Japan International Cooperation Agency (JICA)
National Development Planning Agency (BAPPENAS)
Republic of Indonesia

THE STUDY
ON
INTEGRATED TRANSPORTATION MASTER PLAN
FOR
JABOTABEK (PHASE I)

FINAL REPORT
VOLUME I : SUMMARY REPORT

JANUARY 2001

PACIFIC CONSULTANTS INTERNATIONAL
ALMEC CORPORATION

Japan International Cooperation Agency (JICA)
National Development Planning Agency (BAPPENAS)
Republic of Indonesia

THE STUDY
ON
INTEGRATED TRANSPORTATION MASTER PLAN
FOR
JABOTABEK (PHASE I)

FINAL REPORT
VOLUME I : SUMMARY REPORT

JANUARY 2001

PACIFIC CONSULTANTS INTERNATIONAL
ALMEC CORPORATION

The exchange rates applied in this Study are:

US$ 1.00 = Rp. 7950

Japanese Yen 1 = Rp. 75

(As of the end of September 2000)

PREFACE

In response to the request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct the Study on Integrated Transportation Master Plan for JABOTABEK (Phase 1) and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Isamu Gunji of Pacific Consultants International Co., Ltd. and consisting of members from Pacific Consultants International Co., Ltd. and Almec Corporation to Indonesia, twice between March 2000 and January 2001. In addition, JICA set up an advisory committee headed by Dr. Haruo Ishida, Professor of Tsukuba University between March 2000 and January 2001, which examined the study from specialist and technical points of view.

The team held discussions with the officials concerned of the Government of the Republic of Indonesia and conducted field surveys in the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this study and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

January 2001

Kunihiko Saito
President
Japan International Cooperation Agency

January 2001

Mr. Kunihiko Saito
President
Japan International Cooperation Agency

Subject: Letter of Transmittal

Dear Sir,

We are pleased to submit herewith the Final Report of "The Study on Integrated Transportation Master Plan for JABOTABEK (Phase I)".

The report contains results of the study which was carried out by Pacific Consultants International in association with Almec Corporation between March 2000 and January 2001. The report consists of Summary, Main Text, Review of MRT Project and Review of Jakarta Outer Ring Road.

The Summary briefly illustrates the findings of the entire study. The Main Report is comprised of 10 Chapters and presents current transport profiles, conceptual master plan and selected short term projects. Review of MRT Project discusses a policy direction to realize the Fatmawati-Monas MRT project. Review of Jakarta Outer Ring Road deals mainly with financial and institutional arrangements required to implement the suspended sections of the project. Necessary policy measures and actions should be taken so as to realize the "down-to-earth" blueprint in a timely manner.

We wish to express grateful acknowledgement to the personnel of your Agency, Ministry of Foreign Affairs, Advisory Committee, Ministry of Land, Infrastructure and Transport and Embassy of Japan in Indonesia, and also officials of National Development Planing Agency (BAPPENAS) and counterpart personnel who assisted the Study Team. The Study Team sincerely hopes that the result of this study will contribute to the urban transport development in Jabotabek.

Yours faithfully,

Isamu Gunji
Team Leader, JICA Study Team
The Study on Integrated Transportation Master Plan
for JABOTABEK (Phase I)

Abbreviation/Acronyms and Glossary of Main Text

Abbreviation/Acronyms	English
AASHTO	American Association of State Highway and Transportation Officials
AC	Alternating Current
ADB	Asian Development Bank
AFTA	Asean Free Trade Area
AMDAL	Environmental Impact Assessment (EIA)
ANDAL	Environmental Impact Statement
APBN	National Budget
AQMS	Air Quality Monitoring System
ARSDS	Arterial Road System Development Study
ASAP	As soon as possible
ASEAN	Association of South East Asia Nation
ATC	Automatic Traffic Control
ATO	Automatic Train Operation
ATP	Automatic Train Protection
ATS	Automatic Train Stop
BAPEDAL	Environmental Impact Management Agency
BAPEDALDA	Regional Environmental Impact Management Agency
BAPPEDA	City Planning Bureau
BAPPENAS	National Development Planning Agency
bil.Rp	Billion Rupiah
BOT	Build Operate Transfer
Botabek	Bogor, Tangerang, Bekasi
BPN	Head of National Land Agency
BPPT	Technology Assessment and Application Agency
BPS	Statistics Indonesia
BS	British Standard
BSS	Bulk Supply Substations
CAP	Clean Air Project
CBD	Central Business District
CCTV	Central Control TV
CKD	Complete Knocked Down
CL	Central Line
Comm.	Communication
CPI	Consumer Price Index
CPU	Central Processing Unit
CTC	Centralized Traffic Control
CTS	Centralized Traffic Supervision
D/D	Detailed Design
D/P	Definitive Plan
Daop - 1	1st Railway Operating Division
Daop Jabotabek	Jabotabek Railway Operating Division
dBA	Decibel (Noise Level)
DBC	Design Build Contract
DC	Direct Current
DF/R	Draft Final Report
DGLC	Directorate General of Land Communications
DGLT	Directorate General of Land Transport
DKI	Special Capital City Jakarta
DKI Jakarta	Special Capital City Jakarta
DLLAJ	City Land Transportation Agency
DLLAJR	Dinas Lintas Lintas Angkutan Jalan Raya
DMC	Driving Motor Car
DPJU	Dinas Penerangan Jalan Umum
DPKJ	Dinas Pertamanan Kota Jakarta
DPR	House of Representatives/National Parliament
DPRD	Local Parliament

Abbreviation/Acronyms and Glossary of Main Text

Abbreviation/Acronyms	English
DPU	Public Works Agency
DSS	Depot Substation
DT	Driver Trailer Car
DTC	Driving Trailer Car
E & M	Electrical and Mechanical Systems
E.M.U	Electric Motive Units
EC	Electric Car
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
ELV.	Elevation
EMC	Environmental Management Center
EN	European Standard Institute
F/C	Foreign Currency
FIRR	Financial Internal Rate of Return
FY	Fiscal Year
GAIKINDO	Dealer and Motor Vehicle Makers in Jakarta
GDP	Gross Domestic Product
GFCF	Gross Fix Capital Formation
GIS	Geographic Information System
GL	Ground Level
GNP	Gross National Product
GOI	Government of Indonesia
GOJ	Government of Japan
GRDP	Gross Regional Domestic Product
GTZ	German Agency for Technical Cooperation
h.p.	Horse Power
HBO	Home Based Other
HBS	Home Based School
HBW	Home Based Work
HI	Hotel Indonesia
HOV	High Occupancy Vehicle
HRT	Heavy Rail Transit
HSCB	High Speed Circuit Breaker
HUBDAT	Land Communication
Hz	Hertz
I & M	Inspection and Maintenance
i.e.:	it est (that means)
IBRA	Indonesian Bank Restructuring Agency
IC	Interchange, Intersecting Tollway Facility with non tollway
IEC	Inetrnational Electrical Commission
IJEG	Indonesian Japanese European Group
IMF	International Monetary Fund
INPRESS	Presidential Instruction
IRR	Internal Rate of return
ITC	International Trade Center
ITS	Inteligent Transport System
ITSI	Integrated Transport System Improvement by Railway and Feeder Servic
Jabotabek	Jakarta, Bogor, Tangerang and Bekasi
Jabotabek BKSP	Jabotabek Development Cooperation Agency
JBIC	Japan Bank for International Cooperation
JC	Junction, Intersecting Facility between tollway
JICA	Japan International Cooperation Agency
JIS	Japan Industrial Standard
JIUT	Jakarta Intra Urban Tollway
JKT	Jakarta
Jl.	Street
JMATS	Jakarta Metropolitan Area Transpotation Study

Abbreviation/Acronyms and Glossary of Main Text

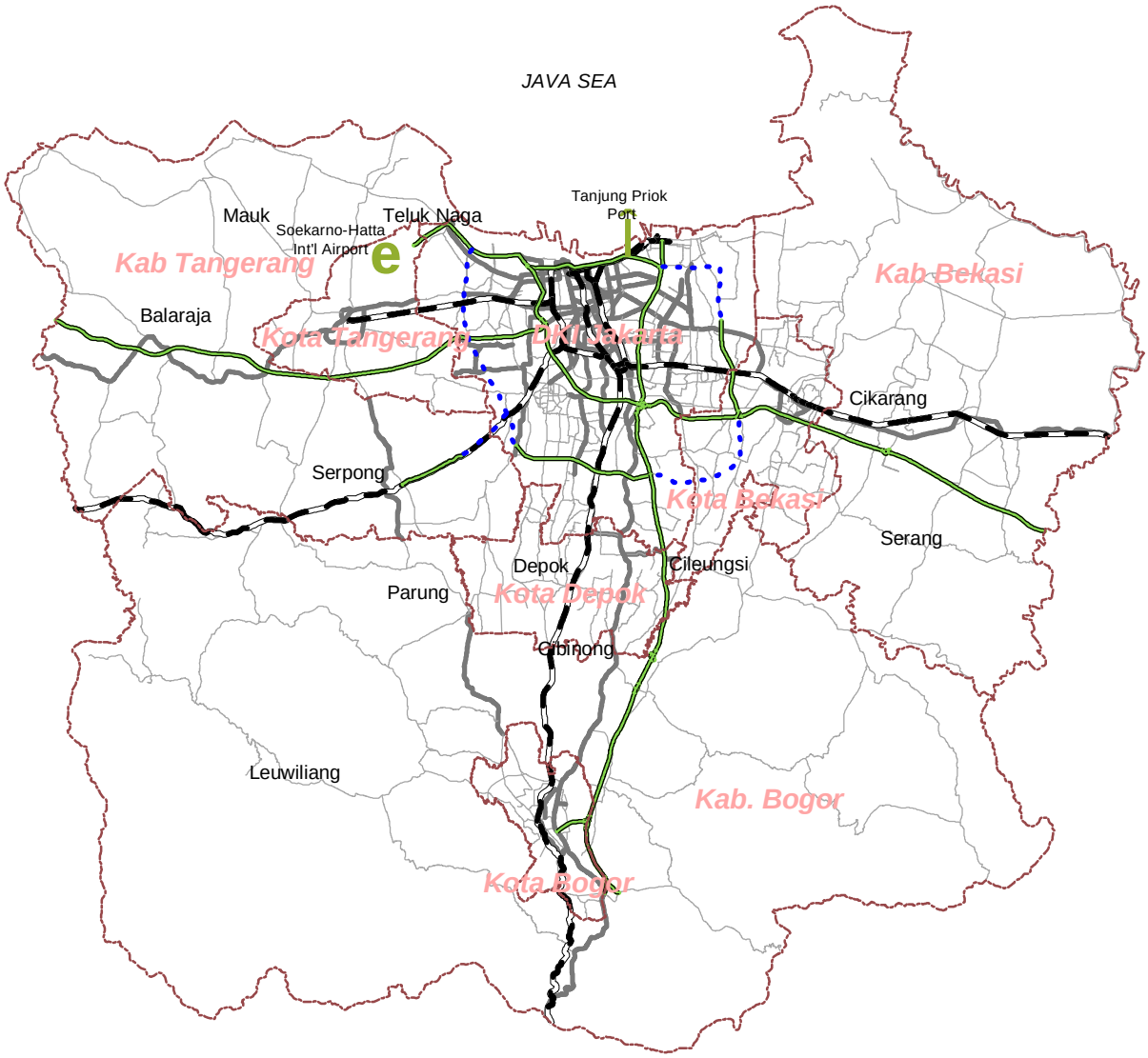
Abbreviation/Acronyms	English
JMDP	Jabotabek Metropolitan Development Plan
JMDPR	Jabotabek Metropolitan Development Plan Review
JMF	Jakarta Metro Fund
JMTSS	Jakarta Mass Transit System Study (GTZ)
JORR	JakartaOuter Ring Road
JTCA	Japan Traffic Cooperation Agency
JUDP	Jabotabek Urban Development Project
Kab.	Kabupaten/Regency
Kandep	Agency Office, a line agency of a ministry at Kabupaten
Kanwil	Regional Office, a line regional agency of a ministry
Kec.	Kecamatan
Kel.	Kelurahan
Kimbangwil	Kimbangwil is now become Kimpraswil
Kimpraswil	Ministry of Settlement and Regional Infrastructure
KKN	Corruption, Collusion and Nepotism
KLH	The Ministry of Save for the Environment
KRD	Diesel Locomotive
KRL	Electric Car
KTP	Resident ID
kV	Kilo-Volt
KVG	Kinematic Vehicle Gauge
L/C	Local Currency
L/M	Long and Middle
LBD	Linked Breaking Devices
LCD	Liquid Crystal Display
LEV	Less Emission Vehicles
LH	Environment
LNG	Liquid Natural Gas
LPG	Liquid Petroleum Gas
LRT	Light Rail Transit
m	Meter
MC	Motor Car
MENLH	Ministry of Environment
MHA	Ministry of Home Affairs
MIGAS	Oil and Gas
mm	Millimeter
MOC	Ministry of Communication
MPR	People Consultatives Assembly
MRT	Mass Rapid Transit
MRTA	Mass Rapid Transit Authority
MRTC	Mass Rapid Transit Corporation
Musyawarah	Community consultation process
NFPA-130	National Fire Protection Association (USA) 130
NGO	Non Government Organization
NHB	None Home Based
NJOP	Selling Value of Tax Object
NOx	Nitrogen Oxide
NPV	Net Present Value
NSTO	New Single Track Operation
NTAM	New Austrian Tunneling Method
O & M	Operations and Maintenance
OC	Operation Center
OCC	Operations Control Center
OCL	Overhead Contact Line
OD	Origin Destination
OHC	Overhead Catenary
P.C.	Point of Curve

Abbreviation/Acronyms and Glossary of Main Text

Abbreviation/Acronyms	English
PA	Public Address
PAM	Water Supply Company
PANTURA	The North Coastal Area
PATAS	Limited Express Bus
PATAS AC	Limited Express Bus with Air Condition
Pb	Lead
PC	Power Car
PC	Prestressed Concrete
PCU	Passenger Car Unit
PDAM	Local Water Supply Company
Pertamina	State-owned Company for Oil and Gas Production
PERUMTEL	Telecommunication Company
PFI	Private Financing Initiative
PGN	State Company for Gas
pH	Hydrogen Ion Concentration
PHBD	Directorate General of Land Transport and Inland Waterways
PKB	Motorized Vehicle Inspection
PKN	Center of National Activities
PLN	State Company of Electricity
PM	Power Motor
PM	Project Manager
PP	Government Regulation
Propenas	The New National Development Program
PSD	Platform Screen Door
PSS	Passenger Station Substations
PT. KAI	Indonesian Railway Company
PT. Telkom	Indonesian Telecommunication Company
PU	Public Works
R	Radius
R.C.D.	Reverse Circulation Drill
RAP	Resette Action Plan
REI	Indonesian Real Estate
Repelita	The five-year National Development Plan
RL	Rail Level
RM-Mode	Restricted Manual Mode
ROW	Right of Way, Border of a road or the area occupied by a road
Rp	Indonesian Rupiah
RT	Neighborhood association, the lowest administrative unit
RTRW	Regional Spatial Structure Plan
RTRWN	National Regional Spatial Structure Plan
RW	Administrative unit at the next-to-lowest in city, consisting several RTs
SCADA	Supervisory Control and Data Acquisition
SII	Indonesian Industrial Standard
SITRAMP	Study on Integrated Transport Master Plan for JABOTABEK
SO2	Sulphur Dioxide
SS	Suspended Solid
SSI	Solid State Interlocking
St.	Station
Sta	Station, Name of 1 km mileage
SYL	Special Yen Loan
T	Trailer
TASC	Train Automatic Stopping Control
TBM	Yunnel Boring Machine
TC	Trailer Car
TC	Time Cost
TNI	Indonesian Army Forces
TNPR	Transport Network Planning and Regulation Project (World Bank)

Abbreviation/Acronyms and Glossary of Main Text

Abbreviation/Acronyms	English
TOD	Time-of Day
TOR	Terms of Reference
TPS	Traction Power Substation
TRANSYT/7F	Name of Software for Timing Calculation
TSP	Total Suspended Particles
TSS	Transit Station Substation
UIC	Union International de Chemin de Fer (French)
V	Volt
VAT	Value Added Tax
VOC	Vehicle Operating Cost
VPI	Vital Processor Interlocking
VVVF	Variable Voltage Variable Frequency
WALHI	Non-governmental Organization on Environment in Indonesia
WAP	Obligatory to Carry Passenger
WB	The world Bank Group
WHO	World Health Organization



0 5 10 15 20 25 30 Km

LEGEND

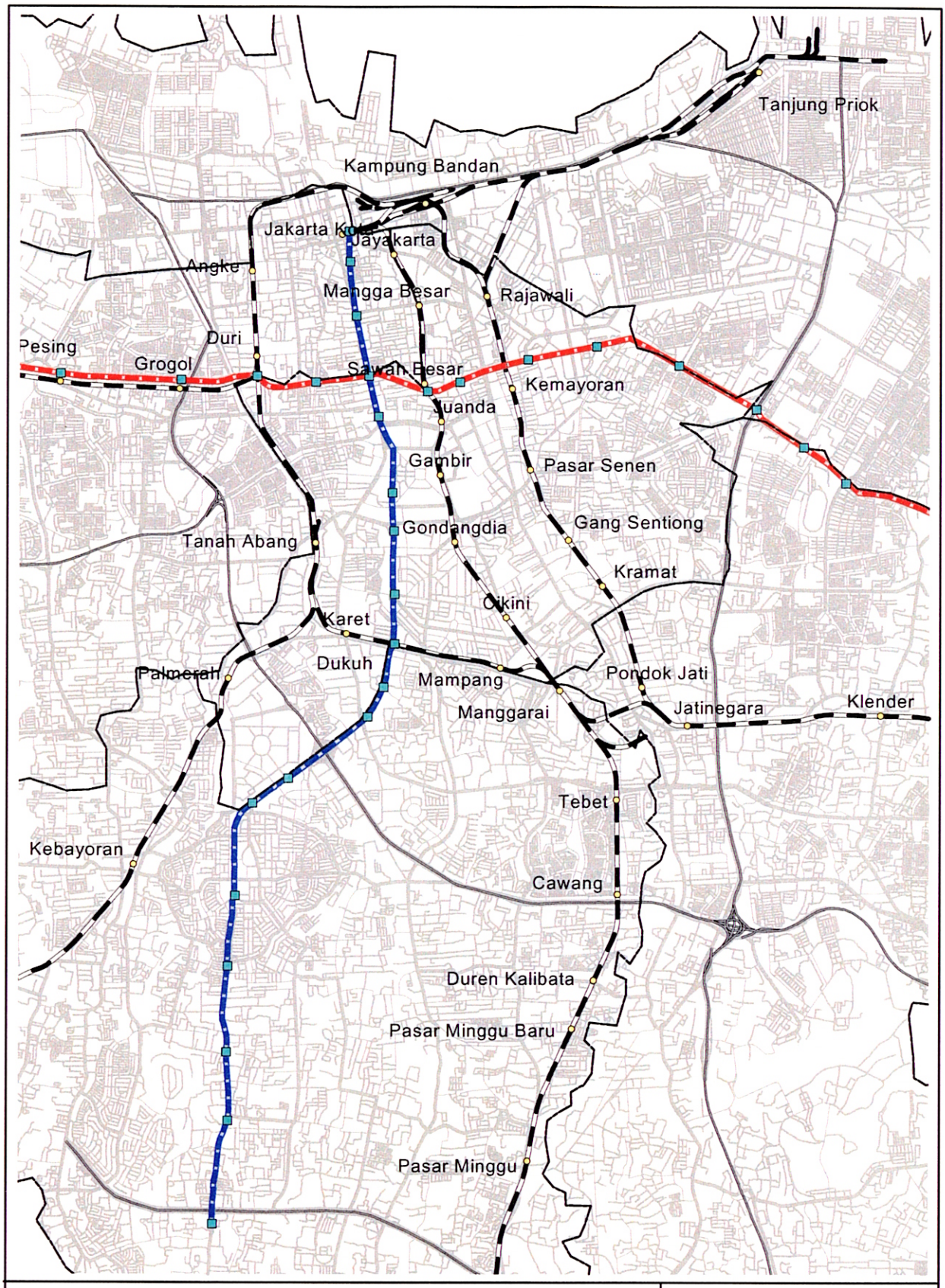
- Tollroad
- Arterial road
- Other road
- JORR Planned Line
- Kabupaten/ Kota Boundary
- Railway

N

Study Area

SITRAMP JABOTABEK

The Study on
Integrated Transport Master Plan
for JABOTABEK
(Phase I)



LEGEND

- Planned MRT Station
- Existing Railway Station
- Planned MRT Line (East - West Line)
- Planned MRT Line (North - South)
- Existing Railway
- DKI Jakarta Boundary
- Tollroad
- Arterial Road
- Main Road
- Other Road

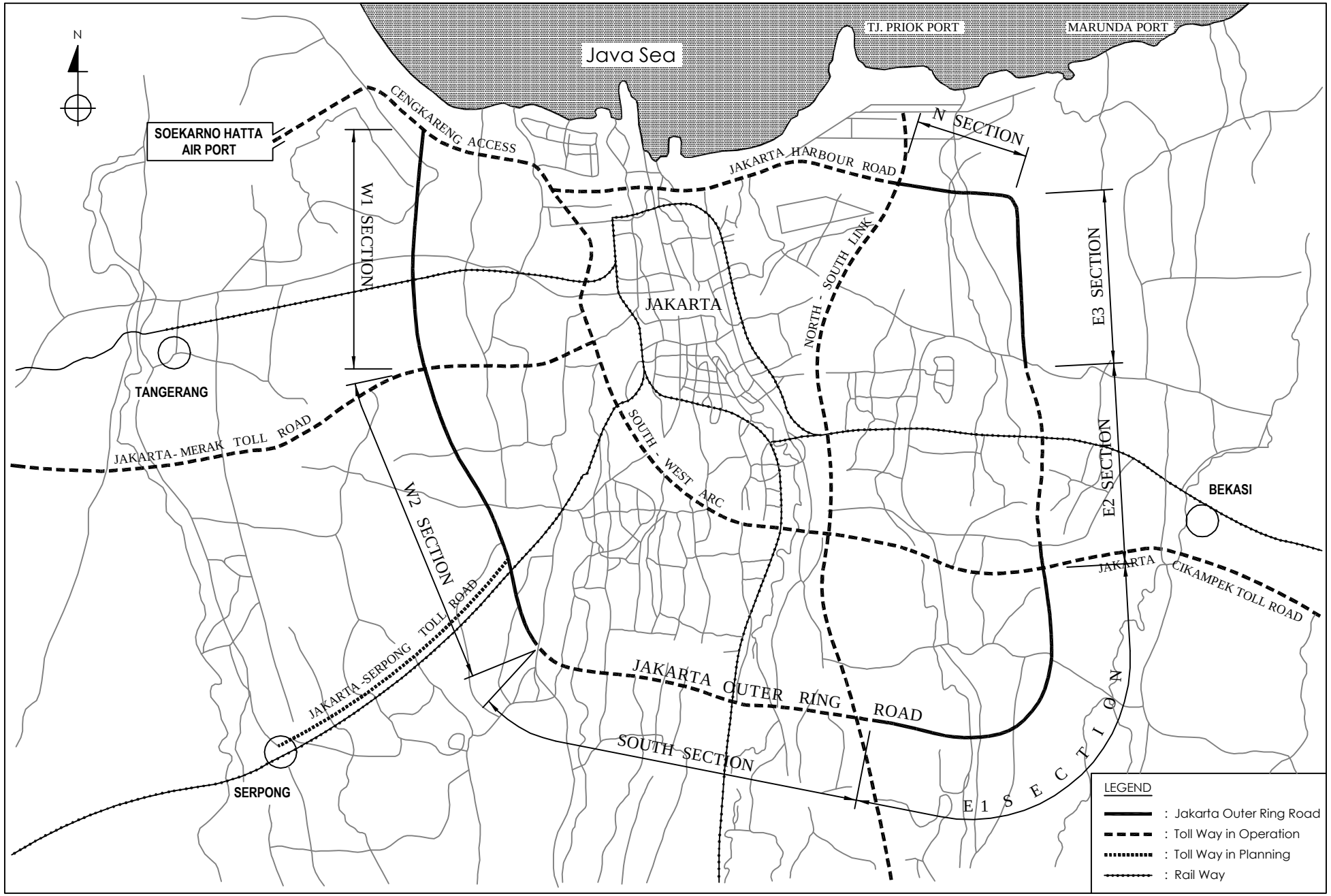
0 1 2 3 Km

N

Project Location Map

SITRAMP JABOTABEK

The Study on
Integrated Transport Master Plan
for JABOTABEK
(Phase I)



Project Location Map

Executive Summary: Main Text

(1) Study Objectives

The development objective of The Study on Integrated Transportation Master Plan for JABOTABEK (Phase 1) is to identify policy measures and to propose concrete solutions that are geared at alleviating transportation problems in the Jabotabek region, especially in the central part of DKI Jakarta, taking into account the existing and planned urban structure. The principal aim is to encourage public transport usage. The Study is divided into two phases, namely Phase (1) and Phase (2). The main objectives of the current Phase (1) Study, are as follows:

- To review the recent evolution of the policy framework, including decentralization, liberalization and privatization, in which the urban transport sector is administered and operated;
- To identify main issues and causes, which delayed the implementation of various projects/programs proposed in the past by a series of planning studies;
- To identify and study a basket of urgent projects that would ease tangible transportation problems in Jabotabek;
- To develop appropriate terms-of-reference for Phase (2) Study by taking into account the close linkage between the results of the transport demand surveys and the final project proposals of the master plan; and
- To transfer urban transport planning, management skills and know-how to Indonesian counterparts through implementation of the Study.

(2) Study Area

The Study area covers the Jabotabek region comprising DKI Jakarta, Bogor, Depok, Tangerang and Bekasi.

(3) Target Years

The target year for the master plan to be formulated in the Phase (2) Study is the year 2020, while the target year for the short-term implementation plan to be formulated in the Phase 1 Study is 2005.

(4) Study Outputs

1) Existing Urban Structure and Changes in the Past

a) Population Growth and Urbanization

The total population size in Jabotabek amounted in 2000 to around 21 million people. The population size in Jakarta and Botabek was recorded at 8.4 million and 12.6 million people, respectively. Urbanization in Botabek has progressed very rapidly; the population growth in Botabek between 1990 and 2000 was 3.7 percent per annum while the growth in Jakarta was merely 0.2 percent per annum. This implies that suburbanization has proceeded rapidly and population has spread out in Botabek area.

b) Growth in Traffic Demand

Compared with the population growth traffic demand at the cordon lines indicated higher growth. During 1993-2000 the traffic at the west and east segment of the cordon line grew at a rate of 8.1 percent per annum and 6.4 percent per annum. During the same period the south segment of the cordon line displayed the smallest growth rate at 3.4 percent per annum. This relatively low traffic growth in the south segment is attributable to the consequence of the restraint of urban development in the southern part of the Jabotabek region.

c) Increasing Concentration of Travel Demand in CBD

Concentration of travel demand in CBD causes traffic congestion on the road network as well as buses and train overcrowded. Trip attraction of "to work" is concentrated in the central area enclosed by the railway semi-loop line, a newly developed "Sudirman-Kuningan Golden triangle" area and areas along the Cawang – Grogol – Pluit toll road. The trip attraction of these areas accounts for 53 percent of the total trip attraction of "to work" trips in DKI Jakarta. Compared with the previous urban structure, the center of gravity has moved to southward due to emerging new CBD.

2) Urban Transportation Problem

The expansion of social and economic activities and subsequent growth of travel demand in Jabotabek has inevitably brought about various urban transport problems, which have become increasingly serious in recent years. Insufficient transportation infrastructure and inefficient public transport service are problem areas that need careful attention. Although Jabotabek's urban structure is changing rapidly and dynamically, the urban transport system serving Jakarta and the surrounding areas has not been expanded in a way that keeps pace with urban development growth. As a consequence, worsening traffic congestion, overcrowded buses and trains, deteriorated air pollution, and increased accidents have been catalyzed.

a) Road Transport Problems and Issues

The remarkable feature of the road network in Jakarta is that several wide arterial streets exists but the network is short of collector streets, which connects arterial street and local streets, thus a road network hierarchy has not been well developed. On the other hand, the road network in Botabek consists of a few arterial roads connecting Jakarta and other regions.

Traffic congestion is caused by various factors; physical bottlenecks, due to inconsistent carriageway width, reduced capacity at intersections, street market/street vendors, loading and unloading of bus passengers on the road, inappropriate parking practices, buses departing or arriving at bus terminals, U-turns, railroad crossing and bad driving practices.

Pedestrian facilities are mostly in poor conditions and not well maintained.

b) Present Railway Transportation Problems

Although passenger demand of Jabotabek railway passenger has been increasing rapidly, the share of railway is still low and accounts for merely two percent of the total person trips made by motorized modes of transport in Jabotabek.

The low passenger demand is partly attributed to low level of service such as low frequency, lack of punctuality, poor station facilities, insufficient station plazas and access roads.

c) Present Bus Transport Problems

The level of bus service at present is low in many aspects, such as lack of punctuality, unexpected cease of operation, long waiting time, insecurity on board, untidy inside bus fleets, among others. One of the root causes of unreliable and uncomfortable bus operation has been found in the bus rental system. Another cause is weak capability in bus route planning, and a lack of enforcement on bus operations.

Bus transport has also been damaged by the Asian Economic Crisis. After the economic crisis, purchase of spare parts imposed an additional financial burden on bus operators and they cannot afford to maintain bus fleets properly. The number of buses operating on the roads has decreased, due to lack of investment for replacement of buses, thus, buses are overloaded.

d) Lack of Integration between Land Use and Transport System

Until recently, the railway network has not been developed for passenger travel within urban areas. Currently the land use surrounding the railway stations is not appropriate for railway transport system. In order to attract rail passengers it is preferable if highly dense urban facilities were located in the walking distance from the stations. However at present high-rised office buildings and commercial facilities are seldom found. The present land use nearby the stations is often occupied by low-class housings in urban areas. Consequently sufficient passenger demand for the railway cannot be expected from the existing urban land use.

e) Lack of Integration between Different Modes of Transport

Integration between railway and other modes of transport can be made at an interchange transport node, namely, a station plaza. Furthermore, integration between railway and road transport is provided by access roads to railway stations. However, these transport facilities have not been well developed.

f) Air Pollution Problems

Air pollution in Jabotabek was an occasional annoyance in the past, but it has become a new chronic issue as a threat to the urban people's health.

Although Nitrogen Oxide (NOx) and Lead (Pb) concentration levels measured at every location, they are all within the allowable levels, daily maximum values of Total Suspended Particles (TSP) exceed the air quality standard at five locations in residential areas and at one location each in commercial and industrial areas out of 12 stations. Besides, the value of Sulfur Dioxide (SO_2) also exceeds the standards at one residential area.

3) Decentralization and Changes in Transport Administration

Indonesia is now in the transition period of decentralization, and it casts significant influence on urban and regional development. The key regulations are Law No.22/1999 on local administration and Law No. 25/1999 on financial demarcation (equalization) between central and local governments. The Law 22/1999 removes the hierarchical structure between province and

regency/municipality, and the responsibility of transportation and public works will principally devolve to regency/municipality. A project planning and operation are carried out by local governments, but policy-making remains at the central level. The role of provincial government will become to act as an arm of the central government. The Law 25/1999 allows local governments to enjoy more freedom on budgeting, yet the central government still reserves the authority on tax collection policy.

A major institutional challenge of the transport sector will be role sharing and collaboration with other agencies within the structure of local governments as well as with the provincial and central governments. Financial and human resources shall be allocated accordingly to meet the share of responsibility.

DKI Jakarta has generated more locally raised revenue than other local governments in Botabek, and it received 1.5 times on average as much financial assistance as Jawa Barat in terms of per household. The resource for development has been unevenly distributed, and the accessibility to the resources generated from their own jurisdiction is appreciably varied. Although DKI Jakarta has spent significant amount of budget for the transport sector compared with local governments in Botabek, they have allocated more share of the budget on transport sector development. However, it is prevailingly understood that an absolute amount of transport development fund is not at a sufficient level to provide sound public services.

4) Future Perspective of the Jabotabek Region

a) Deployment of Suburbanization

Since population in Jabotabek will continue to expand steadily, especially the relatively high growth is expected in Botabek compared to Jakarta. Distribution of population will be further dispersed over the Jabotabek region, and it is predicted that the eastern and western areas will grow more rapidly than the southern areas.

Residential areas therefore will be developed further in Botabek. Planned real estate housing developments can be seen from the permitted real estate housing developments. Most of real estate type housing developments are planned in the east and the west directions. According to the SITRAMP mini-person trip survey, many households in high or upper-middle income groups reside in this kind of housings developed by real estate developers. They are significantly dependent on cars for their travel needs. When they move to suburban area to purchase or rent a new housing, they seem to look for an appropriate housing and its location to meet their needs on the basis of private car use. Under the poor level of public transportation service at present, this tendency would continue again and it would result in dispersed residential area development in suburban areas in Botabek.

b) Concentration of Job Opportunity in the Central Area of Jakarta

Jakarta will continue to play a significant role as a gateway for international trade and business and social communication. Jakarta also provides a variety of services as a national center and the primary center of the region. Up to present a considerable numbers of industrial estates have been established in Botabek and further developments of industrial estates are being planned.

It is expected that the manufacturing industry will take a leading role for providing job opportunity in the Botabek area. In contrast, agriculture will decrease its share in economic activities under the pressure of urbanization. The present function of the service sector is still weak in Botabek and it does not absorb employed population from local communities. It at most provides population related services, including local government services in suburbs and rural areas. As many as 70 to 80 percent of workers in the surrounding areas in Botabek, except those find their working places in manufacturing and neighborhood services, commute to Jakarta every day.

If urban centers in Botabek will not provide sufficient job opportunities for surrounding communities, many people still should commute to Jakarta for their working place.

In this regard, fostering of urban centers in Botabek is of great importance not merely for balanced and sustainable regional development but also for alleviating excessive concentration of economic activities and travel demand in Jakarta.

c) Increasing Commuting Trips from Botabek to Jakarta

As the urbanized area expands, more commuters from Botabek to Jakarta will increase continuously. The total number of commuters from Botabek to Jakarta will increase from 76 thousand persons in 2000 to about 1.8 million in 2015, it accounts for 2.4 times of the present demand. To deal with this enormous commuter trip demand, it will require to develop transportation facilities and emphasis should be given to develop efficient mass rapid transit system connecting Botabek and Jakarta, since merely development of road network seems to be difficult to meet the increasing demand.

d) Increase in Private Car Use

Vehicle ownership will increase in accordance with an increase in real household income. At present owing private passenger cars directly implies use of private cars for travel needs.

When compared with the current poor level of public transport, private cars provide much higher level of convenience, comfort, and security. Private passenger cars are considerably expensive for most of households in the society, thus once people purchase a car even a second-hand car, they attempt to maximize their investment by using their vehicles as much as possible at any occasions. Increase in car ownership, therefore, would imply increase in vehicular trips at the present situation.

If the government does not take any interventions, such as increase in fuel cost by decreasing subsidy for fuel price, or transportation demand management measures including road pricing and support for improving public transport, traffic congestion would be surely worsened than present.

5) Urban Transportation Issues

As pointed out above, the transportation system in Jabotabek would not be able to accommodate the increasing travel demand without enhancement of mass public transportation system. In particular, if people shift to private mode of transport represented by private passenger cars, it is apparent that serious traffic congestion is inevitable and cause enormous economic loss. Therefore, it is essential to prevent the existing and potential public transport users from shifting to private

mode of transport or even to attract the existing car users to public transport through improving the level of public transport service. If the level of service of public transports remains the same as is at present, people would surely shift to using private mode of transport. Promotion of public transport leads to reduction of private car usage and contributes to improve ambient air quality as well. Improvement of public transport system, however, is not so simple. Public transport fare is generally set by the government at low level, taking into account affordability of the low income group. With insufficient amount of revenue due to the low fare level, it is difficult for operators to provide sufficient level of service which satisfy upper middle or high income groups, who usually use cars. Thus the core urban transportation issue in Jabotabek is how to improve public transport service under the limited ability to pay of the majority of the residents.

6) Objectives of Urban Transportation System Development

Based on an understanding of the present urban transportation problems and issues, four major objectives have been identified through the analyses of the present urban transportation problems and issues in the Jabotabek region.

- Efficiency to support economic growth,
- Equity in mobility among all the members in society,
- Betterment of the urban environment by minimizing the adverse effects of vehicle emissions and noise,
- Increased safety to reduce the number of victims caused by transportation accidents.

7) Urban Transportation Policies

The following four major urban transportation policies should be established and implemented to achieve the four development objectives of the urban transportation system.

- Alleviation of vehicular traffic congestion
- Promotion of public transport usage
- Mitigation of atmospheric pollution and noise, and
- Improvement in transport safety

8) Urban Transportation Policy Measures

More concrete policy measures were examined in line with the urban transportation policy. There are a variety of countermeasures such as infrastructure development, traffic control and transportation demand management, improvement of public transport services, among others as described below.

Infrastructure development is a supply side approach, which includes development of facilities of the road and railway networks. **A traffic control system** aims at optimizing the utilization of the existing road facilities by controlling traffic flows. **Improvement of public transport services** can be achieved through bus transport and railway transport network improvements, but emphasis should be given to the integration of modes of public transport and integration between land use and transportation systems. **Transportation**

demand management techniques have become more popular including road pricing, parking control, traffic generation fee, traffic impact assessment, increase of fuel price, and flattening peak traffic demand. **Normalization of transport facilities** includes development of transportation facilities for handicapped citizens and transportation poor and the non-motorized modes of transport. **Reducing air pollution** should be made through reduction of exhaust gases from vehicles by enhancement of vehicle inspection, upgrading to stricter environmental standard, enforcement and adoption of new energy sources. In addition, shift to public transport from private vehicles significantly contributes to reduce air pollution. To improve **transport safety,** enforcement, education, public campaigns and improvement of geometric designs are of great importance. Improvement of signal system is also an urgent measure for the railways.

9) Conceptual Integrated Transportation Infrastructure Development Plan

Based on the understanding of a desirable urban structure designated in the regional development plans, a conceptual transportation infrastructure development plan has been proposed in line with the transport infrastructure development policy proposed previously. The proposed major development policies of transportation infrastructure development are as follows;

- Development of primary transportation system to support inter-regional transport demand,
- Strategic corridor development,
- Strengthening accessibility between urban centers in Botabek,
- Improving accessibility between Jakarta and urban centers in Botabek, and
- Street network as a framework for urban unit (Hierarchical road system development)

10) Urban Transportation Strategies

The urban transport system cannot be developed in the short-term. It requires a long-term framework and continuous efforts to develop toward the final stage of the integrated transportation system proposed in the conceptual transportation master plan.

In order to reach the final configuration of the transportation system, the combination of measures should be carefully arranged, taking time-sequence and logical order among various countermeasures into consideration, and a strategy should be established by prioritizing and packaging transportation policies and measures.

Among these components, the key policy measure is promotion of public transportation system. Since the service level of public transportation system in Jabotabek has been further deteriorated due to the Asian Economic Crisis, an immediate action should be taken to restore the previous service level. In this regard, a rescue program for bus transport and railway service is urgently needed. Furthermore taking the dramatically shrunk government financial capability into account, the short-term policy measures should be selected from those do not require a huge amount of costs and that generate immediate effects.

11) Criteria for selecting measures for short-term implementation plan

The urban transport policy measures have been assessed from the effectiveness viewpoint to achieve the objectives and from the viewpoint of easiness of implementation. The effectiveness of the urban transport policy measures are evaluated for the following items,

- Impact on promoting public transportation usage,
- Impact on alleviating traffic congestion,
- Impact on environmental betterment, and
- Impact on transport safety

12) Selecting Short-term Policy Measures

Among the items for evaluating urban transport policy measures, the possibility of project implementation should be accentuated for selecting short-term policy measures. Thus policy measures for short-term plan have been selected from the projects from the followings;

- Projects that do not require huge amount of funds, and
- Projects without land acquisition problem

13) Short-term Implementation Plan

The description of the short-term projects are listed below and recommended for immediate implementation.

a) Railway Transport Improvement Plan

To increase convenience for passengers and to secure transport capacity, main improvements of the railway transport should be focused on rehabilitation of the existing facilities such as railway station facilities, signal system, level crossing facilities, and communication facilities. For increasing passenger transport capacity, the number of electric cars should be added and stabling yard should be reinforced.

Furthermore, to meet an increasing commuter flows in the east-west direction, construction of the two short-cut sections connecting the Western line and the Tangerang/Serpong lines are proposed. The short cuts enable direct train operation between Tangerang/Serpong and Dukuh Atas/Manggarai. Although the projects are categorized in intermediate term plan since they need acquisition of land, earlier implementation period is recommended because the distance is short and investment cost is relatively small compared with a new line development. When a direct operation commences, the Jabotabek trains should be integrated with the trunk bus system plying the busway on Jl. Sudirman in short term and future development of Jakarta MRT System at Dukuh Atas station. The function of Dukuh Atas station should be enhanced for smooth transfer of passengers.

Short-term projects selected for the railway improvement are categorized as follows:

- Improvement of Station Facilities,
- Rehabilitation of Railway Electric Facilities,

- Communication Facilities,
- Rehabilitation of Level Crossing Equipment, and
- Phased Procurement of Electric Cars

b) Bus Transport Improvement Plan

For bus transport improvement, it is essential to reform bus operation regime. The bus licensing system should be changed from the existing system to tendering system by establishing specification and standard of bus services. To achieve more efficient and reliable bus operation, the possibility of bus fare collection by public sector should be explored and introduction of bus operation monitoring system should also be discussed among the regulatory agency, bus operators, bus drivers and bus passengers. Cooperation on improvement of bus operation between public and private sectors should be explored.

It is recommended to give more priority for bus transport by developing busway or bus priority lanes. However, strong objection from car users is expected, since introduction of busway or an exclusive bus lane takes one lane from private car use and reduces the existing road capacity. The government should make efforts to obtain consensus of the society. If preferential public transport policy were not taken, shifting from public transport to private mode of transport would be inevitable and resulted in worsen traffic congestion.

c) Traffic Restraint Scheme

At the same time, traffic restraint scheme should be employed in the congested area to control excessive traffic demand. It should be recognized that without "Push" policy private car users would not change their mode of transport. Traffic restraint policy such as road pricing should be implemented after providing sufficient level of public transport services.

d) Road Construction Project

In the short term road maintenance and rehabilitation should be given priority because road condition has been deteriorated due to lack of budget for road maintenances. Road construction should focus on missing links, bottleneck sections, and suspended on-going road projects.

Jakarta – Bekasi Connecting Road Project

The Jakarta – Bekasi Connecting Road, Jl. I.G. Ngurah Rai extension, is a missing link. Construction of the road would increase road capacity between Bekasi and Jakarta and reduce traffic congestion on the parallel road of Jl. Raya Bekasi because some of cars will divert to the new road. This reduction of private vehicles would make easier to introduce busway on Jl. Raya Bekasi.

Kota Bogor Ring Road Project

Another proposed road construction project is Bogor Ring Road. This road aims at providing bypass for through traffic to the Bogor City and also connecting the northern part of the city to Jagorawi Toll Road. In relation with this road development project, the existing intercity bus terminal located in the heart of the city will move to the area along the Project road.

e) Traffic Control and Management

Traffic control and management are short term measures in nature. This includes improvement of traffic signal system, installment of traffic control devices, geometric improvement, pedestrian facility improvement and traffic control system.

There are several bottleneck points in the Study area, where heavy traffic congestion is a daily occurrence causing large economic loss in terms of vehicle operating cost and passenger time cost. Slow moving vehicles emit excessive pollutants and contribute to the worsening air quality in Jabotabek.

f) Soft Measures

Soft measures can be implemented even in short term since they require a relatively small amount of funds. Some of them require long time to realize the effects but the action should be taken at earliest time. The soft measures include traffic safety enhancing program, environmental improvement program, land use zoning and so forth.

g) Institutional Setup

To materialize the short term implementation plan, it is recommended to establish a new organization that deals with metropolitan-wide urban transportation planning and travel demand management.

h) Cost Estimation for Short Term Implementation Plan

Cost estimate for short term implementation plan is summarized in Table 1.

Table 1 Summary of Cost Estimate for Short Term Implementation Plan

Field	Project	Implementing Agency	Project Cost (Mil. Rp.)	Remarks
Railway	Station Facility Improvement	Ministry of Communication	93,875	16 stations
	Countermeasure of Lightning for Signaling	Ministry of Communication	37,437	
	Rehabilitation of Communication Facilities	Ministry of Communication	121,192	
	Improvement of Level Crossings	Ministry of Communication	52,329	
	Addition of Recycled Electric Cars	Ministry of Communication	18,668	32 used cars
	Short-Cut on Tangerang/Serpong Lines	Ministry of Communication	211,185	
Bus Transport	Busway Development			
	Pramuka Pemuda Corridor (11.4 km)	DLLAJ	7,903	With flow operation
	Sudirman Thamrin Corridor (8.2 km)	DLLAJ	8,436 (6,230)	With flow operation (Contra flow operation)
	Bus Location System	DLLAJ, Bus Operator	8,703	For 35 buses
Road Development	Jakarta – Bekasi Connection Road Development Project	DKI Jakarta Kota Bekasi	37,470	
	Bogor Ring Road Development Project	Kota Bogor	36,664	

14) Recommendation

In the course of executing the recommended short-term implementation plan, it is of great importance to focus on promotion of public transport services. Under the current limited budget constraint of the governments, the most realistic approach is making most use of the existing facilities.

In line with this approach, it is strongly recommended to give more priority for bus transport in the form of development of busway or bus priority lanes. However, introduction of busway or exclusive bus lane takes one lane from private car use and reduces the existing road capacity. Consequently strong objection from car users is expected.

The government should have a strong will to implement the policy as well as make efforts to obtain consensus in the society. If preferential public transport policy were not taken, shifting from public transport to private mode of transport would be inevitable and resulted in worsen traffic congestion.

At the same time, traffic restraint scheme should be employed in the congested area to control excessive traffic demand. It should be recognized that without "Push" policy private car users would not change their mode of transport. Traffic restraint policy such as road pricing should be implemented after providing sufficient level of public transport services.

To materialize the plan, it is recommended to establish a new organization which deals with metropolitan-wide urban transportation planning and travel demand management.

15) Toward the Phase 2 Study

A variety of information is needed in order to establish an integrated urban transportation master plan for Jabotabek. In the Phase 1 study, eventually, various data have been collected through the cooperation of the city and regencies. It has been revealed, however, that some important data for urban transportation planning such as the number of employees at work place are not available in the Study area. Employment data are important because "to work place" and "to school" trips are two major constituents in urban travel demand and these trips form the morning and afternoon peak trip demand. It is essential to understand the travel pattern of commuting trips. Therefore the surveys to be conducted in Phase 2 Study should explore this kind of missing data.

In addition, in the Phase 2 Study, person trip survey and other relevant transport surveys are planned to execute. Statistical data and the data obtained through the field surveys are important not merely for the master plan study but also transport studies to be conducted in the future and research on urban transportation. An urban transportation database system, which can be opened to the public, should be developed in the course of the Study and an agency should be established for maintenance and updating of the database.

As genuine decentralization starts from the year 2001, local governments will bear more responsibility for infrastructure development including transportation network in their jurisdictions. In the Phase 2 Study in-depth study should be conducted on road network development in the jurisdictions of local governments. Road network development master plan shall be established to guide future urban development and to avoid urban sprawl in suburban area. In addition, according

to the change in administration, responsibility of infrastructure development and maintenance should be reviewed and clarified. Budget allocation shall be examined in accordance with the responsibility for transport infrastructure, which is determined by the analysis based on a comprehensive trip demand data to be obtained from the person trip survey and other surveys.

In Phase 1 Study a conceptual master plan was proposed to avoid conflicts between the short-term implementation plan and the urban transportation master plan. However the conceptual master plan has not given concrete picture of future urban transportation system and merely provides the direction of transportation infrastructure development. In the Phase 2 Study the conceptual transport master plan should be a concrete proposal based on more reliable travel data. Short-term implementation plan should also be re-examined and should be more specific to materialize the plan.

Demonstration projects proposed in the Phase 1 Study shall be executed to pursue the viability of the projects during the Phase 2 Study. Discussion with relevant agencies is essential prior to the implementation. Evaluation of the demonstration projects will give valuable insights for full-scale implementation. Special attention should be paid to understand the level of public transport service that attracts private car users.

In formulating the master plan, emphasis should be placed on developing consensus in the society. In this regard, the Study should make efforts to involve the general public and to reflect feedbacks from public opinion in as many occasions as possible. Stakeholder meetings and public hearings would give good opportunities for receiving such feedbacks.

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.

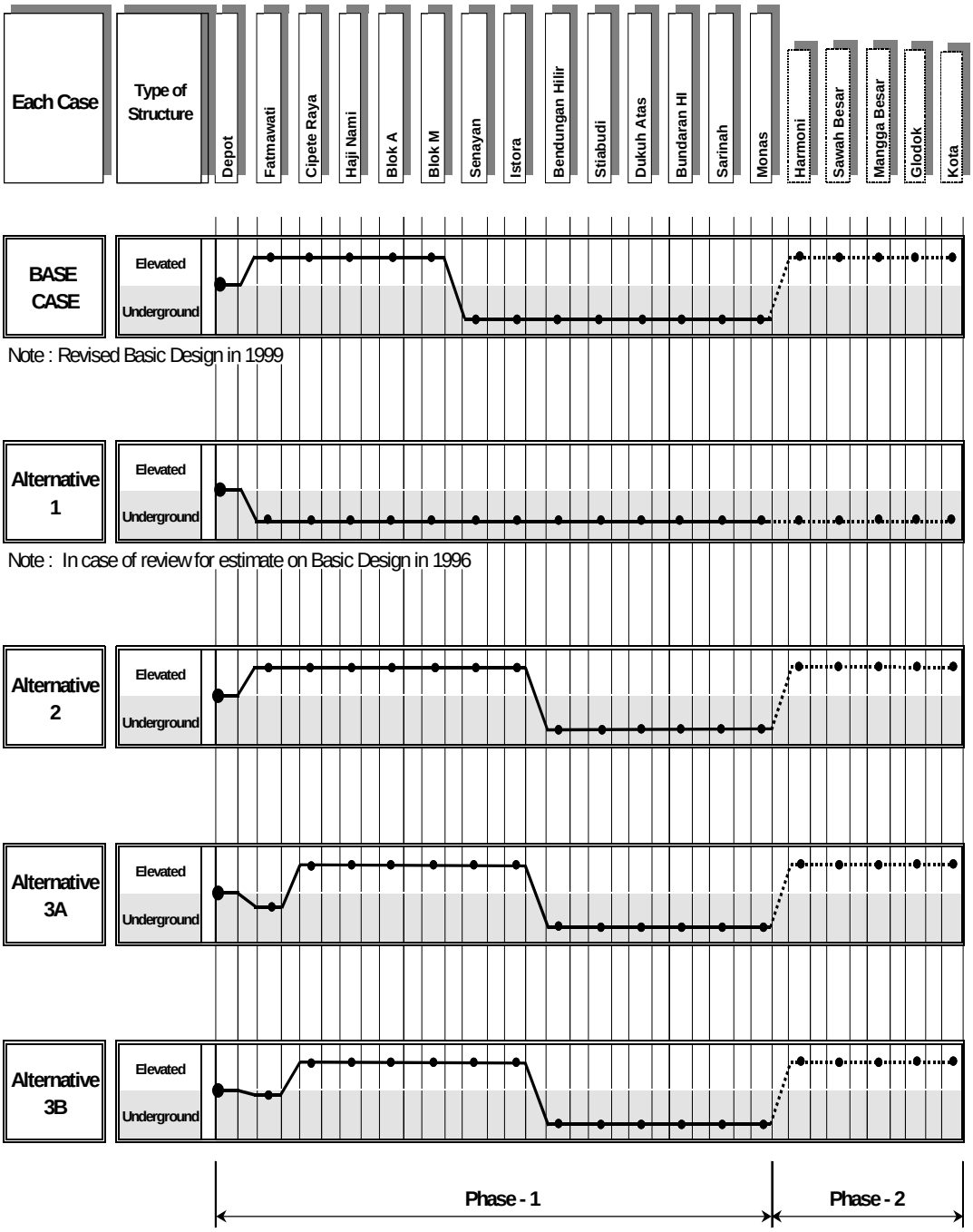


Figure 1.1 Vertical Alignments of Alternative Plans

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.

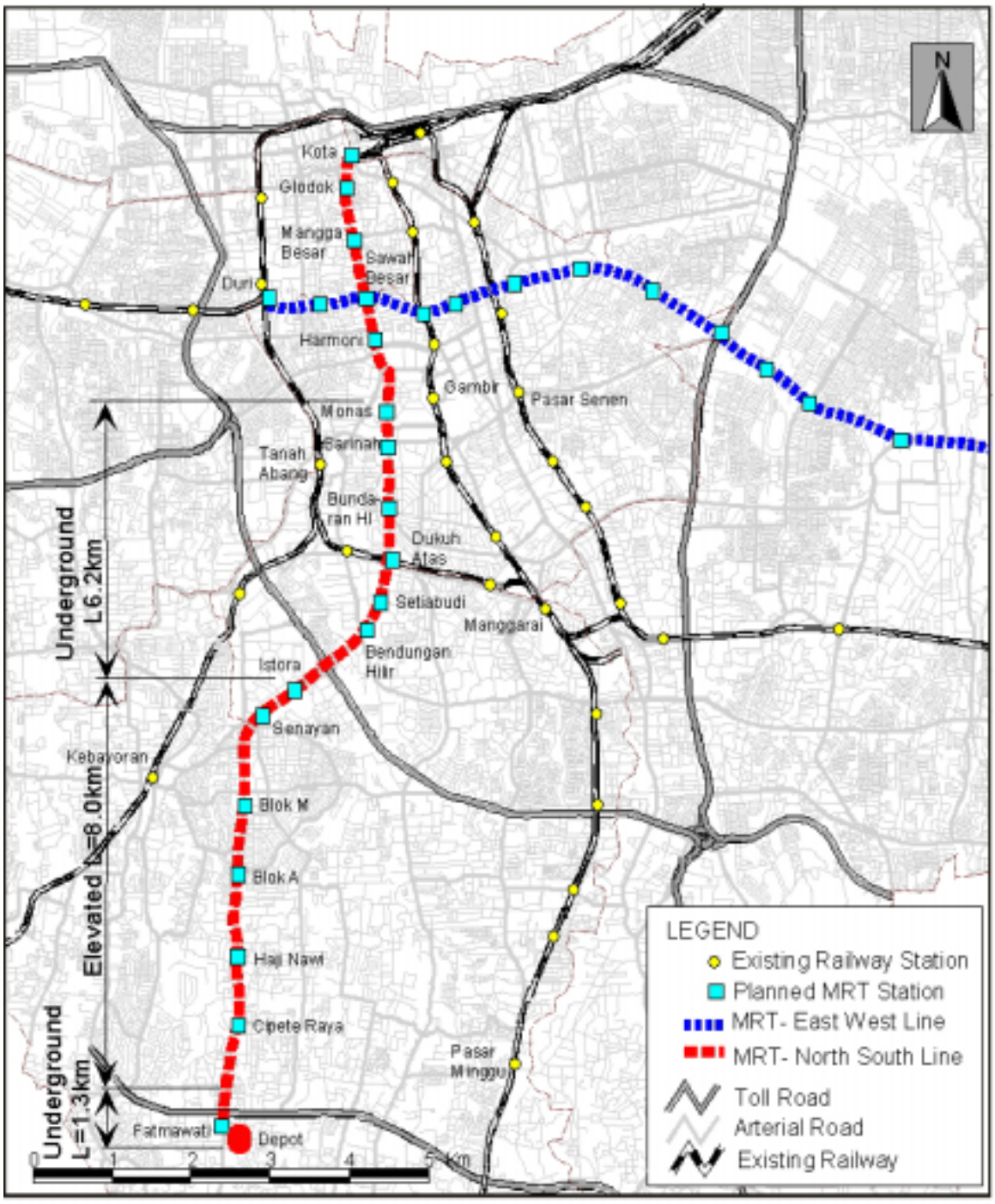


Figure 1.2 Alignment Plan of Alternative 3B

(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.

Executive Summary: Review Result of JORR Project

(1) JORR Project Configuration, Technical and Environmental Aspects

The Study Team reconfirmed the following JORR project system configuration and its major project elements are defined, in principle, as comprising Sections W1, W2, S, E1, E2 and E3 as shown in Table 1.1. The section N, which had been a constituent of the original JORR project, was excluded from the confirmed configuration due to difficulty in land acquisition. In substitution of the section N, Jl. Cakung Cilincing Raya, Jl. Ampera/Jl. Cilincing and Jl. Sulawesi are upgraded for reinforcing accessibility between Tanjung Priok Port and JORR.

Table 1.1 Location and Length of Sections

Section	Extent	Length (Km)
W1	Sta. 0+000 to Sta. 7+350 = 7,350m	7.4
W2	Sta. 7+350 to Sta. 19+555 = 12,205m	12.2
S	Sta. 19+555 to Sta. 32+450 = 12,895m	12.9
E1	Sta. 32+450 to Sta. 44+950 = 12,500m	12.5
E2	Sta. 9+200 (44+950) to Sta. 18+700 = 9,500m	9.5
E3	Sta. 18+700 to Sta. 23+450 = 4,750m	4.8
	Sub-Total	59.3
	Jl. Cakung Cilincing Raya L=3.7km Jl. Jampea/Cilincing L=3.3km Jl. Sulawesi L=0.3km	

Source: JICA Study Team compilation

The project engineering base cost was prepared for a closed toll system, which is applied to the existing operational sections of S and E2, and the system was planned to comprise a basic traffic information and control system covering the JORR as a preferred toll road operation and management.

The results of the previous EIA studies were reviewed and it was confirmed that an EIA (AMDAL) has been carried out for each JORR section. The results were approved by the Central AMDAL Commission organized by the Ministry of Public Works up to the year 1997.

(2) Project Base Costs (all resources) Constant 2000 prices

Total JORR project base cost in constant 2000 prices are estimated at **Rupiah 6,015.4 billion** with such breakdown as:

- **Engineering Base Cost = Rp.5,100.9 billion**
- **Land Acquisition and Compensation = Rp.511.1 billion**
- **Taxes and Duties = Rp.403.4 billion**

Details of the above are presented in Table 2.1

Table 2.1 Summary of Engineering Base Cost

No.	Items	F/C	L/C	Total	
		Mil. Yen	Mil. Rupiah	Mil. Yen	Mil. Rupiah
1	Construction Civil Works	17,056	2,094,619	44,984	3,373,800
2	Equipment Installation	13,194	78,918	14,246	1,068,450
3	Physical Contingency	2,365	213,408	5,211	390,825
4	Consulting Engineering Services for Civil Works	2,006	40,617	2,548	191,100
5	Consulting Engineering Services for Equipment Installation	900	8,293	1,021	76,575
6	Sub-Total of Engineering Base Cost	35,531	2,435,855	68,009	5,100,675
	F/C & L/C Rates	0.522	0.478		
7	Land Acquisition; Compensation; Administration& Utility Relocation	0	464,600	6,195	464,600
	Add: 10% of Physical Contingency	0	46,500	620	46,500
8	Duty and Levies on Imports	0	113,400	1,512	113,400
9	Ppn(VAT)	0	290,000	3,876	290,000
10	Sub-Total of GOI Contribution		914,500	12,193	914,500
11	Grand-total of Project Base Cost	35,531	3,350,355	80,202	6,015,175

	F/C,L/C Rates	F/C	L/C
1	Construction Civil Works	0.379	0.621
2	Equipment Installation	0.926	0.074
2	Physical Contingency	0.454	0.546
3	Consulting Engineering Services for Civil Works	0.787	0.213
4	Consulting Engineering Services for Traffic Managing Systems	0.892	0.108

Source: JICA Study Team computations

Notes:

1) Construction Works consists of Civil Works and Equipment Installation Works
2) Contingency is 10% of the Civil Works and 5% of the Equipment Installation Works
3) Conversion Rates
   Yen 106 = US$ 1.0 = Rupiah 7,950
   Yen 1.0 = Rupiah 75

(3) Traffic Demand Forecast for JORR

The Jakarta Outer Ring Road Tollway is expected to absorb a considerable amount of traffic volume in future. Total On-ramp volume may reach around 465,000 vehicles per day in 2005 and continue to grow to 678,000 vehicles per day in 2015.

The future sectional volumes as projected in Table 3.1 suggest that generally up to the year 2015 demand can be adequately accommodated by a six-lane cross section.

Table 3.1 JORR Sectional Traffic Volume

Section	Average Sectional Volume (pcu/day - two way) Yr 2005	Yr 2015
W1	55,975	76,585
W2	39,831	63,214
S	71,339	108,203
E1	21,738	44,649
E2	62,080	89,567
E3	48,928	85,337

Source : JICA Study Team

(4) Project Economic Internal Rate of Return (EIRR)

The economic internal rate of return (**EIRR**) of the project is estimated at **28.9%**, and which is based on the economic project cost, benefits from savings in vehicle operation costs and time costs and the proposed project implementation schedule shown in Figure 4.1.

(5) Return on Investment (or Project Internal Rate of Return)

The project's ROI provides, since it is calculated in constant prices, a fundamental measure of the project's inherent capacity to generate a return. Traffic demand on the JORR was estimated using a distance proportional model of Rp.330/km, and the revenue was estimated accordingly.

A standard project life cycle of 25 years was assumed. Hence, given a JORR project implementation duration of 6 years, **ROI was estimated at 6.55%**, when the implementing entity is the beneficiary of revenue streams generated by sections S and E2 and covers the O&M cost for these sections.

It was necessary to test the selected base case against the inherent demand error margins and to see what impact such inherent estimation margins of plus/minus 20%, and to see what impact such inherent estimation margins would have on the project's ROI. The results are:

- **In the worst case the Project's ROI will be 2.78% and in the best case some 11.57%.**

In summary, under the most optimistic assumption the JORR project will generate a return on investment in the order of magnitude of 11.6 percent, which is well below the current Indonesian lending rate of around 16.5 percent. It is self-evident that such ROI cannot meet commercial financing terms & conditions.

(6) Investment or Capital Requirement Estimations

Total capital requirements for the selected JORR project base case are estimated at:

- Rupiah 7,133.2 billion in current prices**, equivalent to Yen 95,109.3 million at an exchange rate of 1Yen to 75 Rupiah**
- **About 5.8% of this total, equivalent to** Rupiah 414.6 billion represents IDC **costs.**

The total capital requirements, therefore, amounts to **Rupiah 7,547.8 billion.**

(7) Project Structure

The following project structure is recommended, in view of the low project's ROI of around 6.55%, as shown in Table 7.1.

(8) Cash Flow Projections and Debt Service Capability

The cash flow projections and debt service capability of the JORR project was established based on the above fundamental assumptions. The results show that the project is fully capable of meeting long-term debt service under the following assumption:

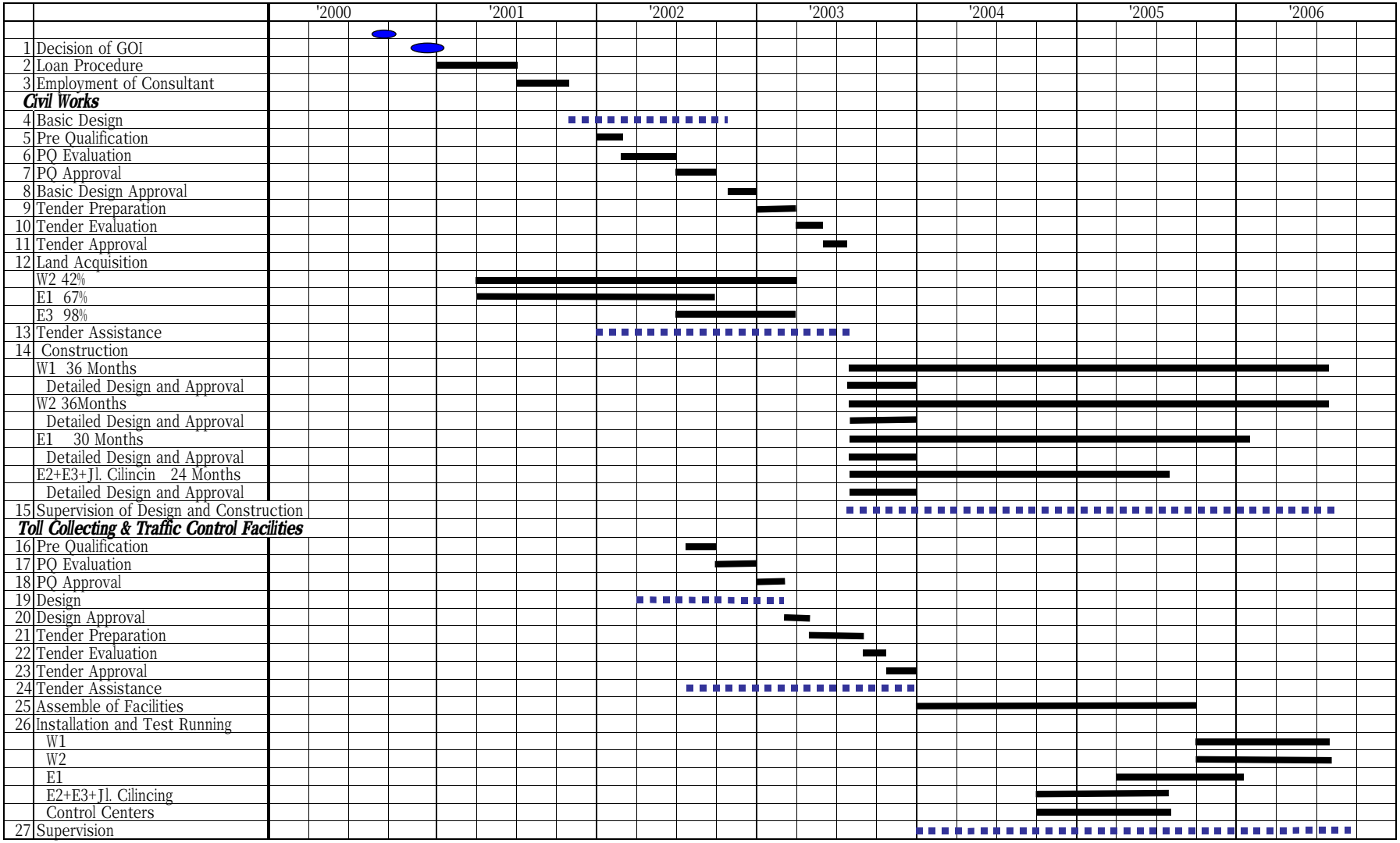


Figure 4.1 Proposed JORR Project Implementation Schedule

- As indicated above, the implementing entity is the beneficiary of revenue streams already generated by the S and E2 sections
- There is only one long-term loan, which is sovereign guaranteed. The loan terms and conditions are duration n= 40 years, interest rate to the GOI 0.75% and a grace period on principal repayment of 10 years
- On-lending conditions from the GOI are 40 years repayment period, interest rate of 5% and a grace period for repayment of principal of 10 years.

The cash flow and debt service analysis shows a positive accumulated net cash flow after long-term financing of about Rupiah 821.3 billion in the year 2005. Hence, there will be no need to finance working capital requirements.

Furthermore, if the JORR project is implemented in the suggested fashion, there will be no need for short-term bridging financing.

Table 7.1 Definition of Project Structure for Implementing Entity

(Unit : all figures are in current prices)

Parameter	Structure	Comments
Equity to Debt Structure	**43.3% : 56.7%**	1.) Cashflow to indicate whether this structure allows for high enough debt coverage ratio. If not, equity portion will need to be increased. 2.) It appears to be best to target an as high as possible equity share with a view to reduce the interest during construction load.
Equity Structure	**43.3% = 3,088.2 billion Rp.** **of which:** 1.) 830.8 billion Rp. in kind for existing JORR assets. 2.) 2,257.4 billion Rp. in cash.	1.) "Equity in kind" in form of a debt for equity swatch. However, this is cash flow neutral. 2.) However, the debt-for-equity swatch does not address the issue of outstanding liabilities of the old concessionaires.
Debt Structure	**56.7% = 4,045.1 billion Rp.** To be financed from long-term confessional ODA loan with: **Terms & conditions of lender to GOI:** n = 40 years (10 years grace) i = 0.75% p.a. **On-lending terms to implementing entity:** n = 40 years (10 years grace) i = 5.0% p.a.	Depending on the results of the FIRR and the cashflow, on-lending terms may have to be adjusted, in order to minimize the need for short-term bridging financing and in order to optimize the net cashflow after long-term financing.
	HOWEVER: Liabilities tied to the D/E swatch will have to be covered somehow.	Amount and terms for covering such liabilities need to be established.
	Short-term working capital for 2006 will have to be added	Not included in long-term loan. Financing to be secured from operational income.

Source: JICA Study Team.
Note: Please consult with Chapter 8, Table 8.2, on the question of outstanding liabilities of the old concessionaires.

(9) Strategic Implementation Options

There are, in principle, four strategic scenarios on how to proceed with JORR project realization, they are:

- **Strategic scenario 1.** This option entails that P.T. Jasa Marga implements the JORR project out of its own resources and merit
- **Strategic scenario 2.** Entails that P.T. Jasa Marga teams up with a domestic private sector partner under a new concessionaire agreement.
- **Strategic scenario 3.** Entails that P.T. Jasa Marga teams up with on overseas private sector strategic partner under a new concessionaire agreement. (of course, a combination of scenarios 2 and 3 is also possible), and
- **Strategic scenario 4.** P.T. Jasa Marga implements the JORR project with the assistance of a long-term sovereign guaranteed ODA loan that is extended under "best available" terms & conditions.

These scenarios were assessed with the following results:

1) Strategic Scenario 2 and 3.

The JICA Study Team is of the considered opinion that the quick realization of this approach is highly unlikely for the following reasons. The JORR is a very capital-intensive project with a relatively modest project specific ROI of only 6.55 percent (constant price base), or 11.6 percent under the best of circumstances, namely an underestimation of demand by 20 percent and an overestimation of base cost by also 20 percent. It is very difficult to imagine how either domestic and/or overseas private capital could come up with the necessary financing, either on a cash and/or loan basis.

There is no long-term capital market in Indonesia from commercial banks, which are anyway under restructuring. Financing the JORR at around 16 percent interest per year is, under the given ROI, unrealistic.

2) Strategic Scenario 1.

This option is indeed a possibility. However, it has also strong demerits, which cannot be dismissed easily. First, the JORR capital requirements are much too large for P.T. Jasa Marga to be shouldered alone. Hence, it is likely that P.T. Jasa Marga would have to implement the JORR section by section, in order to minimize risk and reduce strongly capital requirements through phasing over time. Since there is no long-term capital market in Indonesia, P.T. Jasa Marga would have to finance the sections at market rates of around 16 percent per year with term money that does not match the life cycle of the project. It is likely that such approach would render the individual sections not viable from a financial point of view. In short, the Study Team considers this option possible, but not representing an optimal approach to the question at hand

3) Strategic Scenario 4.

The Study Team considers this option has the most merits and the most viable one. This is so because lending terms could be matched to the life cycle of the project at the lowest possible interest rate for both, the GOI and the implementing entity, since the on-lending rate is determined by the GOI and could be determined flexibly, reflecting project risk conditions. In addition, the JORR could be

implemented in the shortest time possible and in one piece. The project risk could be hedged against through proper risk distribution among the stakeholders, and the issues pertaining to the existing JORR assets and related liabilities of the old concessionaires could be addressed to a certain degree.

In short, the Study Team considers this option has the highest level of merits.

(10) Conclusions & Recommendations

The following is recommended in conclusion:

1) The JORR project should be realized as soon as possible to prevent further economic losses not only in transport sector but also in other industrial sectors.
2) The JORR project is most suitable for a public sector project, because of its high economic IRR (28.9%) but small financial IRR (6.6%).
3) The JORR project is estimated to accommodate relatively high traffic demand, and therefore it brings about the steady toll revenue. Unlike general infrastructure projects, the JORR is a revenue producing project and the revenue can be used solely for its operation/maintenance expenses and the loan repayment without further investments or expenses by the GOI.
4) If it is a decisive policy for the GOI to pursue the private sector participation into the JORR investment the GOI should deliberate how to impose on the private sector the responsibility to maintain safety and expressway function of the JORR as a public facility.
5) The JORR project is not going to be the last toll road project in Jabotabek. Hence, the GOI should investigate and establish appropriate toll road development policies such as:
    a) Toll road master plan that comprises a basic structure of the metropolitan toll roads
    b) Toll road law that allows for a transparent and suitable toll rate adjustment mechanism. This will greatly contribute to foreseeing a firm financial performance in future
    c) Standardization of “authorization agreement” and “concession agreement” which takes due account of private sector participation.

Table of Contents

PART II : Review of Jakarta MRT Project

PART III : Review of JORR Project

List of Figures

List of Tables