Executive Summary

Executive Summary: Review Result of Jakarta MRT Project

(1) Selection of Optimum Alignment Plan

Five alternative technical implementation options, as presented in Figure 1.1, were considered under this review exercise. Comparative cost analysis was undertaken for these alternative options, and differences among them from technical perspectives were discussed to select the optimum alignment plan.

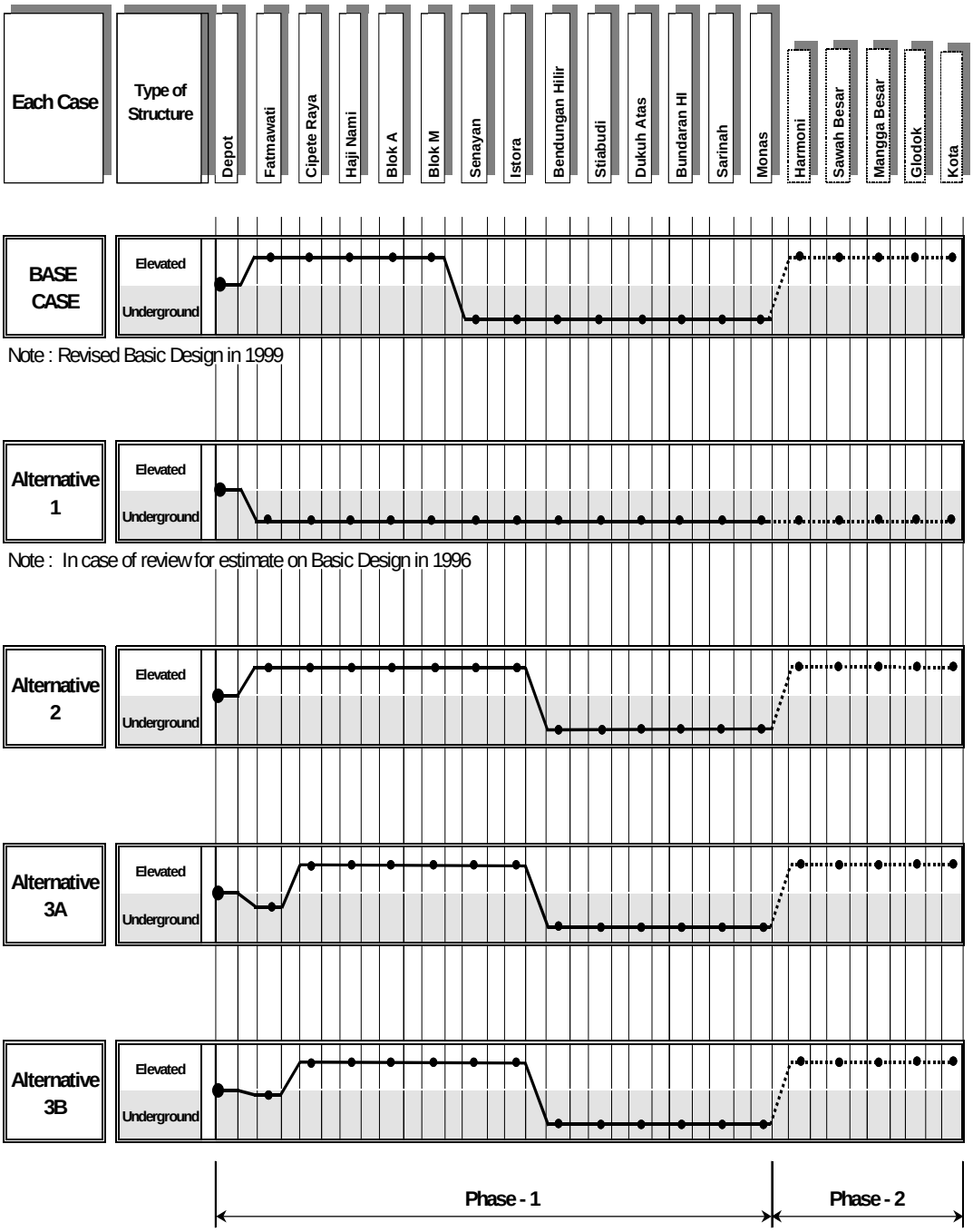

Figure 1.1 Vertical Alignments of Alternative Plans

As the consequence, Alternative 3B was recommended by the Study Team and it was generally accepted at the Steering Committee and Working Group Meetings. Major reasons to select Alternative 3B include:

- The transition trough area of Alternative 3B is less affected by the required widening of the road relative to other Alternatives, except for Alternative 1 (Because alignment of Alternative 1 is full underground).
- The route alignment of Alternative 3B entails comparatively lower construction cost (Base Case=100, Alternative 1=130, Alternative 2=90, Alternative 3A=98, and **Alternative 3B=95**).
- Although the cost of Alternative 2 is the lowest among others, a vertical alignment between the crossing point over the existing toll road and Fatmawati Station will become very steep, and the noise will bring about significant impact upon the settlement environment.
- The construction of Fatmawati underground station, adopted for Alternative 3B, by using a shallow cut & cover method is environmentally sound compared to other Alternatives (Base Case, Alternative 1 and Alternative 2).

Major features of Alternative 3B are shown in Table 1.1 and Figure 1.2.

Table 1.1 Alternative 3B

Section	Distance	No. of Station	Structures
Fatmawati Depot	-	-	Ground
Fatmawati Station	1.3 km	1 Station	Underground
Cipete Raya - Istora	8.0 km	6 Stations	Elevated Guideway
Bendungan Hilir – Monas	6.2 km	6 Stations	Underground
Total	15.5 km	13 Stations	

Source: JICA Study Team

All further considerations in this review and assessment exercise are based on the MRT project definition as outlined above.

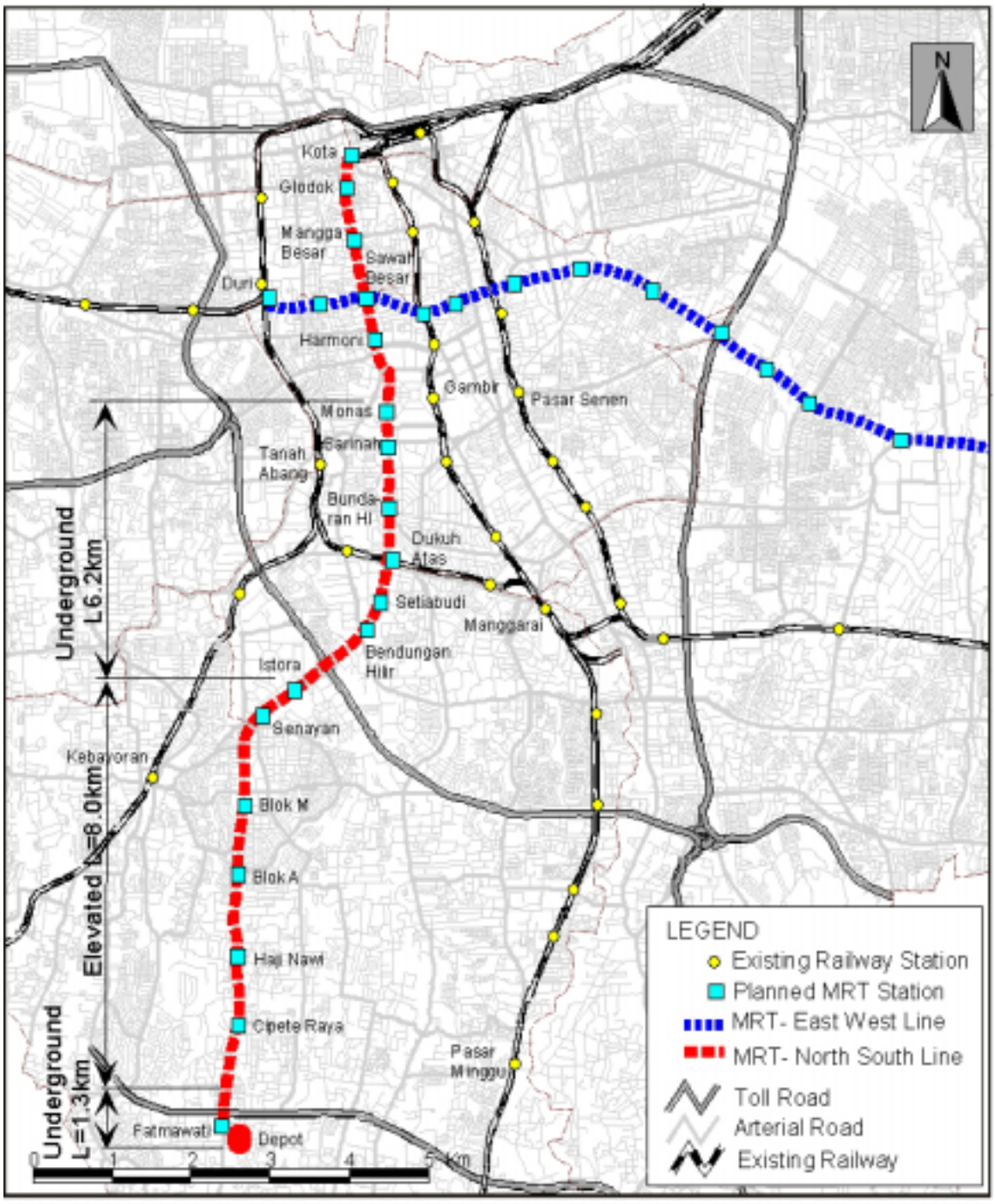

Figure 1.2 Alignment Plan of Alternative 3B

(2) Project Base Cost

The project base cost was estimated for the selected "Alternative 3B". Total MRT project base cost in constant 2000 prices was estimated at **Rupiah 13,683 billion (rounded)** and its breakdown is presented in Table 2.1

Table 2.1 Total MRT Project Base Cost

Fatmawati – Monas Section	Japanese Yen (million)			Indonesian Rp. (million)		
	L/C	F/C	Total	L/C	F/C	Total
(1) Civil works & Equipment	39,123	81,026	120,149	2,934,208	6,076,936	9,011,143
(2) Detailed Design & Tender Assistance	1,176	2,448	3,623	88,166	183,566	271,732
(3) Construction Supervision	2,347	4,862	7,209	176,052	364,616	540,669
(4) System Integration & Trial Running	80	526	606	5,976	39,438	45,414
(5) Physical Contingency	4,610	6,365	10,975	345,723	477,369	823,092
(6) Insurance	1,369	2,836	4,205	102,697	212,693	315,390
Sub-total (Engineering Base Cost)	**48,704**	**98,062**	**146,766**	**3,652,823**	**7,354,618**	**11,007,441**
L/C & F/C Composition (%)	*(33.2%)*	*(66.8%)*	*(100.0%)*	*(33.2%)*	*(66.8%)*	*(100.0%)*
(7) Land Acquisition & Compensation, etc.	10,286	0	10,286	771,457	0	771,457
(8) Import Duty, VAT, etc.	25,384	0	25,384	1,903,808	0	1,903,808
Sub-total (GOI Contribution)	**35,670**	**0**	**35,670**	**2,675,266**	**0**	**2,675,266**
Total (Project Base Cost)	**84,375**	**98,062**	**182,436**	**6,328,088**	**7,354,618**	**13,682,706**

Source: JICA Study Team
Note: US $ 1= Yen 106= Rp.7,950

(3) MRT Demand Profile

1) Demand Projection with "No Enhancement Measures"

Demand forecast for the Jakarta MRT was carried out under the most basic assumptions with 'no enhancement measures' such as road pricing imposed onto the system. Given this a condition, several fare levels were examined to find an optimum fare that maximizes the fare box revenue. Consequently, the optimum fare was found to be Rp.2,600/pax on an average with a split fare system of Rp.800/access plus Rp.325/km, which is almost the same level as the fare of Air-conditioned Express "Patas AC" bus services of Rp.2,500/pax.

Thus, the total passenger demand for the Fatmawati-Monas stretch of the Jakarta MRT is forecast to be 176,800 boarding passengers per day or around 53 million annual ridership in the year 2005. This demand may reach around 98 million annual ridership in the year 2015. Dukuh Atas and Blok M stations are predicted to become the busiest stations whereas the Dukuh Atas – Setiabudi – Bendungan Hilir section the busiest sections in the Jakarta MRT system. The maximum line loading is around 103,000 passengers (year 2005) and 191,600 passengers (year 2015) per day for both directions as shown in Table 3.1.

Table 3.1 Projection of MRT Passengers for Alternative Demend Scenarios

	Case Description	Year 2005				Year 2015				Note
		Total Passenger *(pax/day)*		Max Loading *(pax/day 2way)*	Pax.km *(daily)*	Total Passenger *(pax/day)*		Max Loading *(pax/day 2way)*	Pax.km *(daily)*	
Without Enhancement Measures										
CASE 1	**"Draft Final Version"** *Fare Structure :* Rp 500 access + Rp 286/km *Enhancement :* No enhancement	185,518	105%	108,462	1,029,971	340,651	105%	201,160	1,921,564	Avg Fare Rp. 2100 Target Market : Patas AC users
CASE 2	**"Comparable to Patas AC"** *Fare Structure :* Rp 800 access + Rp 325/km *Enhancement :* No enhancement	176,751	100%	103,012	975,103	325,043	100%	191,560	1,822,319	Avg Fare Rp. 2600 Target Market : Patas AC users
CASE 3	**"Fare 50% higher"** *Fare Structure :* Rp 800 access + Rp 425/km *Enhancement :* No enhancement	137,414	78%	79,661	745,778	285,870	88%	167,500	1,578,899	Avg Fare Rp. 3100 Target Market : Patas AC users
CASE 4	**"Double the Fare"** *Fare Structure :* Rp 1000 access + Rp 575/km *Enhancement :* No enhancement	84,309	48%	49,084	446,865	229,497	71%	133,131	1,238,110	Avg Fare Rp. 4050 Target Market : Patas AC users
CASE 5	**"Half the Fare"** *Fare Structure :* Rp 500 access + Rp 100/km *Enhancement :* No enhancement	367,782	208%	217,309	2,109,993	491,745	151%	293,454	2,857,681	Avg Fare Rp. 1075 Target Market : All bus users
With Enhancement Measure(s)										
CASE 6	*Fare Structure :* Rp 500 access + Rp 286/km *Enhancement :* Road capacity capping	286,409	162%	165,613	1,480,034	586,514	180%	330,207	2,969,576	"Push" car user on Senayan-Monas to use MRT
CASE 7	*Fare Structure :* Rp 800 access + Rp 325/km *Enhancement :* (1) Road capacity capping	277,633	157%	160,189	1,425,287	570,912	176%	320,590	2,870,380	
CASE 8	*Fare Structure :* Rp 800 access + Rp 325/km *Enhancement :* (1) Road capacity capping (2) Limit competition from bus	391,849	222%	225,015	2,070,294	636,774	196%	356,181	3,254,524	
CASE 9	*Fare Structure :* Rp 800 access + Rp 325/km *Enhancement :* (1) Road capacity capping (2) Limit competition from bus (3) Land Use Dev around sta.	402,395	228%	230,888	2,133,827	649,806	200%	363,902	3,337,777	

2) Demand Projection with "Enhancement Measures"

Preliminary economic and financial analysis on the MRT project revealed that the MRT demand level projected under the assumption of "no enhancement measures" would not be able to achieve the project feasibility. Eventually, the demand projection was made for such conditions of "with enhancement measures" as (i) road capacity capping, which constrain the growth of corridor traffic beyond the existing service level, (ii) additionally to the above (i), competition from buses on the same corridor is limited, and (iii) additionally to the above (i) and (ii), intensive land use around MRT railway stations is encouraged.

Compared to the "No Enhancement Measure" condition, the passenger demand estimated under the "road capacity capping" condition was pushed upwards by more than 50% or about 100,000 passengers increase from the "No Enhancement Measure" condition in 2005. "All the enhancement measures" condition, i.e.(iii) above, could attract more than 400,000 passengers/day to the MRT in 2005, and which is more than double the demand for "No Enhancement Measure" condition as shown in Table 3.1.

(4) Economic Internal Rate of Return (EIRR)

Cost and benefit streams were based on the estimated project cost, the proposed implementation schedule, future traffic demand, and a project life cycle of 47 years (including the construction period). The Economic Internal Rate of Return (EIRR) was subsequently calculated for alternative MRT demand scenarios, the results of which are summarized below as:

- Demand Scenario 1: EIRR= 7.48%
- Demand Scenario 2: EIRR=13.19%
- Demand Scenario 3: EIRR=14.11%

Note:
Demand Scenario 1: "No enhancement" measures are assumed.
Demand Scenario 2: "Road capacity capping" measures are assumed.
Demand Scenario 3: "Road capacity capping, bus route restructuring and intensive land use around rail stations" measures are assumed.

(5) Return on Investment (ROI in constant prices)

The full scale MRT investment, i.e. the total initial investment and all other life cycle costs, could not bring about the MRT project's feasibility from a financial point of view. Hence, it was both necessary and useful to investigate alternative investment scenarios that assume different financial burden sharing between the central and local governments and the MRT operating entity. The alternative investment scenarios are defined as described in Table 5.1 and the result of the financial analysis on Return on Investment (ROI) of the MRT project was established as presented in Table 5.2.

Table 5.1 Investment Options and Alternative Scenarios

	Initial Investments		All life cycle investment into additional rolling stock	All life cycle investment into facility replacement	Recurring operation and maintenance
Investment Scenarios	Only operations related initial investment	The remaining Investments			
Scenario 1:	x	x	x	x	x
Scenario 2:	x	-	x	x	x
Scenario 3:	x	-	-	x	x
Scenario 4:	x	-	-	-	x

Note: "x" means the operating entity bears the relevant cost
"-" means the central government bears the relevant cost

Table 5.2 Return on Investment of MRT Project under Different Demand Scenarios

(Constant 2000 prices)

(Unit: percent)

Investment Scenario Options	Parameter	Demand Scenario 1 [1]	Demand Scenario 2 [2]	Demand Scenario 3 [3]
1	Total Project Base Cost & All Life Cycle Investments into New Rolling Stock and Replacement Investments	**Negative**	**Negative**	**Negative**
2	Only Operations Related Initial Investment Cost & All Life Cycle Investments into New Rolling Stock and Replacement Investments	**4.16%**	**6.39%**	**7.06%**
3	Only Operations Related Initial Investment Cost and Replacement Investments	**5.10%**	**7.56%**	**7.94%**
4	Only Operations Related Initial Investment Cost No Investment into New Rolling Stock & No Replacement Investments	**7.12%**	**9.35%**	**9.63%**

Source: JICA Study Team.
Notes: [1] This demand scenario is based on "no enhancement" measures.
[2] This demand scenario is based on "road capacity capping" measures.
[3] This demand scenario is based on "road capacity capping"; "limited competition from bus" and "land use development" measures.
(4) The terminology "no investment into…" means that such cost are treated as "sunk cost" in the ROI/IRR computations.
(5) All revenue streams reflect "capping" when maximum capacity is reached.

Based on the ROI analysis, the result can be summarized as follows:

1) The full-scale investment assumed under investment scenario 1 resulted in the financially negative feasibility with any of the demand scenarios 1, 2 and 3.
2) In order to achieve a positive ROI (or project IRR) to the operating entity, about 80% of the required initial investment of Rp.13,683 billion has to be borne by the central government and the balance, about 20% of the required initial investment, which approximates the directly operations related investment, has to be borne by the operating entity.
3) It is a vital precondition for the central government to secure a long-term loan that matches the life cycle of the MRT project and that offers favorable terms & conditions, such as lower rate of interest, longer repayment and grace periods. The terms & conditions of Special Yen Loan are an interest rate of 0.75% and a 40 years repayment period, inclusive of 10 years grace.
4) On-lending terms that the central government intends to impose on the MRT operating entity should be as low as around 5% for the investment scenario 2 or around 7-8% for the Investment Scenario 3.
5) Therefore, it will be a matter of choice for the central government whether it provides a softer on-lending rate to the operating entity or it guarantees additional investments required in future for additional rolling stock and replacement of old facilities.

(6) Cash Flow Analysis

The cash flow analysis was undertaken for scenarios combining demand and investment as follows:

1) **Cash Flow Case 1**: Demand Scenario 1 with Investment Scenario 4
2) **Cash Flow Case 2**: Demand Scenario 2 with Investment Scenario 2
3) **Cash Flow Case 3**: Demand Scenario 2 with Investment Scenario 4
4) **Cash Flow Case 4**: Demand Scenario 3 with Investment Scenario 2, and
5) **Cash Flow Case 5**: Demand Scenario 3 with Investment Scenario 4.

For the cash flow analysis, the following conditions were assumed for the Equity-Debt ratio of operations related initial investment and the long-term loan conditions:

- **Equity-Debt ratio:** 30% - 70%
- **Terms and conditions of lender to GOI:** 40 years repayment period with 10 years grace, and a rate of interest 0.75% p.a.
- **On-lending terms to operating entity:** 40 years repayment period with 10 years grace, and a rate of interest 5.0% p.a.

The cash flow analysis revealed that case 1 and 2 could only attain in 2025 and 2030, respectively, a positive surplus of cumulative net cash flow after servicing of long-term-debts. The remaining cases 3, 4 and 5 resulted in a sound positive cash flow after long-term debt service from the very beginning of the MRT operation. Eventually, the following conclusions can be obtained from the cash flow analysis:

6) If the operating entity should shoulder directly operations related initial investments, additional rolling stock and facility replacement investments additionally to the annual O/M costs (investment scenario 2) the target MRT rider-ship will require more than 400,000 passengers per day in 2005, and 650,000 passengers in 2015 (demand scenario 3), in order to achieve a sound financial condition for the operating entity.

7) If the operating entity should shoulder only directly operations related initial investments additionally to the annual O/M costs (investment scenario 4) the target MRT rider-ship will require about 280,000 passengers per day in 2005 and 570,000 passengers in 2015 (demand scenario 2), in order to achieve a sound financial condition for the operating entity.

(7) Conclusion and Recommendations

All previous studies have confirmed the need for a MRT system in the Fatmawati-Kota corridor, in which commercial, financial, administrative, diplomatic and other economic activities at international, national and regional levels are located on an intensive scale.

The economic internal rate of return (EIRR) analysis proved the economic feasibility of the MRT project at a rate of over 13%-14% with enhancement measures of the MRT rider-ship.

The financial viability can be confirmed only when the government guarantees to provide the operating entity with the infrastructure component (equivalent to about 80% of the initial investment cost). Under this condition, the investment scenario 2 and 3 will attain a Return on Investment (ROI or Project IRR) of over 7%.

The recommendations that make the MRT project financially viable are summarized as follows:

1) It is quite essential for the central government to procure a very soft loan, such as the Special Yen Loan (i.e. interest rate: 0.75% p.a. for 40 years repayment period including 10 years grace period), and on-lend these resources to the operating entity at an as low as possible interest rate of around 5% p.a.

2) The central government may on-lend funds to the operating entity at 7-8% p.a., but the investment scenario 2 combined with any of the alternative demand scenarios shows that the operating entity cannot service its long-term debt at such a high rate. If the higher on-lending rate is the condition, it is indispensable to apply the investment scenario 3, which requires the central government to provide the operating entity with additional investments for future rolling stock requirements and facility replacement. On the other hand, a lower on-lending rate would eliminate such additional investments by the government in future operation.

3) The government's limited, but clear-cut support to the operating entity at the initial investment stage will help foster stronger responsibility and management of the operating entity in future, rather than the management/additional investment continues to rely on the central government even after the MRT operation starts. Therefore, the investment scenario 2 is recommended as a government policy on the MRT investment.

4) If the investment scenario 2, which assumes that the operating entity should shoulder directly operations related initial investments, additional rolling stock and facility replacement investments additionally to the annual O/M costs, the target MRT rider-ship will require more than 400,000 passengers per day in 2005, and 650,000 passengers in 2015 (demand scenario 3), in order to achieve a sound financial condition of the operating entity.

5) In order to optimize the use of the MRT, enhancement measures as listed below should be further pursued and evaluated towards a step to be taken for the realization of the MRT project.

List of Possible Enhancement Measures:

- road pricing
- increase fuel taxes
- increase vehicle registration fee
- prioritize rail and busway service improvement to feed the MRT
- improvement of land use intensity around the MRT stations
- increase parking charges, or parking restriction area
- improve pedestrian access to the MRT stations and inter-modal facilities
- develop the MRT network extensively in Jabotabek
- others.

If such MRT system enhancing measures are adopted in a timely fashion, they would not only strengthen the financial sustainability of the MRT, but they would also contribute to the timely realization of Jakarta MRT as the first modern public mass transit system.

Finally it is essential, in the context of decentralization, to obtain the consensus among all the citizens in the country that the Central government would bear about 80 percent of investment costs of the MRT project.

Table of Contents

List of Figures

Figure **Page**

Figure **Page**

List of Tables

Table **Page**

Table **Page**

Table **Page**

Table **Page**