

2-5 Result and Evaluation

Under the aforementioned conditions, the cost-benefit was calculated, and the result of the calculation is as shown in Appendix 3-1. The results of various test cases can be summarized as shown in Table 2-5.1.

- ① The results of the above calculations listed by the scores are as follows:

Economic Indicators	Value Range	Minimum Case	Maximum Case
Net Present Value (NPV) (Mil.Sucres)	7,100 - 18,000	Case E	Case A-1
B/C Ratio	1.50 - 1.82	Case G	Case A-2
EIRR (%)	16.5 - 19.5	Case G	Case A-2

- ② The most advantageous plan for the project is found to be the Case A-1 in terms of NPV and the Case A-2 in terms of B/C ration and EIRR.
- ③ The plan evaluated least in terms of NPV and B/C ratio is Case-E, and Case-G in terms of EIRR. Even these plans, however, cannot be regarded as unfeasible plans, since the values of NPV are not negative; B/C ratios are at least larger than 1.0; and EIRR is larger than the opportunity cost.
- ④ Some consideration are made from these results as follows:

i) Sequence of work

In starting the construction work, whether it should be started from the south side (Guasumo) or the north side (Terminal Terreste) has to be decided. For example, when Case C-1 proposing to start the work from South side and Case A-1 proposing to start the work from the north side are compared, Case A-1 is advantageous over Case C-1 as to all the indexes compared, thereby indicating that it is desirable to start the work from the north side. This can be presumed due to the fact that the demand for the MRT of the passengers transferred from the bus terminal can be expected earlier by starting the work from the north side.

Case	N.P.V. (Mil.Sucres)	B/C Ratio	EIRR
Case A-1	18,000	1.77	19.1
Case C-1	16,800	1.69	18.4
Comparison	A-1	A-1	A-1

ii) Opening of MRT by stages

The opening of MRT by stages is advantageous because its operation is started from the section for which the largest demand of the passengers can be expected. In this method, therefore, the construction works and opening of the sections for which the demand of the passengers is relatively small, will be started when the demand of the passengers for them has become large enough. This method is useful in controlling the investment in nonbeneficial project, so that the project executed in this method will be more economical than those executed by other methods.

For example, the comparison of the Case A-2 representing the case where the opening of the MRT is to be started section by section and the Basic case representing the case where the operation of the whole MRT is to be started at a time is as shown in the follow.

Case	Staging	MPV (Mil, Sucres)	B/C Ratio	EIRR (%)
Basic Case	Guasmo 1990 T/T 	17.200	1.64	17.8
Case A-2	Guasmo 1996 1993 1990 T/T 	17,600	1.82	19.5
Comparison		A-2	A-2	A-2

The above table indicates that Case A-2 is more advantageous than the Basic case as to all of NPV, B/C ratio and EIRR, thereby suggesting that starting the operation of the MRT by stages is more advantageous.

iii) Operation by section

As the cases where MRT is operated by only some sections, there are cases E through G. As pointed out previously, the results of these cases are poorer than those of other cases to some extent.

This can be considered suggesting that when the route extension is made, the increase in the benefit is larger than the increase in the expense and also that it is more reasonable in terms of the comparison of the expense and the benefit.

Therefore, if the financial limitation is disregarded, constructing the whole line can be said to be reasonable in terms of the economic evaluation.

iv) First opening year

The opening year of this project is set up in 1990 for all test cases, since it was recommended in the implementation program of the M/P.

As for this first opening year, some examination is made on the additional cases which the opening year of the Basic case is changed 1993 or 1996 respectively.

It is found that there is no significant change on economic evaluation between the case of the opening year 1990 and 1993, and the NPV gets worse in the case of opening year 1996 than others.

This shows it is reasonable to open the first section of MRT in 1990.

Table 2-5.1 COST BENEFIT ANALYSIS RESULT

Case	Net present Value (in Mil. Sucres)	B/C Ratio	Economic Internal Rate of Return %	Remarks
Basic Case	17,229	1.64	17.8	
Case A-1	17,980	1.77	19.1	
Case A-2	17,596	1.82	19.5	
Case B-1	17,649	1.72	18.6	
Case C-1	16,774	1.69	18.4	
Case C-2	16,144	1.73	18.6	
Case D-1	16,332	1.64	17.8	
Case E	7,096	1.56	17.0	
Case F	12,753	1.76	18.4	
Case G	8,540	1.50	16.5	

3. Financial Analysis

3-1 Approach

The financial analysis is based on the cash flow analysis that is concerned with the incoming and outgoing flows of cash for the project. The objects of the financial analysis are as follows:

- ① To examine whether the MRT project is potential to operate on a financially sound and self-paying basis.
- ② To verify that the MRT project can be executed within the limit of the allocated budget.
- ③ To examine whether the governmental subsidy is necessary for the execution of the MRT project.
- ④ To study the levels of fare and the fare system.

(1) Content of cash flow

The cash flow is represented by the difference between the cash inflow and the cash outflow. The cash inflow and the cash outflow respectively represent the flow of cash incoming to and outgoing from the project during the period of the project. The cash flow comprises the following items:

① Cash inflow

Cash inflow is the total amount of money put into this project and equivalent to the Net operating profit. Net operating profit is calculated as follows:

$$\text{Net profit} \begin{cases} (+) \text{ Gross operating revenue} \\ (-) \text{ Operating expenditure} \\ (+) \text{ Depreciation} \end{cases}$$

The residual value of the investment in the project in its final year should be added to the cash inflow.

② Cash outflow

The cash outflow represents the investment of the fixed capital in the project. The cash outflow accrues when the cash is procured and used for the execution and administration of the construction work. Thus, the repayment of the loan should not be included in the cash outflow.

③ Discount rate

In order to determine the discount cash flow, the opportunity cost of the capital prevailing in Guayaquil, which is 12% in net value, is used as the discount rate.

(2) Evaluation indexes

The following indexes are used for the evaluation in the financial analysis.

① Financial internal rate of return
(hereinafter referring to FIRR)

In order to evaluate the financial profitability of the project, the FIRR is calculated by the following formula:

$$\phi(p) = \frac{\sum (R_i - C_i)}{(1 + p)^{i-1}}$$

Where R_i : Cash inflow in i -th year

C_i : Cash outflow in i -th year

p : Discount rate

The FIRR should be determined where $\phi(p) \doteq 0$.

② Net operating profit after depreciation

The net operating profit is calculated by cash business year and tested when it turns to positive from deficit and its accumulated value as well.

③ Interest earned ratio

The ratio of net profit to the interest paid.

④ Debt service covering ratio

It represents the ratio of the income before depreciation to the annual repayment of the debt, and it can be calculated by the following formula:

$$\text{Debt service covering ratio} = \frac{\text{GOR} - \text{OEX} + \text{DEP}}{\text{DIT} + \text{ROL}}$$

Where GOR: Gross Operating Revenue
OEX: Operating Expenditure
DIT: Debt Interest Payment
ROL: Repayment of Loan
DEP: Depreciation

3-2 Financing Plan for Construction Fund

1) Introduction

Here, the sources and the conditions for the borrowing of the funds appropriate to the construction work will be summarized, and a proposal will be made concerning the combination of these funds for the necessary investment to be made.

(1) Possible sources of the funds for this project

a. Source in Ecuador

• General budgets of Ecuadorian government and local public bodies.

• Borrowing from Banco de Desarrollo del Ecuador.

• Borrowings from commercial banks in Ecuador.

b. Sources in foreign countries

• Development aid loans from foreign governments.

• Borrowings from IBRD (International Bank for

Reconstruction and Development - World Bank), IBD (Inter-American Development Bank), etc.

- Borrowings from foreign commercial banks or syndicate of foreign commercial banks.

In the following financial analysis, some combinations of the above sources of the funds will be considered, and the most realistic combination will be applied to each of the test cases of the construction project so that the financial conditions of these test cases can be compared and evaluated respectively.

Other combinations of the sources of the funds will also be applied to some of the probable cases of the construction projects in order to make the sensitivity analysis of the effect of the conditions of the fund on the financial of the project.

Through the above-mentioned approach, both the advantages and disadvantages of the sources of the funds and their combinations in each of the test cases and the effects of the conditions of the fund on the fare level and the profitability of the MRT project will be analyzed.

- (2) Since the MRT project is regarded as one of the national projects, in the following study, it is assumed that all the necessary funds for this project will be raised on the responsibility of the Ecuadorian government.

2) Loan Conditions of Financial Sources

- (1) Amounts of budgets and investable funds of Ecuadorian government and local public bodies

In the case of the construction fund to be appropriated to the unprecedented project such as the MRT project and

falling under none of the existing budget items, a special budget has to be set up. In the following, the size of the budget to be invested in the traffic sector within Study area and the amount of the budget appropriable to this project allocated from it, is estimated.

a. Status of the budgets of local public bodies

a-1 Authorities having jurisdictions over ground transport in study area

The construction and maintenance of the ground transport facilities in the study area under the jurisdiction of the authorities listed in Table 3-2.1

Table 3-2.1 AUTHORITIES IN CHARGE OF ON-LAND TRANSPORT

Authorities	Main matters to be in charge	Main financial sources
1. Ministerio de Obras Públicas	Construction and maintenance of roads inside and outside of the urban area in Guayaquil	National general accounts (National budget)
2. C.T.G. (Ministerio de Gobierno)	a. Execution of traffic and transport administration, management and installation of transport facilities	a. Independent budget of C.T.G.
	b. Construction of Bus Terminal	b. Loan from the Ecuador Development Bank for the full amount
3. Consejo Provincial del Guayas	Construction and maintenance of roads specially designated	Income by the toll bridge between Durán and Guayaquil. Allocation from national general accounts
4. Municipalidad de Guayaquil	Construction and maintenance of roads inside the urban area	Local tax income
5. Fondo de Desarrollo Urbano de Guayaquil	Grade separation of roads, specially designated bridges and construction of elevated roads inside	Independent budget irrelative to national general accounts

Besides the above authorities, there is Unida Ejecutora de Transporte Masivo de la Ciudad de Guayaquil as the authorities having jurisdiction over the urban traffic projects, but its budget is not fixed.

a-2 Investment from national budget in traffic system in study area

Table 3-2.2 shows the sizes of the national budgets in the last three years and the budgets appropriated for the investments in the traffic sector. The budgets for this sector are appropriated to Ministro de Obras Publicas (Ministry of Public Works) having jurisdiction over the planning, construction and maintenance of roads, Empresa de Ferrocarriles (National Railway) and Obras de Interes Provincial (Authorities for local public works) having jurisdiction over the road construction work. Each of these budgets is divided into the budget for construction work and the budget for the labor cost and maintenance cost. Thus, the budget for the construction work will be appropriated for the MRT project.

Estimate of construction fund to be appropriated for the project in study area

- Allocation rate to the Guayas province in the construction fund: 18% (Actual rates in the last few years were 16 to 20%).
- Allocation rate to the study area in the Guayas Province is estimated to be 90%.
- Estimate of the construction fund for the ground transportation in the study area in 1985 is as follows:
 $18,261 \text{ million Sucres} \times 0.18 \times 0.90 = 2,960 \text{ million Sucres.}$

a-3 Investment in traffic system by other public bodies

i) Consejo Provincial del Guayas

The actual investment amount in the last few years was about 900 million Sucres on the annual average. This amount is equivalent to about 30% of the budget estimated to be appropriable to the project in the study area from the national budget. Of this 900 million Sucres, however, about a half consists of the appropriation from the national budget, so that the actual amount of the investment in the traffic system by this public body is about 15% of the budget from the national budget.

ii) According to the results of the calculations made based on the same rule as that of the above case, the ratios of the investments in the traffic systems by other local public bodies to the budgets appropriated from the national budget are as follows:

- Road construction budget by Municipalidad de Guayaquil: 20%
- Road construction budget by FODUR (Unida Ejectora del Desarrollo Urbano de Guayaquil): 15%

a-4 Summary

From the above data, the fund invested in the transportation in the study area in 1985 is estimated as follows:

National budget	2,960 million sucres
Total of budgets of other public bodies	1,480 " " (50% of the above)
<hr/>	
Total	₣ 4,400 million sucres in 1985

Table 3-2.2 RATE OF TRANSPORTATION BUDGET TO NATIONAL BUDGET

× 10⁶ sucres

	1983			1984			1985		
	Personnel & maintenance	Construction fund	Total	Personnel & maintenance	Construction fund	Total	Personnel & maintenance	Construction fund	Total
A. Total national budget	56,853	18,947	75,800	82,143	25,607	107,750			144,152
B. Transportation & Communication									
(1) Ministro de Obras Publicas	1,157	3,885	5,042	1,805	9,967	11,772	2,330	15,623	17,953
(2) Empresa de Ferrocarriles	295	50	345	399	50	449	570	638	1,208
Total	1,452	3,935	5,387	2,204	10,017	12,221	2,900	16,261	19,161
C. Obras de Interes Provincial	-	2,000	2,000	-	2,000	2,000	-	2,000	2,000
D. Total of (BIC)	1,452	5,935	7,387	2,204	12,017	14,221	2,900	18,261	21,161
Rate of D/A (%)	2.55	31.3	9.75	2.68	46.9	13.20	-	-	14.68

Sources: Presupuesto del Estado 1983, 1984, 1985 Ministro de Finanzas

(2) Setting investment amount

The construction fund (not including the maintenance and personnel costs) invested in the ground transportation in study area is estimated to be 4,400 million sucres in 1985.

As mentioned previously, the construction fund for a new project such as the MRT project should be financed by a special budget. When it is assumed, however, that 10% of the total construction cost of the project will be financed by the aforementioned general account of the national budget, the ratio of the budget to be allocated is as follows:

- Largest possible amount of fund: 24,901 mil. sucres (Case where the whole line covering 14.7 km is to be put to full opening in 1990).

- 10% of the above: 2,490 mil. sucres (Amount of fund to be allocated from the general account of the national budget).
- Period of budget allocation: 3 years (1 year for preparation and 2 years for construction work).
- Ratio of allocation from general account of national budget: $2,490 \div (4,400 \times 3) = 0.188$

Thus, when it is assumed that the 10% of the construction cost is financed by the general account of the national budget as indicated in the above, even in the case where the largest possible amount of the budget is needed, a little less than 20% of the construction fund to be allocated for the ground transportation in the study area may be allocated in three years. The allocation ratio of this much will be acceptable even though the construction schedules of other projects are affected to some extent.

(3) Loans from banks in Ecuador

The consumer price index of Ecuador has been most stable among those in other South American countries until 1982 (12 to 15%/year), but it has sharply risen to 50.3% in 1983. In 1984, it showed a sign of stabilization, but it rose again at an annual rate of 27.9% as of September, 1985 (Source: Banco Central del Ecuador, Information Estadística No.1583, October, 1985). Such high inflation rate was reflected on the interest rate of the loans made on sucre basis. For instance, the interest rate as of November, 1985 is as follows:

a. Banco de Desarrollo del Ecuador

The interest rate of this bank is applied to the national projects and other similar public projects. The current annual interest rate practiced by this bank is 11 to 13%. The grace period and the term of repayment vary depending on the natures of the individual projects. In the case of the MRT project, however, the term of repayment including grace period of 3 years is assumed to be 15 years, and the actual annual interest rate to be 12%.

b. Private (Commercial) banks

The interest rates on the loans from commercial banks are within 15 to 18% annually, though varying depending on the project or the conditions of the syndicate loans. In the case of the MRT project, the applicable term of repayment is estimated to be 10 years including grace period of 3 years, and the annual interest rate to be 16%.

(4) Conditions of borrowings from foreign banks

a. Governmental development aid loan between two countries

As an example of the bilateral official aid (excluding international multilateral aid), the financing conditions are set as follows:

- Interest rate: 4.75%/year
- Period: 25 years (Including grace period of 7 years)
- Method of repayment: Annual equal installment in 18 years

b. Borrowings from international organizations such as IBRD, IDB, etc.

The interest rate (Interest rate on raised fund + commission of 0.75%) on the loans provided by IBRD (International Bank for Reconstruction and Development) is reviewed semiannually. The interest rate of this bank as of May, 1985 is 8.5%/year. The conditions for the repayment vary depending on the GDP (Gross Domestic Product) and the nature of the project, but, as the guidelines, the repayment terms of 15 to 20 years including the grace period of 2 to 7 years are offered by this bank.

IDB (Inter-American Development Bank) offers almost the same financing conditions as those of the IBRD.

From the examples of the above financing conditions, the following conditions are assumed as the average conditions.

- Interest rate: 8.5%/year
- Term: 20 years (including grace period of 5 years)
- Method of repayment: Annual equal installment in 15 years

c. Borrowings from foreign private (commercial) banks and syndicate of these banks

The interest rates on the borrowings from foreign commercial banks on the dollar basis are determined based on LIBOR (London Inter-Bank Offering Rate). The annual interest rate as of May, 1986 was a little higher than 7%. The spread (management fee, commitment fee, etc.) of about 1.5 to 2% will be added to this annual interest rate (the spread can be higher depending on the economic situation of the country of the financing bank).

As for the syndicate loans on yen-basis, the interest rate will consist of the long-term prime rate of 6.4%/year and the spread.

From the above conditions, the average financing conditions can be set as follows:

- Annual interest rate: 9%
- Term: 12 years (including grace period of 3 years)
- Method of redemption: Annual equal installment in 9 years

3) Fund Raising Plan

The shares of the foreign fund and the domestic fund in the total amount of the funds needed for completing the construction of the whole line of the MRT are 65% and 35% respectively. In raising the construction fund, the cost of foreign fund should be charged to the portion of the construction work financed by the foreign fund while the cost of the fund raised in Ecuador to the portion of the construction work financed by the domestic fund.

However, the loans from foreign private banks may be used for the portion of the construction work financed by the domestic fund.

The funds allocated from the general accounts of the budgets of the government and the local public bodies may be regarded as the public subsidies to this project, and such funds are provided free of interest rate and need not to be refunded.

(1) Fund raising plan for the construction of initial construction stage and its extension

a. Financing conditions of various sources of funds are set as follows:

- Fund from Ecuadorian government

The financing conditions are set as to the following two cases:

Fund for 10% or 0% of total project cost.

- Development aid loans from foreign governments

Up to 8,600 mil. sucres (15,000 mil. Japanese yen) out of the total project cost may be used for the portion of the construction work to be financed by the foreign fund.

- Loans from international organizations

To be used for the remainder of the portion of the construction work financed by the loans from foreign governments.

- Loans from foreign private banks

Same as the above; however, may be used for a part of the portion of the construction work financed by the domestic fund.

From the above conditions, some of the possible cases of fund raising plans are proposed as shown in Table 3-2.3.

Table 3-2.3 COMBINATION OF FUND SOURCES

	Foreign Currency(65%)			Local Currency (35%)			
	Foreign Government	Int'national organization	Foreign Private banks	Ecuadorian Government	Banco de Desarrollo del Ecuador	Ecuadorian Private banks	Foreign Private banks
Financing condition							
Interest rate/year	4.75%	8.5%	9%	-	12%	16%	9%
Term of repayment, years (grace period)	25(7)	20(5)	12(3)	-	15(3)	10(3)	12(3)
Method of refunding, years	Average over 18 yrs	Average over 15 yrs	Average over 9 yrs	-	Average over 12 yrs	Average over 7 yrs	Average over 9 yrs
Case 1	0	0		10%	10%		15%
Case 2	0		0	10%	10%		15%
Case 3	0		0	10%		15%	10%
Case 4	0	0		15%		20%	
Case 5	0		0	15%		20%	
Case 6	0		0	15%	20%		

Of the above 6 cases, case 2 is applied to the financial analysis for evaluating various cases of construction works, and the most advantageous case will be selected based on the result of evaluation. The rest of five cases of the combinations of fund sources are used for the sensitivity analysis.

- (2) Fund for purchasing train coaches needed after the start of operation of the MRT

When the fund is needed for the purchase of new train coaches to meet the increasing demand for transportation, the borrowing may be made from foreign private banks under the aforementioned conditions.

3-3 Other Preconditions for Analysis

- (1) Treatment of inflation in calculating price and cost

The cost of investment and operating expenses should be estimated at the market prices. That is, the project cost and the operating expenses calculated in PART 1 are used as they are.

The rise of costs during the period of this project is not considered in the financial analysis. That is, the prices used in the analysis are those as of 1985.

Similarly, the average fare used in calculating the revenue from the fare is that as of 1985, and the increase of the fare is not considered in the analysis.

- (2) Depreciation

The depreciation expense should not be included in either the cash inflow or the cash outflow, because, in the cash flow analysis, all the revenues and expenses analysed are those on the cash basis, so that the depreciation expense which will not cause any flow of cash is not considered to fall under the category of the cash transaction.

At the end of the final year of the project, however, the depreciation expense is taken into consideration in calculating the salvage value of the project. The depreciation expense should be calculated by either the fixed instalment method or the fixed percentage method based on the lives of the individual facilities as shown in Table 3-3.1.

(3) Revenue from transportation

The transportation revenue is determined by multiplying the number of the users of the MRT by the average paid fare. The average paid fare, 25 sucres which is the average fare level per passenger estimated in the demand forecast is used in consideration of the number of passengers distance (kilometer).

The transportation revenue should include the non-transportation revenues such as those from the fees for the advertisements in the stations, and the revenue from the advertisement fees is estimated to account for about 5% of the total transportation revenue in consideration of the case in Japan. That is, the total operating revenue is calculated as transportation revenue $(1 + 0.05)$.

Table 3-3.1 DEPRECIATION PERIOD BY CONSTRUCTION ITEM

Items	Depreciation Period (Year)	Remarks
1. Track	30	Depreciated by fixed annual amount
2. Super and Sub-structure	50	Ditto
3. Station	45	Ditto
4. Depot	30	Ditto
5. Substation	20	Ditto
6. Power supply	30	Ditto
7. Signal and communication	30	Ditto
8. Rolling stock	20	Depreciated by fixed annual rate
9. Land acquisition and compensation	-	Not depreciated
10. Engineering	-	Ditto
11. Contingency	-	Ditto

3-4 Result and Analysis

1) Financial Analysis Result

The results of the cash flow analysis and profit & loss account analysis are as follows: (see Appendix 3-2).

(1) FIRR (Table 3-4.1)

A maximum FIRR of 13.26 is obtained in the Case B-1, while a minimum FIRR of 6.41% is obtained in Case G.

(2) Profit and loss after depreciation (Table 3-4.1)

Both and net profit after depreciation in a single business year and the accumulated net profit after depreciation in the best case turn to positive in 5 year just like Case B-1, and, in the worst cases such as Case C-1, Case E and Case G, they will not be able to turn to positive throughout the period of this project, which is 30 years.

(3) Debt service coverage ratio (Table 3-4.2)

As far as the period of 10 years following the start of operation is concerned, this ratio is within a range of 1.0 to 2.0 as to each of the cases.

(4) Total of debt balances (Fig. 3-4.1)

In a desirable case, the debts is able to be repaid within the period of this project, but this is impossible in the worse cases.

2) Observation

(1) FIRR

The FIRR represents the investment efficiency of this project in a simple form. When the investment is assumed to be made from the borrowing, however, the FIRR should be interpreted to represent the upper limit of the interest on the raised fund.

In other words, when the FIRR is higher than the level of the interest rate in the financial market, it seems difficult to finance the construction of this project with the fund raised from such financial market, and in such case, it will be necessary to use the interest-free public fund to cover the part of the construction cost.

When the FIRRs of various cases are compared assuming that the interest rate in the financial market of Guayaquil is 10%, the cases which can be considered feasible from the financing conditions are the following 5 cases: the Basic Case, Case A-1, Case A-2, Case B-1 and Case F. Of these cases, there is the Case B-1 as those promising a high return of over 13%, so that the priority has to be given to this case from the financial standpoint.

(2) Net profit after depreciation

The net profit after depreciation serves as a measure of the result of operation after the commencement of the business. More specifically, during the early period immediately following the commencement of the business, not only the earnings is generally small but also the interest expense is relatively large to the income, so that the MRT has to be operated at deficit during this period. After several years, however, the payment of the interest will decrease as the redemption of the borrowing progresses, and the operating revenue will increase on the other hand. As a result, the business will become able to produce surplus.

The number of years required to turn to positive can be used as an index to measure the condition of the business. In the case of this project, when the business is operated at the conditions of the most desirable Case B-1 and Basic Case, the business is to be run soundly without deficit in 5 years. This case is followed by Case A-1, Case A-2 and Case F. All of these are the cases with little risks.

On the other hand, in the cases C-1, C-2, D-1, E and G, the business is not able to produce surplus by cleaning the deficit, or the business will require a considerable length of time before becoming able to produce profit, and the management is not able to have any positive vision of the future business. Thus, these cases will be evaluated negatively in terms of the financial analysis.

(3) Debt service coverage ratio (DSCR)

The debt service coverage ratio represents the ratio of operating revenue to the rapid amount of borrowing with interest included. This ratio is used as an index to measure the qualification of the borrower of the fund from the standpoint of the financier where the long-term loan is to be provided continuously.

That is, this coefficient decreases sharply with the start of the repayment of the borrowing, but it will become difficult for the financier to recover its loan at the end of the term if it starts to accommodate another new fund, so that when the value of (DSCR) falls below a certain level, the financier may stop supplying its fund, and the project will have to be suspended in such situation.

Normally, the value of DSCR as the above-mentioned reference is set to 1.5. That is, if DSCR remains below 1.5 constantly during the progress of the project, the funding for the project will substantially become difficult.

In the case of this project, after 10 years from the commencement of the operation, the cases other than Case C-1, D-1, E and G will be able to meet the required conditions almost completely, but the above-mentioned four cases will be unable to meet the required conditions. Thus, as far as these four cases are concerned, the

execution of the project will become impossible depending on the policy of the international financial institutions.

(4) Total of debt balances

In the early stage of the operation following the commencement of the operation, the amount of repayment of the borrowing including interest is relatively large compared with the operating revenue. Thus, in order to cover the shortage of the fund for the repayment of the borrowing, the short-term borrowing is used. As the demand (for the service of the MRT) increases, the operating revenue will increase accordingly. In this stage, the project will be able to be operated at profit without using any short-term borrowing.

The case described in the above is the normal case, but in the case of the project to be executed under poor conditions, the repayment of the short-term borrowing increases acceleratingly, and in the worst case, the project may fall default due to the overborrowing.

In order to judge the financial position of the project, the change in the balance of the long-term borrowing and that in the balance of the long-term borrowing were examined respectively (see Table 3-4.3). In the case where the project is executed under reasonable conditions, the balance of the outstanding borrowing will be able to be repaid within the period of the project. Besides, the balance of the borrowing during the period of the project can be maintained within a certain limit.

In the cases C-1, C-2, E and G, the debt will not be able to be cleared within the period of the project, so the execution of the project will be impossible. Also, it can be noticed that, in all these cases, the maximum balance of the debt is too large compared with the cost of investment.

As for the cases other than those discussed in the above, the balance of the debt will be able to be cleared, and the balance of the debt can be considered to be within reasonable amount.

Table 3-4.1 FINANCIAL ANALYSIS RESULT (1)

Case	No. of Years after Commencement		Financial Internal Rate of Return %
	Yearly Net Profit turns to positive	Accumulated Surplus turns to positive	
Basic Case	5	6	12.79
Case A-1	6	11	12.33
Case A-2	7	7	12.41
Case B-1	5	5	13.26
Case C-1	-	-	11.05
Case C-2	25	-	10.53
Case D-1	16	25	11.43
Case E	-	-	7.94
Case F	8	14	10.75
Case G	-	-	6.41

(Note) Calculation is made based on the assumption that fare level is 25 sucres/ride.

Table 3-4.2 FINANCIAL ANALYSIS RESULT (2)

Case	Interest Earned Ratio		Debt Service Coverage Ratio	
	Lowest	Highest	Lowest	Highest
Basic Case	0.8	5.2	1.1	1.8
	5.4	46.4	1.8	7.8
	15.1	43.2	5.3	14.2
Case A-1	0.3	3.0	1.0	1.6
	3.3	37.9	1.4	6.8
	14.3	42.9	5.2	13.3
Case A-2	0.3	5.0	1.1	2.0
	1.6	21.4	1.2	3.7
	12.4	41.7	3.6	12.8
Case B-1	0.9	3.4	1.0	2.2
	3.7	40.0	1.5	6.8
	14.7	43.2	5.2	14.2
Case C-1	-0.8	2.8	0.2	1.5
	3.1	38.0	1.3	6.8
	14.4	42.9	5.2	13.3
Case C-2	-0.8	4.7	0.2	1.8
	1.4	20.5	1.1	3.6
	12.2	41.7	3.5	12.8
Case D-1	0.0	3.3	0.7	1.3
	3.6	40.0	1.4	6.8
	14.7	43.2	5.2	14.2
Case E	0.3	1.8	0.8	1.3
	2.3	14.1	1.1	2.7
	12.4	82.3	2.7	18.2
Case F	0.7	3.0	1.0	1.7
	4.0	27.2	1.5	4.7
	10.3	32.6	3.3	10.7
Case G	0.0	1.7	0.6	1.0
	2.4	16.0	1.0	2.9
	13.4	81.9	2.8	26.5

(Note) Upper row: 1990 -1999
 Middle row: 2000 - 2009
 Lower row: 2010 -

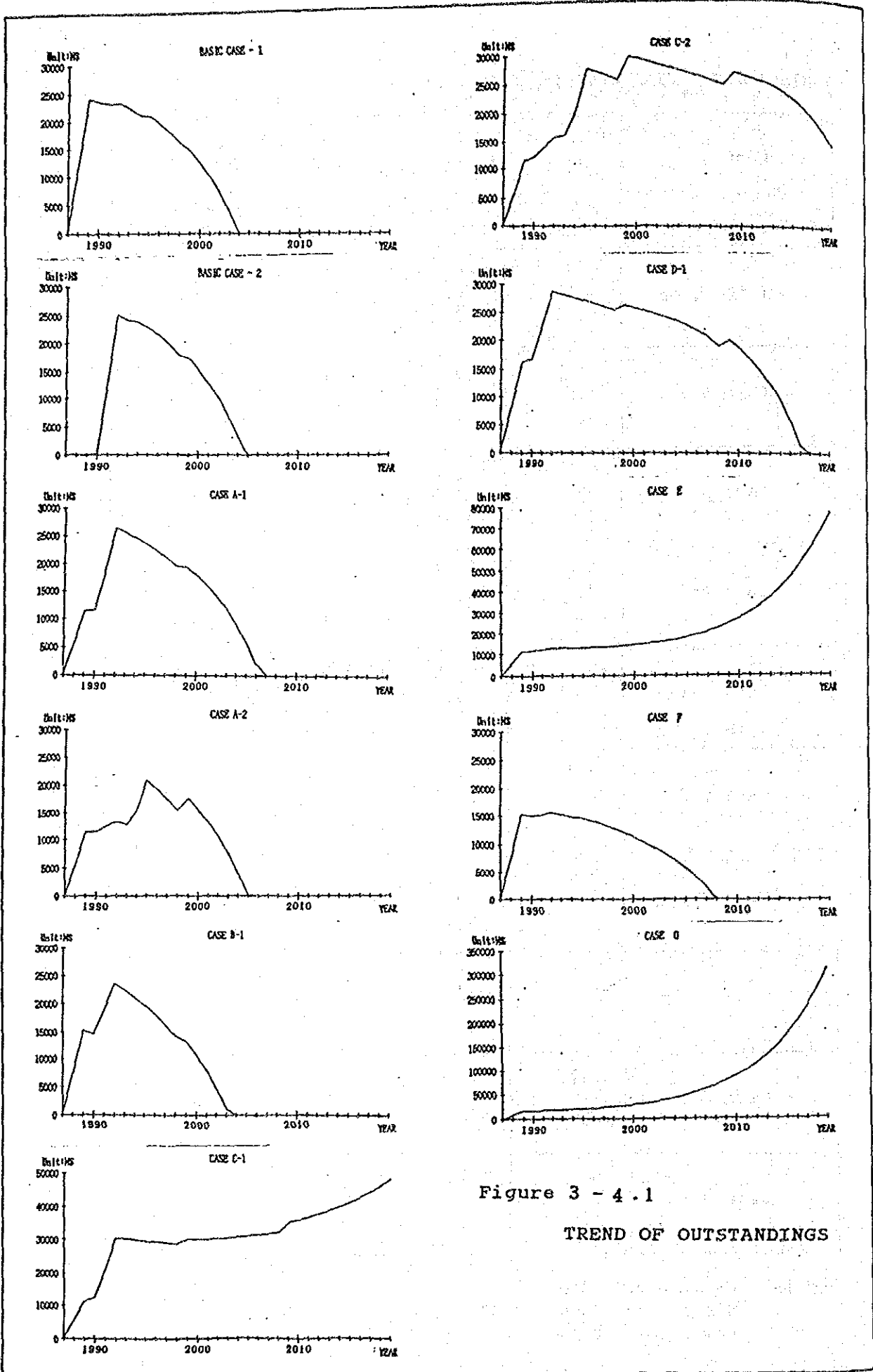


Figure 3 - 4.1

TREND OF OUTSTANDINGS

Table 3-4.3 BORROWING AND REPAYMENT

Case	FIRR %	Working capital Required(Max) during 1990 - 2000 (Mil. Sucres)	Maximum Cumulative Long term and Short term loan(Mil. Sucres) (Year)	Final maturity year		Construction cost (Mil. Sucres)
				Short Term Loan	Long Term Loan	
Basic Case	12.79	785	23,577	2003	2004	31,275
Case A-1	12.33	1,122	26,401	2006	2007	31,586
Case A-2	12.41	259	20,812	1996	2006	31,680
Case B-1	13.26	735	23,584	1999	2004	31,573
Case C-1	11.05	2,379	30,288	-	-	32,933
Case C-2	10.53	1,566	27,887	-	-	33,036
Case D-1	11.43	1,921	28,742	2017	2017	32,946
Case E	7.94	1,189	76,855	-	-	13,781
Case F	10.75	747	15,612	2007	2008	19,704
Case G	6.41	3,309	307,544	-	-	18,384

3-5 MRT Fare System Consideration

In the financial analysis, the MRT fare level was studied based on the average fare level of 25 sucres/ride which was proposed as one of the preconditions for the demand forecast, but the uniform fare system is considered not realistic, so that it will be necessary to set up more rationalized fare system. This is discussed later.

1) Analysis of Preconditions of Demand Estimate

In the demand forecast, the standard fares of the MRT are estimated as the bases for estimating the number of the users of the MRT. Such estimate is made in consideration of the present bus fares and the related conditions, but the estimate is made assuming that a uniform fare will be applied to all the users (of the MRT). It is, however, considered not realistic to apply a uniform fare to all the passengers of the MRT for the reason that the total distance to be covered by the MRT is 14.7 km. Thus, this study is intended to estimate the average fare in the case where the fare system proportional to the distance is applied.

According to the result of the demand estimate, the distribution of the passengers among the sections between various stations at the start of the full operation of the MRT is as shown in Table 3-5.1.

Table 3-5.1 NUMBER OF PASSENGERS BY RIDING DISTANCE

(Distribution of passengers among the sections between various stations at the start of full operation of MRT.)

Distance(km)	Number of passengers	Ratio (%)	Accumulated Ratio (%)
0 - 3.0	141,349	35.3	35.3
3.1 - 7.0	143,169	35.7	71.0
7.1 - 10.0	83,998	21.0	92.0
10.1 - 15.0	32,434	8.0	100.0
Total	400,950	-	-
Passenger. km	2,193,051.51		
Average trip distance (Km)	5.47		

The average trip distance of the MRT users is estimated to be about 5.5 km, less than a half of 14.7 km, the full length of the MRT. As for the distribution of the passenger volume by trip distance, the share of the passengers whose trip distances ranges from 3 km to 7 km is 36%, the largest share of all.

The fare of 25 Sucre per passenger as an assumptive condition is simply divided by the average trip distance to calculate the assumptive fare rate, which is about 4.57 Sucre/km.

2) Study of Fare System

The fare system will have a large influence on the future financial status of the MRT, since the transportation income and the demand for the transportation of the MRT are dependent on it.

In general, there are three different fare systems for the transportation system, that is, (1) uniform fare system, (2) sectional fare system and (3) proportional-to-distance fare system.

In the city of Guayaquil, the existing public transportation system is the bus transportation system which is at present operated on the uniform fare system charging a fixed rate regardless of the trip distance. Most of the bus lines cover the routes ranging from the suburban districts to the central district of the city, so that the passengers desiring to make trips covering the long distance between the bus terminals in the suburban areas have to change the bus lines, and consequently, such passengers have to pay double fares in most instances.

The fare system cited in the above appears similar to the aforementioned sectional fare system (2) wherein a uniform fare is applied to the trips within a certain range from the central district of the city and an additional fare is charged for the trips beyond such range.

Any passenger desiring to make a trip beyond the end of the MRT will have to change to the bus service. For this reason, a fare of 20 Sucre or more that is more than two times the currently practiced uniform fare of 10 Sucre may be allowable.

As for the fare system to be applied (to the MRT), the uniform fare system seems to be not practical as discussed previously. That is, the uniform fare system may give rise to the complaints of the short-distance passengers regardless of the level of the uniform fare, and such complaints may lead to the decrease in the demand for the service of MRT.

Thus, the fare systems worthy of being considered as the possible fare system seem to be the zone fare system and the proportional-to-distance fare system. Under the zone fare system, the line of the MRT is divided into a certain number of zones; a uniform fare is applied to the trip within a zone; and an additional fare is charged for the trip beyond the zone. In the case of this fare system, the complaints concerning the fare may be made by some of the users depending on the mode of the division of the line into the sections (see Fig. 3-5.1)

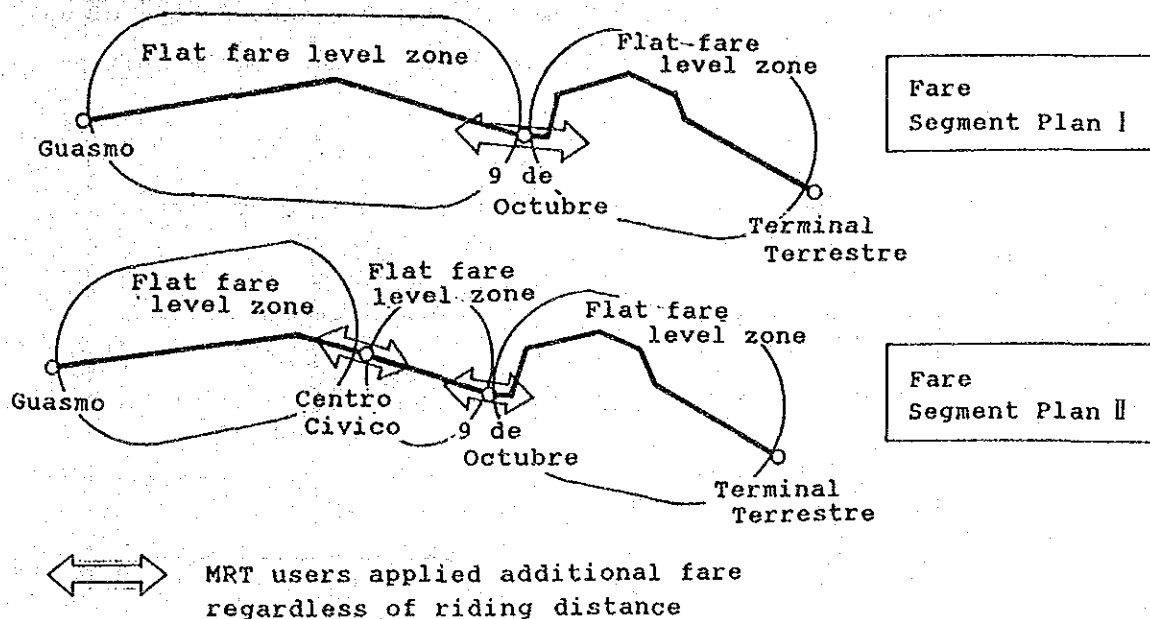


Figure 3-5.1 EXAMPLES OF SECTIONAL FARE SYSTEM

On the other hand, the proportional-to-distance fare system is characterized by the system wherein the fare is charged in proportion to the trip distance, so that this system seems more easier to get the support of the users. Under this fare calculation are required to familiarize themselves with the selling of tickets and the calculation for the fare adjustment, but, in the case of the MRT, its total length is only about 15 km, so that the fare system will not be so complex.

Thus, the proportional-to-distance fare system seems more practical for the MRT than other systems.

3) Calculation of Average Fare

In determining the average fare, the zone fare level is set so that the average fare rate calculated by the proportional-to-distance fare system can be approximated to the average fare rate based on the aforementioned demand forecast, and the actual average fare based on the system is determined from the result of such calculation.

The fare zones by distance are determined on the four zones comprising the first zone of up to 3 km, the second zone of up to 7 km, the third zone of up to 10 km and the fourth zone of up to 15 km.

Fig. 3-5.2 shows some examples of the fare zone by distance and the corresponding fare rates.

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

Under this fare system, (1) the initial fare in using the MRT is 15 Sucres, which is 50% higher than the corresponding bus fare that is currently practiced, and this fare does not seem to cause any serious complaints of the users, and (2) the fare rate per kilometer beyond 3 km will be reduced gradually so that the maximum fare of the MRT will not exceed the two times the corresponding bus fare (estimate) that is currently practiced.

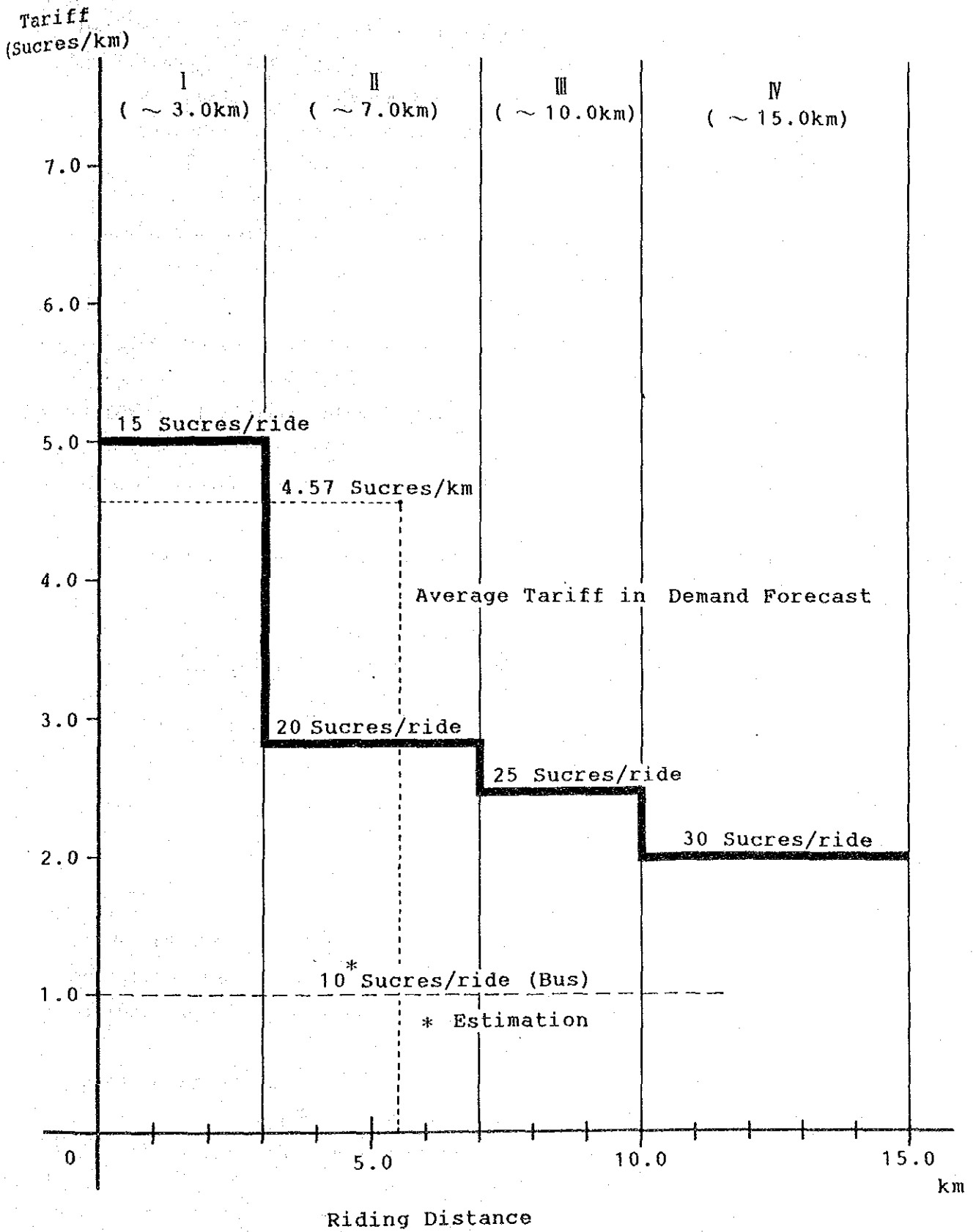


Figure 3-5.2 TARIFF CURVE SELECTED

Thus, in the case of the MRT, the fare for the trip up to 7 km is 20 sucre, the same for trip from 7 to 10 km is 25 sucres and the same for the trip beyond 10 km is 30 sucre. Thus, the proposed fare system of the MRT does not seem to make any substantial difference from the current bus fare.

Now, the average fare of the MRT per passenger where the above-mentioned fare system is applicable is calculated as follows:

$$\text{Average fare per passenger} = 15 \text{ Sucre} \times 0.353 + 20 \text{ Sucre} \times 0.357 + 25 \text{ Sucre} \times 0.21 + 30 \text{ Sucre} \times 0.08 = 20.1 \text{ Sucre}$$

Thus, the average fare per passenger calculated by this formula is a little lower than the assumptive fare, so that this average fare per passenger is on the safe side from the financial side.

The fare by kilometer per passenger can be calculated as follows:

$$\begin{aligned} \text{Fare by kilometer per passenger} &= \frac{(15 \text{ Sucre} \times 141,349 + 20 \text{ Sucre} \times 143,169 + 25 \times 83,998 + 30 \text{ Sucre} \times 32,434)}{2,193,051.51} \\ &= 3.67 \text{ Sucres/person.km.} \end{aligned}$$

4) Financial Condition

When the aforementioned fare system is applied, the average fare per passenger is about 20 sucres/ride. In this case, the financial position of the project discussed in the preceding section is deteriorated to some extent.

The result of the supplementary financial analysis, which the above situation is taken, is shown in Table 3-5.2. According to this table, when the proposed fare system is applied, following changes are foreseen.

- (1) FIRR will be lower by 1.5% than before.

- (2) The transfer of net profit from deficit to surplus will delay by 2 years in single year basis and by 7 years in accumulated profit basis.

This result proves that no significant adverse effect can be seen from standpoints of financial aspect even if the aforementioned fare system is introduced to the MRT.

Table 3-5.2 FINANCIAL ANALYSIS RESULT IN CASE OF 20 SUQUES/RIDE

Case	No. of Years after commencement		Financial Internal Rate of Return (%)
	Yearly Net Profit turns to positive	Accumulated Surplus turns to positive	
Basic Case	7	13	11.26
Case A-1	8	18	10.80
Case A-2	11	14	10.88
Case B-1	8	11	11.73
Case C-1	-	-	9.52
Case C-2	27	-	9.00
Case D-1	18	-	9.90
Case E	-	-	6.41
Case F	10	21	9.22
Case G	-	-	4.88

(Note) The fare level is about 20 suques/ride.

Table 3-5.2 FINANCIAL ANALYSIS RESULT (Cont'd)

Case	Interest Earned Ratio		Debt Service Coverage Ratio	
	Min.	Max.	Min.	Max.
Basic Case	0.6	4.8	1.0	1.6
	5.0	43.6	1.7	7.1
	13.7	38.6	4.7	13.3
Case A-1	0.1	2.6	0.9	1.4
	2.9	35.1	1.3	6.1
	12.9	38.3	4.6	12.4
Case A-2	0.1	4.6	1.0	1.8
	1.2	18.6	1.1	3.0
	11.0	37.1	3.0	11.9
Case B-1	0.7	2.9	0.9	1.9
	3.2	35.5	1.3	6.1
	12.9	38.3	4.6	12.6
Case C-1	-1.0	2.4	0.1	1.3
	2.7	35.2	1.2	6.1
	13.0	38.3	4.6	12.4
Case C-2	-1.0	4.3	0.1	1.6
	1.0	17.7	1.0	2.9
	10.8	37.1	2.9	11.9
Case D-1	-0.2	2.9	0.6	1.1
	3.2	37.2	1.3	6.1
	13.3	38.6	4.6	13.3
Case E	0.1	1.4	0.7	1.1
	1.9	11.3	1.0	2.0
	11.0	77.7	2.1	17.3
Case F	0.5	2.6	0.9	1.5
	3.6	24.4	1.4	4.0
	8.9	28.0	2.7	9.8
Case G	-0.2	1.3	0.5	0.8
	2.0	13.2	0.9	2.2
	12.0	77.3	2.2	25.4

(Note) The fare level is about 20 sucres/ride.

4. Evaluation of Test Cases

In the following, the best plans are selected from among the test cases according to the results of the economic and financial analysis already examined and other findings obtained. A sensitivity analysis will be conducted on each of the selected best plans.

4-1 Economic Aspect

Figure 4-1.1 ~ 4-1.3 show the value of EIRR, NPV, and B/C Ratio obtained from the economic analysis.

- (1) No substantial difference is found in all the test cases as to EIRR. It requires further examination since the EIRR exceeds the opportunity cost of 12% every test case deserve further examinations. Especially in Case A-1 and Case A-2 which are a stage construction plan in which the construction is to be started from the north side, the EIRR is so high as more than 19%.
- (2) As for NPV, those in Case E, Case F and Case G where a operation of the MRT within partial section is scheduled, are slightly smaller than those in other cases. However, as they have a positive (+) project value, all the cases should be examined. In view of the difference in the project value, it is obvious that the stage construction plan to be started from the north is superior, as a whole, to the plan to be started from the south and that priority should be given to Case A-1, Case A-2 and Case B-1.

As mentioned above, the NPV in the cases of a operation of the MRT within partial section are small as the project scale is small. Among these cases, the NPV is higher in Case F than those in the two other cases.

- (3) The B/C Ratio directly represents the investment efficiency of this project. The higher the B/C Ratio is, the more efficient the project is. In this sense, when compared with other cases, Case A-2 and Case F may be considered a

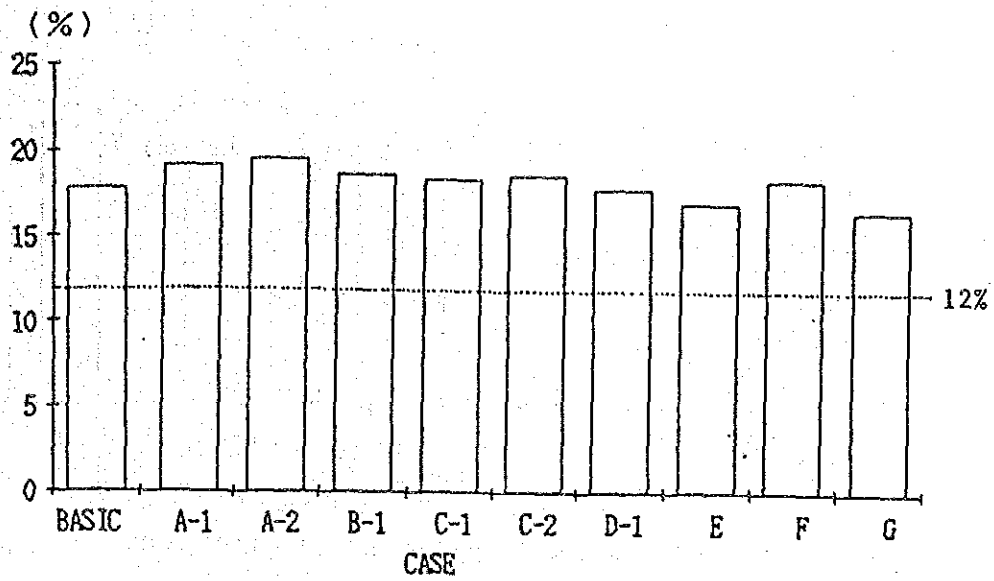


Figure 4-1.1 COMPARISON OF ECONOMIC INTERNAL RATE OF RETURN BY TEST CASE

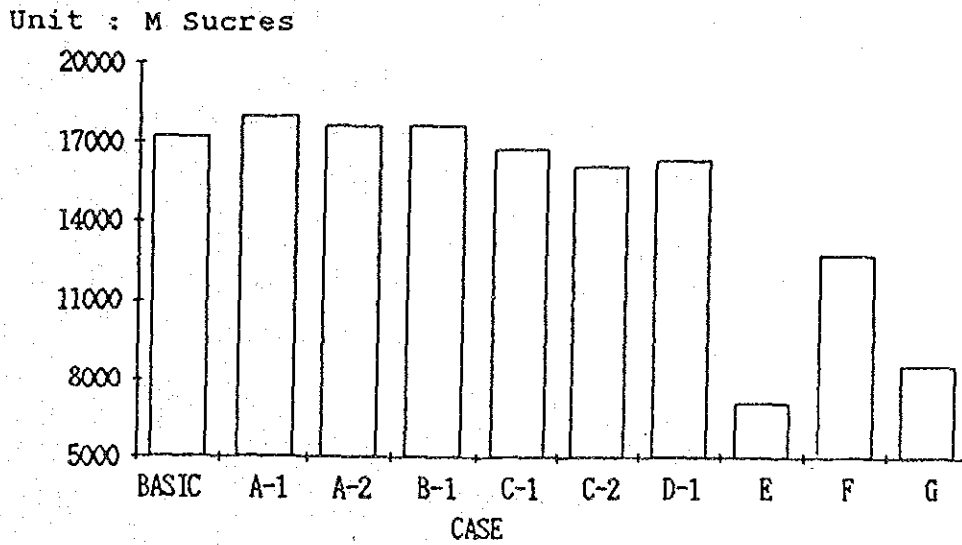


Figure 4-1.2 COMPARISON OF NET PRESENT VALUE BY TEST CASE

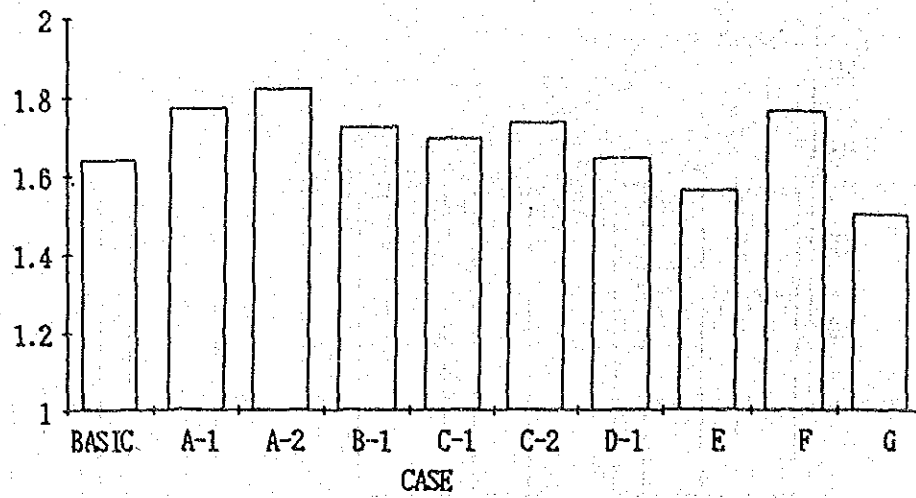


Figure 4-1.3 COMPARISON OF B/C RATIO BY TEST CASE

plan with a slightly higher investment efficiency. On the contrary, Case E and Case G seem to be inferior in efficiency to other cases.

(4) The following conclusions can be obtained from the results of the above examination.

- ① No plans are considered to be inappropriate from the trend of each index obtained by the economic analysis. Basically, any of these cases cannot be excluded from examination.
- ② However, Case E and Case G of an operation of the MRT within partial section may be considered a relatively inferior plan because any of EIRR, NPV and B/C Ratio is slightly lower than other cases.

On the other hand, Case F can be adopted as the best plan of three cases with an operation of the MRT in a partial section. Because it is not by no means inferior to the case of full operation in terms of two indexes other than NPV, which depend basically on the scale of construction and operation of MRT.

Where a full operation is scheduled in terms of the two indexes other than NPV as the NPV in Case F is slightly small due to the small scale of the project.

- ③ Case A-1, Case A-2 and Case B-1 are considered to be superior to other cases in terms of some indexes, so that higher priority should be given to them.
- ④ As stated above, the three plans of Case A-1, Case A-2 and Case B-1 can be recommended as a better plan from the economic aspect, but the two plans of Case E and Case G are a little inferior.

4-2 Financial Aspect

Figure 4-2.1 ~ 4-2.4 show the FIRR, the number of years required for transfer of the net profit from deficit to surplus including depreciation after the start of the operation of the MRT, etc. based on the results of the financial analysis.

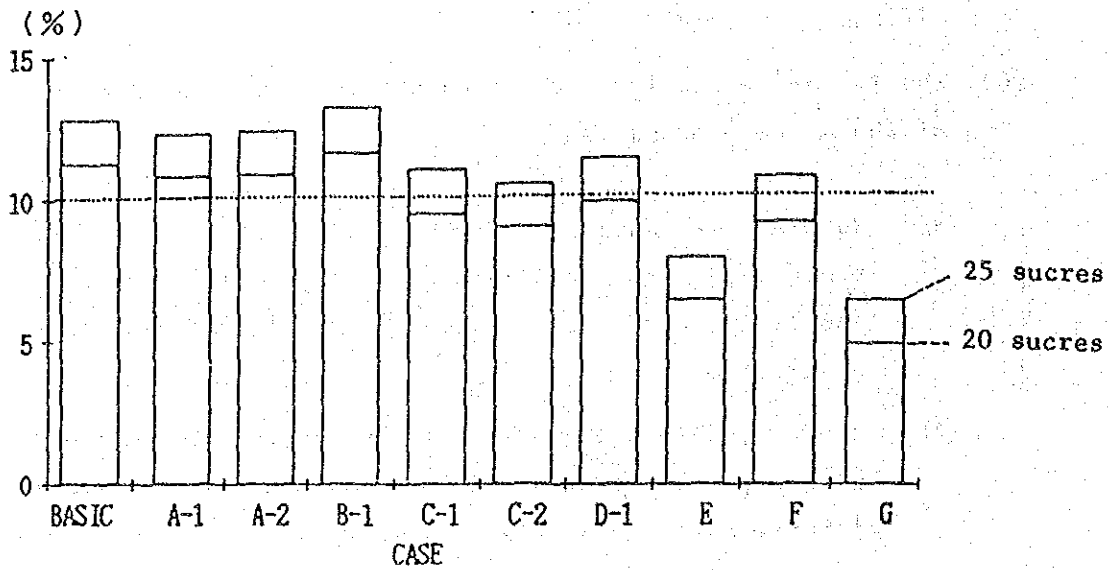


Figure 4-2.1 COMPARISON OF FINANCIAL INTERNAL RATE OF RETURN BY TEST CASE

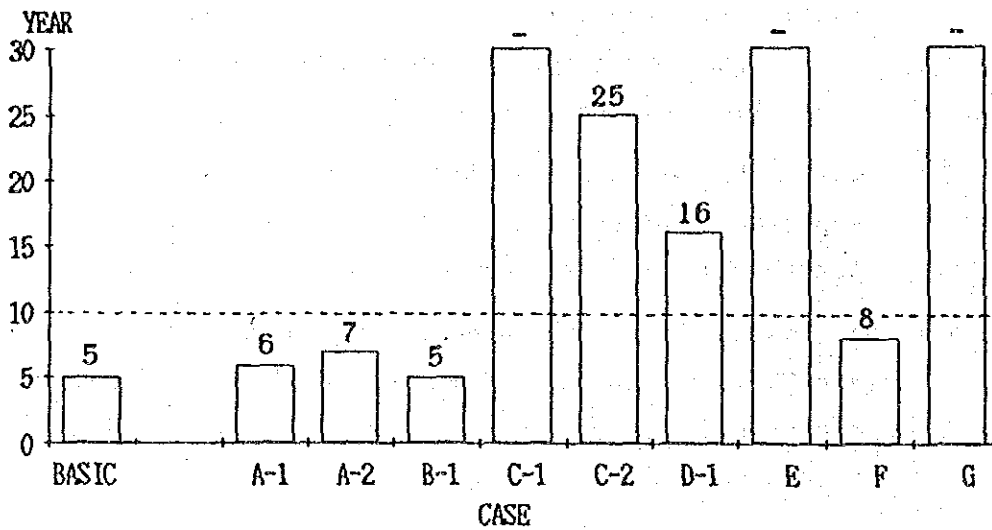


Figure 4-2.2 NO. OF YEAR WHEN YEARLY NET PROFIT TURNS TO POSITIVE

- (Note)
1. Yearly net Profit includes the depreciation.
 2. Average MRT fare levelis 25 sucres/ride.

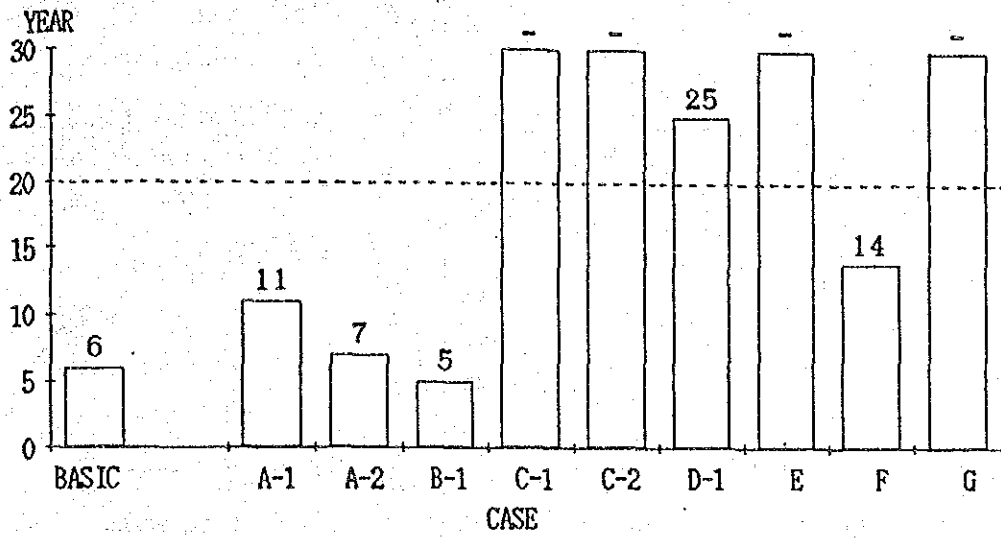


Figure 4-2.3 NO. OF YEAR WHEN ACCUMULATED SURPLUS
TURNS TO POSITIVE

(Note:) 1. Average MRT fare level is 25 sucres/ride.

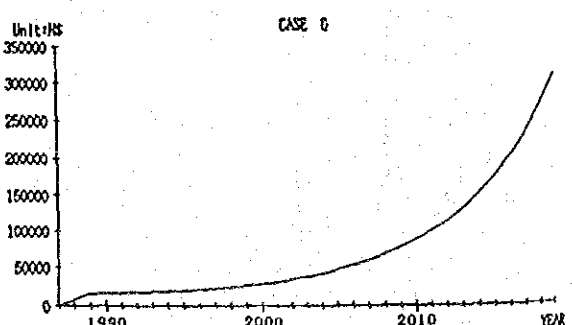
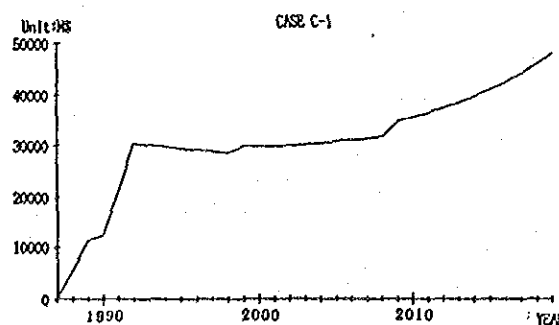
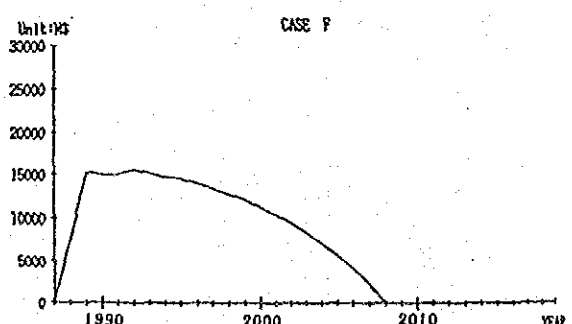
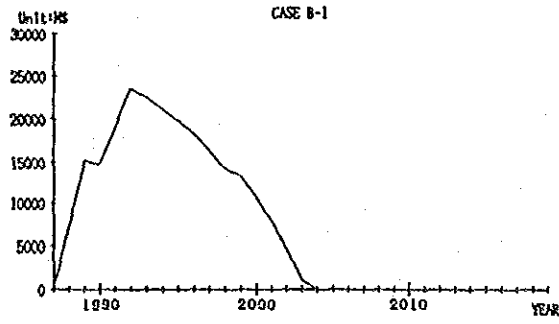
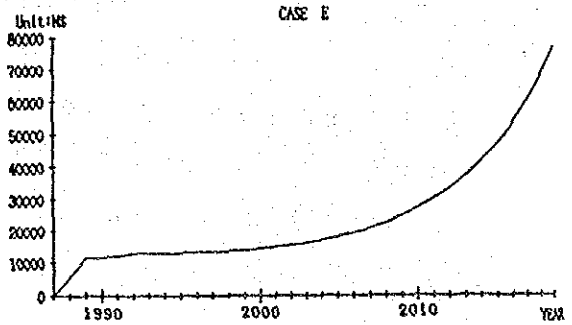
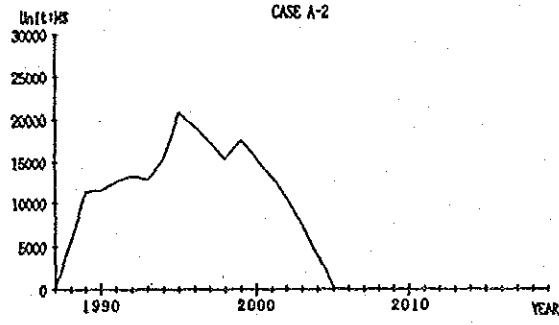
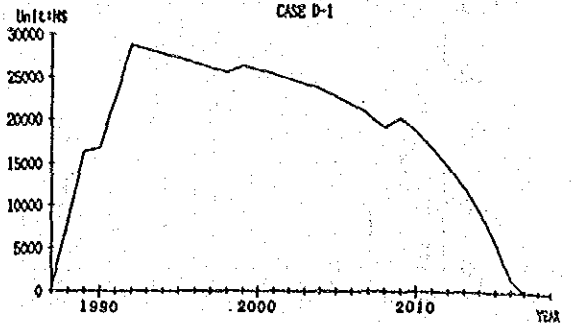
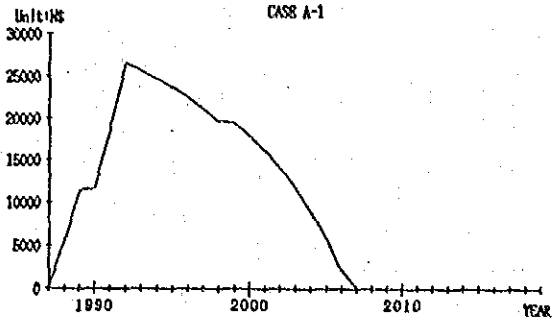
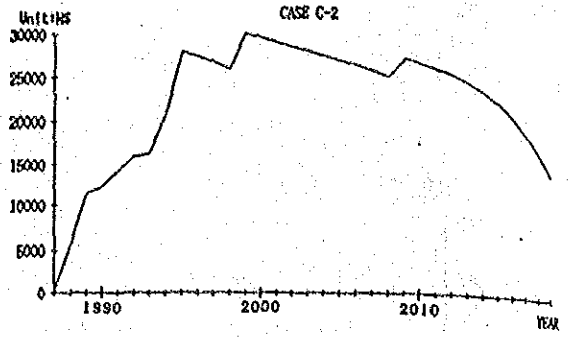
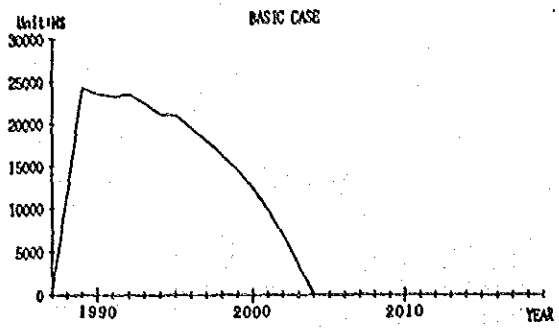


Figure 4-2.4 TREND OF THE OUTSTANDINGS

- (1) The FIRR is distributed between 5% and 12%. Supposing that the average interest rate on the raised funds invested in this project is 10% and the plans in which the FIRR becomes lower than 10% are excluded, Case E and Case G will be considered to be inappropriate without reserve. On the other hand, Case C-1 and Case C-2 can be regarded as a plan that can be adopted with reserve. All other plans can be adopted without reserve.
- (2) If the test cases are evaluated based on the standard used in Japan for good management of new railway company, in which the yearly net profit including depreciation should transfer to surplus within 10 years and accumulated one should transfer within 20 years, it is considered possible to adopt the five plans of the Basic case, Case A-1, Case A-2, Case B-1 and Case F from viewpoints of both terms aforementioned.
- (3) In view of changes in the balance of the cumulative debt, the plans in which it is impossible to repay the debt within the period of the project (30 years) are the four cases of Case C-1, Case C-2, Case E and Case G, which are considered to be inappropriate. Other plans deserve further examination as the debt can be repaid within the period of the project. Judging from the above results, the four cases of the Basic Case, Case A-1, Case A-2 and Case B-1 can be selected as the final plan from the financial viewpoint, considering that it is more desirable to construct whole line of the MRT.

4-3 Final Evaluation

1) Method of Evaluation

The cases are screened so far based on the economic and financial analysis, but the best case has not yet been selected.

In the following each case is evaluate based on the angles other than the economic and financial aspects in order to determine the best case. The evaluation items taken up here are as follows:

(1) Required initial investment cost

In this project, the MRT with the whole line of 14.7 km will be constructed. It requires a large amount of investment.

Therefore, in the case where the whole line is constructed at stage one, it is necessary to raise the total funds in a short period of time, and it is anticipated that it will be difficult to complete the construction work within the limit of budgetary appropriation.

(2) Technical implementation capability

As there has been no example of the execution of such construction work as the MRT in Ecuador, it may be concluded that Ecuador has neither the technology nor the experience required for such construction work. From this standpoint, the feasibility of the case of stagewise-construction is considered to be higher than the case of one-stage construction. Because it is possible to gain necessary technology for management of operation during the long term of construction work.

(3) Securing the connection facilities of MRT with buses

A great number of passengers are expected to come together to and depart from the starting station and the terminal station at the start of the operation. Therefore, a reasonable size of space will be required for their transfer except for the terminal Terrestre in the north, which kept large space already. In this sense, it is considered appropriate to provide such stations in places other than the center of the city that is subject to space restriction. Moreover, in connection with the above, traffic nodes should be secured by providing the space for terminal in consideration of the connection with the bus system and the role of the regional centers working in the areas. By so doing, the MRT can be utilized more conveniently and the formation of desirable urban areas is made possible.

(5) Facilities for passengers and accessibility to CBD (against the stage construction plan)

It is desirable to provide the terminals in places convenient to the MRT passengers.

The CBD of a Guayaquil is about 2 km x 2 km in size.

It is considered desirable to provide a few stations in the CBD, pass through the CBD and provide the terminal in the periphery of the CBD in order to keep wide service area in the CBD and facilitate the extension work of the MRT after its partial opening.

In this sense, it is considered appropriate for MRT to start/arrive from/at the station in the area excluding the city center where it is very difficult to secure the big space for terminal facilities because of the high density of buildings and business activity.

2) Evaluation Results

The characteristics of each test case in relation to the aforementioned items are shown in Table 4-3.1. It is found from the results that Case B-1 is the best plan as a whole. Either of the three remaining cases is regarded as a plan proposed for the second best plan. Of these cases, the Basic case seems not to be urgent, taking into account the large amount of funds to be raised immediately, the fact that it requires a so-called ex-ante investment in the economic and financial aspects, and the fact that the project is finally achieved by any case even if any plan is adopted.

The remaining Case A-1 and Case A-2 have the same operation section in the first stage but only differ in the step taken for the extension work in and after the second stage. Thus, almost no difference exists between the two cases, and both can be regarded as the second best plan. However, if there arises any restriction on the fund raising, priority should be given to the stage construction work plan to be executed on a sure management basis, paying sufficient attention not to increase the amount of the balance of debt. In this sense, Case A-2 may be adopted as the second best plan.

When compared with the above cases, Cases E, F and G where this project is executed only for the first stage section without conducting the subsequent extension work are much inferior. Nevertheless, only Case F has a possibility that the project is feasible from the economic and financial standpoint.

It may safely be said that the project can be made profitable only by the section of 9.1 km between Terminal Terrestre in the north and Centro Civico even if the whole line of the MRT is not completed for some reason.

3) Conclusion

The Study team recommends to execute Case B-1 as the best plan, provided that Case A-2 can be adopted as an urgent step on condition that the subsequent extension work will be conducted if Case B-1 cannot be started immediately due to the funds availability or other restrictions.

Even if the whole line of the MRT cannot be completed, it is considered that the project is made profitable only by the completion of the section of 9.1 km between Terminal Terrestre in the north and Centro Civico.

Table 4-3.1 FINAL 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	

4-4 Sensitivity Analysis

1) Economic Sensitivity Test

In the sensitivity analysis, the various parameters used in the economic analysis are varied, and the effects of such variations on the result of analysis are evaluated.

a. Cases for analysis

As the case for analysis, the Case B-1 which was concluded to be most favorable in the preceding section with varied conditions is used. The conditions for analysis are set up as follows:

(1) Cost inflation

The case of cost inflation is analyzed when the investment cost has risen by 20% and 50%.

(2) Reorganization of bus line

The reorganization of the bus line is a precondition for the execution of the project. The case without the reorganization of the bus line is tested.

(3) Change of MRT fare

In the demand forecast, 25 sucres per passenger on the average is assumed. The effect of the decrease of the fare to 20 sucres and the effect of the increase to 30 sucres are analyzed.

(4) Variation of time value

The benefit from the reduction of the time is estimated from the time value based on the income distribution in Guayaquil. The time value is proportional to the quality and the quantity of the actual economic activity. Cases where the time values are 70% and 50% of the assumptive values are tested.

b. Result of analysis

(1) Cost inflation

The variations of EIRR where the investment cost estimated for the project has increased by 20% and 50% are shown in Figure 4-4.1.

When the investment cost has increased by 20%, EIRR is 16.5%, and when the investment cost has increased by 50%, EIRR is 14.1%, which are much higher than 12%. This indicates that this project is feasible enough and has the allowance for the increase of the investment cost to some extent.

(2) Reorganization of bus line

When the reorganization of the bus line is dropped, EIRR is 16.2%, and this indicates that (the project) is feasible, but EIRR has fallen obviously, and the reorganization of the bus line is considered necessary in this case.

(3) Variation of MRT fare

The variations of EIRR where the MRT fare is set to 20 sucres and 30 sucres are as shown in Figure 4-4.2.

The EIRR is 19.2% at 20 sucres and 16.5% at 30 sucres, which are both feasible, but too much increase of the MRT fare is not desirable, since the decrease of EIRR is largely affected by the increase of the MRT fare.

(4) Variation of time value

The variations of EIRR where the time value has become 70% and 50% of the assumed value are shown in Figure 4-4.3.

The EIRR at 70% of the assumed time value is 17.0% and the same at 50% is 15.9%, which are feasible enough. Even in case no time value is taken into account or

when it is 0%, the EIRR can be estimated to be about 13.0% from the data shown in Figure 4-4.3. This indicates that this project can be made feasible when it can contribute at least to the economization of the vehicle running costs through the alleviation of the road traffic congestion.

Table 4-4.1 SENSITIVITY ANALYSIS RESULT

Economic Indicators Compared Cases		Net Present Value (Mil. Sucres)	B/C Ratio	Economic Internal Rate of Return (%)
Base (Case B-1)		17,649	1.72	18.6
Investment Cost Inflation	Base X + 20%	13,514	1.47	16.5
	Base X + 50%	7,311	1.21	14.1
Without Bus route reorganization		9,920	1.41	16.2
MRT Fare Level Change	20 sucres/ride	19,979	1.82	19.2
	30 sucres/ride	11,246	1.46	16.5
Time Value	Base X 70%	12,728	1.52	17.0
	Base X 50%	9,447	1.39	15.9

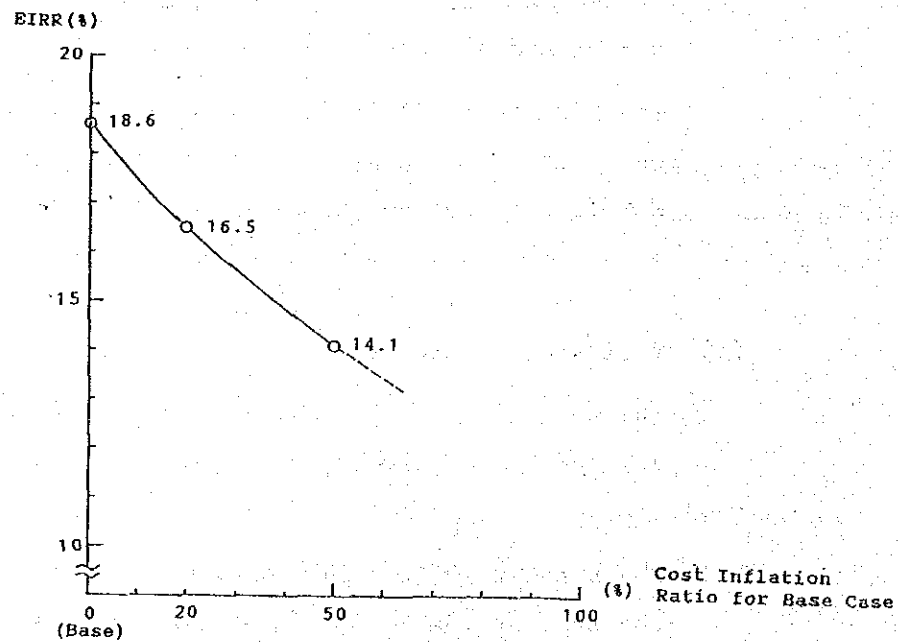


Figure 4-4.1 RELATIONSHIP BETWEEN EIRR AND COST INFLATION

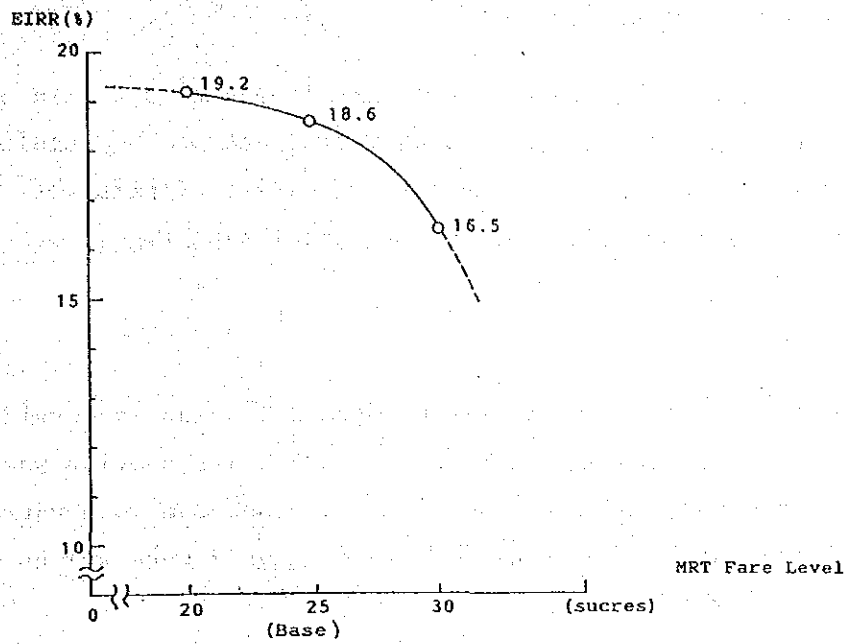


Figure 4-4.2 RELATIONSHIP BETWEEN EIRR AND MRT FARE LEVEL

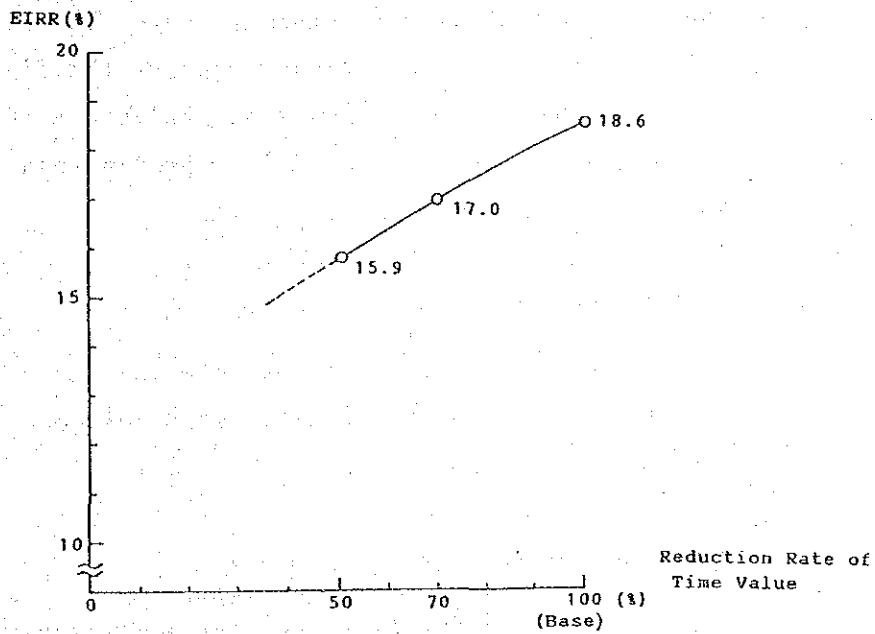


Figure 4-4.3 RELATIONSHIP BETWEEN EIRR AND TIME VALUE REDUCTION

2) Financial Sensitivity Test

Various parameters used in the financial analysis were varied, and the effects of such variations on the result of analysis were examined in order to clarify significant parameters from viewpoints of financial aspect.

a. Cases for analysis

As the cases for analysis, Case B-1 which is considered to be most favorable case in the preceding section was selected, and the conditions for the case were varied for analysis. The conditions for analysis were set up as follows:

(1) Alteration of fund raising plan (see Table 4-4.6)

The fund can be raised through several combinations of the financial sources as are shown in Table 3-2.3 in the preceding section in PART 3. Here, the effect (of the alteration of the fund raising plan on the financial position of the project) will be analyzed as to the cases except the case-2 used for the financial analysis.

(2) Cost inflation

The cases where the actual cost has increased by 20% and 50% against the originally estimated cost for the project will be analyzed.

(3) Variation of MRT fare

As for the MRT fare, 25 sucres per passenger on the average was already assumed in the demand forecast. Here, the cases where this estimated average fare per passenger are changed to 20 sucres and 30 sucres and the effects of such changes is analyzed.

b. Result and its analysis

The cash flow analysis discussed in the preceding section was applied to each of the aforementioned conditions, and the results of analyses shown in Tables 4-4.3 ~ 4 were obtained.

(1) FIRR

- The rise of the construction largely affects FIRR. For instance, it can be lower by 2 to 50% than 13.3% of the original case. The decrease of this much in the value of FIRR seriously affects the feasibility of the project, and this indicates that the rise of the construction cost even by about 20% can be disadvantageous to the project.
- The variation of the fare leads to the variation of the operating revenue, and thus this affects FIRR. For instance, the variation of the fare is known to cause the fall of FIRR though not so much as the rise of the construction cost. In this case, regardless of whether the average fare is decreased to 20 sucres or increased to 30 sucres, FIRR is found to fall yet. The former instance indicates that the reduction of the average fare of that much is not large enough to increase the demand for the service of the MRT, while the latter instance indicates that the increase of the average fare of that much adversely affects the demand for MRT.

(2) Net profit after depreciation

- When the mode of fund raising is varied, the time for the transfer of the net profit to the surplus will have the variance of 0 to + 10 years, and the accumulated net profit will have the variance of 0 to + 14 years. Especially, in the cases 4, 5 and 6 where no investment is given from the government, the result tends to show unfavorable condition.

This suggests that the introduction of the interest free fund of the government in any form is necessary for the project.

- Also, the rise of the construction cost can substantially delay the time when the project will become able to operate at a profit. For example, 20% rise of construction cost can delay the profitable operation of the project by + 10 to + 16 years, and 50% increase of the construction cost can make the project unfeasible.
- The variation of the fare level also affects the time when the project will become able to operate at profit. It can, however, be disregarded. For example, when the average fare level is set to 20 sucres, this can cause the delay of + 3 to + 5 years, while the same set to 30 sucres causes relatively short delay such as + 1 year.

(3) Balance of debt

- Table 4-4.5 shows the change in the balance of the debt as to each of the analyzed cases. According to this table, the alteration of the conditions for the raising of the fund can cause the increase the limit of the short-term loan as much as 3 times at a maximum, and this can also cause 18% increase of the debt balance or the elongation of the period for the repayment of the debt by 14 years at the longest.
- The inflation of the construction cost can cause more adverse effect. For instance, the inflation of the construction cost may end up with the increase in the short-term loan by as much as 12 times or the insolvency leading to the default in the worst case.
- Compared with the inflation of the construction cost, the adverse effect of the alteration of the fare level on the financial position of the project is much smaller. For instance, when the average fare level is set to 20 sucres, it causes the short-term

loan to increase to 2 times at the most, while the balance of the debt will remain unchanged, though the period for the redemption will be elongated by + 5 to 6 years. Thus, the alteration of the average fare level does not seem to cause any serious problems.

What has been discussed in the foregoing can be summarized as shown in the following Table 4-4.2.

Table 4-4.2 RESULT OF FINANCIAL PROBLEM TEST

	FIRR	Net Profit	Debt Repayment
Loan Condition	Not affected	In case of government fund = ϕ , Max. +10 - +14 yrs delay.	In worst case, maturity delay reaches +14 yrs.
	-	Δ	Δ
Construction Cost Inflation	Cost up 20% - +2% Cost up 50% - -5%	Cost up 50% - Do not turn to positive	Cost up 50% - Maturity period is beyond project life.
	\blacktriangle	\blacktriangle	\blacktriangle
MRT Fare level	Fare level 20 syces - -1%	Negrigible	Allowable
	Δ	-	-

(Note) \blacktriangle : Project feasibility is reduced heavily.
 Δ : Project feasibility is reduced slightly.
 - : Project feasibility is not changed.

Table 4-4-3 FINANCIAL SENSITIVITY TEST RESULT (1)

	Case	No. of Years after commencement		Financial Internal Rate of Return (%)
		Yearly Net Profit turns to positive	Accumulated Surplus turns to positive	
Loan Condition Change	Case 1	5	5	13.26
	Case 3	6	7	13.10
	Case 4	6	8	13.10
	Case 5	8	10	13.10
	Case 6	15	20	13.02
Construction Cost Inflation	Base X +20%	15	21	10.98
	Base X +50%	-	-	8.65
MRT Fare Level Change	20 sucres	8	11	11.73
	30 sucres	5	5	12.87
	Base Case (Case B-1)	5	5	13.26

Table 4-4.4 FINANCIAL SENSITIVITY TEST RESULT (2)

	Case	Interest Earned Ratio		Debt Service Coverage Ratio	
		Lowest	Highest	Lowest	Highest
Loan Condition Change	Case 1	0.9	2.5	1.2	2.2
		2.6	18.8	1.4	3.8
		11.4	29.2	3.4	12.7
	Case 3	0.7	4.0	0.9	1.9
		4.3	43.2	1.5	7.1
		13.9	43.7	5.1	13.4
Case 4	0.7	2.2	1.0	1.9	
	2.3	18.4	1.3	3.8	
	10.5	26.7	3.3	11.5	
Case 5	0.6	2.9	0.9	1.9	
	3.2	38.4	1.3	6.6	
	13.2	37.8	4.9	12.7	
Case 6	0.5	3.6	0.8	1.7	
	3.9	42.2	1.4	6.9	
	12.8	39.4	5.2	12.1	
Construction Cost Inflation	Base X +20%	0.6	2.7	0.9	1.8
		3.0	33.2	1.2	5.7
12.0		35.8	4.4	11.8	
Base X +50%	0.3	2.0	0.7	1.5	
	2.2	26.3	1.0	4.6	
	9.4	28.4	3.5	9.4	
MRT Fare Level Change	20 sucres	0.7	2.9	0.9	1.9
		3.2	35.5	1.3	6.1
		12.9	38.3	4.6	12.6
	30 sucres	0.8	3.3	1.0	2.1
		3.6	38.8	1.4	6.6
		14.2	41.9	5.1	13.7
Base Case (Case B-1)	0.9	3.4	1.0	2.2	
	3.7	40.0	1.5	6.8	
	14.7	43.2	5.2	14.2	

(Note) Upper : 1990 - 1999
 Middle : 2000 - 2009
 Lower : 2010 -

Table 4-4.5 CHANGE OF LOAN MATURITY UNDER THE DIFFERENT FINANCE CONDITION

Case	Working Capital Required (Max.) during (1990 - 2000) (Mil. Sucres)	Maximum Cumulative Long term and Short term loan (Mil. Sucres)	Final Maturity Year		Remarks
			Short Term Loan	Long Term Loan	
Loan Condition	-	23,480.4	1990	2003	
	1,337.0	24,367.7	2004	2005	
	808.8	27,157.2	2004	2007	
	1,653.9	27,258.0	2009	2010	Without government capital investment
	2,340.2	27,902.2	2014	2015	
	120%	2,041.7	29,608.6	2015	2015
Cost Infl.	5,415.3	348,978.3	-	-	Project cost = 46,911 Mil.Sucres
	20 Sucre	1,387.9	2008	2009	
MRT Fare Level	30 Sucre	900.5	2002	2005	
	Base Case	734.7	1999	2004	Case B-I

Table 4-4.6 VARIOUS LOAN CONDITION FOR FINANCIAL SENSITIVITY TEST

Case	Repayment Period	Grace Period	Annual Interest Rate (%)	Combination Rate (%)
Base	15	3	12	10
	12	3	9	15
1	15	3	12	10
	12	3	9	15
3	10	3	16	15
	12	3	9	10
4	15	3	12	15
	12	3	9	20
5	15	3	12	15
	12	3	9	20
6	10	3	16	15
	12	3	9	20

- (Note)
1. Finance for the local portion of investment.
 2. Base, Case 1 and Case 3 include the government fund of 10% besides.

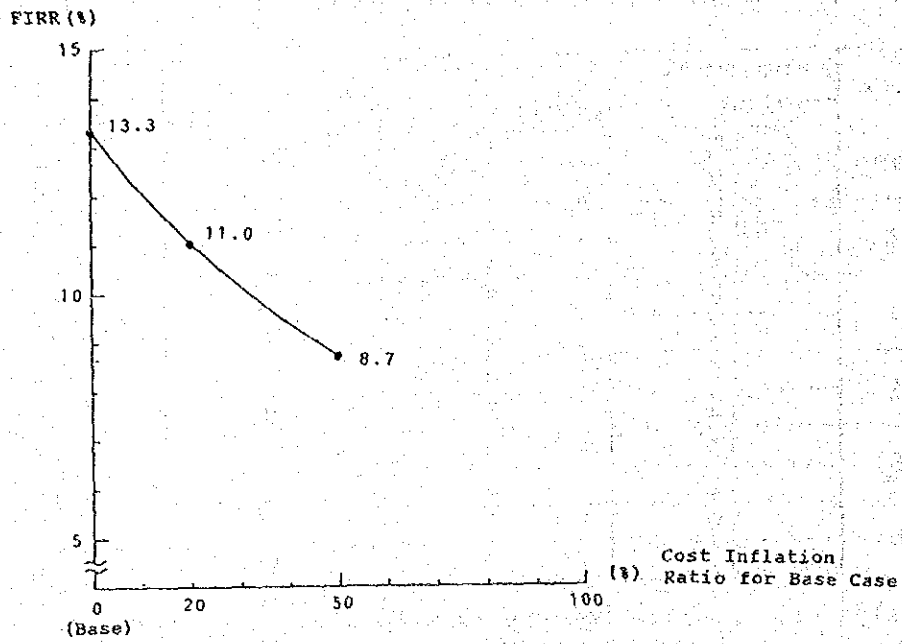


Figure 4-4.4 RELATIONSHIP BETWEEN FIRR AND COST INFLATION

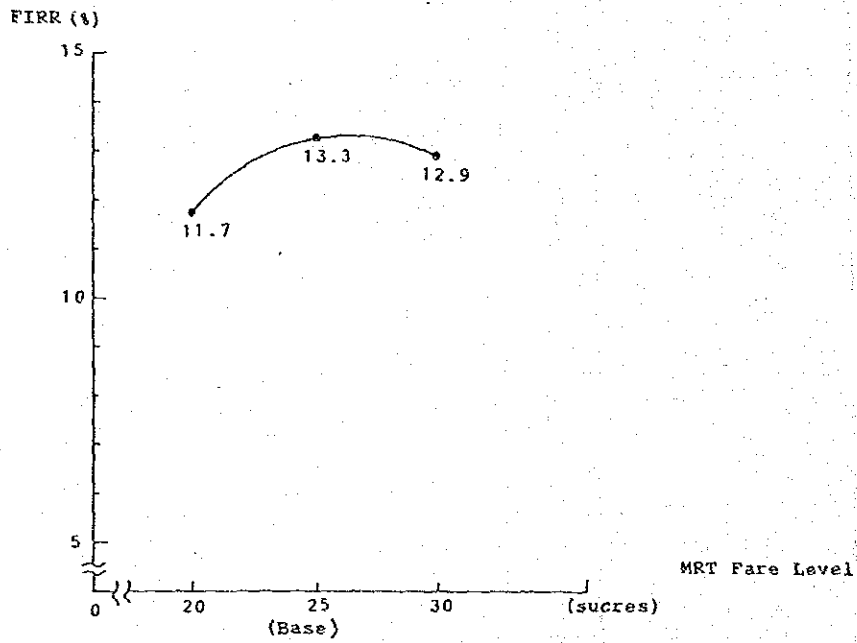


Figure 4-4.5 RELATIONSHIP BETWEEN FIRR AND MRT FARE LEVEL

PART 4

IMPLEMENTATION PROGRAM

PART 4 IMPLEMENTATION PROGRAM

1. Implementation Program

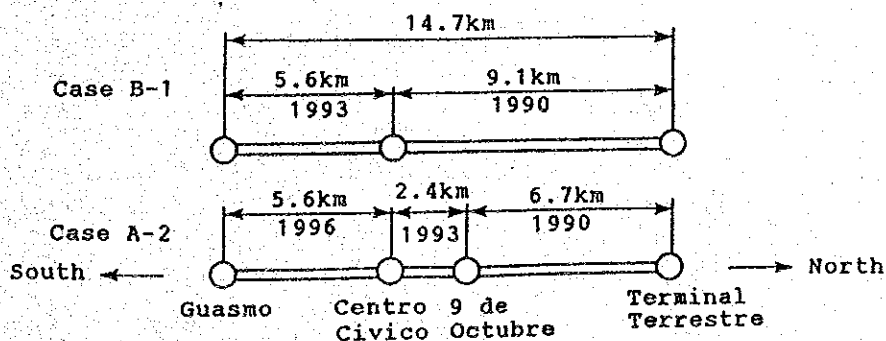
1-1 Fund Raising Plan

This chapter deals with the implementation program of the Case B-1 selected according to the results of the economic and financial analyses. This implementation program comprises the following three parts:

1. Annual investment program and fund raising program by the source of fund.
2. Preparation program for the commercialization of the MRT.
3. Construction schedule.

When an entirely new railroad has to be constructed, it is advantageous to construction and open a longest possible line, since it is more attractive and convenient for the users. The Case B-1 is an ideal one in that it meets all such requirements. However, the section to be constructed first covers 9.1 km out of the total length of 14.7 km, so that a substantial portion of the total fund needed for constructing the full length of the line has to be raised in the early stage of the construction work. Therefore, in the following fund raising plan, besides the Case B-1, the Case A-2 will also be considered, since the amount of initially needed fund is smaller than that of the former case. As indicated below, the construction work proposed by the Case A-2 is divided into three sections. Each of these sections is to be open in every three years, so that the inconvenience of the users will not last so long, and the financial payability of this case is relatively high.

(Cases to be studied and year of opening)



1) Annual Project Cost

According to the construction cost estimate in the PART 1, the annual project costs for the above-mentioned cases are as shown in Table 1-1.1. In this table, the amounts of annual L.P. (Local Portion) and F.P. (Foreign Portion) are divided according to the ratios of L.P. and F.P. of each construction section to the total L.P. and F.P.

Table 1-1.1 ANNUAL PROJECT COST

L.P. = Local Portion
F.P. = Foreign Portion

Unit: Million sucres in 1985 prices
1 US dollar = 120 sucres = 210 Japanese Yen
(November, 1985)

Case	Year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Total
	Open year				1st Section opening			2nd Section opening				
Case B-1	L.P.	58	2,812	2,812	50	1,653	1,653	-	-	*	(46)	9,084
	F.P.	104	5,044	5,044	117	3,864	3,864	-	-	(1,570)	-	19,607
	Total	162	7,856	7,856	167	5,517	5,517	-	-	(1,616)	-	28,691
	Open year				1st Section opening			2nd Section opening			3rd Section opening	
Case A-2	L.P.	48	2,100	2,100	24	900	900	45	1,504	1,504	-	9,125
	F.P.	85	3,774	3,774	48	1,839	1,839	122	4,096	4,096	-	19,673
	Total	133	5,874	5,874	72	2,739	2,739	167	5,600	5,600	-	28,798
	Open year				1st Section opening			2nd Section opening			3rd Section opening	

* Figures in parentheses represent the cost for increasing the number of train coaches, and this cost should not be included in the initial cost of project.

2) Raising of Fund

Mainly due to the following two reasons: (1) about two thirds of the construction cost of this project will be financed by foreign funds and (2) there is no Ecuadorian contractor with experience in this kind of construction work, it is desirable for this project to be offered for an international tender in order to have it undertaken by a competent foreign company on what is called the turnkey basis embracing all the processes ranging from the construction work to the commencement of the operation including the technical guidance and training for the local personnel.

On the other hand, the whole line covering 14.7 km will have to be completed by the construction work divided into two or three phases. The major portion of the first-phase work has to be entrusted to foreign contractors. It is also necessary, however, to promote the development of competent domestic contractors, since such construction works are desired to be undertaken by domestic contractors in the future. Therefore, in executing the construction work of the first phase, it is recommendable to carry out the construction work by a joint-venture company organized by foreign contractors and domestic contractors.

As for the fund needed for purchasing train coaches in order to meet the increasing demand for the transportation service in the future, it is most common practice to use the supplier' credit in order to finance such purchases, since such coaches will have to be imported from foreign manufacturers.

With the above kept in mind, of the cases for the combinations of the fund sources shown in Table 3-2.3 in PART 3, the possibilities of the funds by their sources in case-2 will be discussed in the following.

Table 1-1.2 COMBINATION OF FUNDS IN CASE-2 (REFER TO Table 3-2-3 in PART 3)

Source of fund	Local portion cost (About 35% of total)			Foreign portion cost (About 65% of total)		
	* Ecuadorian government	Banco de Desarrollo del Ecuador	Foreign Private banks	Foreign governments	Foreign private banks	
Estimate of loan conditions						
Annual interest	-	12%	9%	4.75%	9%	
Term (Grace period)	-	15 (3) years	12 (3) years	25 (7) years	12 (3) years	
Repayment system	-	paying in yearly flat installment of 12 years	paying in yearly installment of 9 years	paying in yearly flat installment of 18 years	paying in yearly flat installment of 9 years	
Combination of funds	10% of total	10% of total	15% of total	** Of foreign portion, 8,600 mil. sucres at a max.	Remainder of foreign portion	

*: As for the fund from the Ecuadorian government, the payment of the interest and the repayment of the principal are not required.

** : 8,600 million sucres = 15,000 million Japanese yens

(1) Availability of fund from the Ecuadorian government

a. Necessity of fund from the Ecuadorian government

This project is promoted as a national project aiming at the improvement of the lives of the citizens of Guayaquil City and the improvement of the infrastructure for the domestic industries, which leads to the general development of the Republic of Ecuador as the whole. In this study report, it is proposed that this project should be operated by a new semipublic corporation jointly organized by public bodies and private companies.

Besides, in order to introduce foreign long-term funds at low interest rates, it is important for the Ecuadorian government to expressly manifest its positive attitude towards this project, and, in order to do so, it is absolutely necessary for the government to invest its fund in this project.

b. Availability of fund

A special new budget should be made available for financing the construction work for this project. A comparison between the amount of the fund which has already been invested in the study area and the amount of the fund which will be needed for this project as will be made in the following, assuming that the project has to be financed within the existing budget.

The fund invested in the on-land transportation in the study area during 1985 is estimated at 4,400 mil. sucres/year in total comprising 2,960 mil sucres from the government and 1,480 mil sucres from the local public bodies (Refer to 3-2.1, 1) a-4 Summary in PART 3).

Of the annual amounts of the investments (the total of local portion and foreign portion) listed in Table 1-1.1, the amount expected to be allocated from the budget of the government is 10% of the total amount of

the fund needed, so that the annual amount of the investments by the government are as follows:

Table 1-1.3 AMOUNT OF INVESTMENT FROM GOVERNMENTAL BUDGET IN CASE B-1

Million sucres in 1985 prices

Year	A. Annual project cost	B. Governmental fund (A × 10%)	C. Investment in transportation in study area	B/C (%)
1987	162	16.2	4,400	0.4
1988	7,856	785.6	"	17.9
1989	"	"	"	"
1990	167	16.7	"	0.4
1991	5,517	551.7	"	12.5
1992	"	"	"	"
Total	27,075	2,707	26,400	10.3

According to Table 1-1.3, if the fund to be invested in this project by the government is to be taken from the existing budget of the government, the governmental fund accounting for about 18% of the total fund needed annually should be provided for 2 years at the longest (or 10.3% of the total amount on the average for 6 years).

The appropriation of the fund for this project from the existing governmental budget may affect the progress of other projects to some extent, but this project deserves such action of the government in view of the importance of this project in that it is directly concerned with the daily lives of the citizens.

In the case where the construction of the line covering 14.7 km is to be completed by the construction work divided into three phases, the ratio (of the governmental fund to the total fund) is 13.4% annually (1988 and 1989), so that the annual share (of the governmental fund) can be reduced.

TABLE 1-1.4 AMOUNT OF INVESTMENT FROM GOVERNMENTAL BUDGET IN CASE A-2

Million sucres in 1985 prices

Year	A. Annual project cost	B. Governmental fund (A × 10%)	C. Investment in transportation in study area	B/C (%)
1987	133	13.3	4,400	0.3
1988	5,874	587.4	"	13.4
1989	"	"	"	"
1990	72	7.2	"	0.2
1991	2,739	273.9	"	6.2
1992	"	"	"	"
1993	167	16.7	"	0.4
1994	5,600	560.0	"	12.7
1995	"	"	"	"
Total	28,798	2,880	39,600	7.3

(2) Borrowing from Banco de Desarrollo del Ecuador

The interest rate on the loans made by this bank is 12% annually which is higher nominally than the annual interest rate of 9% which is estimated to be charged by foreign private banks, but the actual annual interest rate to be charged by the former is quite low when the current inflation in Ecuador (Inflation in terms of consumer price index: 28% annually as of September, 1985) is taken into account.

As generally known, the international price of oil, one of the staple products for export supporting the Ecuadorian economy, is hovering around quite a low level, and this is restricting the investments of the bank. In view of the importance of this project, however, at least 10% (the share equal to that of the government fund indicated in Tables 1-1.3 and 1-1.4) of the total cost of the project should be covered by the fund from this bank by strongly urging the bank to do so.

(3) Economic cooperations extended by foreign governments

The Ecuadorian government should give high priority to this project as a national project and seek the largest possible values of foreign economic aids and loans at the best conditions. Introducing the funds at the lowest possible costs leads to low project cost and the benefit of the citizens.

The combination of the funds proposed by this case does not include the loans from international organizations, but the Ecuadorian government should be recommended to seek the loans from international organizations at the conditions almost equal to those of the loans from foreign governments.

(4) Loans from foreign private banks

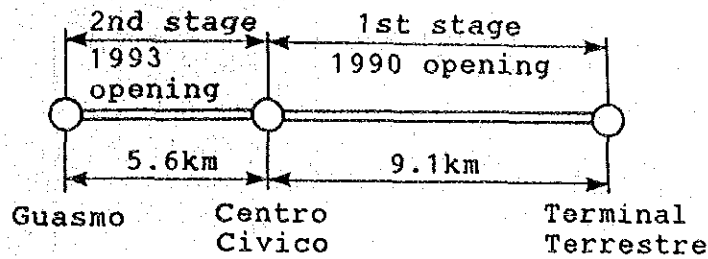
In raising the fund for any project through an international tender, it is a common practice to require the tenderers to present their financing plans, and this system should be recommended for this project too.

Normally, the interest rate on the loan provided by a private bank includes the commission of the broker and risk coverage cost. Thus, the conditions at which the loans from foreign private banks are available area, to some extent, dependent on the attitude of the Ecuadorian government towards this project. Thus, it is important for this project to introduce the governmental fund, the loan from Banco de Desarrollo del Ecuador and the loans form foreign governments and international organizations.

3) Annual Fund Raising Plan

The examples of annual fund raising plan using the various funds listed in Table 1-1.2 are shown in Table 1-1.5 (Case B-1) and Table 1-1.6 (Case A-2) respectively. Besides these combinations, there are many other combinations of the funds. Thus, it should be recommended for the project to seek a better and more potential combination of funds according to the progress of the project.

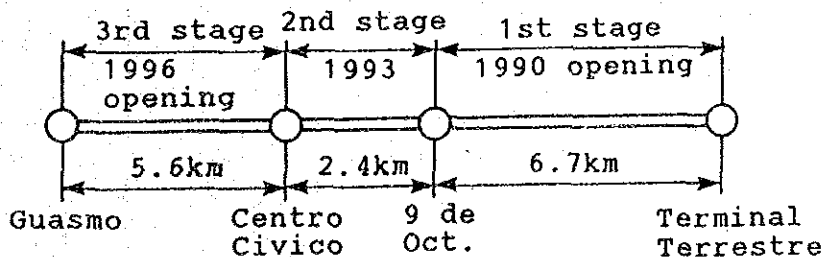
(1) Case B-1 (Refer to Table 1-1.5)



This case proposes to divide the construction work into two phases. The fund amounting to 15,874 mil. sucres is appropriated for the first-phase work (Work for the section between Terminal Terrestre and Centro Civico covering 9.1 km). The breakdown of this fund is as follows:

<u>Source of fund</u>	<u>Mil. sucres</u>	
Ecuadorian government	1,588 (10.0%)	Local portion
Banco de Desarroll del Ecuador	1,588 (")	" "
Foreign governments	8,600 (54.2%)	Foreign portion
Foreign private banks	4,098 (25.8%)	Local & foreign portion
Total	15,874 (100.0%)	To be outlaid in three years

(2) Case A-2 (Refer to Table 1-1.6)



This case proposes to divide the construction work into three phases. The fund amounting to 11,881 mil. sucres is appropriated for the first-phase work (Work for the section between Terminal Terrestre and 9 d Octubre covering 6.7 km). The breakdown of the fund is as follows:

<u>Source of fund</u>	<u>Mil. sucres</u>	
Ecuadorian government	1,187 (10.0%)	Local portion
Banco de Desarrollo del Ecuador	1,187 (")	" "
Foreign private banks	1,874 (15.8%)	" "
Foreign governments	7,633 (64.2%)	Foreign portion
Total	11,881 (100.0%)	To be outlaid in three years

In this case, the foreign portion is totally covered by the funds from foreign governments. The burden of the domestic financial sources in Ecuador will be reduced largely by increasing the shares of the loans from international financial organizations and the loans from foreign private banks (What is called the supplier's credit).

Table 1-1.5 AN EXAMPLE OF FUND RAISING PLAN (CASE B-1)

Million sucres in 1985 prices

Source of fund	Year	1st Stage (1990 opening)					2nd Stage (1993 opening)				Total (%)
		1987	1988	1989	1989	Sub-total (%)	1990	1991	1992	Sub-total (%)	
Local portion	Ecuadorian Government	16	786	786	786	1,588 (10.0)	17	552	552	1,121 (10.0)	2,709 (10.0)
	Banco de Desarrollo	16	786	786	786	1,588 (10.0)	17	552	552	1,121 (10.0)	2,709 (10.0)
	Foreign private banks	26	1,240	1,240	1,240	2,506 (15.8)	16	549	549	1,114 (10.0)	3,620 (13.4)
	Sub-total	58	2,812	2,812	2,812	5,682 (35.8)	50	1,653	1,653	3,356 (30.0)	9,038 (33.4)
Foreign portion	Foreign governments	88	4,256	4,256	4,256	8,600 (54.2)	-	-	-	-	8,600 (31.8)
	Foreign private banks	16	788	788	788	1,592 (10.0)	117	3,864	3,864	7,845 (70.0)	9,437 (34.8)
	Sub-total	104	5,044	5,044	5,044	10,192 (64.2)	117	3,864	3,864	7,845 (70.0)	18,037 (66.6)
Total	162	7,856	7,856	7,856	15,874 (100)	167	5,517	5,517	11,201 (100)	27,075 (100)	

(Note) 1. 1 US\$ = 120 Sucres = 210 Yenes (Free market exchange rate as of October, 1985)

- The loan from foreign governments is limited to 8,600 mil. sucres (15,000 mil. Japanese yen) at a maximum in one case, and such fund should be applied to the foreign portion. This fund is available at the lowest interest rate and wholly appropriated for the first-stage (phase) work.
- The fund amounting to 1,616 mil. sucres which will be needed for the purchases of train coaches to be used in 1995 should be made available by the credit to be offered by the coach manufacturers. This fund should not be listed in Table 1-1.5.

Table 1-1.6 AN EXAMPLE OF FUND RAISING PLAN (CASE A-2)

Million sucres in 1985 prices

Source of fund	Year	1st Stage (1990 opening)			2nd Stage (1993 opening)			3rd Stage (1996 opening)			Total (%)			
		1987	1988	1989	Sub-total (%)	1990	1991	1992	Sub-total (%)	1993		1994	1995	Sub-total (%)
Local portion	Ecuadorian government	13	587	587	1,187 (10.0)	7	274	274	555 (10.0)	17	560	560	1,137 (10.0)	2,879 (10.0)
	Banco de Desarrollo	13	587	587	1,187 (10.0)	7	274	274	555 (10.0)	17	560	560	1,137 (10.0)	2,879 (10.0)
	Foreign private banks	22	926	926	1,874 (15.8)	10	352	352	714 (12.9)	11	384	384	779 (6.9)	3,367 (11.7)
	Sub-total	48	2,100	2,100	4,248 (35.8)	24	900	900	1,824 (32.9)	45	1,504	1,504	3,053 (26.9)	9,125 (31.7)
Foreign portion	Foreign governments	85	3,774	3,774	7,633 (64.2)	48	919	-	967 (17.4)	-	-	-	-	8,600 (29.9)
	Foreign private banks	-	-	-	-	-	920	1,839	2,759 (49.7)	122	4,096	4,096	8,314 (73.1)	11,073 (38.4)
	Sub-total	85	3,774	3,774	7,633 (64.2)	48	1,839	1,839	3,726 (67.1)	122	4,096	4,096	8,314 (73.1)	19,673 (68.3)
	Total	133	5,874	5,874	11,881 (100)	72	2,739	2,739	5,550 (100)	167	5,600	5,600	11,367 (100)	28,798 (100)

(Note) 1. } The same as those in Table 1-1.5
 2. }

3. The fund needed for purchasing train coaches in 1995 is included in the fund appropriated for the third-stage (phase) work (Not listed in Table)

1-2 Preparatory Process of MRT Management

1) Implementation Schedule of Preparatory Works

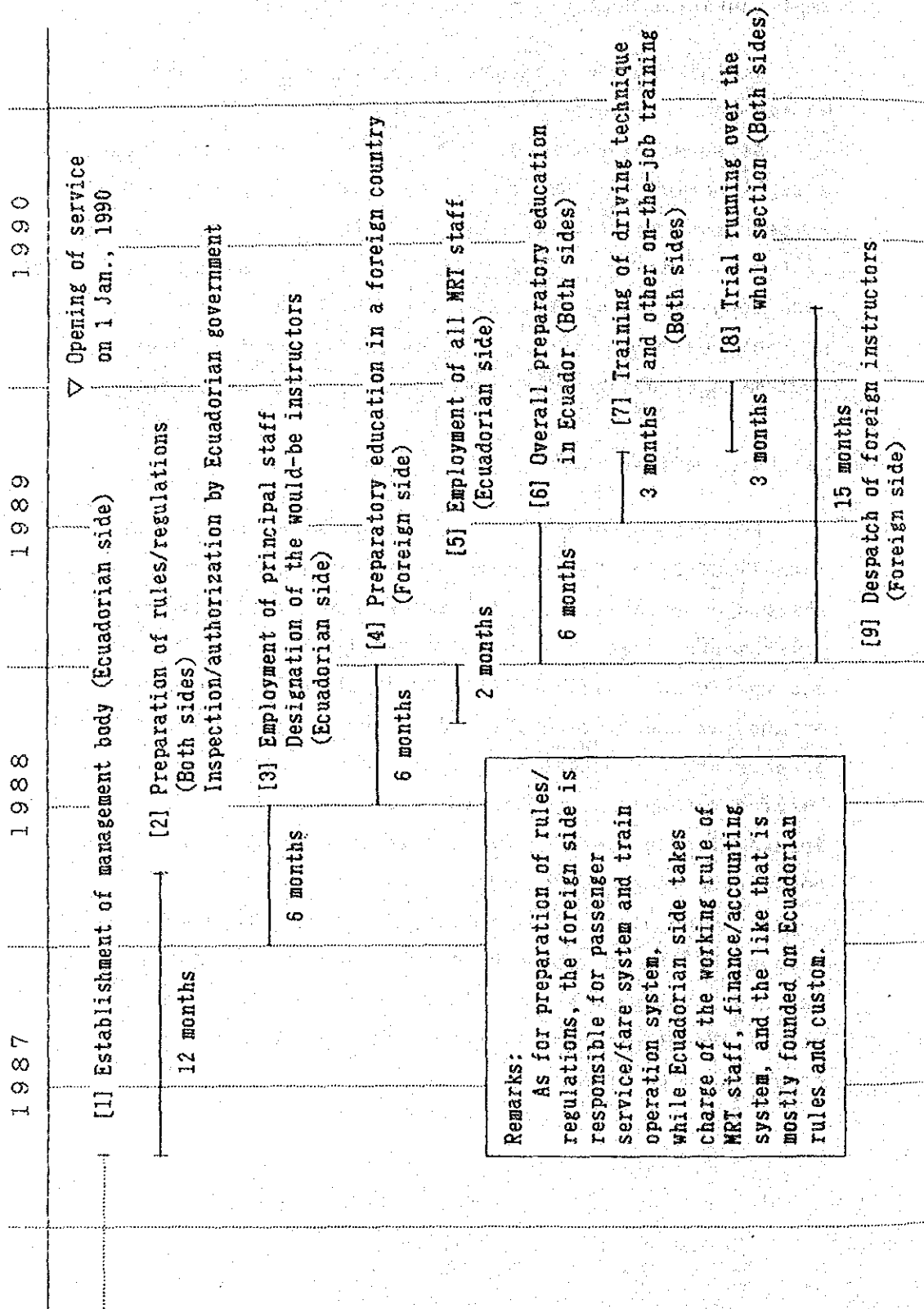
Implementation schedule of preparatory works for MRT management is described in Table 1-2.1.

As shown in the Table 1-2.1, all the schedule is packed in a tight period of less than three years. This requires all members concerned their strong will of completing Guayaquil MRT system by January 1, 1990. Ecuadorians will have to receive a good cooperation by the country to which the contract of this project would go. The summarized explanation of this implementation schedule is made item by item hereunder.

2) Establishment of MRT Management Body

Prior to other items in the preparatory works, the establishment of MRT management body is the first prerequisite. The would-be management body is proposed to be a semi-governmental organ that would be managed in a way of private enterprize and be controlled indirectly by relevant governmental organs, if necessary. The body is required to deal with all the preparatory works that will arise before the commencement of services as well as management and operation of MRT system after opening its services. Unless this body is established, any consultant would not be able to go into the detailed consultation of any item concerned, because this body has first responsibility in implementation or decision of MRT construction and other relevant works. This is, in another sense, the establishment of contact channel between Ecuadorians and the consultants concerned.

Table 1-2.1 PREPARATORY PROCESS IN GUAYAQUIL MRT PROJECT



3) Preparation of Necessary Rules

Necessary rules and regulations will have to be prepared beforehand. The consultant is required to prepare those relating to the passenger service system including fare control system and train operation system. The Ecuadorians is required to prepare those relating to the working rule of MRT staff, finance and accounting system, and the like which are mostly founded in the general Ecuadorian rule and custom. All these rules and regulations prepared by both parties would go under the inspection and authorization by the Ecuadorian Government that will take a fairly long time in general. Therefore, this process has a key to lead this MRT project to a final success for the opening on the target date of January 1, 1990.

4) Employment of Principal MRT Staff

Principal MRT staff have to be employed at first and among them some will be designated to be instructors who receive preparatory education of electric railways in a foreign country where an electric operation is carried out at present and from where the Ecuadorian would procure railcars and other facilities under foreign loan. They, the Ecuadorian instructors, will engage later in the preparatory education implemented in Ecuador to the major part of staff in general. Later, they will be a key staff in the management of MRT system.

5) Preparatory Education for Ecuadorian Instructor

The designated would-be Ecuadorian instructors will have to stay in the foreign country for about six months where they will receive the basic knowledge of electric railways and will go for the inspection trip to the manufactures of railcars and other facilities/equipments. They will be given a wide range of railway engineering in general in a limited period, so they are required to have an ample capability of understanding basic science.

6) Employment of All MRT Staff

All the remaining MRT staff will have to be employed at the last part of the preparatory education for the Ecuadorian instructors so that they can receive education by the Ecuadorian instructors just in time.

7) Overall Preparatory Education in Ecuador

Ecuadorian instructors who received education in a foreign country will come back to Ecuador and give other MRT staff the preparatory education of electric railways. Some foreign instructors will also come to Ecuador in time of this overall preparatory education and they will assist Ecuadorian instructors who might find some difficulties in their instruction.

8) Train Operation and Other On-the-job Training

The last six months of the construction schedule will be assigned for the training of driving technique of trains and other on-the-job training of every facilities/equipments. Of these six months, the last three months will be spent for the trail running over the whole construction section in the Case B-1.

9) Despatch of Foreign Instructors

Foreign instructors will be sent to Ecuador to assist Ecuadorian instructors in giving preparatory education in due course. They will come to Ecuador at the time of the beginning of the overall preparatory education in Ecuador and will stay until the time three months after the opening of MRT services. The period of their stay in Ecuador will be 15 months long.

1-3 Construction Schedule

The construction schedule for case B-1 is shown in Table 1-3.1.

Table 1-3.1 IMPLEMENTATION PROGRAM

Item	Year	1986	1987	1988	1989	1990	1991	1992	1993
A. Preparatory Work									
A-1 Preparation of Tender Document		=====							
A-2 Bidding & Contract			=====						
B. Survey & Detailed Design			=====						
C. Land Acquisition & Compensation			=====						
D. Civil Work Construction									
D-1 Trackway Structure			=====						
D-2 Track			=====						
D-3 Station			=====						
D-4 Depot & Maintenance Shop			=====						
D-5 Road Improvement & Others			=====						
E. Electrical Facilities Construction									
E-1 Substation			=====						
E-2 Power Distribution			=====						
E-3 Signal & Telecommunication			=====						
F. Rolling Stock									
G. Overall Test & Trial Run									
H. Preparations for Management Body and Training									
H-1 Establishment of Management Body		=====							
H-2 Preparation of rules/regulations			=====						
H-3 Employment of Staff									
H-4 Education & Training									
I. Preparation of Bus Route Reorganization									
J. Financing Plan									

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