriving at Centro Civico station. Thus, for the passengers using the bus service covering this section, the Case B-1 to provide the service of the MRT over the exactly same section will be very convenient.

d. Conclusion

The result of the foregoing general evaluation can be summarised as shown in Table S-2 .

Besides the results of the economic and financial evaluations, other important matters on raising of the funds, engineering execution capability, and the convenience for passengers, etc. were also considered. As a result, the study team has come to a conclusion that the Case B-1 is the best solution to be recommended.

Table S - 2 EVALUATION RESULT

Test Cases	Economic Aspect	Financial Aspect	Intermediate Selection	Other Aspects				Final Selection	Test Cases
				Initial Investment Cost	Technical Implementation capability	Transfer Problem at Terminal Point	Passengers Convenience Characteristics		
Basic Case	○	○		△	△	○	○	Basic Case	
Case A-1	◎	○		○	○	△	△	Case A-1	
Case A-2	◎	○		○	○	△	△	Case A-2	
Case B-1	◎	◎		○	○	○	△	Case B-1	
Case C-1	○	×		○...Small	○...Possible	○...Enough	○...Excellent	Case C-1	
Case C-2	○	×		△...Large	△...Difficult	△...Not enough	△...Fair	Case C-2	
Case D-1	○	×						Case D-1	
Case E	△	×						Case E	
Case F	○	○						Case F	
Case G	△	×						Case G	

However, such unexpected situation as shortage of the project funds necessary for the first stage construction of the Case B-1 might happen. Therefore, the second best solution will be considered under, on condition that it would be financially difficult to execute the Case B-1.

The previous construction stage before completing the 1st stage of the Case B-1 (Terminal Terrestre to Centro Civico in 1990) is a section between Terminal Terrestre and 9 de Octubre, which equals the 1st stage of the Case A-1 and A-2. They differ slightly in the procedure of the extension work, so that these cases can be considered as the second best cases. When there is any financial limitation, however, the case where the gradual extension of the line based on the steady operation of the MRT should precede all other conditions, and in this point of view, the Case A-2 featuring a smaller outstanding balance of liabilities should be selected as the second best case.

Of the cases with no further extension of the line after the completion of the first-stage construction work, only the Case F can be considered feasible both economically and financially. More specifically, the project will be able to be operated at profit by operating the section covering 9.1 km between Terminal Terrestre station and Centro Civico station.

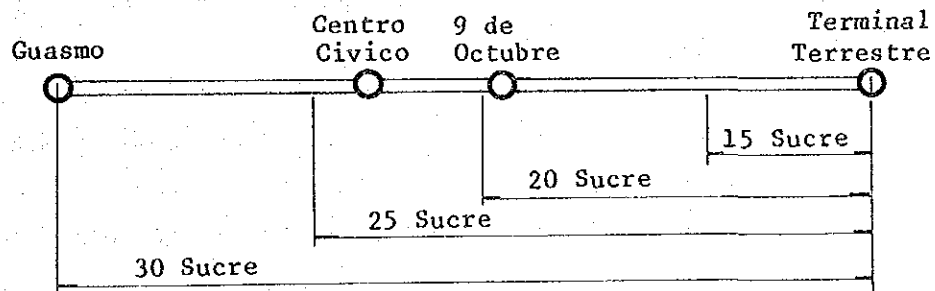
(6) Fares of the MRT

The demand of the MRT is considered to be diverted mainly from the existing bus passengers on condition that the unit fare of the MRT is 25 Sucres (uniform fare system). Actually, however, it seems more convenient for both the users and the management of the MRT to charge the fares proportional to the distance used by each trip than the uniform fare system.

The financial analysis which we have already discussed has been made based on the fares proportional to the distance converted from the average fare of 25 Sucres. The study team, however, has made further study on the fare and recommends the following fare system based on the result of the study.

	Distance covered			Fare
I	0	-	3.0 km	15 Sucres
II	3.1	-	7.0	20
III	7.1	-	10.0	25
IV	10.1	-	14.7	30

For example, the fares for the trips starting from Terminal Terrestre will be as follows when the above fare system is applied.



In the above fare system, however, the average fare will decrease to about 20 Sucres, so that the financial profitability is lower to some extent than the case where the average fare is 25 Sucres (the FIRR will fall by about 1.5% in both of these cases), but there will be no problem from the standpoint of the management. Rather, the increase in the demand can be expected owing to the lower fare level, and these conditions are considered to work favorably for the management of the MRT.

(7) Implementation Program

a. Fund raising plan


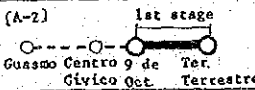
As for the fund raising plan for the project, the feasibilities of various fund sources have been studied, and the plan has been drawn up as shown in page S-28, b-1 of (4). In this plan, of the total project cost, the whole of the foreign currency portion and a part of the local currency portion are dependent on the foreign financial sources.

Thus, the Ecuadorian Government is recommended to regard this project as one of the national projects with the highest priority and do its best in order to introduce the foreign loans at the best possible conditions. Introducing the foreign funds at the lowest possible cost will lead to the lower fare level and the higher profitability of the project, thereby eventually enabling the return of such profit to the general public.

The examples of the combinations of the sources of the funds needed by the time of the commencement of the first stage proposed in Case B-1 (the best case) and Case A-2 (the second best case) are as follows:

Table S-3 Examples of the Combinations of the Sources of the Funds Needed by the Time of the First Commencement of the Service in 1990

(Unit: Million Sucras in 1985 prices)

Case	(B-1) 	(A-2) 	Remarks
	%	%	
Ecuadorian Government	1,588 (10.0)	1,187 (10.0)	Local portion
Banco de Desarrollo del Ecuador	1,588 (10.0)	1,187 (10.0)	"
Foreign governments	8,600 (54.2)	7,633 (64.2)	Foreign portion
Foreign private banks	4,098 (25.8)	1,874 (15.8)	L. & F. in (B-1) L. in (A-2)
Total	15,874 (100.0)	11,881 (100.0)	

The above funds are expected to be defrayed in three years from 1987 to 1989.

b. Preparatory process in MRT management

In parallel with the survey and construction of the MRT system, if this project is to be implemented, various kinds of preparatory work have to be planned carefully. Proposed schedule of this preparatory work is shown in Table S-4 in which the target date of opening MRT services is set as 1 January, 1990.

Among various items shown in the table, items (1) and (2) are thought urgently required. The both are the establishment of the basic character and rules of the MRT system and eventually might produce a heated debate among Ecuadorian parties concerned. But, if the work on these two items delays, then the opening of service on the target date would not be assured, because every work on other items is planned in a limited period and will not be able to carry out in a less period.

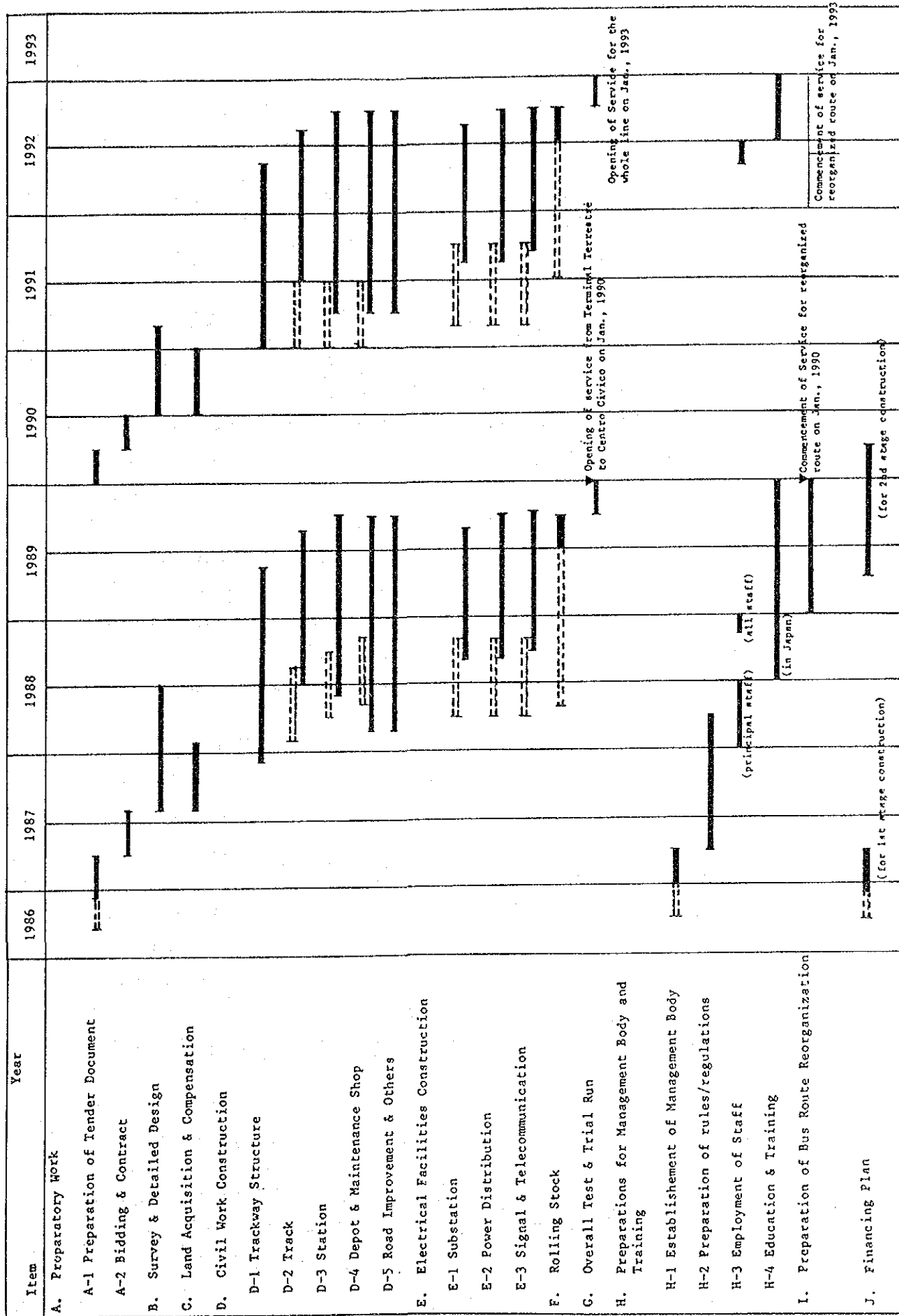
c. Execution schedule

The execution schedule of the construction work covering the whole of 14.7 km proposed in the Case B-1 is as shown in Figure S-6.

Table S-4 PREPARATORY PROCESS IN GUAYAQUIL MRT PROJECT

1987	1988	1989	1990
<p>[1] Establishment of management body (Ecuadorian side)</p> <p>12 months</p>	<p>[2] Preparation of rules/regulations (Both sides) Inspection/authorization by Ecuadorian government</p> <p>[3] Employment of principal staff Designation of the would-be instructors (Ecuadorian side)</p> <p>6 months</p>	<p>[4] Preparatory education in a foreign country (Foreign side)</p> <p>6 months</p>	<p>Opening of service on 1 Jan., 1990</p>
<p>Remarks: As for preparation of rules/regulations, the foreign side is responsible for passenger service/fare system and train operation system, while Ecuadorian side takes charge of the working rule of MRT staff, finance/accounting system, and the like that is mostly founded on Ecuadorian rules and custom.</p>	<p>[6] Overall preparatory education in Ecuador (Both sides)</p> <p>6 months</p>	<p>[7] Training of driving technique and other on-the-job training (Both sides)</p> <p>3 months</p>	<p>[8] Trial running over the whole section (Both sides)</p> <p>3 months</p>
	<p>[9] Dispatch of foreign instructors (Foreign side)</p> <p>15 months</p>		

Figure S-6 IMPLEMENTATION PROGRAM



Note. For Items D, E and F, "=====" means period for manufacturing and transport of imported equipments and materials.

3. RECOMMENDATION

(1) Importance and Necessity of the MRT Project

Owing to the rapid economic growth and population increase, Guayaquil city is now facing serious urban traffic problems such as the all-day-long traffic congestion in the central area, several bottlenecks in the area surrounding the central and the extreme imbalance between the demand and supply of the public transportation service throughout the city. In addition, the recent development of industrial activities has been causing the rapid urbanization in the northern and southern districts of the city, and this has created the streams of the heavy traffic of vehicles heading the central area, thereby further accelerating the traffic congestion in the city. Furthermore, the Terminal Terrestre opened in October 1985 is now used daily by about 100,000 passengers, and this has made it urgently necessary to establish an efficient mass transportation system between this Terminal and the central area.

Under such circumstances, this project is proposed in order to provide a major mass transportation system passing through the central area to connect the northern and the southern area of the city directly, aiming at the drastic solution of serious traffic problems. On a long-term basis, it will promise the further progress of the lives of the citizens and industrial activities in the city, and will lead to development of the whole Ecuador. Thus, the Ecuadorian Government is recommended to give the first priority to this project and promote it as one of the most important national projects.

(2) Economic and Financial Characteristics of the Project

Many cases have been studied concerning the priority of the construction work by stages of the whole line

between the Terminal Terrestre in the north and Guasmo in the south. The result of the economic analysis indicates that all of the cases studied are able to promise the high net profit ratio, high B/C ratio and high internal return ratio.

The result of the financial study, however, indicates that the case to start the construction work from the north (Terminal Terrestre) can be considered to promise the highest profitability, whereas the case proposing to start the construction work from the south (Guasmo) cannot be considered feasible.

(3) Priority for Execution of Construction Work

The study team has studied the preliminary process for raising the fund needed in the initial stage of the project in addition to the economic and financial evaluations. As a result, the study team has reached a conclusion that it is the best plan to complete the proposed construction work by dividing it into the following two stages;

1st Stage (opening in 1990)

- . Section Terminal Terrestre - Centro Civico
(9.1 km)
- . Investment 15,900 million Sucres in 1985 prices
(Local currency portion 5,700)
(Foreign currency portion 10,200)

2nd Stage (opening in 1993)

- . Section Centro Civico - Guasmo (5.6 km)
- . Investment 11,200 million Sucres in 1985 prices
(Local currency portion 3,400)
(Foreign currency portion 7,800)

However, when the completion of the construction work for the full 9.1 km for the first stage has become difficult due to the limitations including the financial

difficulty, it should be recommended first to complete the construction for the 6.7 km between the Terminal Terrestre and 9 de Octubre and to conduct the subsequent extension of the line.

Even when the line proposed under this project cannot be completed fully, the project will be feasible, since the operation of the MRT by the 9.1 km between the Terminal Terrestre and Centro Civico alone can generate a profit large enough to make the project financially feasible.

(4) Management System of the MRT

The study team would like to recommend the authorities concerned to organize a new semipublic corporation for the MRT management which is participated by both public organizations and private companies so that the project will be able to be operated most efficiently.

The number of the staff required at the time of the commencement in 1990 of the service for the section between Terminal Terrestre and Centro Civico as stated below, and also it is necessary to train the personnel in time for the scheduled start of the operation.

Estimated Number of Staff Needed for Start of Operation in 1990 between Terminal Terrestre and Centro Civico

Organ		Number of Staff	
Office Organization	General Manager and his		
	Directly - attached Members -----	7	} 78
	Administration Dept. -----	24	
	Transportation Dept. -----	20	
	Rolling Stock Dept. -----	12	
Civil & Electrical Dept. -----	15		
Field Organization	Station -----	193	} 372
	Railcar Depot -----	135	
	Civil Maintenance Depot -----	22	
	Electrical Maintenance Depot -----	22	
Total -----			450

(5) Raising of Funds and Investment by Ecuadorian Government

In view of the fact that this project is assumed to be one of the most important national projects, the Ecuadorian Government is expected to do its best in making all the necessary arrangements not only for acquiring the economic cooperation of foreign governments but also for introducing the foreign funds at the best possible conditions.

The Ecuadorian Government is also recommended to invest at least 1,590 mil. Sucres, 10% of the initial project cost of 15,900 mil. Sucres, in the semipublic corporation to be organized as the management body of the project in order to expressly manifest its positive attitude towards the fulfillment of the project.

The investment by the government is quite effective in persuading other financial sources to invest in the project at favorable conditions. Raising the necessary funds at low interest rate enables the MRT to be operated at lower fares, and the profit thus obtained in the project can be returned to many citizens.

(6) Fare System of the MRT

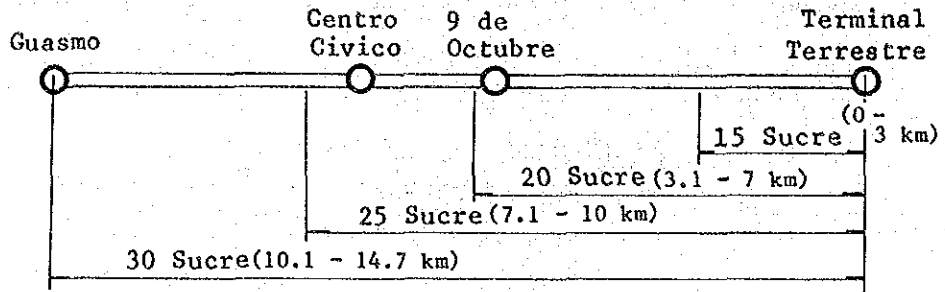
The demand of the MRT was estimated assuming that the unit fare per passenger is 25 Sucres, but the result of the study indicates that even the unit fare of 20 Sucres is good enough to keep the management of the MRT profitable.

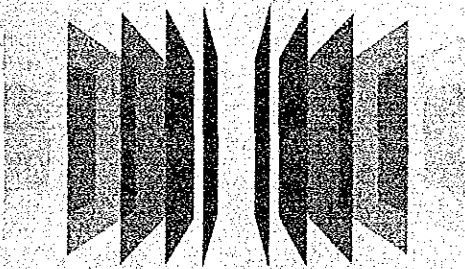
In establishing the actual fare system, however, it is recommendable to set the unit fare to 20 Sucres so that the profit generated by the MRT will be able to be returned to all the users as much as possible and also to operate the MRT under the following fare system:

(Fare System)

	Travel Distance			Fare
I	0	-	3.0 km	15 Sucres
II	3.1	-	7.0	20
III	7.1	-	10.0	25
IV	10.1	-	14.7	30

For example, when the above fare system is applied to the trips starting from Terminal Terrestre, the fares will be as follows:





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