NO.

JAPAN INTERNATIONAL
COOPERATION AGENCY (JICA)

DIRECTORATE GENERAL OF HIGHWAYS
MINISTRY OF PUBLIC WORKS

THE STUDY ON PUBLIC-PRIVATE PARTNERSHIP SCHEME FOR TRANS JAVA TOLL ROAD IN THE REPUBLIC OF INDONESIA

FINAL REPORT

MAIN TEXT

JANUARY 2007

KATAHIRA & ENGINEERS INTERNATIONAL
PRICEWATERHOUSECOOPERS
PwC Advisory Co., Ltd.

SD
JR
07-09

PREFACE

In response to a request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct “The Study on Public-Private Partnership (PPP) Scheme for Trans Java Toll Road in the Republic of Indonesia” and entrusted it to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a Study Team headed by Dr. Hani Abdel-Halim of Katahira & Engineers International from April 2006 and January 2007. The team held discussions with the officials concerned of the Ministry of Public Works as well as other officials concerned, and conducted field surveys, data analysis and PPP financial scheme. Upon returning to Japan, the team prepared this final report to summarize the results of the study.

I hope that this report will contribute to development in the Republic of Indonesia, 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 Study Team.

January 2007,

Kazuhisa MATSUOKA,
Vice President
Japan International Cooperation Agency

Mr. Kazuhisa MATSUOKA,
Vice President
Japan International Cooperation Agency

January 2007

Dear Sir,

Letter of Transmittal

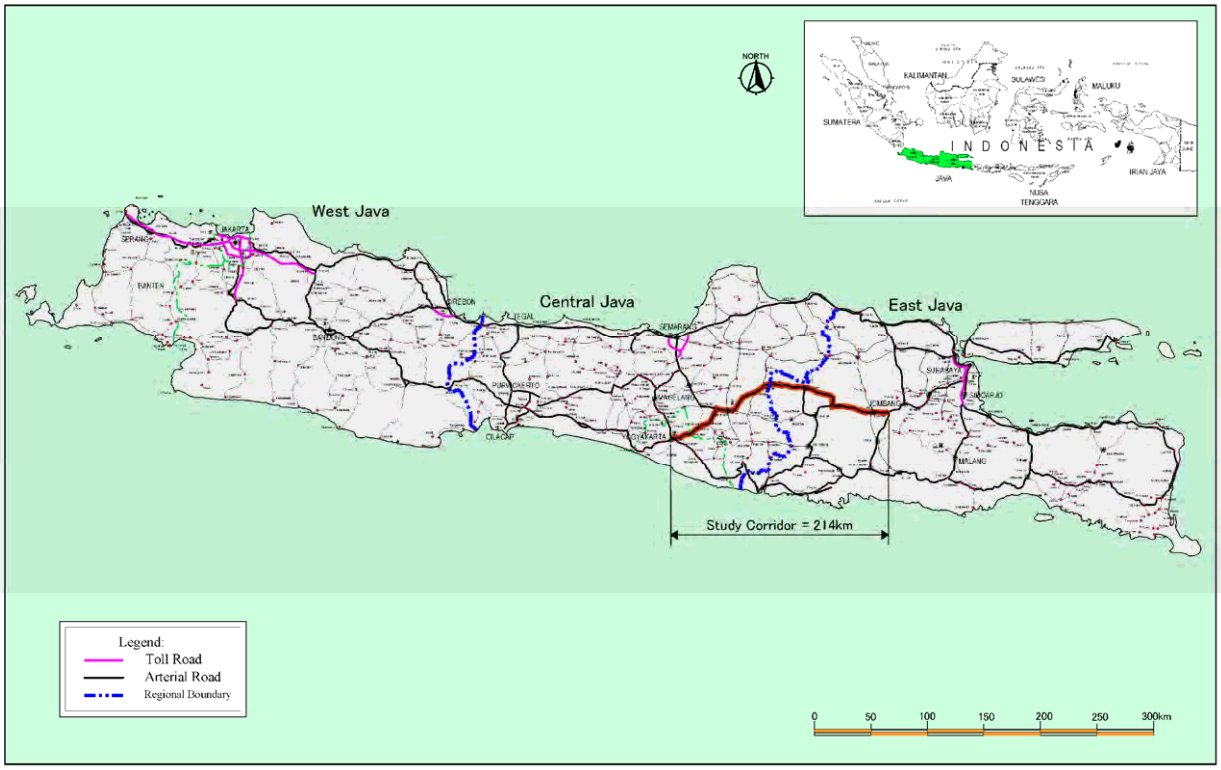
We are pleased to submit herewith the Final Report of "The Study on Public-Private Partnership (PPP) Scheme for Trans Java Toll Road in the Republic of Indonesia". The report compiles the results of the Study and includes the advices and suggestions of the authorities concerned of the Government of Japan and your agency as well as the comments made by the Ministry of Public Works and other authorities concerned in the Republic of Indonesia.

The report includes review of previous feasibility study on the study road, and analyses the present and future road network conditions and demand of transport in Java Island. Revised cost estimate and transport demand are applied for the economic evaluation and financial analysis of six established PPP options. An optimum PPP scheme is recommended based on a comprehensive evaluation and assessment process that takes into consideration the pros and cons of each option and the minimum financial requirements by the Government of Indonesia. In addition, bidding guidelines and implementation plan are included for the smooth and on-schedule implementation of the toll road project.

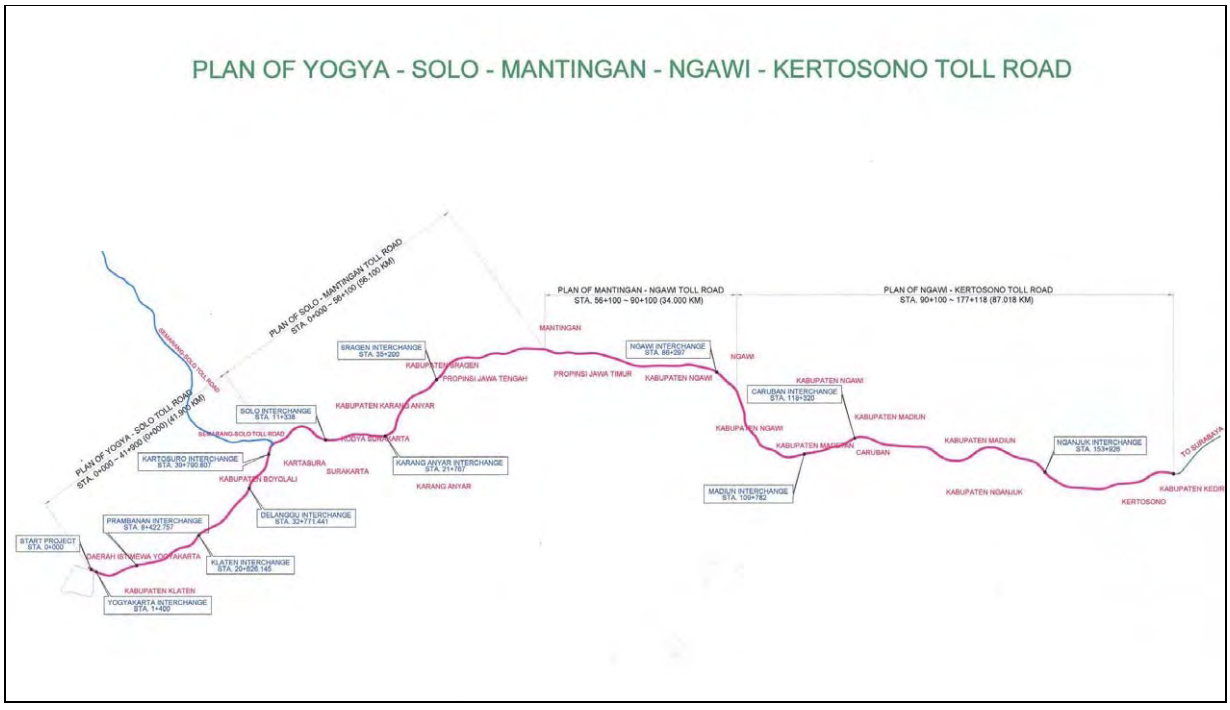
We wish to take this opportunity to express our sincere gratitude to your agency and the Ministry of Foreign Affairs. We also wish to express our deep gratitude to the Ministry of Public Works as well as other Governmental Agencies concerned in the Republic of Indonesia for the close cooperation and assistance extended to us during the Study. We hope this report will contribute to the development of the Republic of Indonesia.

Very truly yours,

Dr. Hani Abdel-Halim
Team Leader,
The Study on Public-Private Partnership (PPP) Scheme for
Trans Java Toll Road in the Republic of Indonesia



Study Area



LOCATION MAP

TABLE OF CONTENTS

CHAPTER 7 STUDY ON PPP SCHEME

PART III: RECOMMENDED PPP SCHEME AND IMPLEMENTATION PLAN

CHAPTER 8 RECOMMENDED PPP SCHEME

CHAPTER 9 IMPLEMENTATION PLAN

List of Tables

List of Figures

Appendix

ABBREVIATIONS

ASEAN	:	Association of South East Asian Nations
ADT	:	Average Daily Traffic Volume
BAPPENNAS	:	National Development Planning Agency
B/C	:	Benefit/Cost Ratio
BLU	:	Management of Public Service Agency
BOT	:	Build, Operate and Transfer
BPJT	:	Indonesian Toll Road Authority
CA	:	Concession Agreement
CCTV	:	Closed-Circuit TV
DBFO	:	Design, Build, Finance, and Operate
DGH	:	Directorate General of Highway
EIA	:	Environmental Impact Assessment
EIRR	:	Economic Internal Rate of Return %
GDP	:	Gross Domestic Products
GOI	:	Government of Indonesia
GOJ	:	Government of Japan
GRDP	:	Gross Regional Domestic Products
ITRA	:	Indonesia Toll Road Authority
ITT	:	Invitation to Tender
JARNS	:	Java Arterial Road Network
JBIC	:	Japan Bank for International Cooperation
JORR	:	Jakarta Outer Ring Road
KKPPI	:	National Committee for the Acceleration of Infrastructure Provision
LCC	:	Life Cycle Cost
MOF	:	Ministry of Finance
MPW	:	Ministry of Public Works
NPV	:	Net Present Value
OD	:	Origin-Destination
ODA	:	Official Development Assistance
OPEX	:	Operating Expenditures
PPP	:	Public-Private Partnership
PPITA	:	Private Provision of Infrastructure Technical Assistance
PQ	:	Pre-Qualification
PRC	:	People’s Republic of China
PSO	:	Public Service Obligation
PSP	:	Private Sector Participation
QC Consultant	:	Quality Control consultant
ROW	:	Light of Way
Rp.	:	Rupiah

RPJM	:	Mid-Term Development Plan 2005-2009
SPC	:	Special Purpose Company
STRADA	:	System for Traffic Demand Analysis
SUTT	:	High Voltage Aerial Cable
SUTET	:	Extra High Voltage Aerial Cable
TEV	:	Time Evaluation Value
TTC	:	Travel Time Cost
UKL	:	Environmental Management Plan
UNCITRAL	:	United Nations Commission on International Trade Law
UPL	:	Environmental Monitoring Plan
VCR	:	Vehicle Capacity Ratio
VFM	:	Value for Money
WTP	:	Willingness-To-Pay

CHAPTER 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Java Island is the mainstay of socioeconomic activities of Indonesia as well as the nucleus of prospective industrial development and diverse economic investment. Economic activities in Java Island have been boomed by domestic and international enterprises, which have inevitably induced remarkable development of road network in Java Island. Due to the rapid development of economic activities, however, the congestion level of trunk roads has reached to the critical limit in terms of physical capacity and network function, and thus emergent increment of road capacity in duly required. To cope with this situation and to support the booming socioeconomic activities and further development in Java Island, many road development projects are being implemented to attain substantial enhancement of the road transport system in the island.

Previous toll road projects in Indonesia have been implemented by government finance, foreign funds, Jasa Marga fund, BOT schemes and so forth. However, the current economic conditions and financial uncertainty in Indonesia induce certain constraints in project finance by the government, and conventional BOT schemes has been depressed mainly due to intolerable risk for the private sector in terms of demand, tariff, land acquisition and taxes. With the existing financial constraints, new and stable sources of fund are required. This financial gap is expected to be filled by the private sector that is also expected to be capable of improving the quality of transport infrastructure services. The development of private sector involvement in the provision of public services can be achieved through insuring private as well as public benefits. The benefits through private sector participation will be greater when the government clarifies the responsibilities of involved governmental agencies, optimizes risk and work sharing between both public and private sectors and develops supporting policies on competition and regulations.

The approach of applying PPP schemes in financing toll road projects is currently applied in different countries. In Indonesia, however, it is still new financing mechanism that requires to be carefully studied in order to successfully apply. Applying PPP scheme on the study road has many objectives and is expected to generate many benefits, including:

- To provide a pilot PPP project that will open the market for more private sector participation in financing public infrastructure projects.
- To develop, strengthen and open more business opportunities for the private sector to carry out more roles in future.
- To reduce the life-cycle governmental burden in financing public infrastructure projects which will support the national budget on the long term.
- To allow the utilization of private sector experience, efficiency, flexibility and advanced technology in implementing and operating public projects.
- To deliver better and less expensive services to road users.

In response to the request of the Government of the Republic of Indonesia (GOI), the Government of Japan (GOJ) has decided to conduct "The Study on Public-Private Partnership (PPP) Scheme for Trans Java Toll Road in the Republic of Indonesia". Accordingly, JICA organized and dispatched a Study Team, from Katahira & Engineers International (KEI) and PwC Advisory Co., Ltd. (PwC), a member firm of PricewaterhouseCoopers, to Indonesia to commence the Study on April 2006. The Final Report is scheduled to be submitted to the Government of the Republic of Indonesia on January 2007.

1.2 OBJECTIVES OF THE STUDY

The objectives of the Study are:

1. To propose financially viable PPP scheme for the selected section of Trans Java Toll Road based on the proposed PPP scheme; and
2. To transfer a set of PPP related knowledge and know how to the counterparts during the course of the Study.

1.3 STUDY CORRIDOR

The road corridor under this Study is the section of "Yogyakarta ~ Surakarta (Solo) ~ Ngawi ~ Mantingan ~ Kertosono" with a total length of 219 km of Trans Java Toll Road.

1.4 SCOPE OF THE STUDY

In order to achieve the objectives mentioned above, the Study will cover the following items:

1. Collection and Review of Basic Information

- Laws and regulations related to PPP road projects
- Status and progress of other donors' activities related to the project

2. Review and Analysis of Relevant Data and Reports
   - Central and provincial development plans by Sector
   - Socioeconomic data and information (population, GDP, employment, etc.)
   - Land use and ownership
   - Natural conditions in the Study Area
   - Environmental conditions
   - Trend of other donors and NDOs activities

3. Review of Results of the Feasibility Study on the Study Road Section
   - Present conditions
   - Traffic and road network conditions
   - Results of traffic demand forecast
   - Engineering aspects
   - Estimated cost
   - Environmental conditions
   - Economic viability
   - Implementation strategy and plan

4. Traffic Surveys and Demand Forecast
   - Field survey
   - Supplementary traffic count surveys
   - Willingness-to-Pay interview survey
   - Review of demand forecast
   - Simulation of toll levels and revenues
   - Review of cost estimate

5. Formulation of Optimum PPP Scheme for Yogyakarta – Kertsono Section
   - Information on pre-conditions PPP projects
   - Interview with related government agencies, prospective operators/investors and financial institutions.
   - Optimum PPP scheme

6. Project Implementation Plan
   - Proposed implementation plan based on work sharing between public and private sectors
   - Review of existing tender procedures and proposed procedures for the PPP road project

- Proposed evaluation points of the proposals

7. Effective Utilization of PPP Scheme
   - Review existing BOT projects and identify problems
   - Proposed improvements for implementation plans of PPP projects
   - Identifying legislative hurdles which hamper PPP operations

8. Conclusions and Recommendations

1.5 SCHEDULE OF THE STUDY

The Study is commenced in April 2006 and the Final Report is scheduled to be submitted by January 2007. Figure 1.5-1 shows the Study Flow Diagram.

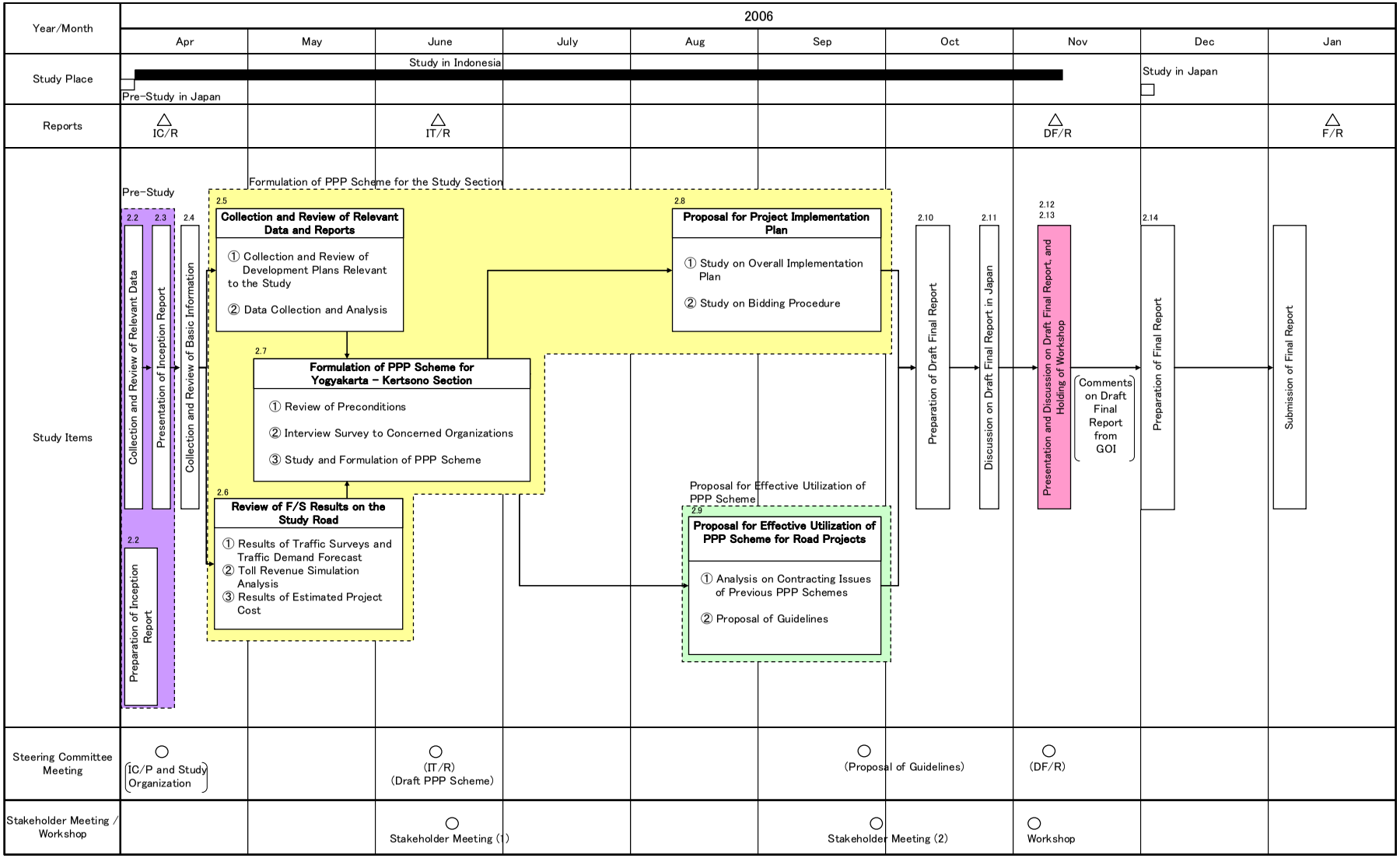
1.6 ORGANIZATION OF THE STUDY

The Study is carried out by JICA Study Team which is composed of the following experts:

Dr. Hani ABDEL-HALIM	Team Leader / PPP Scheme
Mrs. Yumiko NODA	PPP Structure
Ms. Mariko OGAWA	PPP Maintenance and Operation Plan
Mr. Soemu OSHITA	PPP Construction Plan
Mr. Jon SIVERTSON	Bidding Procedure (1)
Mr. Munehiko ETO	Bidding Procedure (2)
Mr. Hiroo TAKEDA	Toll Road Legislation
Dr. Shingo GOSE	Toll Road Plan
Mr. Tatsuyuki SAKURAI	Toll Road Policy Advisor

An Implementing Committee is set up to steer the Study effectively under the initiative of the Ministry of Public Works. The committee is consisted of the following:

Mrs. Sri Apriatini Soekardi	Chairman; Director of General Planning, Directorate General of highways, MPW
Mr. Soebagiono	Secretary; Head of Sub Directorate of Freeways and Toll Road Development, Directorate of Freeways and Urban Road, Directorate General of Highways, MPW



＊IC/R : Inception Report　IT/R : Interim Report　DF/R : Draft Final Report　F/R : Final Report

Figure 1.5-1 Study Flow Diagram

Mr. Nurdin Manurung	Member; Director of Freeways and Urban Road, Directorate General of Highways, MPW
Mr. Muhammad Irian	Member; Secretary of BPJT, MPW
Ms. U. Hayati Triastuti,	Member; Director of Transportation, Bappenas
Mr. Imron Bulkin	Member; Director of PPP Development, Bappenas
Mr. Ceppie Kurniadi Sumadilaga	Member; Director of Bilateral Funding, Bappenas
Mr. Agus Suprijanto	Member; Director of Loan and Grant Management, Ministry of Finance

The Study is supposed to be conducted in a manner of a joint work of Indonesian and Japanese sides. In this context, the Ministry of Public Works allocated the Counterpart Personnel as follows:

Mr. Herry Trisaputra Zuna	Sub Directorate of Freeways and Toll Road Development
Mr. Dedy Gunawan	Sub Directorate of Freeways and Toll Road Development
Mr. Rahman Arief	Sub Directorate of Planning
Mr. Hardi Siahaan	Toll Road Regulatory Board (BPJT)

The Organization Chart of the Study is shown in Figure 1.6-1.

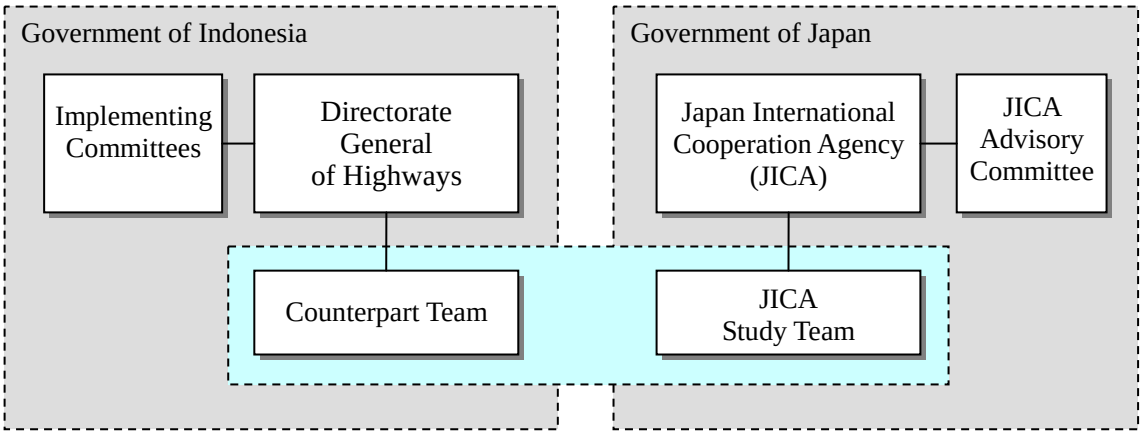


Figure 1.6-1 Organization Chart

PART I

YOGYAKARTA – SOLO – KERTOSONO TOLL ROAD DEVELOPMENT

CHAPTER 2

DESCRIPTION OF THE PROJECT

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DESCRIPTION OF THE PROJECT

2.1 BACKGROUND OF THE PROJECT

Compared with other ASEAN countries, Indonesia has a low density of road networks, which give a density of 0.02 km per sq. km of land area. The road is rapidly getting crowded as the number of motor vehicles increased more rapidly than the growth of road network, particularly in Java Island, which accommodates the highest population density and economic activities in the country.

The rapid socioeconomic growth at the southern and eastern areas of Java Island is increasing the demand for better transportation facilities including road infrastructure. Such areas are varying in terms of regional capacity, characteristics and potential. Yogyakarta is known as a tourism area and the centre of education. Solo city has also the same characteristics. Meanwhile, other cities along the corridor have potential as centres of agriculture production and some tourism spots.

The Project Road is a section of Trans Java Toll Road, located in Central and East Java that connects East Java and Central Java heading to Jakarta. The distribution of goods from production areas to markets and the movement of people require higher travel speed and shorter travel time to decrease travel cost with higher safety levels. The development of a toll road will overcome the existing problems regarding the growth in transport demand due to development in socioeconomic sectors.

The project's main purpose is to provide an efficient road transport network in Java Island in order to promote its rapid socioeconomic development. Java Island, with its highest population density, is the mainstay of socioeconomic activities in Indonesia. Due to the rapid development of economic activities, the congestion level of trunk roads is expected to reach critical limits in the near future in terms of physical capacity and network function. The proposed sections are critical components of Trans Java Toll Road.

The current economic conditions and financial uncertainty in Indonesia induce certain constraints in financial viability of projects. With the existing financial difficulties, new and stable sources of fund are required through PPP schemes. In order to attract the private sector participation, which is expected to improve the quality of the transport services, the appropriate public sector's support under PPP schemes will be

required to lower financial requirements of the private sector down to the level affordable by toll revenues.

2.2 OBJECTIVE OF THE PROJECT

The objectives of implementing the road project, between Yogyakarta – Solo – Kertosono to Surabaya as a part of Trans Java Toll Road, are as follows:

- To improve accessibility and capacity of road networks for the movement of people and freight on this important transport corridor.
- To promote national and regional socioeconomic development in corridor-impact areas and cities along the road in eastern parts of Java Island
- To increase productivity with repression of distributional cost and giving access to regional and international markets
- To provide an efficient road transport network in Java Island to promote its rapid socioeconomic development

2.3 NECESSITY OF THE PROJECT

The economic growth and increase of social, economic and tourism activities within the project area and along its corridor as well as the need to enhance the regional development in central and eastern areas in Java Island, as per the targets of national development plans, it can be said that this toll road project is the optimum alternative to meet these requirements and conditions.

The Project Road has been declared in the RPJM (Mid-Term Development Plan 2005-2009) and also has been stated in the following:

- Strategic Plan of the Ministry of Public Works, 2005-2009
- Minister of Public Works Decree No. 369/KPTS/M/2005 on National Road Network Master Plan to include toll road network master plan.
- GOI has launched the Toll Road Acceleration Development Program through Indonesia Infrastructure Summit I, January 2005.

2.3.1 National Mid-Term Development Plan

National road infrastructure in the National Mid-Term Development Plan of 2005 - 2009 represents an important sector that requires approximately Rp 25 trillion for maintenance and upgrading, while the expected available fund is only Rp 15 trillion. The needs for the development of strategic national road network including shortcut

roads, roads in isolated areas and in small islands and long span bridges is approximately Rp. 50 trillion. The development of about 1,600 km of the highway network in the three main islands of Java, Sumatra and Sulawesi requires a budget of Rp 89 trillion in the five year plan. The Plan also states that the length of the national road network will be expanded from 26,853 km to 34,828 km. To overcome this financing gap, the funding scheme includes the involvement of the public sector together with both domestic and foreign private sector.

The general policy of the plan includes the following major points:

- Harmonizing the road network system with the policy of national spatial planning to support regional development and integrate with other infrastructure network systems.
- Maintaining the performance of road infrastructure by optimizing the handling of road network development to meet the transportation needs.
- Improving the accessibility of regional development in the framework of a unified nation of the Republic of Indonesia.
- Promoting professional attitudes and institutional efficiency with human resources independency in handling the road sector development.
- Encouraging the involvement of private sector and business circles to participate with the public sector in developing the road network.

The following points are stated under the operational policy of the Plan:

- Prioritization in handling the development of strategic national roads has the criteria of supporting the national economy as well as the completion of road segments for optimum function in supporting developing areas, state-bordering areas and isolated areas.
- Maintaining the existing road network in good operational conditions
- Increasing the strength of structures and capacity of roads in line with the increase in demand for cargo movement and growth in traffic volumes.
- Establishing standards, guidelines and manuals on road development to support regional autonomy as well as to optimize road operation and management.
- Providing information to stakeholders on road infrastructure operation and encouraging investment for the acceleration of road development.

Goals of the Plan include the creation of reliable national road network with strategic and collaborated interconnections to increase the accessibility and mobility for goods and services from production centres to marketing areas. It has also the objective of opening opportunities in road operation for the involvement of stakeholders including

regional governments, private partners and the public sector.

Three scenarios; limited, moderate and ideal, are developed with different levels of road network performance targets, as presented in Table 2.3-1. Based on each performance target, road network improvement tasks are established regarding lengths of roads under maintenance, rehabilitation, widening and construction. In addition, required funds for national roads are estimated as Rp 30.0 trillion for the limited, Rp 45.0 trillion for moderate and Rp 75.0 for the ideal scenario. In addition, a fund of Rp 89.4 trillion is required to improve other roads under any of the three scenarios.

Table 2.3-1 Performance Targets of National Road Development Scenarios

Item		Limited Scenario	Moderate Scenario	Ideal Scenario
Average Speed		Decrease: 44 km/hr to 42 km/hr	Increase: 44 km/hr to 48 km/hr	Increase: 44 km/hr to 55 km/hr
Road Condition	Good	From 37 % to 28%	From 37 to 31%	From 37 to 40%
	Moderate	From 44% to 42%	From 44% to 50%	From 44% to 60%
	Bad	From 8% to 24%	From 8% to 11%	From 8% to 0%
	Very Bad	From 11% to 6%	From 11% to 8%	From 11% to 0%

2.3.2 Infrastructure Road Map

The Infrastructure Summit of January 2005 in Jakarta confirmed the Indonesian Government intention to launch an extremely huge amount of new investments for the development of infrastructure projects, including 38 toll road projects with investment of about USD 9.5 billion in total. Such projects are now left to the investors, as Jasa Marga is no longer the single operator and regulator assigned bt the Government.

Infrastructure development is now a pillar for the 5-year development strategy under which the growth of GDP has the target of increasing from 4.9% in 2003 to 7.2% by 2009, reducing unemployment from 9% to 5.1% and the income poverty rate from 16.6% to 8.2% of Indonesia's population. The targeted macroeconomic indicators are presented in Table 2.3-2 for the years 2009 – 2009.

The Infrastructure Road Map established under the Strategic Initiatives to Accelerate Infrastructure Development in Indonesia, Bappenas, addresses the private sector participation with the following three policy initiatives:

1. General Policy Environment: Appropriate Guarantee for reducing uncertainty
   a) Ensure predictability in rules and policies (including tariff and market arrangement

Table 2.3-2 Annual Macroeconomic Indicators 2005 – 2009

Macro Indicators	2005	2006	2007	2008	2009
Inflation, CPI (%)	7.0	5.5	5.0	4.0	3.0
Nom. Exchange Rate (Rp/US$)	8,900	8,800	8,800	8,700	8,700
GDP Growth by Expenditure (%)	5.5	6.1	6.7	7.2	7.6
Current Account/GDP (%)	1.6	0.5	0.1	-0.2	-0.5
Foreign Reserves (US$ billion)	36.8	36.0	35.6	35.2	35.9
GDP/Capita (Rp thousand)	7,946	8,333	8,791	9,317	9,914
Budget Deficit/GDP (%)	-0.7	-0.6	-0.3	0.0	
Tax Revenue/GDP (%)	11.6	11.6	11.9	12.6	13.6
Debt Stock/GDP (%)	48.0	43.9	39.5	35.4	31.8
Open Unemployment (%)	9.5	8.9	7.9	6.6	5.1

b) Introduce enforceable contractual agreements, essential for mitigating non-commercial investor risks
c) Policy certainty that can be offered, not a blanket "comfort letter".
d) Commitment to accelerate infrastructure development and consistency with the latest progress in other policy reform.
e) Policy direction for the management and mitigation of non-commercial risks, such as political, economic, project, legal and other risks

2. Entry Policies: Reduced regulatory obstacles and facilitate fair competition
   a) Reducing regulatory obstacles by facilitating reforms to remove obstacles for private participation
   b) Unbundling/liberalization of infrastructure sectors
   c) Establishing fair competition, with models of competition such as deregulation, BOT schemes and concessions for delegated management.

3. Pricing Policy: Reliable procedure and institutional setup for price determination
   a) A simplified procedure for tariff setting
   b) Strengthening/establishing regulatory body to oversee fair process of tariff determination

<u>Supportive Policies</u>

1. Infrastructure Development Fund
   a) Developing infrastructure development fund to tap domestic savings, by creating an institutional framework/mechanism to raise funds from public and institutional investors to support infrastructure development on a medium to long term basis.

b) Potential use of infrastructure development fund

2. Consolidate Indonesia Infrastructure Forum as a strategic partner of government and as a conduit for private sector.

The issues and challenges in the transport sector are expressed as degradation in the level-of-services as follows:

- Low quality and quantity of transportation services and un-integrated inter-modal network services
- Inadequate government spending in transportation sectors needed to support economic growth, to attain higher quality of welfare, and to facilitate regional development
- Inadequate regulatory frameworks for fruitful public-private partnership in transportation investment

The policy direction for the transportation sector has the targets of:

- Higher level-of-service: by rehabilitating and maintaining the existing infra-structure to increase the quality of services to an acceptable level and by enforcing law to attain safety.
- Greater integration: by developing a network of transportation that facilitates inter-modal function, focusing along commercially viable corridors (demand driven) while facilitating new investments for opening under-developed areas (supply-driven).
- Better regulatory frameworks: for private participation and develop Blue Print of national transportation system and roadmap strategy.
- Increasing mobility: by improving road quality performance to reduce road user cost along national important corridors, e.g., Sumatra East Corridor and North Java Corridor.
- Developing high grade network: along North-Coast Java and attracting private investment
- Addressing bottleneck issues: in toll road industry, such as land acquisition, tariff setting, government guarantee such as subsidy for low economic tariff and low occupancy for pioneer transport services set by the government, etc.

2.4 SOCIOECONOMIC CHARACTERISTICS IN PROJECT AREA

2.4.1 Population

Population data are based on the national census that is conducted every 10 years, with the last one on the year 2000 and predictions of 2004. As presented in Table 2.4-1, the average growth rate of population in Indonesia had decreased from 1.97% in the 1980s to 1.43% in recent years, while it is increasing in Java Island from 1.3% to 1.5% in the same period. Most of Indonesia population is concentrated in Java Island, which occupies only an area of 7% of the total country and accommodates about 60% of the population, without a well balanced regional distribution.

Table 2.4-1 Population and Growth Rate

Region	Area (km^2)	Population ('000)			Annual Growth Rate (%)		
		1990	2000	2004	1980-90	1990-00	2000-04
DKI Jakarta	740	8,228	8,361	8,750	2.38	0.17	1.14
Java Barat	36,925	29,414	35,724	38,611	2.57	2.03	1.96
Java Tengah	32,800	28,516	31,223	32,543	1.17	0.94	1.04
DI Yogyakarta	3,133	2,913	3,121	3,223	0.57	0.72	0.81
Java Timur	46,690	32,488	34,766	36,482	1.08	0.70	1.21
Banten*	9,019	6,968	8,098	9,129	-	3.21	3.04
Java Island	129,306	107,527	121,293	128,738	1.30	1.21	1.50
Indonesia	1,860,360	178,500	205,843	217,854	1.97	1.49	1.43

* Was formed in 2000
Source: Statistical Yearbook of Indonesia – 2004, June 2005

2.4.2 Economy

For the year 2004, growth rate of Indonesian economy showed a better performance than that of 2003. Based on GDP at 2000 constant prices, growth of Indonesian economy in 2004 was 5.13 percent, as presented in Table 2.4-2. Almost all of the sectors of economy, which compose the GDP, produced a positive growth in 2004, except mining and quarrying sector.

The highest growth was reached by transportation and communication sector at 12.7 percent. Per capita national income at current prices increased from Rp 8.3 million in 2003 to Rp 9.5 million in 2004. At 2000 constant prices, the growth rate on the per capita national income was 5.87% in 2004 compared with only 1.51% in 2003.

Table 2.4-2 Trend of Economic Indicators

Indicator	Year				Annual Growth Rate (%)			
	2001	2002	2003	2004	2001	2002	2003	2004
At current market prices								
GDP (billion Rp)	1,684,281	1,863,275	2,045,854	2,303,031	-	-	-	-
GDP/Capita (Rp)	8,080,533	8,828,050	9,572,485	10,641,732	-	-	-	-
GNP (billion Rp)	1,623,229	1,808,762	1,966,225	2,223,983	-	-	-	-
GNP/Capita (Rp)	7,787,633	8,569,771	9,199,905	10,276,467	-	-	-	-
NI (billion Rp)	1,507,590	1,644,412	1,778,660	2,046,297				
NI/Capita (Rp)	7,232,838	7,791,094	8,322,295	9,455,426				
At constant 2000 market prices								
GDP (billion Rp)	1,442,984	1,506,124	1,579,559	1,660,579	3.84	4.38	4.88	5.13
GDP/Capita (Rp)	6,922,888	7,135,900	7,390,707	7,673,119	2.54	3.08	3.57	3.82
GNP (billion Rp)	1,376,774	1,449,767	1,498,328	1,580,111	6.10	5.30	3.35	5.46
GNP/Capita (Rp)	6,605,235	6,868,885	7,010,631	7,301,296	4.78	3.99	2.06	4.15
NI (billion Rp)	1,277,342	1,316,776	1,353,474	1,451,041	0.90	3.09	2.79	7.21
NI/Capita (Rp)	6,128,196	6,238,784	6,332,861	6,704,898	-0.35	1.80	1.51	5.87
GRDP (billion Rp at current market prices)								
Java Island	809,942	926,110	1,031,446	-	-	-	-	-
DKI Jakarta	219,934	253,435	284,000	-	-	-	-	-
Java Barat	193,297	214,302	234,451	-	-	-	-	-
Java Tengah	136,131	156,418	175,106	-	-	-	-	-
DI Yogyakarta	14,577	16,713	18,839	-	-	-	-	-
Java Timur	195,763	226,957	254,381	-	-	-	-	-
Banten	50,241	58,284	64,670	-	-	-	-	-
GRDP (billion Rp at constant 1993 prices)								
Java Island	243,772	253,104	264,108	-	3.88	3.81	4.35	-
DKI Jakarta	61,868	64,338	67,163	-	3.69	3.88	4.51	-
Java Barat	58,312	60,594	63,179	-	4.67	3.95	4.29	-
Java Tengah	42,305	43,776	45,605	-	3.42	3.55	4.11	-
DI Yogyakarta	5,187	5,395	5,616	-	4.00	3.85	3.70	-
Java Timur	58,750	60,754	63,252	-	3.34	3.40	4.11	-
Banten	17,350	18,246	19,293	-	5.45	4.60	6.04	-

Source: Statistical Yearbook of Indonesia – 2004, June 2005

Among all the provinces of Indonesia, DKI Jakarta has the highest GRDP with about 16.6% of total 30 provinces at 2003 current prices. The second and third ranks were Java Timur (East Java) and Java Barat (West Java) with 14.9% and 13.7% of total 30 provinces, respectively.

2.4.3 Socioeconomic Framework

Socioeconomic growth parameters of Java Island applied in the future socioeconomic frameworks of the related studies of Java Arterial Road Network Study, JARNS 2001, Heavy Loaded Improvement Project II, HLIRP 2001 and the Feasibility Study on Yogyakarta – Solo – Kertsono Toll Road, F/S 2006 are reviewed in relation to the national and regional future growth rates. Applied growth of population shows the same rates of 1.12% to the year 2010 and 1.09 to the year 2020.

Economic growth rates are developed under the 3 scenarios of high, medium and low growth of GDP, in which the medium scenario is adopted in JARNS and HLIRP with slightly different rates. This scenario is the base of estimating the expenditures on roads in Java Island as a percentage of total roads expenditures and is utilized in the forecast process of future OD matrices of JARNS. The HLIRP adopted also the moderate scenario with a lower growth rate between 2005 and 2010.

The Feasibility Study on the project road applied adjustment factors to adjust the framework based on the recent economic performance and the realization of existing economic growth to reach the targets of the Government, as shown in Table 2.4-3. This adjusted scenario is applied in the demand forecast process of this study as the most newly developed scenario that reflects the latest developments in the Indonesian economy and meets the established economic development targets produced under the Infrastructure summit.

Table 2.4-3 Future Socioeconomic Growth Rates

Study	Area	2005 - 2010	2010 - 2015	2015 – 2020
HLIRP-F/S	Indonesia Population	1.33%	1.30%	1.30%
HLIRP-F/S	Java Island Population	1.12%	1.09%	1.09%
JARNS	Indonesia GDP – Moderate	5.40%	5.50%	5.60%
HLIRP	Indonesia GDP – Moderate	5.10%	5.50%	5.50%
HLIRP	Java Island GRDP – Moderate	3.78%	4.90%	5.34%
F/S	Indonesia GDP – Adjusted	6.60%	7.12%	7.12%
F/S	Java Island GRDP – Adjusted	6.34%	6.91%	6.91%

2.5 ROAD NETWORK DEVELOPMENT

2.5.1 Arterial Road Network Development

In 2001, a comprehensive study on the development Java Arterial Road Network (JARNS) was completed with the objectives of establishing a 20-year road network development plan that indicates the most economically feasible means of providing future capacity and access needs, and formulating a series of 5-year implementation plans indicating the forecast optimal timing of successive additions to and improvements of the network. The initial stimulus for the study derived from a number of different issues and concerns:

- The realization of the need for future road capacity expansion in Java
- The belief that there was a need for toll roads which would be provided through a high decree of private sector participation
- The absence of an overall road network development plan that would coordinate and prioritise government's investment programs in arterial road network capacity provision in Java Island, and
- The relative disarray in the planning and coordination of emerging a program for toll road schemes available to the private sector.

A Road Network Development Plan with staged Implementation Programs for the whole of Java Island were established for the strategic network that includes all inter-urban roads of strategic significance in Java for a period of 20 years.

Under the Main Trunk Network, the creation of a major "backbone" for the Java network has been formed as essential as a continuation of the strategy that has been pursued by several other programs, including the North Java corridor program. The overall objective here is to create a high-quality high-capacity route between the western and eastern ends of Java, connecting the major cities and provincial capitals and promoting the flow of long distance traffic through the economic heart of Java and Indonesia.

Identification of the future need for toll roads in Java and their staged development priorities was one of the original motivations of JARNS study. It was found that with the exception of a number or predominantly urban or urban-fringe toll road schemes, inter-urban traffic volumes are generally low to achieve financial viability roads based on traditional BOT schemes for private sector financing.

2.5.2 Toll Road Development

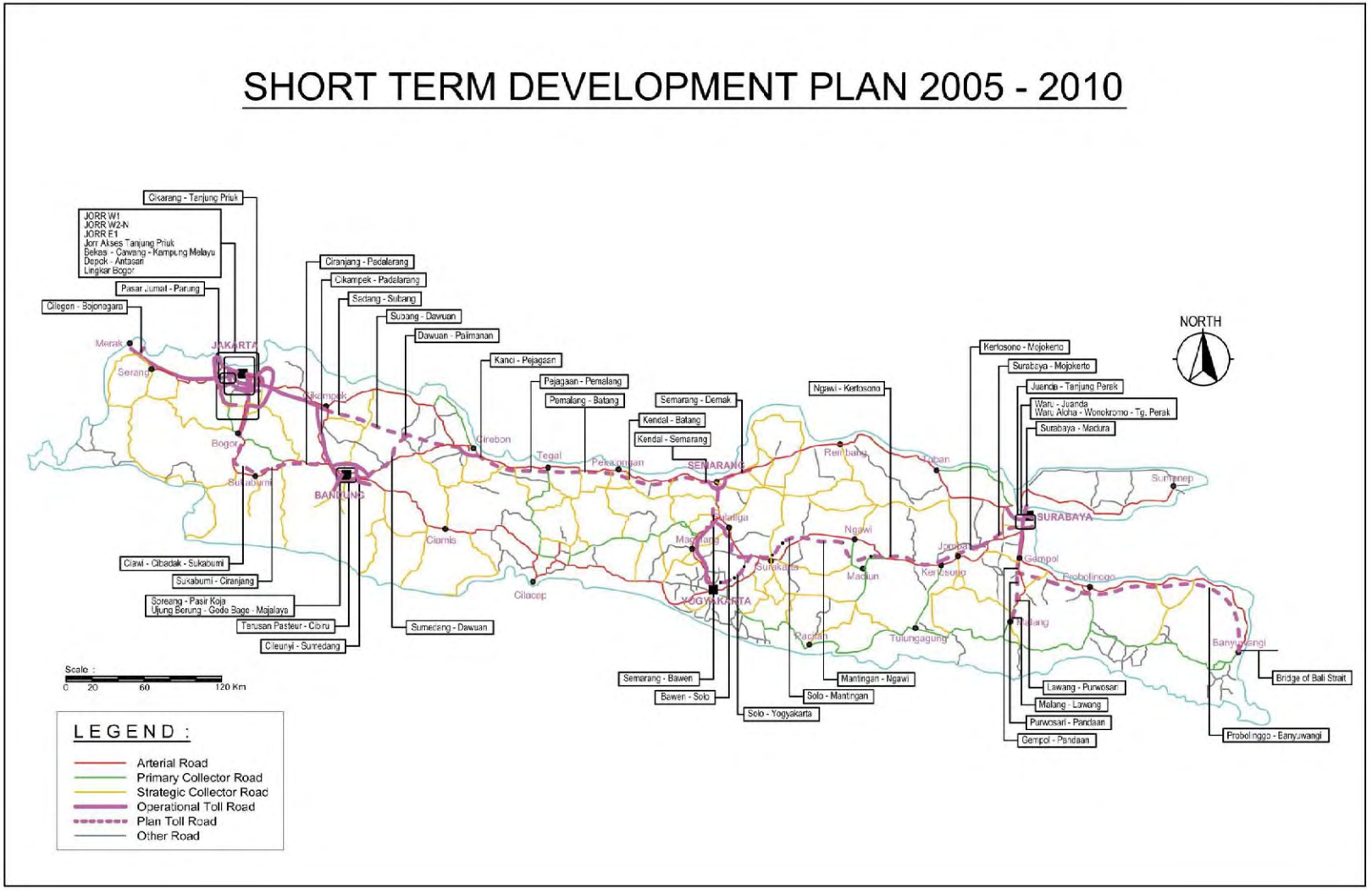
The urban development in Indonesia had been increasing ever since the First Five Year Development. This fact led to the increase of social and economic activities which caused high growth in traffic volumes. Arterial roads, which were to be used for long distance traffic had been confuse not only with collector roads but also local roads. These situations caused traffic congestion and obstruction for targeted growth in economic sectors.

Developing arterial road network requires a large amount of fund, while the national budget was very limited. Although the basic principal is that a public road is free-of-charge to use, the urgency of, and the insufficiency in the fund for, road network development necessitate the governments to adopt toll road systems. Collecting toll is justified by the beneficiary-pay principal for the new service provided by expressways as long as free alternatives exist. Figures 2.5-1 and 2.5-2 shows the short-term and long-term development plans of toll roads in Java Island

The first toll road built in Indonesia was the "Jagorawi Toll Road" with a length of 46 km linking Jakarta to the outer suburbs of Bogor and Ciawi in March 1978. The Government funded it through offshore loans and the issuance of Indonesia Highway Corporation (Jasa Marga) bonds. Having been founded to operate the toll road on March 1st, 1978 based on the Government Regulation No. 4 of 1978, later based on Presidential Decree no. 38 of 1981, PT Jasa Marga (Persero) was appointed to operate nine toll roads/bridges in Indonesia. At the end of 1980s, the Government invited the private sector to take part in the development of the toll road network through Build, Operate and Transfer (BOT) schemes. As of the beginning of 2006, 649.12 km of toll roads are in operation in Indonesia, of which and 165 km are managed by private operators.

In general, toll roads form part of the road infrastructure network. They were deemed to be implemented in a self-sufficient context without straining the Government's budget. In order to give further strength to that investment concept, the regulatory status of toll roads was alerted by the Road Law No. 38/2004. The government tends to finance future toll roads through both approaches of fully private funds and Public-Private Partnership (PPP) programs. In order to attract private sector, there are steps that are done or being considered by the Government:

- Strengthening the institutional and regulatory framework for toll roads
- Establishing the Indonesian Toll Road Authority (BPJT) which will be responsible for investment regulations on toll roads to replace Jasa Marga regulatory role



Source: Ministerial Decree 369, August 2005

Figure 2.5-1 Toll Roads Short-Term Plan

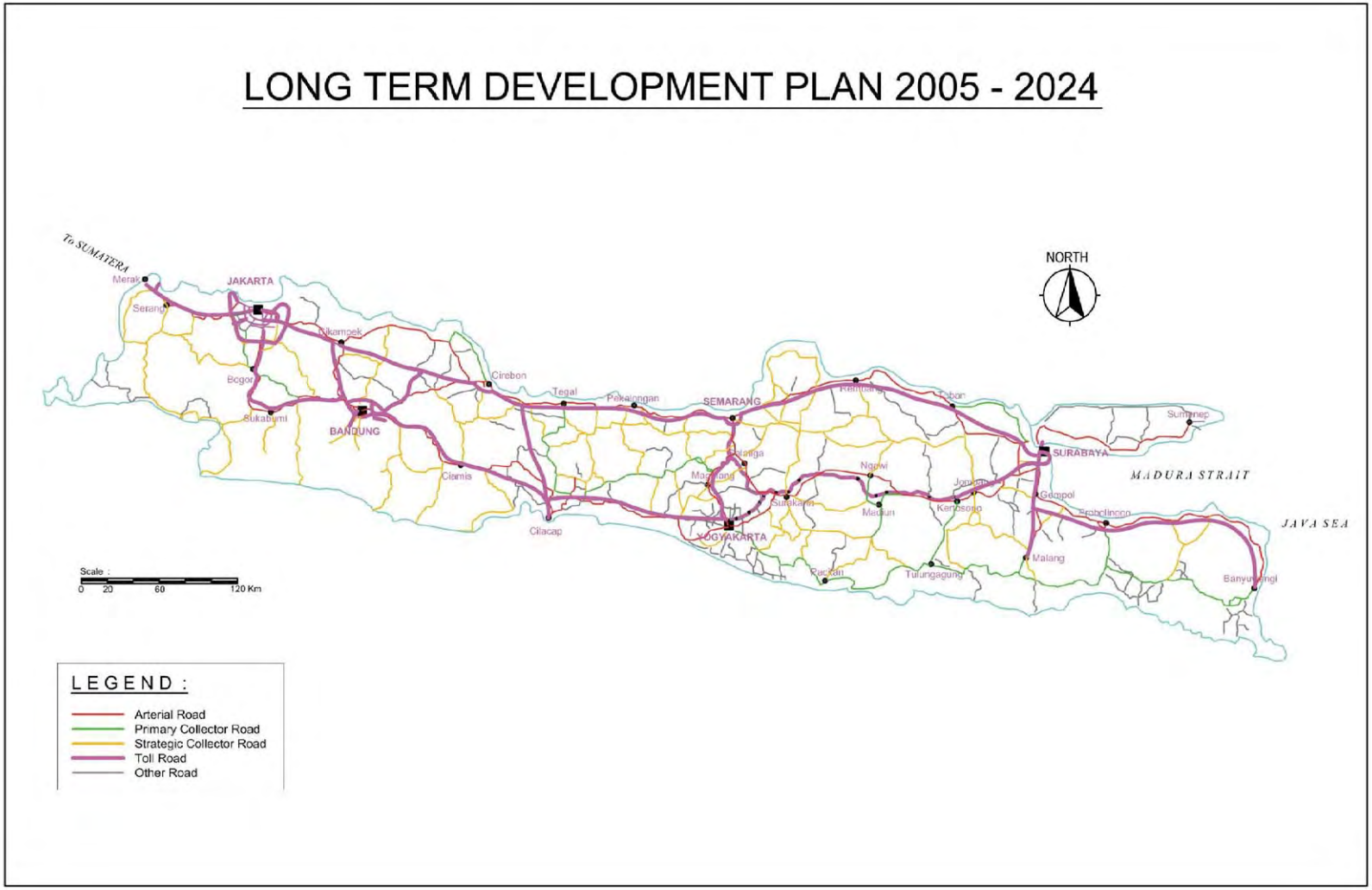


Figure 2.5-2 Toll Roads Long-Term Plan

・Formulating appropriate structure for the automatic adjustment of toll rates
・Applying transparent and competitive process
・Addressing issues on land acquisition and rights
・Establishing clear and sound policies to determine the proper conditions under which Government support should be extended
・Formulating a road master plan including toll road master plan

Article 43(2) of the Road Law No. 38/2004 gives the new policy of the Government regarding the development of toll roads, and the Government Regulation No. 15/2005 on toll roads, article 19-23 shows that for the toll road sections that indicate positive economical viability but not financially viable, the Government will finance or construct the respective toll road. After constructing the toll road, the Government will practice contract management for the operation and maintenance of the facility.

For toll road sections with indications for positive economic viability but marginal financial viability, they can be implemented by the Government and an enterprise in which finance and construction can be conducted through a partnership scheme. For toll roads having good economic and financial viability, they will be offered through open and transparent investment tender process.

The Road Law No. 38/2004 encompasses the following regulations:

Indonesian Toll Road Authority (BPJT)
・Indonesian Toll Road Authority (BPJT) established by, and is responsible to the Minister of Public Works.
・The Authority includes participants from the Government, stakeholders and the public.
・BPJT's basic responsibilities encompass the implementation of regulations and the supervision of toll road operators in accordance with the policies and regulations specified in Law No. 38 of 2004 and Government Regulation No. 15 of 2005.
・Major tasks to be carried out by the Government/BPJT include: project preparation, invitation to pre-qualification (PQ & bidding), pre-bid conference, evaluation of bids, appointment of successful bidder, contract signing and contract implantation.

Toll Rates
・Initial toll rates and subsequent toll rate adjustments are proposed by the investor through BPJT and approved by the Minister of Public Works.
・The rates are calculated by taking into consideration the willingness-to-pay of toll road users, savings in vehicle operating cost and the feasibility of the investment.
・Tariffs are regulated under a toll road authorization agreement; however, their

application is subject to the official announcement of the toll road operation.
- Tariffs are subject to be reviewed and adjusted every two years with a coefficient based on the inflation rate.

Land Acquisition
- The Government is responsible for the acquisition of land through the Ministry of Public Works.
- Land Acquisition is funded either by the Government, State Owned Company or Private Sector.
- The budget for land acquisition is determined by the Government.
- The toll road and the land on which it is built are the property of the Government.
- In case of land acquisition funds emanating from private parties if the cost exceeds the approved budget, the shortfall will be compensated by an adjustment of the concession or through other acceptable methods.

To cope with the problem of land speculation that has caused project-cost inflation and uncertainty, it is expected that the Government will issue a regulation banning the use of land designated for turnpike projects for other purposes. With this regulation, land that has been earmarked for turnpike projects can not be sold except to the local government at a price that is slightly higher than the market value. This will be a part of the Government's efforts to encourage investors to participate in future toll road projects and to reduce the length of the land acquisition process.

2.5.3 Indonesia Highway Corporation

On March 1978, Indonesia Highway Corporation, PT Jasa Marga (Persero), was established to operate the first section of toll roads in Indonesia. It was established as a state-owned corporation whose business includes the construction, management and maintenance of toll roads based on the Government's Rules No. 4 and the Decision of the Minister of Finance of No. 90/KMK.06/1978, about the capital of PT Jasa Marga (Persero), dated February 27, 1978. The official document for establishment had been legalized by The Minister of Justice by the Decision No.YA5/130/I, dated February 22, 1982. It had been registered at the Office of the Court of First Instance in Jakarta No. 767 dated March 2, 1982 and had been announced in the State News of The Republic of Indonesia, No. 73 dated September 10, 1982, addition number 1138.

March 9, 1978, the operation of first Toll Road in Indonesia was officially opened, called Jagorawi Toll Road that covers Cawang-Cibinong for about 27 km. This Toll road was operated right after it was officially opened. Until 1987, Jasa Marga was the only toll road operator in Indonesia. As of the beginning of 2006, a total of 649.12 km

of toll roads, or 74.6% of the whole toll roads in Indonesia, are operated by Jasa Marga. At present, there are private sector operators who manage a total of about 165 of toll roads under BOT schemes.

With the establishment of BPJT that have the responsibilities of the implementation of regulations and the supervision of toll road operators and the new roles of the Directorate General of Highways (Bina Marga), the role of Indonesia Highway Corporation became as an operator for toll roads. For private sector finance project, Bina Marga activities include the preparation of business plans, technical and environmental feasibility studies, detailed engineering design, construction development, routine and periodic maintenance and traffic operation services.

At present, Jasa Marga is offering bonds and after several delays caused by regulatory uncertainties, it is expected that it will go public via an initial public offering and will sell some of its stock to raise funds required to finance new toll road projects.

2.6 TRANS JAVA TOLL ROAD

The Study Road between Yogyakarta and Kertsono is a part of Trans Java Toll Road which connects Merak to the west with Surabaya to the east, with a total length of 863.7 km, of connecting the centres of social and economic activities in Java Island. This road, which was called Pantura Road, has been pioneered in 1660s as the first version of Trans Java Road to connect Banten in west Java with Banyuwangi in the east with a length of 1400 km. Until now the road condition is far from satisfactory with only small sections that served by toll road and most parts are still marked as bad condition road.

The Trans Java Toll Road is essential for Java Island from the social, economic and commercial points of view. It is the artery of land transportation in the island used by 50-70 thousand units of vehicles every day and more important than rail and sea transport. Figure 2.6-1 shows the major national activity centres in Java Island that are served by Trans Java Toll Road. Figure 2.6-2 shows the status of each section of Trans Java Toll Roads as of the beginning of 2006.

Trans Java Toll Road has been a dream for decades. A notable connection between Jakarta and West Tangirang, as a segment of the road, was completed in 1984. In East Java, another segment was completed in 1986, connecting Surabaya and Gempol. Jakarta Cikampek Toll Road, going eastward from Jakarta, was completed in 1988 to be a busy road along the northern coast of Java.

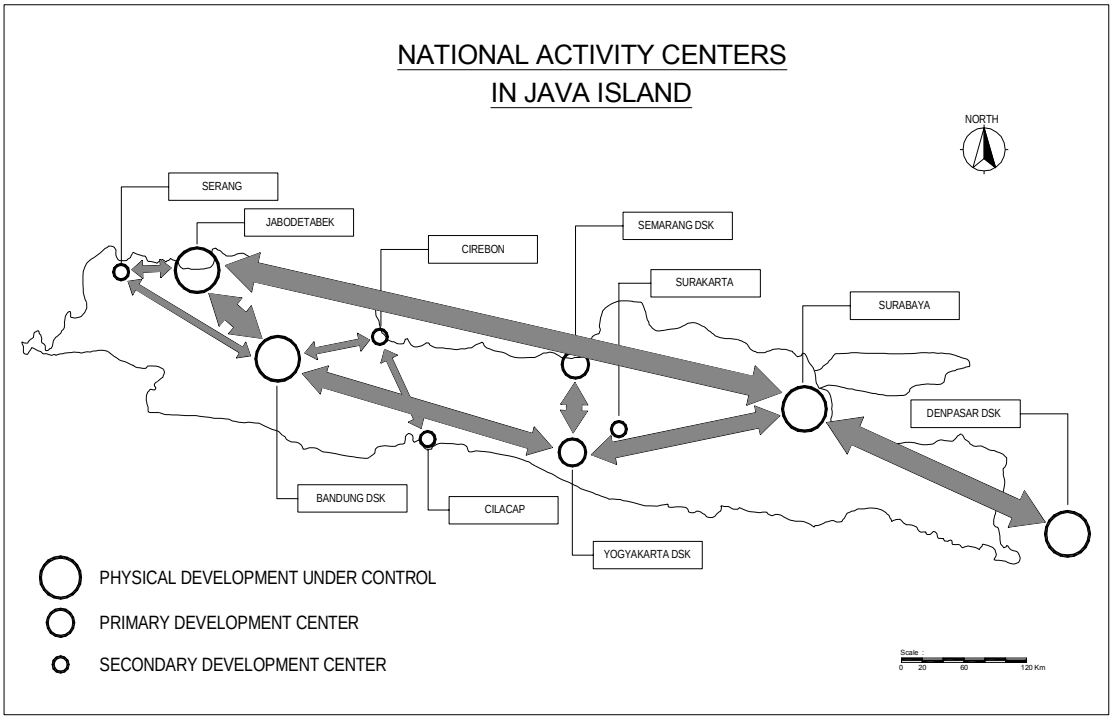


Figure 2.6-1 National Activity Centres in Java Island

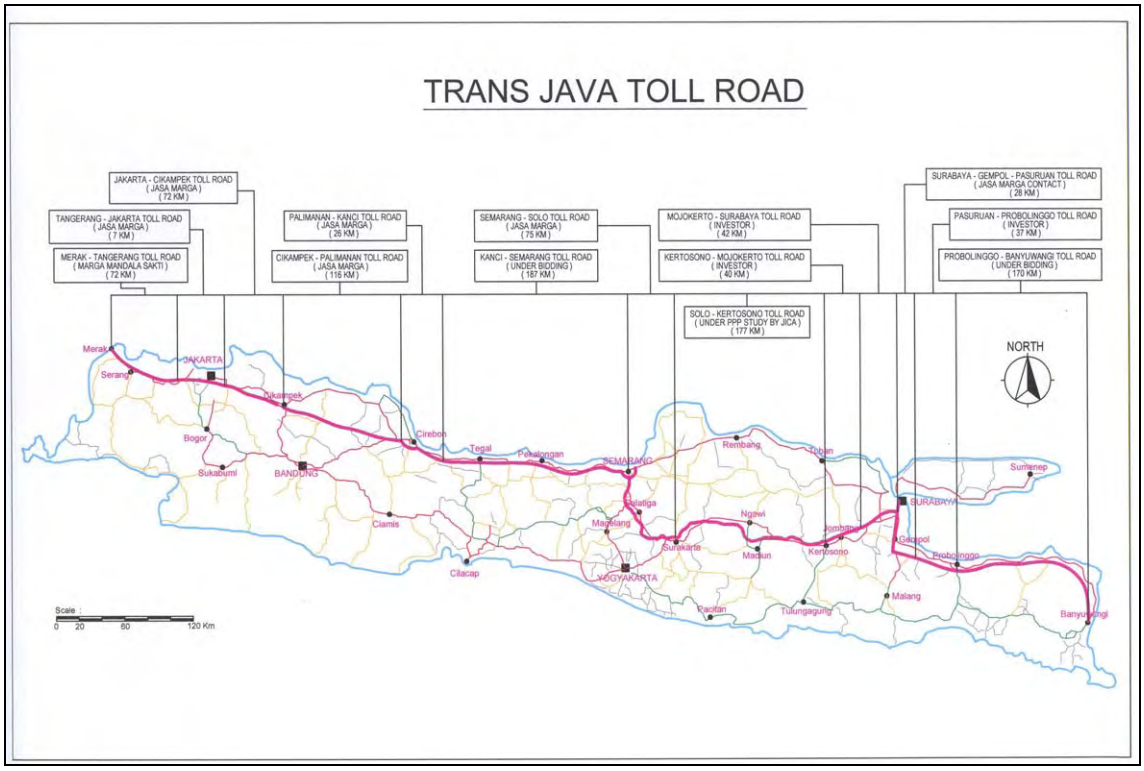


Figure 2.6-2 Trans Java Toll Road Development Plan

2.7 MAJOR COMPONENTS OF THE PROJECT

Tasks of the project under this study involve all the works required for the new construction of a toll road facility between Yogyakarta and Kertosono with a total length of 219.018 kilometres. The Study Road is divided into 12 segments between interchanges with the lengths shown in Table 2.7-1. It contains 13 interchanges and one junction at its connection with Semarang – Kartosuro section of Trans Java Toll Road. The road is planned to be constructed as divided with two lanes in each direction that will require a right of way of 60 – 70 meters. During the feasibility study stage, it was basically divided into the following four sections:

Section I: Ygyakarta – Surakarta (Solo)

Yogyakarta is characterised as a student and tourism city that is always busy with domestic and foreign tourism. More than the cultural heritage, the city has beautiful natural panorama. The existing road between the two cities, passing through 4 districts with high agricultural productivity, was widened to 2 lanes in each direction; however, the road is still characterized by traffic congestions due to the high traffic volumes and traffic friction at built-up areas. In line with the increase of economic activities in the area, the new toll road connection between the two cities is required.

Section II: Surakarta (Solo) – Mantingan

Surakarta is one of the big cities in Central Java and is the centre of trade, industry and other services in the region. The limited-capacity road network in this heavily built-up area with concentration of population density is handling high traffic volumes of heavy vehicles that transport heavy commodity vehicles.

Section III: Mantingan – Ngawi

Ngawi, neighboring with Kapupaten Sragen, is expected to practice rapid development in the near future. With Mantigan, being a growth center in the district, traffic volumes are rapidly growing. Meanwhile, the capacities of the existing road networks, which need improvement works, can not be well operated as distributed by mixed traffic and heavy side friction.

Table 2.7-1 Length of Study Road Segments

Interchange		Yogyakarta	Prambanan	Klaten	Delanggu	Kartosuro (Junction-I/C)	
Kilometer	0+000	3+413	8+423	20+626	32+274	39+791	41+900
Length, km	3.413	5.010	12.203	11.648	7.517	2.109	

Interchange	Kartosuro (I/C)	Solo	Karanganyar	Sragen	Ngawi	Madiun	Caruban	Nganujuk	Kertosono
Kilometer	41+900/0+000	11+338	21+787	35+543	86+297	109+782	118+320	153+925	177+118
Length, km	11.338	10.449	13.756	50.754	23.485	8.538	35.605	23.193	

Section IV: Mantingan - Kertosono

The corridor in this area region consists of built up and densely populated areas and traffic is characterized with large volumes of heavy-duty vehicles transporting natural products like oil, oil palms, tea and rubber destined for Kertosono.

To realize the Project, major tasks which are expected to be carried out by either the Government or private sector based on the formulated work sharing program can be setup as follows:

- Fund Arrangement: based on the formulated PPP scheme and the sharing in the financial responsibilities between both the Government and PPP entities of the private sector, arrangements should be done to secure both public and private funds for different steps of project implementation
- Selection of Consultant: with the utilization of public funds under the PPP scheme, consultants should be selected under the Governmental roles and those of the financing agencies involved in providing funds for the Government.
- Detailed Engineering Design: Due to the large volume and nature of works of the Project, which composes of the construction of a large number of structures including interchanges and bridges as well as the construction of the toll road carriageway, the Project should be divided into several packages, to be designed and implemented simultaneously.
- Land Acquisition: as this task composes a high risk toward the implementation of the project on schedule and it usually requires long time to finalize, it should be started at earliest possible stages.
- Environmental Impact Assessment: although high negative environmental impacts are not expected, acquiring environmental clearance based on EIA with mitigating measures for any expected impacts is necessary for such large-scale project.
- Tender Documents: The ordinary procedure for the tendering stage is to be conducted after the completion of the detailed engineering design stage which includes the preparation of the tender documents; however, with the adoption of a PPP scheme, early tendering stage is required to select the private sector partner that will handle designated tasks under the scheme. This task includes the sub-tasks of: Advertisement - Prequalification - Bidding – Contracting.
- Construction: based on the source of utilized funds and the contracting agreement, construction activities are defined under the work sharing concept. With the limited time-frame for construction, the issue of land acquisition should be completely cleared in advance.
- Operation and Maintenance: are the two tasks that are completely carried out by the private sector partner under any of the proposed PPP schemes of the Study.

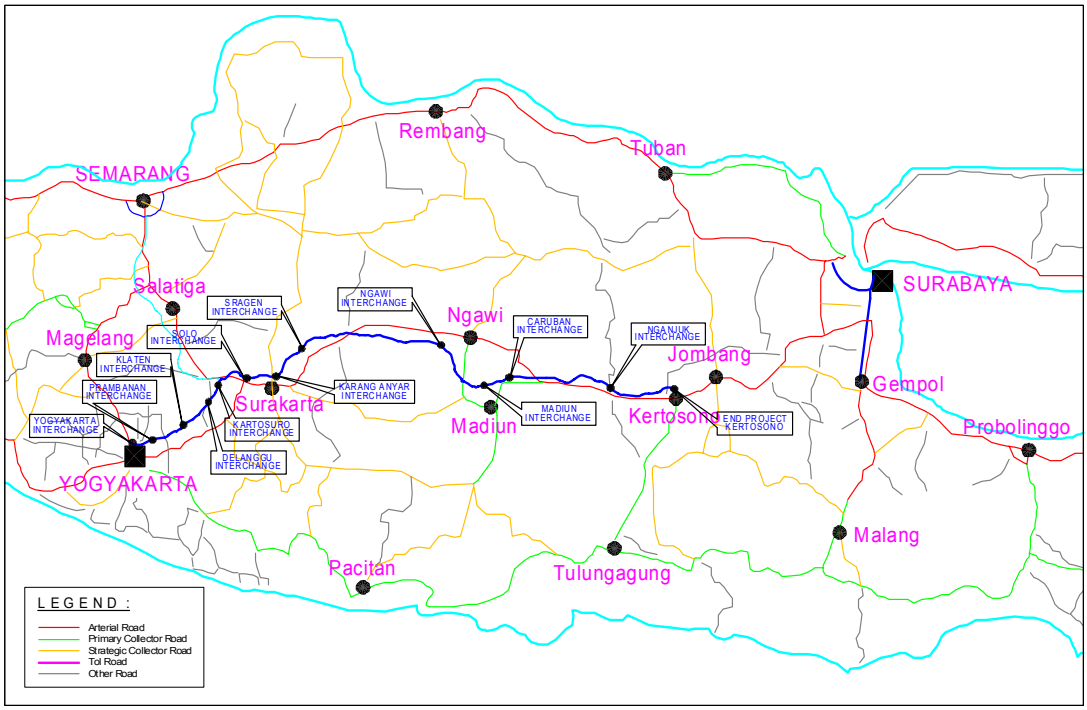


Figure 2.7-1 Yogyakarta – Solo – Kertosono Toll Road

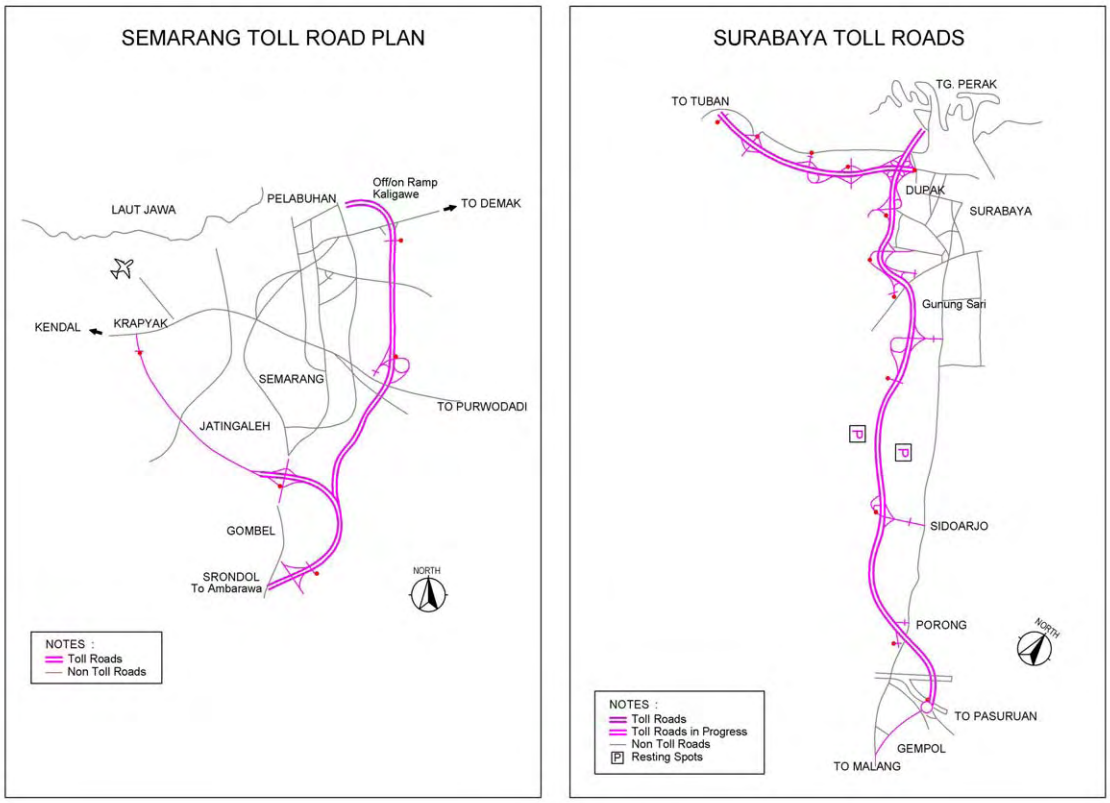


Figure 2.7-2 Semarang and Surabaya Toll Road Connections

2.8 EFFECTS OF TOLL ROAD PROJECT

Fully access control roads, such as the Toll Road Project, have various and far reaching effects on a variety of economic sectors and individuals as well, not only on their areas of construction but also on other parts of the whole region or country. Socioeconomic effects gained by the construction of fully access control roads can be usually classified in two major categories; direct effects and indirect effects. Direct effects are those benefits which road users directly receive by using the road as savings in travel time and cost and can be basically evaluated on monetary basis to some extent, while the indirect effects that are mostly represented as regional and national development effects.

Since Indonesia aims to further nationwide and regional development, greater focus should be placed on the regional development, or indirect, effects rather than the direct effect and the profitability of applying toll on the road. Regional development will bring a variety of benefits to the whole nation, and if adequate policies and investment schemes accompany road development, regional development can be set efficiently and equitably.

2.8.1 Direct Effects

1) Savings in Travel Time: This is the most important effect of the new road gained through the reduction in trip distance and time due to its higher speed and level-of-service compared with other ordinary roads.
2) Savings in Vehicle Operating Cost: Contribution to energy savings including fuel and lubricant consumption as well as other savings in vehicle tyres, parts, maintenance and capital consumption provide benefits on individual base as well as on national level.
3) Improvement in Traffic safety: Higher safety for road traffic is a major benefit to the road users as well as to the whole society. This benefit can be partially expressed in monetary basis; however, the social impact has more effect.
4) More comfortable and safe driving: With the high level-of-service facility and non-interrupted traffic, it is expected that travel on the road will be more comfortable and safe for road users with reduced driver's fatigue and other related effects.
5) Decreasing congestion on ordinary roads: This benefit is not for the users of the new facility but for drivers on the existing ordinary roads. By diverting a portion of the traffic volume from ordinary roads to the new high level-of-service facility, it is expected that congestions on the ordinary roads will be alleviated. In addition, as new road facilities have the bypass function at built-up areas, through traffic

moves outside centre of cities and towns along the road.

6) Improvement in punctuality: Toll roads with access control enable punctual arrival at destinations, which help production centres to perform detailed scheduling of transport for products and efficient logistic systems for different activities distributed between different locations.
7) Betterment of environment: The better energy efficiency of vehicles on high level-of-service roads will lead to reducing emission of exhausted gases and improvement in air quality. In addition, less traffic on ordinary roads at city centres and populated areas will result in better urban environment.
8) Promotion of mobility (long-distance bus service): With toll roads that provide higher travel speeds than ordinary roads, inter-urban high-speed bus services can be provided for long-distance public transport trips in shorter travel times.

2.8.2 Regional Effects

1) Betterment of nationwide development: Promotion of economic activities in rural and local, including; industry, manufacturing, agriculture, tourism and commercial activities, is an important task in the national development planning process. The toll road plays an important role toward this end, which will result redistributing excess agglomerated activities in metropolitan areas. This will consequently result in creating demand by road investments, higher productivity, betterment of economic activities distribution, increase in tax revenues, increase in exports, increase in population and income in rural areas and enhanced national identity.
2) Improvement in living conditions: Better road infrastructure facilities will result in widening life and employment opportunities, providing region-wide services such as medical care and education as well as efficient recovery systems in case of natural disasters.

CHAPTER 3

TRAFFIC SURVEY AND DEMAND FORECAST

CHAPTER 3

TRAFFIC SURVEY AND DEMAND FORECAST

3.1 OBJECTIVES

The purpose of this chapter is to review the future traffic volume of the F/S conducted for the study section by GOI in February of 2006 in order to ensure the precision of PPP scheme study. The following tasks were carried out for the review.

- Conducting traffic surveys including traffic volume count survey, road side OD survey and willingness-to-pay (WTP) survey.
- Collecting and reviewing the trends of the past traffic volume and growth, and the present toll rates of the existing toll roads to support the traffic analysis in interpretation of its results and setting the socially acceptable level of toll rate.
- Reviewing procedure and factors for traffic demand forecast used in the F/S to identify the issues for this study.
- Forecasting future traffic demand and assignment with JICA STRADA.

3.2 TRAFFIC SURVEY

3.2.1 Survey Method

Traffic survey was conducted on both May 2 (Tuesday) and May 3 (Wednesday) of 2006, which consists of the following surveys;

(1) Traffic Volume Count Survey for 24-hour and 12-hour

- Survey Location: Eight (8) locations for each as shown in Figure 3.2-1 that are near the locations where the survey was conducted in the F/S.
- Survey Time: 6:00 AM to 6:00 AM of the next day for 24-hour.
  6:00 AM to 6:00 PM for 12-hour.
- Survey Method Manual count by direction and vehicle type, data of which was recorded at every 15 minutes.

(2) Roadside Origin and Destination (OD) Interview Survey for 12-hour.

- Survey Location: Eight (8) locations shown in Figure 3.2-1.
- Survey Time: 6:00 AM to 6:00 AM
- Survey Method: Around 20% out of the traffic were stopped at random, drivers being interviewed.

(3) Willingness-To-Pay (WTP) Survey

- Survey Location: Eight (8) locations including gas stations.
- Survey Time: 6:00 AM to 6:00 AM
- Survey Method: Interview with vehicle owners.
- Survey Format: Some examples shown in Table 3.2-1. Note that in order to avoid the bias of individuals, five (5) kinds of questionnaire sheets with various toll rates were prepared - one sheet is for one interviewee.

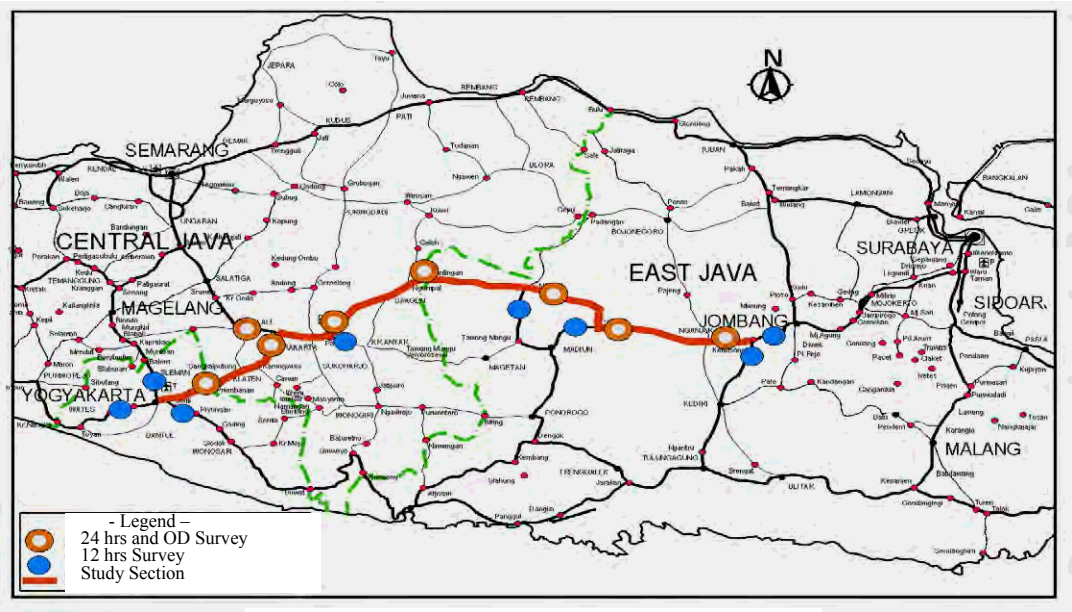
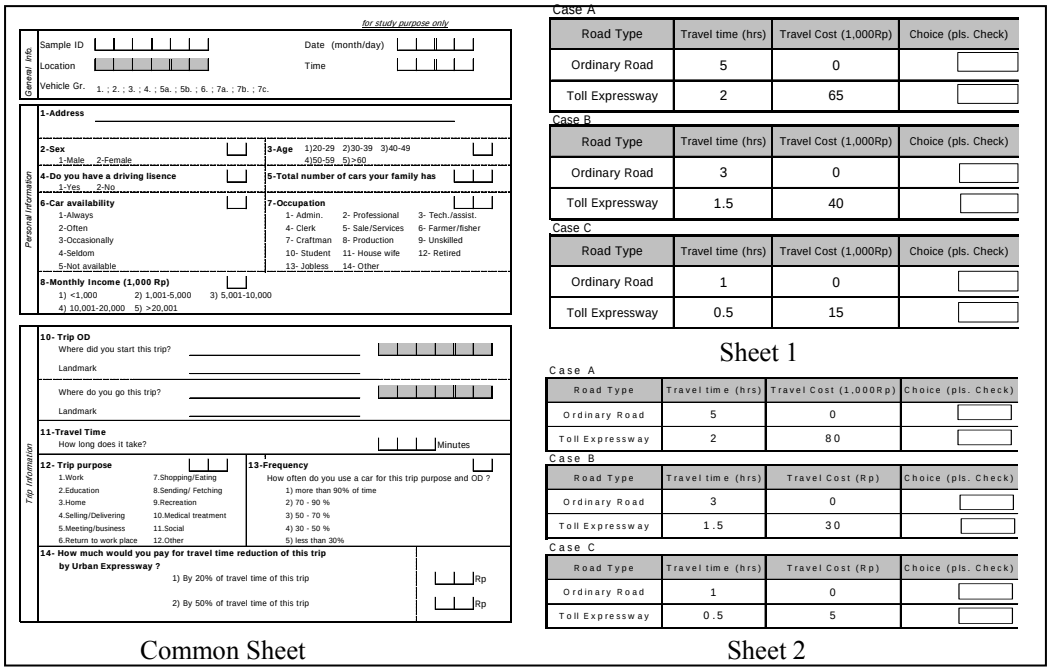


Figure 3.2-1 Traffic Survey Location Map

Table 3.2-1 Questionnaire Sheets (Sample) for WTP Survey



for study purpose only

General Info.
Sample ID
Location
Vehicle Gr. 1. ; 2. ; 3. ; 4. ; 5a. ; 5b. ; 6. ; 7a. ; 7b. ; 7c.
Date (month/day)
Time

Personal Information
1-Address
2-Sex 1-Male 2-Female
3-Age 1)20-29 2)30-39 3)40-49 4)50-59 5)>60
4-Do you have a driving lisence 1-Yes 2-No
5-Total number of cars your family has
6-Car availability 1-Always 2-Often 3-Occasionally 4-Seldom 5-Not available
7-Occupation 1- Admin. 2- Professional 3- Tech./assist. 4- Clerk 5- Sale/Services 6- Farmer/fisher 7- Craftman 8- Production 9- Unskilled 10- Student 11- House wife 12- Retired 13- Jobless 14- Other
8-Monthly Income (1,000 Rp) 1) <1,000 2) 1,001-5,000 3) 5,001-10,000 4) 10,001-20,000 5) >20,001

Trip Information
10- Trip OD
Where did you start this trip?
Landmark
Where do you go this trip?
Landmark
11-Travel Time
How long does it take? Minutes
12- Trip purpose 1.Work 2.Education 3.Home 4.Selling/Delivering 5.Meeting/business 6.Return to work place 7.Shopping/Eating 8.Sending/ Fetching 9.Recreation 10.Medical treatment 11.Social 12.Other
13-Frequency How often do you use a car for this trip purpose and OD ? 1) more than 90% of time 2) 70 - 90 % 3) 50 - 70 % 4) 30 - 50 % 5) less than 30%
14- How much would you pay for travel time reduction of this trip by Urban Expressway ?
1) By 20% of travel time of this trip Rp
2) By 50% of travel time of this trip Rp

Common Sheet

Case A

Road Type	Travel time (hrs)	Travel Cost (1,000Rp)	Choice (pls. Check)
Ordinary Road	5	0	
Toll Expressway	2	65	

Case B

Road Type	Travel time (hrs)	Travel Cost (1,000Rp)	Choice (pls. Check)
Ordinary Road	3	0	
Toll Expressway	1.5	40	

Case C

Road Type	Travel time (hrs)	Travel Cost (1,000Rp)	Choice (pls. Check)
Ordinary Road	1	0	
Toll Expressway	0.5	15	

Sheet 1

Case A

Road Type	Travel time (hrs)	Travel Cost (1,000Rp)	Choice (pls. Check)
Ordinary Road	5	0	
Toll Expressway	2	80	

Case B

Road Type	Travel time (hrs)	Travel Cost (Rp)	Choice (pls. Check)
Ordinary Road	3	0	
Toll Expressway	1.5	30	

Case C

Road Type	Travel time (hrs)	Travel Cost (Rp)	Choice (pls. Check)
Ordinary Road	1	0	
Toll Expressway	0.5	5	

Sheet 2

3.2.2 Results of Traffic Survey

(1) Grouping of Vehicles

There are ten (10) types of vehicles surveyed in the study. They can be categorized into three (3) groups following regulation in Indonesia except for such small vehicles as motorcycles, etc. which are usually not allowed to use toll roads.

Grouping of Vehicles is as follows (refer to Figure 3.2-2):

Group-I

- Utility (sedan, jeep, etc.), Small public and cargo transport (oplet, pick-up, micro truck, small bus, etc.).

Group-IIA

- Big bus, Truck with 2-axle

Group-IIB

- Truck with 3-axle or more

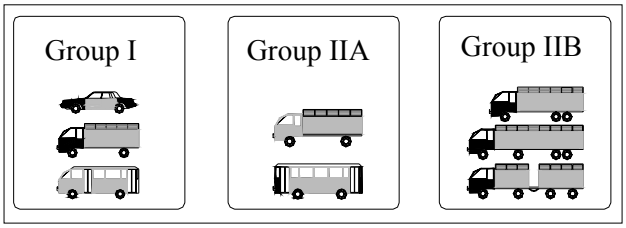


Figure 3.2-2 Grouping of Vehicles

(2) Traffic Volume along the Study Section and Its Interpretation

The result of traffic volume count survey is shown in Table 3.2-2 and Figure 3.2-3 with comparing to the F/S. The result has the following tendency.

- Traffic volume counted in the study is smaller than that in the F/S. Difference in total traffic volume between them is 10 to 30%.

The tendency of difference in traffic volume between both surveys is interpreted as follows.

- Seasonal fluctuation as shown in Table 3.2-3
  --The study's survey was in early May of 2006, the F/S's survey in September of 2005. While traffic volume in April and May when the study's survey was conducted is constantly smaller than in other months, traffic volume in September is larger than in other months
- Influence of gasoline price hike as shown in Table 3.2-3
  --Gasoline price has been almost double since November of 2005; the F/S's survey and the study's survey conducted before and after gasoline price hike, respectively.
  --According to the table, traffic volume in 2006 is almost the same as that in 2004.

Since seasonal factor for traffic on toll roads has been prepared, average annual traffic volume may be estimated to be smaller than that of the F/S but larger than that of the

study. As for the influence of gasoline price hike, decrease of the traffic volume is considered to be temporary phenomenon according to Figure 3.2-4, which shows the past trend of the traffic growth after/before Asian Monetary Crisis in 1998. In several years after 1998, the traffic growth has tendency to get back on the past growth trend line. These trends seem to be true of the traffic on the arterial road where the traffic survey was conducted.

Table 3.2-2 Traffic Volume on the Study Section

Section		Grp-I		Grp-IIA		Grp-IIB		Total	
		F/S	Study	F/S	Study	F/S	Study	F/S	Study
Yogya-Solo	Yogya-Prambanan	34,498	-	3,024	-	703	-	38,225	-
	Prambanan-Klaten	21,074	17,570	2,481	683	1,024	201	24,579	18,454
	Klaten-Delanggu	21,807	-	2,105	-	1,074	-	24,986	-
	Delanggu-Kartosuro	19,158	17,670	2,111	923	1,113	239	22,382	18,832
Solo-Mantingan	Solo-Sragen	14,869	13,584	3,753	1,463	1,538	443	20,160	15,490
	Sragen-Mantingan	9,961	7,424	1,690	1,517	1,214	641	12,865	9,582
Mantingan-Ngawi	Mantingan-Ngawi	9,399	-	1,620	-	1,183	-	12,202	-
Ngawi-Kertosono	Ngawi-Maospati(S)	N.A.	6,327	N.A.	789	N.A.	656	8,591	7,772
	Maospati-Madiun(S)	10,894	-	880	-	319	-	12,093	-
	Madiun-Caruban(S)	9,457	9,214	1,303	683	584	106	11,344	10,003
	Ngawi-Caruban(N)	7,609	-	865	-	1,109	-	9,582	-
	Caruban-Nganjuk	12,599	9,694	1,909	1,229	1,462	529	15,970	11,452
	Nganjuk-Kertosono	10,766	10,250	1,701	815	1,050	611	13,517	11,676
Remarks	Note: Group-I=Sedan,Jeep,Kijang,Taxi, Small/Medium Bus, Pick-up,Truck(3/4ton),) Group-IIA=Large(55 seats),Truck(2xle) Group-IIB = 3axle, Trailer (S): south route, (N): north route, F/S: September of 2005, Study: May of 2006								

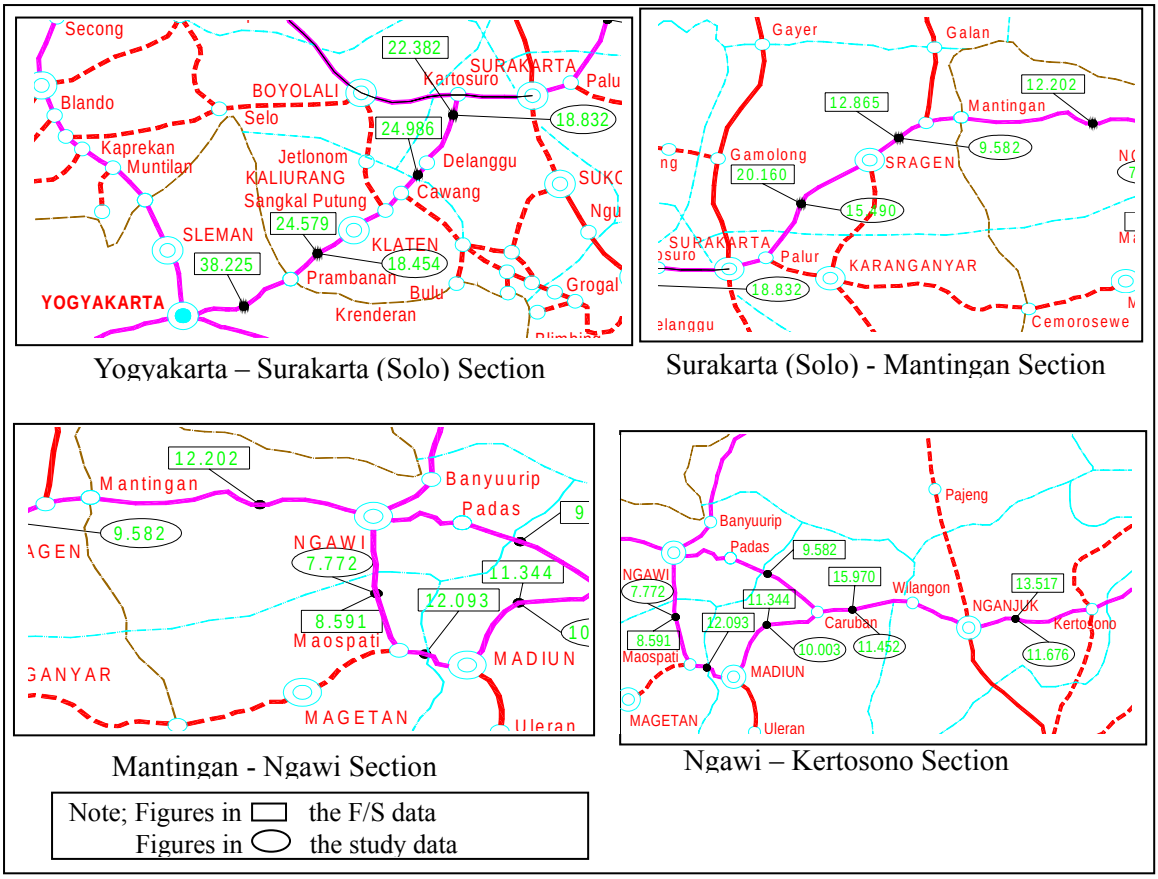


Figure 3.2-3 Traffic Volume at Each Location

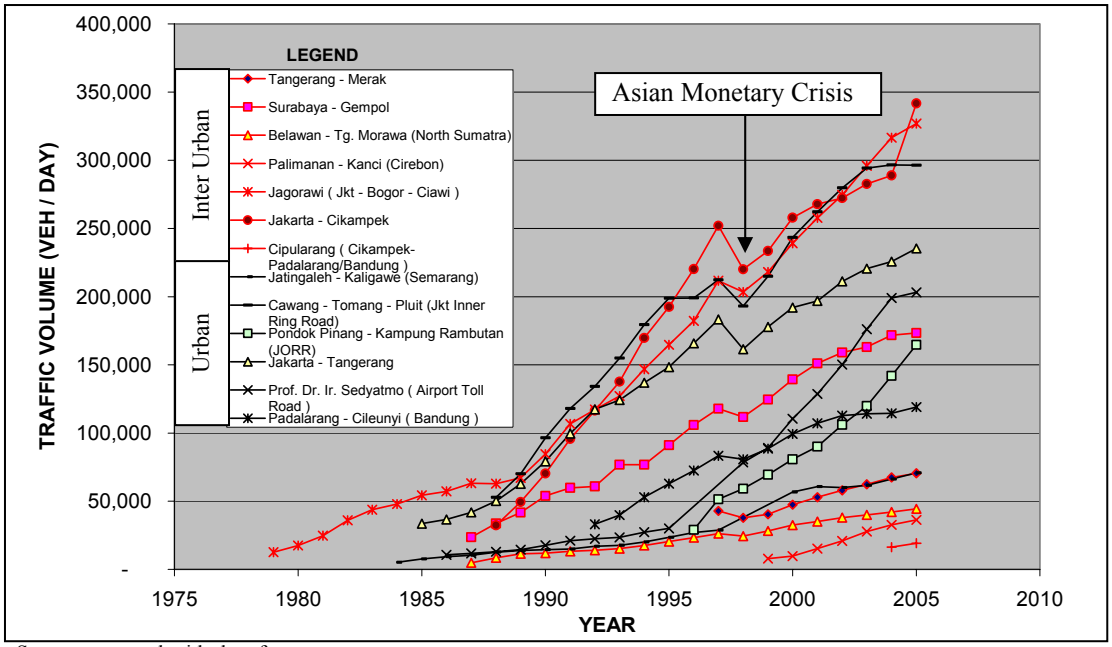
Table 3.2-3 Traffic Volume on Tangelan-Merak Toll Road

Month	Year			
	2003	2004	2005	2006
January	1,880,277	1,978,276	2,093,880	**1,980,662**
February	1,651,493	1,796,862	1,921,849	**1,818,531**
March	1,831,481	1,946,006	2,121,884	**1,993,091**
April	1,758,192	1,844,930	2,048,320	**1,927,233**
May	1,858,637	1,981,066	2,148,405	
June	1,860,102	2,013,991	2,156,877	
July	2,004,239	2,129,871	2,310,138	-
August	1,912,491	2,101,240	2,270,167	-
September	1,894,286	2,068,690	2,244,444	-
October	2,029,482	2,161,946	2,066,010	-
November	1,842,182	2,072,564	**1,881,388**	
December	1,967,800	2,199,801	**2,058,476**	-
Total	22,490,662	24,295,243	25,321,838	7,719,517
Average	1,874,222	2,024,604	2,114,479	1,929,879
Remarks	Gasoline Price 2,400 Rp/l before and 4,500 Rp/l after October of 2005			

Traffic survey conducted in the F/S

Gasoline Price hike

Source: PT. MARGA MANDASAKTI, May 2006



Source: prepared with data from MPW, May 2006

Figure 3.2-4 Traffic Growth of Toll Roads

(3) Roadside OD Survey

OD survey data were used for revising OD table established in the study conducted in October of 2001 by the IBRD – "FINAL REPORT OF JAVA ARTERIAL NETWORK STUDY (JARNS)". The OD table was not prepared in the F/S, as the F/S forecasted the future traffic volume on the toll road by using a theoretical method, the method of

which doesn't require road network in the study regions.

(4) Willingness - To - Pay (WTP) Survey

The main purpose of WTP survey is to reflect its data to prediction of diversion rate. An example of simplified summary table of WTP survey result is shown below for reference (Table 3.2-4).

Table 3.2-4 Part of Summary Table of WTP Survey Result

No. Sample	Time Difference x 60	Toll Ratex1000	Toll Rate/Time difference
1	2	30	250
	1.5	20	222
	0.5	10	333
2	2	30	250
	1.5	20	222
	0.5	5	167
3	2	40	333
	1.5	40	444
	0.5	5	167
4	2	30	250
	1.5	20	222
	0.5	5	167
5	2	30	250
	1.5	20	222
	0.5	5	167
6	2	30	250
	1.5	20	222
	0.5	5	167
7	2	30	250
	1.5	20	222
	0.5	5	167
8	2	30	250
	1.5	30	333
	0.5	5	167
9	2	40	333
	1.5	30	333
	0.5	10	333
10	2	30	250
	1.5	20	222
	0.5	5	167
11	2	30	250
	1.5	20	222
	0.5	10	333
12	2	30	250
	1.5	20	222
	0.5	5	167
13	2	30	250
	1.5	20	222
	0.5	10	333

Note: total number of samples is 1,610.

3.3 DEMAND FORECAST

3.3.1 Basic Policy

In the study the demand forecast of the F/S was reviewed following the procedure below.

- Present and future OD matrix tables of the IBRD study- "FINAL REPORT OF JAVA ARTERIAL NETWORK STUDY (JARNS), 2001"- were utilized as the basis of the study.
- Since OD table of the IBRD study covers entire Java Island, the scale of which was simplified focusing on the regions where the study section is located.
- The present OD table was revised based on the roadside OD survey results conducted by the study. As for the present traffic volume, adjustment was made targeting around traffic volume obtained from both the F/S and the study from the reasons described in Section 3.2.2(2).

3.3.2 OD Zoning System

OD zoning system applied in the study is shown in Figure 3.3-1 and in Appendix 3-1.

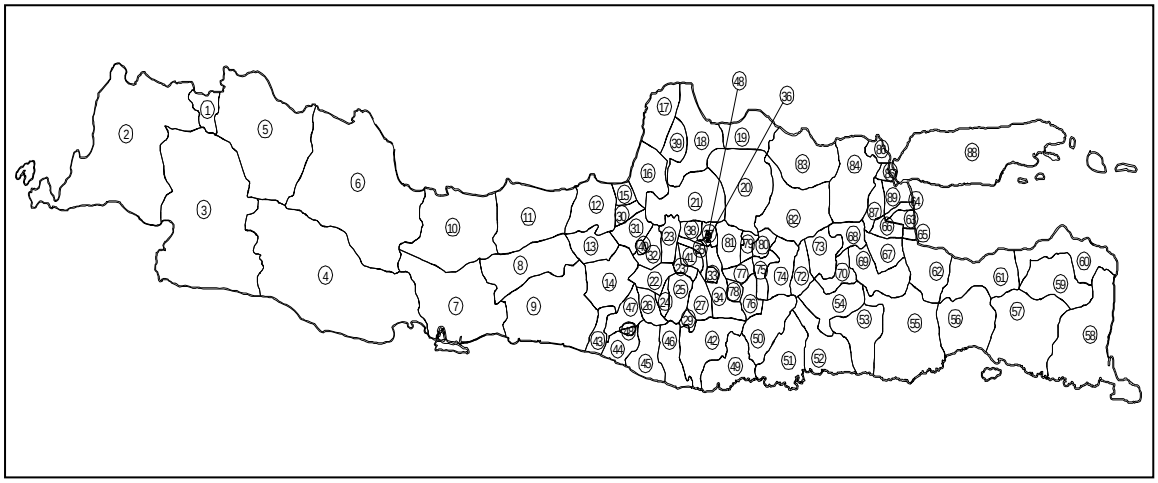


Figure 3.3-1 Study Area Zone Plan

3.3.3 Present and Future Trip Pattern

Figure 3.3-2 shows that high trip growth is expected in the future due to the rapid socio-economic development in Java Island.

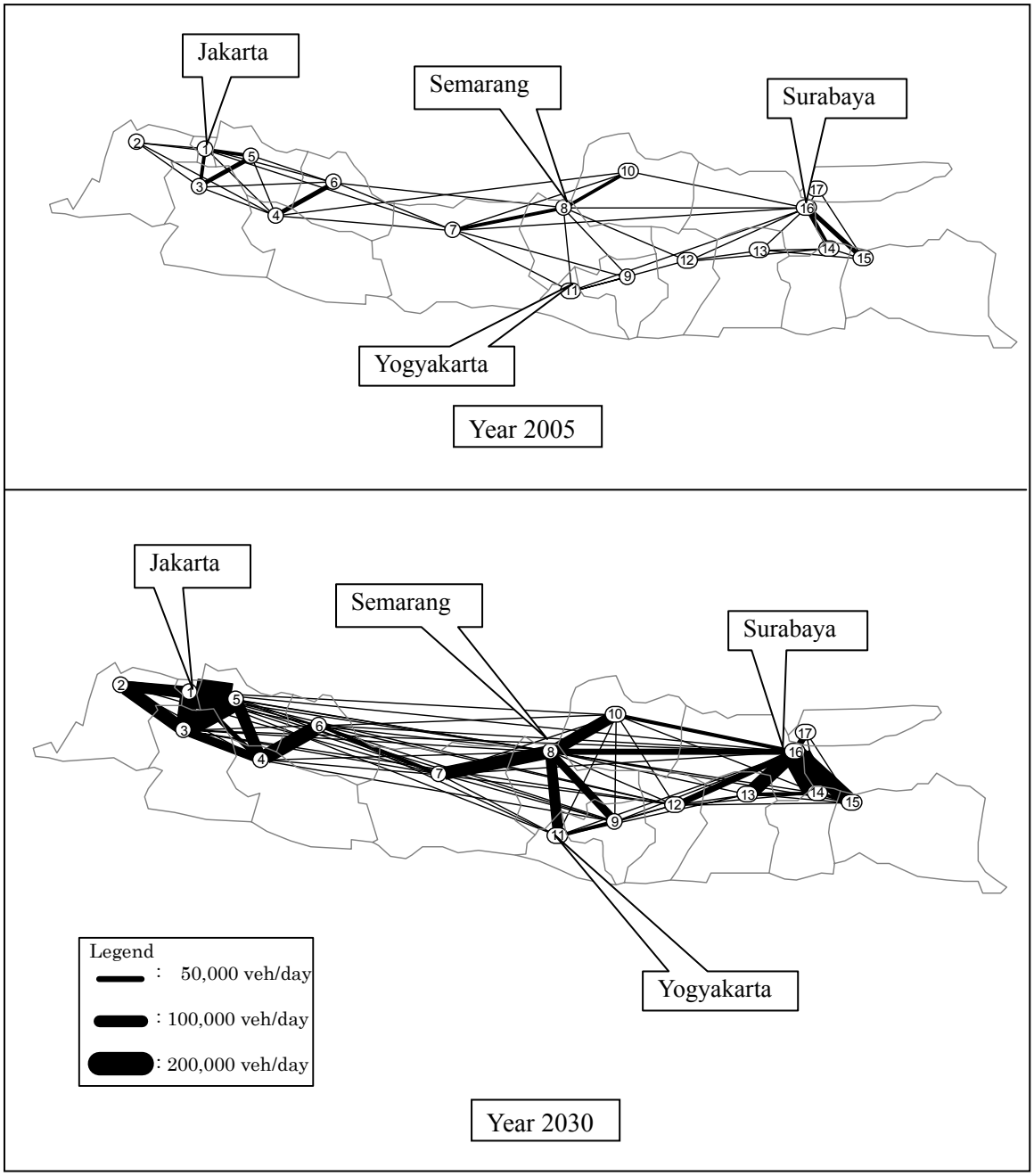


Figure 3.3-2 Future Desire Lines

3.4 FUTURE TRAFFIC VOLUMES

3.4.1 Basic Policy

The future traffic volume on the study section was reviewed following the policies below.

- Present and future road network for the study regions established in the study of IBRD (refer to Section 3.2.2(3)) is basically applicable.
- By adding toll roads of study section, Semarang - Solo section and Surabaya - Kertosono section, to the above road network, basic road network for the traffic assignment analysis is to be established.
- Toll roads of Semarang-Solo and Surabaya-Kertosono are to be constructed before construction of whole/part of the study section.
- The national road in the north corridor is to be widened to 4-lane road in 2020.

Forecasting of future traffic volume on the study toll road in the F/S was carried out without considering the road network by using theoretical method. However, for the section between Solo and Kertosono, diversion traffic from national road in the north corridor between Semarang and Surabaya shall be highly expected, since two toll roads, one is from Semarang and the other is from Surabaya, to be connected with the study section will be constructed earlier than construction of the study section according to the Status of Land Acquisition for Toll Road, 7 April 2006, MPW.

3.4.2 Traffic Assignment Procedure

(1) Assignment Procedure

In the study, the capacity restraint assignment method was used, the method of which is the most straightforward technique among the network models, and the most efficient one, particularly where the number of the trip matrix is relatively large. This assignment is based on the speed-flow relationship. The traffic assignment procedure is shown in Figure 3.4-1 as a flow chart.

In this assignment technique, and calculating the required travel time for each link according to its travel time and road conditions, the program determines the fastest routes between each origin and destination by evaluating the travel time on links, and assigns the trips between the given origins and destinations to these routes starting at the destinations and getting back to the origins. As congestion increases to a certain level as traffic volume increases, alternative routes are introduced to handle the unassigned traffic. Zone-to-zone routing is built, which is the fastest path from each zone to any other, all trips are assigned to these optimum routes.

Computer software of the JICA STRADA (System for Traffic Demand Analysis) was utilized for the traffic assignment, which has all necessary tools for transportation planning and was developed to analyze transportation problems, model demand forecast and develop project proposals.

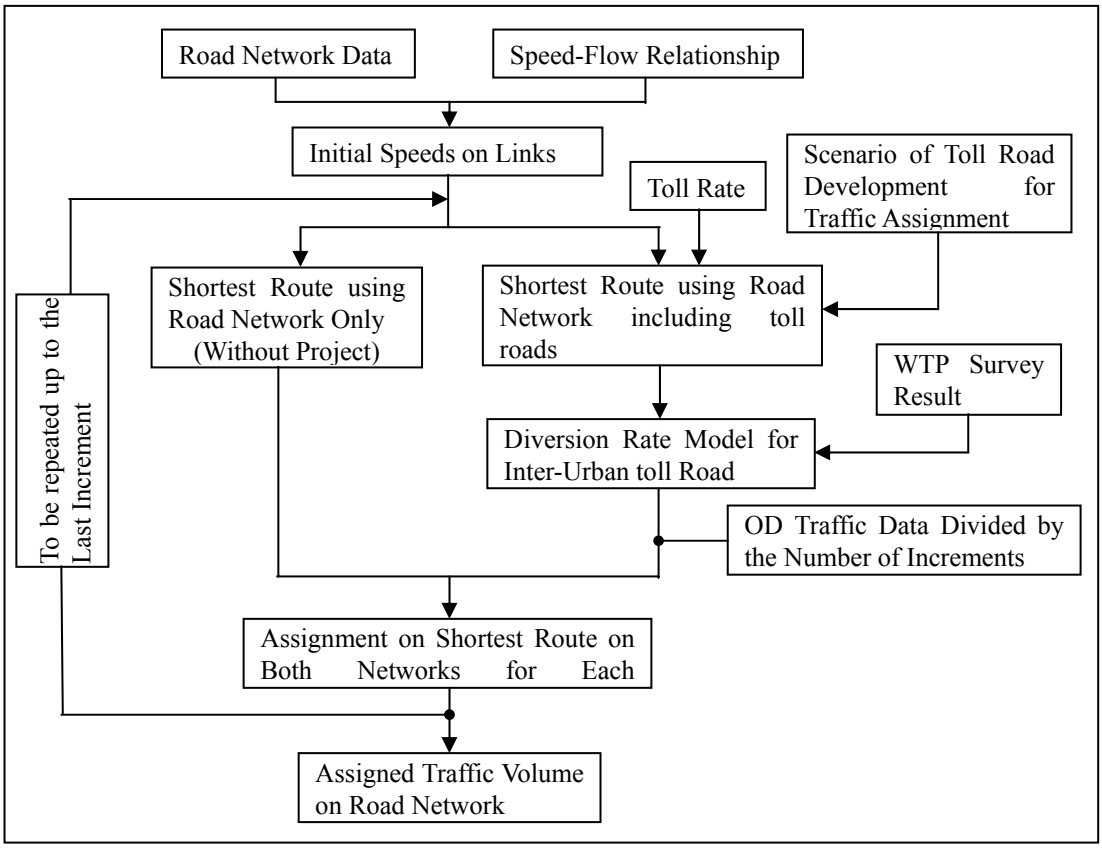


Figure 3.4-1 Traffic Assignment for the Road Network in the Study Regions

(2) Speed-Flow Relationship

The speed-flow relationship used in the course of the traffic assignment analysis is shown in Figure 3.4-2. With the traffic volume increasing in traffic volume in excess of 0.3 Q_{max}, the travel speed begins to decrease gradually up to V_{min} which is about 0.10xVmax at Q_{max}. After reaching V_{min}, the travel speed of V_{min} is assumed to be kept constantly in order to avoid unrealistic assignments in the assignment applications.

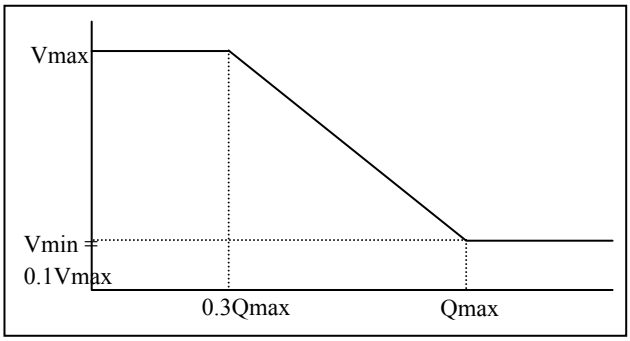


Figure 3.4-2 Speed-Flow Relationship

(3) Time Evaluation Value

The time evaluation Value (TEV) is applied to evaluate the travel time on links of road network in use for persons, either passenger or assistants in trucks , in all vehicle categories. The TEV prepared in the F/S as shown in Table 3.4-1 was utilize as the basis of estimating the TEV for the study. As for present and future TEV, it was estimated by considering the inflation rate of 7.2%.

Table 3.4-1 Time Evaluation Value (Rp/hour)

Vehicle Category	***Java***	Sumatra	Kalimantan	Sulawesi
Light Vehicle	***15,437***	14,105	18,448	11,560
Mini Bus	***17,159***	15,679	20,506	12,850
Medium Vehicle	***35,022***	32,001	41,853	26,226
Big Bus	***72,104***	65,884	86,167	53,996

Source : Studi HLRIP, Ditjen Prasarana Wilayah 2001

(4) Incremental Assignment with Diversion Rate Method

This assignment incorporates the diversion rate method with the formula 3.4.2(1), developed by the Japan Highway Public Corporation for inter-urban expressway, into incremental assignment which divides the input OD traffic data into certain increments and assigns each increment to the minimum route.

$$P = \frac{1}{1+\alpha(X/S)^{\beta}} \times 100 \quad \text{----------3.4.2(1)}$$

Where,
P : Diversion Rate (%)
X : Toll Rate (Rp) / Time Difference (minutes)
$= C/(t_1 - t_2)$
t_1 : Travel Time when passing a Non-Toll Road (minutes)
t_2 : Travel Time when passing a Toll Road (minutes)
S : Future Shift Ratio
α, β : Local Factors

The diversion rate method is applied to estimate the proportion of traffic volumes diverted from the future ordinary road network to the newly developed toll roads. The factors having the greatest influence on the routes taken by drivers are the comparative travel time and distance. Several diversion rate models have been developed for toll roads within urban areas and for inter-urban toll roads. Since having been developed for inter-urban toll roads such as the study section, the formula 3.4.2(1) was utilised for the study.

The steps of assignment per increment are shown in Figure 3.4-3.

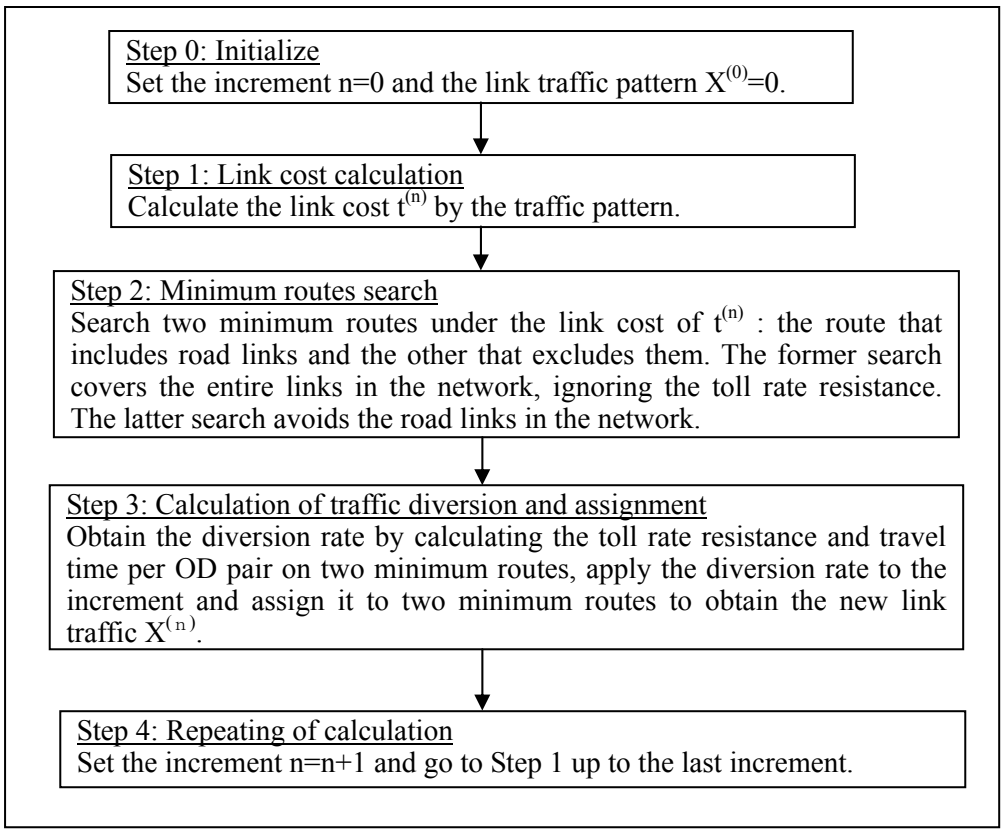


Figure 3.4 -3 Assignment Steps per Increment

Table 3.4-2 and Figure 3.4-4 presents the results of traffic assignment verification process on observed and assignment traffic volumes with a correlation factor of 0.91.

Table 3.4-2 Observed and Assigned Traffic Volumes

Location	Section	Observed(a)	Assigned(b)	(c=b-a)	(d=c/a)
TC 01 Wates	Yogyakarta - Wates	9,940	10,448	508	5%
TC 02 Tempel	Yogyakarta - Magelang	15,987	14,668	-1,319	-8%
TC 03 Piyungan	Wonosari - Yogyakarta	6,372	6,286	-86	-1%
TC 04 Karang Anyar	Kr ANYAR - Palur	21,127	19,656	-1,471	-7%
TC 05 Magetan	Madiun - Ngawi	7,414	7,050	-364	-5%
TC 06 Nganjuk	Madiun - Nganjuk	11,452	10,298	-1,154	-10%
TC 07 Kediri	Kertosono - Kediri	9,235	8,411	-824	-9%
TC 08 Kertosono	Jombang - Kertosono	14,364	15,903	1,539	11%
TC OD1 Prambanan	Yogyakarta - Klaten	17,247	21,533	4,286	25%
TC OD2 Boyolali	Boyolali - Kertosura	11,865	12,456	591	5%
TC OD3 Kartosuro	SOLO - Yogyakarta	17,600	21,087	3,487	20%
TC OD4 Palur	PALUR - SRAGEN	15,490	13,119	-2,371	-15%
TC OD5 Mantingan	Ngawi - Sragen	9,582	10,220	638	7%
TC OD6 Ngawi	Caruban - Mantingan	7,772	7,324	-448	-6%
TC OD7 Nganjuk	Kediri - Kertosono	9,235	12,406	3,171	34%
TC OD8 Nganjuk	Kertosono - Nganjuk	11,676	9,330	-2,346	-20%

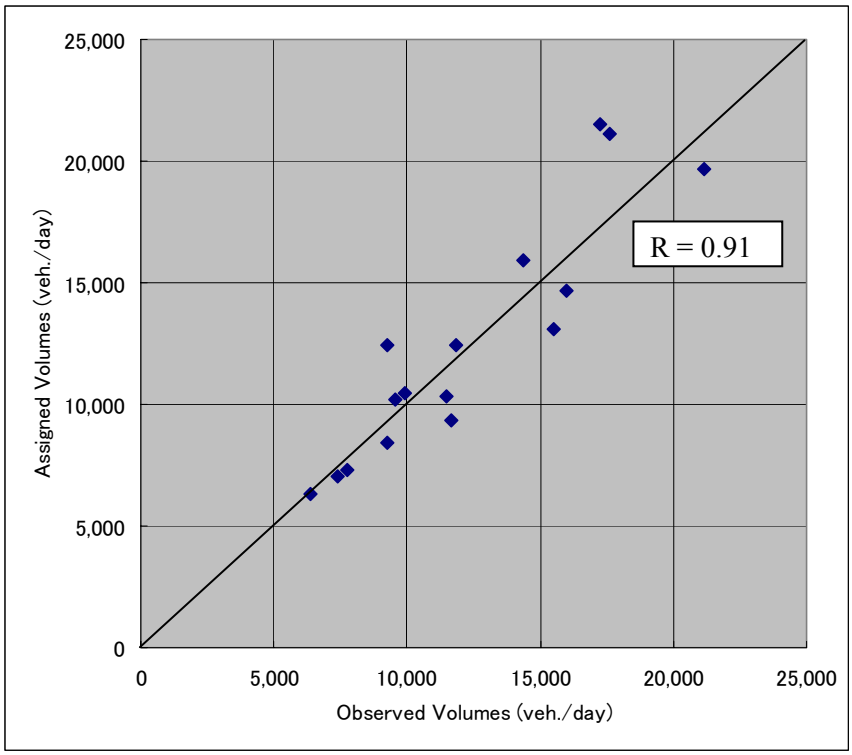


Figure 3.4-4 Traffic Assignment Verification

Local factors of α, β of the formula 3.4.2(1) were determined with the least square method based on the WTP survey result as shown in Figure 3.4 -5 and Table 3.4-3.

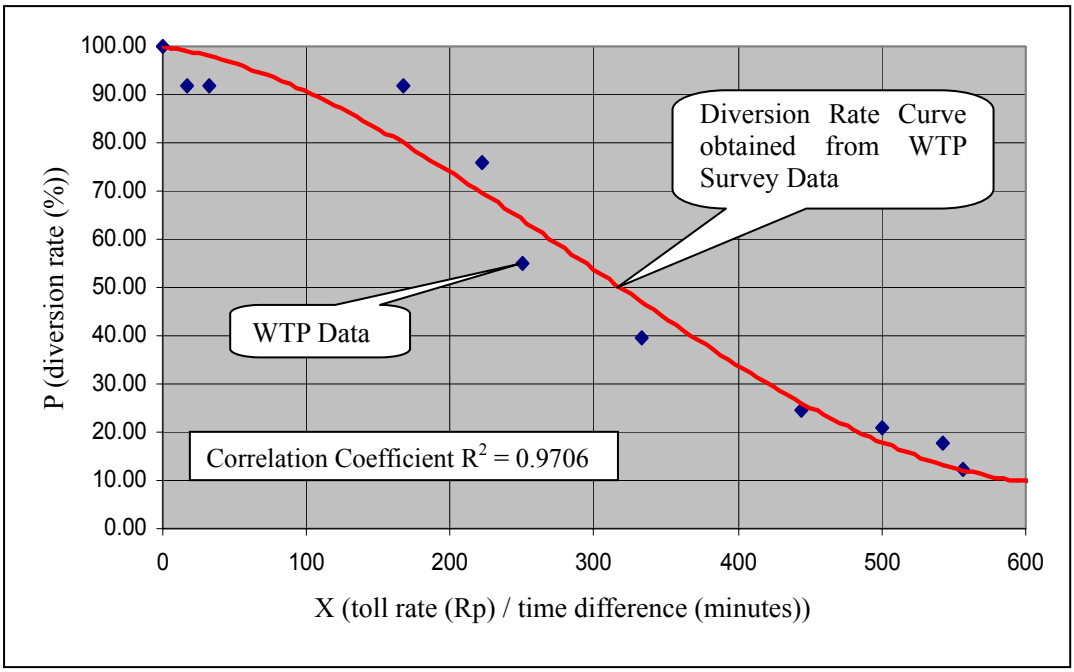


Figure 3.4 -5 Determination of α and β from WTP Survey Result

Table 3.4-3 α and β for Diversion Rate

Vehicle Group	α	β
Group- I*	7.220×10^{-6}	2.095
Group- IIA**	3.088×10^{-6}	2.095
Group- IIB**	1.690×10^{-6}	2.095

* : obtained from Figure 3.4-4

**: obtained by following the F/S method; toll rates of Group-IIA and Group-IIB are 1.5 times and twice that of Group-I, respectively.

As for the Shift Ratio (S), it was determined based on the growth of GRDP per capita of Java Island as shown in Table 3.4-4. The S after year 2020 was extended.

Table 3.4 -4 Growth of GRDP per Capita in Java Island (per year)

	2005-2010	2010-2020
Growth of GRDP (%)	6.34	6.91
Growth of Population (%)	1.12	1.09
Growth of GRDP per Capita (%)	5.16	5.76
Shift Ratio S (Year 2006; S=1.0	1.29 (2010)	2.26 (2020)

Source of GRDP and Population (2005-2020): F/S Report

3.4.3 Future Traffic Volume

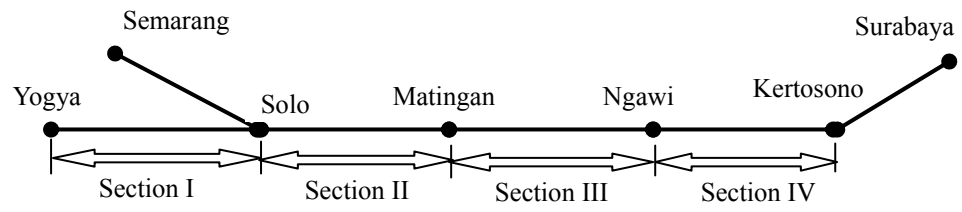
(1) Scenario of Toll Road Development

As described in Section 3.4.1, the scenario of toll road development was presumed as follows:

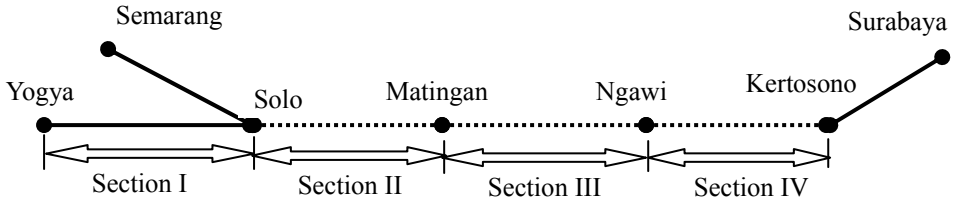
- Toll roads between Semarang and Solo, and between Surabaya and Kertosono are to be developed earlier than the study section.
- Either case that Yogya-Solo section only is constructed or that Solo-Kertosono section only is constructed is considered.
- Operation of the study section will be opened from 2010.

(2) Assignment Cases

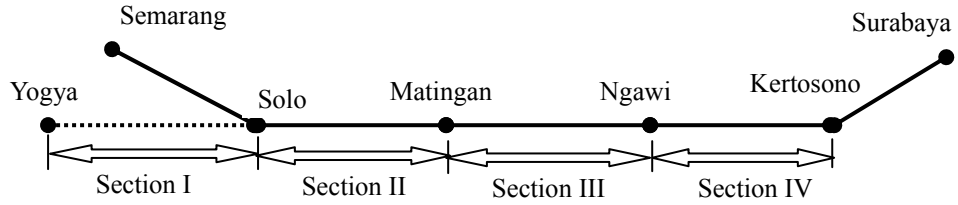
The following cases for traffic assignment were analyzed.



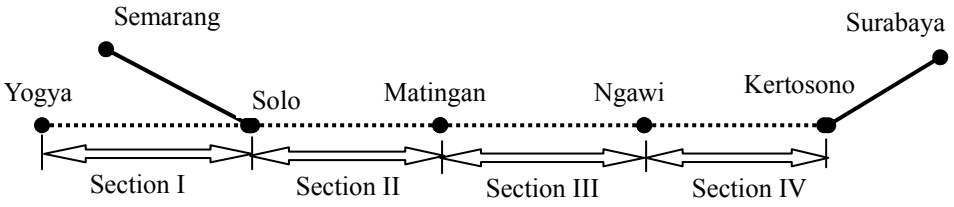
Case1: with all sections in 2010, 2020 and 2030.



Case2: with section I only in 2010, 2020 and 2030.



Case3: with section II, III and IV below in 2010, 2020 and 2030.



Case4: without toll on all sections in 2010, 2020 and 2030 for Economic

(3) Study on Maximum Revenue Level

In order to search the maximum revenue level for the study section, the calculation varying toll rates from Rp100/km to Rp 1,000/km as shown in Figure 3.4-6 was carried out in Group-I with case 1 in 2010. From the calculated results, the maximum revenue level of Group-I is presumed to be about Rp 400/km.

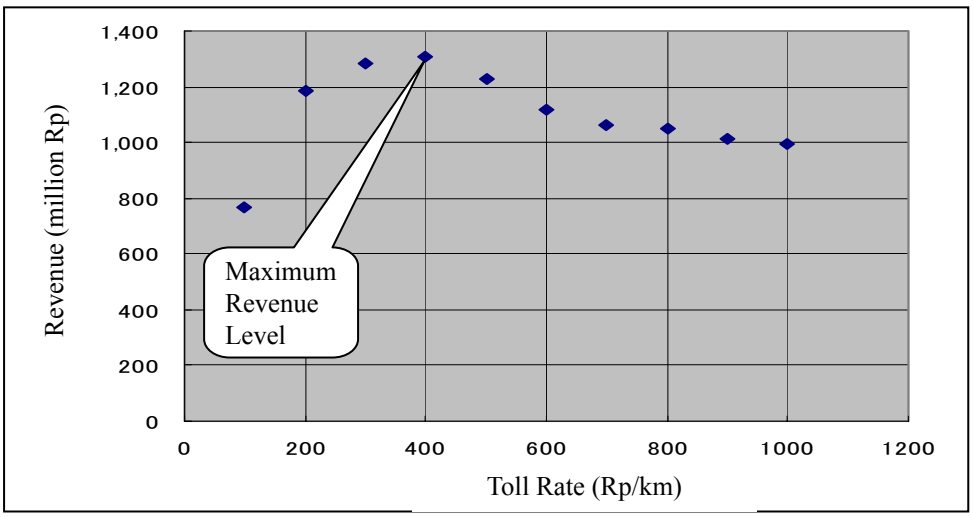


Figure 3.4-6 Searching the Maximum Revenue for the Study Section

(4) Study on Toll Rate of Socially Acceptable Level

Table 3.4-5 shows the toll rates of existing toll roads by toll road type - inter-urban type and urban type. According to the Table, toll rates of existing toll roads in inter-urban toll roads vary from around Rp100/km to around Rp354/km.

Table 3.4-5 Toll Rates of Existing Toll Roads

	NO.	Toll Road	LENGTH (KM)	TOLL RATE (Rp) GROUP I Toll Rate	GROUP I Per Km	GROUP IIA Toll Rate	GROUP IIA Per Km	GROUP IIB Toll Rate	GROUP IIB Per Km	Opening Year
Interurban Toll Roads	1	Tangerang - Merak	72	15,000	208	21,000	292	26,000	361	1996
	2	Surabaya - Gempol	42	4,500	107	7,000	167	9,000	214	1986
	3	Surabaya - Gresik	21	6,000	286	8,000	381	11,500	548	-
	4	Belawan - Tg. Morawa (North Sumatra)	34.4	3,500	102	6,000	174	6,500	189	1986
	5	Palimanan - Kanci	26.3	3,000	114	3,500	133	5,000	190	1998
	6	Jagorawi	46	4,500	98	6,000	130	8,000	174	1978
	7	Jakarta - Cikampek	72	10,000	139	17,000	236	20,000	278	1987
	8	Cipularang (Cikampek-Padalarang/Bandung)	41	14,500	354	22,000	537	29,000	707	2003
Urban Toll Roads	1	Jatingaleh - Kaligawe (Semarang)	24.6	3,000	122	4,000	163	5,000	203	1983
	2	Cawang - Tomang - Pluit (Jkt Inner Ring Road)	18	4,500	250	6,000	333	7,500	417	1987
	3	Jakarta - Serpong	7	3,000	429	5,500	786	6,500	929	1999
	4	Ujung Pandang	7	1,500	214	2,500	357	3,000	429	-
	5	Pondok Pinang - Kampung Rambutan (JORR)	14.8	5,000	338	5,000	338	5,500	372	1995
	6	Jakarta - Tangerang	27	3,000	111	3,500	130	4,500	167	1984
	7	Prof. Dr. Ir. Sedyatmo	13.5	5,000	370	6,000	444	7,000	519	1985
	8	Padalarang - Cileunyi	46.6	4,500	97	7,500	161	9,000	193	1991

Source: No. 309/KPTS/M/2005, No.374/KPTS/M/2005
No.165/KPTS/M/2006 from WPT

Figure 3.4-7 shows the relationship between toll rate and diversion rate based on the WTP survey for Group-I in case that difference in travel speeds between vehicles using toll-road and non-toll road is assumed to be 60km/hour. It can be anticipated that more than 70 % of users will accept a toll rate of Rp200/km according to the Figure.

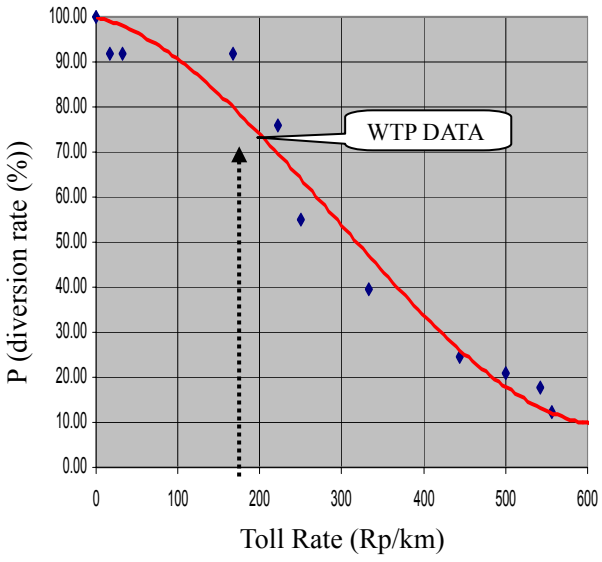


Figure 3.4-7 Relationship between Toll Rate and WTP Data

From both the Table and the Figure, a toll rate of Rp200/km for Group-I could be regarded as socially acceptable level in the study.

(5) Future Traffic Volume

Calculation Cases for Traffic Assignment

Future traffic volume on the study section was forecast for the cases shown in Table 3.4-6 considering the convenience for cash flow analysis, economic benefit analysis and review of the F/S results. Regarding assignment cases in the Table, refer to Section 3.4.3(2).

Table 3.4-6 Calculation Cases

Assignment Case		Year					
		10		20		30	
		S.A.L	M.R.L	S.A.L	M.R.L	S.A.L	M.R.L
Case 1	Toll Rate (Rp/km)	200	400	400	800	800	1,000
	Case Name	Case1-10S	Case1-10M	Case1-20S	Case1-20M	Case1-30S	Case1-30M
Case 2	Toll Rate (Rp/km)	200	400	400	800	800	1,000
	Case Name	Case2-10S	Case2-10M	Case2-20S	Case2-20M	Case2-30S	Case2-30M
Case 3	Toll Rate (Rp/km)	200	400	400	800	800	1,000
	Case Name	Case3-10S	Case3-10M	Case3-20S	Case3-20M	Case3-30S	Case3-30M
Case 4	-	-	-	-	-	-	-
	Case Name	Case4-1		Case4-2		Case4-3	
Remarks		• Toll Rates of Group-I are presented here. Toll rates of Group-IIA and Group-IIB were to be 1.5 times and twice those of Group-I, respectively. • S.A.L: Socially Acceptable Revenue Level. • M.R.L: Maximum Revenue Level. • Toll rates of S.A.L and M.R.L after 2010 were estimated at a inflation rate of 7.2%					

Comparison with the F/S Results

Figure 3.4-8 shows the future total traffic volume on the toll road by segment in 2010 with the F/S results. The segment means a section between two interchanges (regarding relationship between segment numbers and interchange names, refer to Table 3.4-7). Traffic volume at the case1-10S in 2010 forecast by this study is approximately corresponding to the F/S, the toll rate of which is Rp450/km for Group-I. Traffic volumes forecast by the study in 2020 and 2030 are shown in case of the toll rate of the socially acceptable level as shown in Figure 3.4-9. With respect to the case numbers, refer to Table 3.4-6.

Traffic volume on Segment 1 (Yogay-Prambanan) obtained from the study is expected to be much less than the results of the F/S. As the reasons for this, the following are pointed out.

- There are many alternative routes in the area.
- The arterial road running parallel with the toll road has been widened to 4-lane.

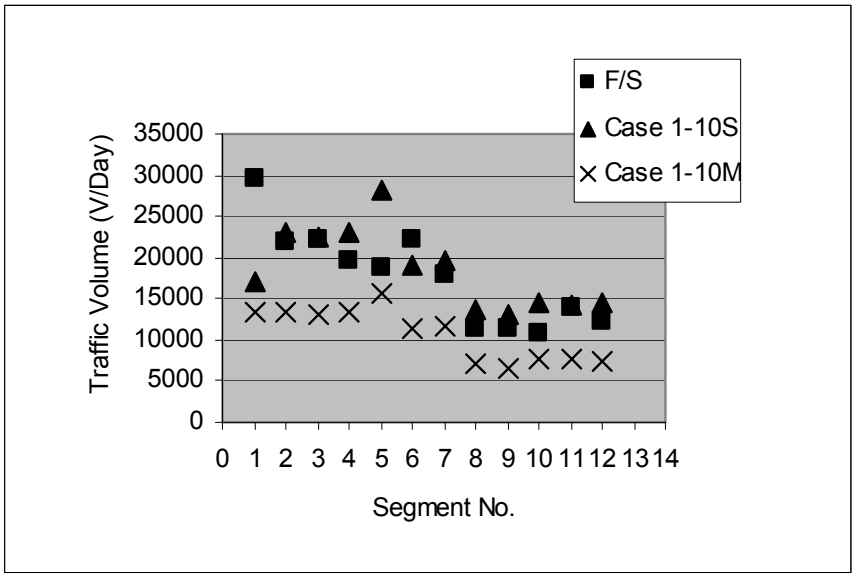


Figure 3.4-8 Traffic Volume in 2010

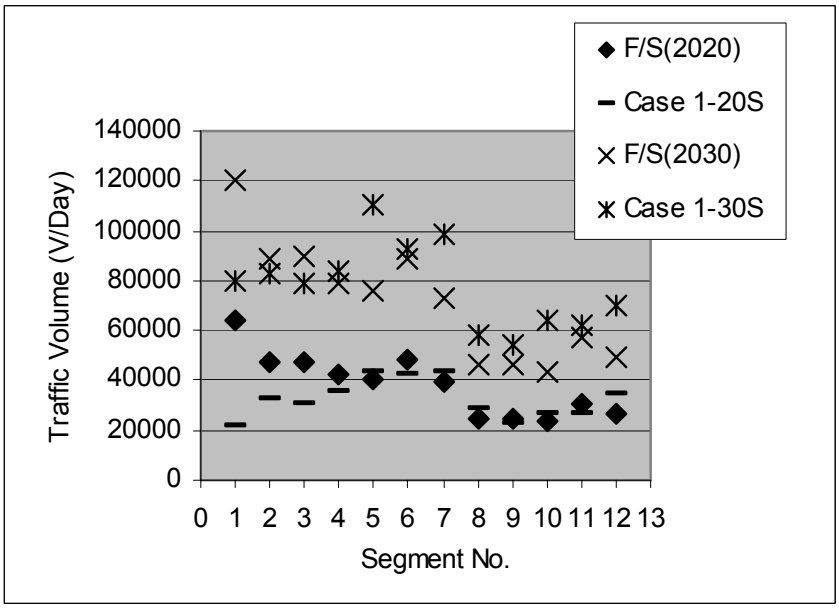


Figure 3.4-9 Traffic Volume in 2020 and 2030

Assigned Traffic Volume

Tables 3.4-7, 3.4 -8 and 3.4-9 show traffic volume of all calculation cases by vehicle group except for case 4 and cases of maximum revenue level. Figures 3.4-10 and 3.4-11 show the distribution of the assigned traffic volumes with VCR (Vehicle Capacity Ratio) - the former is for 2006 and 2010, the latter for 2020 and 2030.

Table 3.4-7 Future Traffic Volume of Case 1

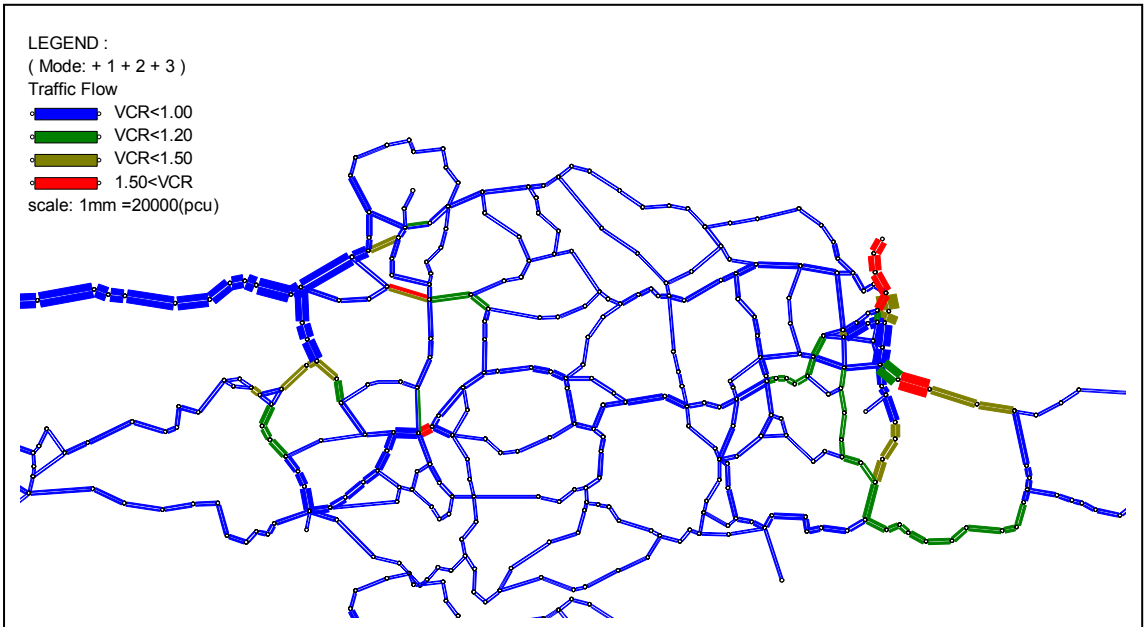
Section Name			Yogya - Solo					Solo - Mantingang		Mantingang-Ngawi	Ngawi - Kertosolo			
Segment Name			1	2	3	4	5	6	7	8	9	10	11	12
			Yogya - Pramb.	Pramb.- Klaten	Klaten - Delanggu	Delanggu - Kartosuro	Kartosuro- Solo	Solo - K. Anyar	K. Anyar - Sragen	Sragen - Ngawi	Ngawi - Madiun	Madiun - Caruban	Caruban - Nganjuk	Nganjuk - Kertosono
Distance (km)			8.42	12.20	11.65	7.52	13.45	10.45	13.76	50.75	23.49	8.54	35.61	23.19
Case 1-10S	F/S	Grp-I	26,765	18,920	19,439	16,834	17,092	20,109	13,255	8,872	10,393	8,997	11,107	9,778
		Grp-IIA	2,244	2,178	1,841	1,846	1,395	1,640	3,384	1,512	823	1,222	1,641	1,519
		Grp-IIB	533	913	958	993	270	317	1,401	1,106	305	558	1,281	957
		Total	29,542	22,011	22,238	19,673	18,757	22,066	18,040	11,490	11,521	10,777	14,029	12,254
	Study	Grp-I	10,937	14,336	13,923	14,266	17,968	12,358	12,759	8,009	7,499	8,524	8,360	8,451
		Grp-IIA	5,228	7,016	6,926	7,062	8,113	5,212	5,446	4,380	4,193	4,519	4,634	4,812
		Grp-IIB	1,023	1,590	1,597	1,625	2,025	1,519	1,522	1,355	1,272	1,354	1,359	1,316
		Total	17,188	22,942	22,446	22,953	28,106	19,089	19,727	13,744	12,964	14,397	14,353	14,579
Case 1-20S	F/S	Grp-I	58,399	40,927	41,922	36,232	37,276	43,857	28,843	19,401	22,660	19,705	24,318	21,455
		Grp-IIA	4,560	4,486	3,757	3,765	2,881	3,387	7,182	3,149	1,696	2,534	3,408	3,151
		Grp-IIB	1,139	1,953	2,049	2,123	586	689	3,045	2,403	663	1,213	2,783	2,079
		Total	64,098	47,366	47,728	42,120	40,743	47,933	39,070	24,953	25,019	23,452	30,509	26,685
	Study	Grp-I	13,933	21,098	20,156	23,127	27,911	29,787	30,200	16,875	13,240	15,541	15,215	20,572
		Grp-IIA	6,389	9,731	9,424	10,484	12,177	10,066	10,244	9,311	8,165	9,167	9,289	11,342
		Grp-IIB	1,050	1,343	1,355	1,600	2,960	2,450	2,450	2,100	1,515	1,780	1,762	2,518
		Total	21,372	32,172	30,935	35,211	43,048	42,303	42,894	28,286	22,920	26,488	26,266	34,432
Case 1-30S	F/S	Grp-I	109,722	76,895	78,764	68,073	69,345	81,586	53,656	36,092	42,154	36,657	45,238	39,913
		Grp-IIA	8,567	8,429	7,058	7,074	5,359	6,301	13,361	5,858	3,156	4,713	6,339	5,862
		Grp-IIB	2,139	3,670	3,849	3,989	1,090	1,282	5,664	4,471	1,234	2,257	5,178	3,867
		Total	120,428	88,994	89,671	79,136	75,794	89,169	72,681	46,421	46,544	43,627	56,755	49,642
	Study	Grp-I	53,898	56,531	53,403	57,034	74,062	65,905	70,807	36,482	33,747	41,104	37,776	42,322
		Grp-IIA	23,003	22,835	21,896	23,029	30,820	22,052	22,883	18,314	16,939	18,911	19,359	21,386
		Grp-IIB	2,805	3,191	3,183	3,326	5,702	4,495	4,505	3,640	3,662	4,163	4,501	6,587
		Total	79,706	82,557	78,482	83,389	110,584	92,452	98,195	58,436	54,348	64,178	61,636	70,295

Table 3.4-8 Future Traffic Volume of Case 2

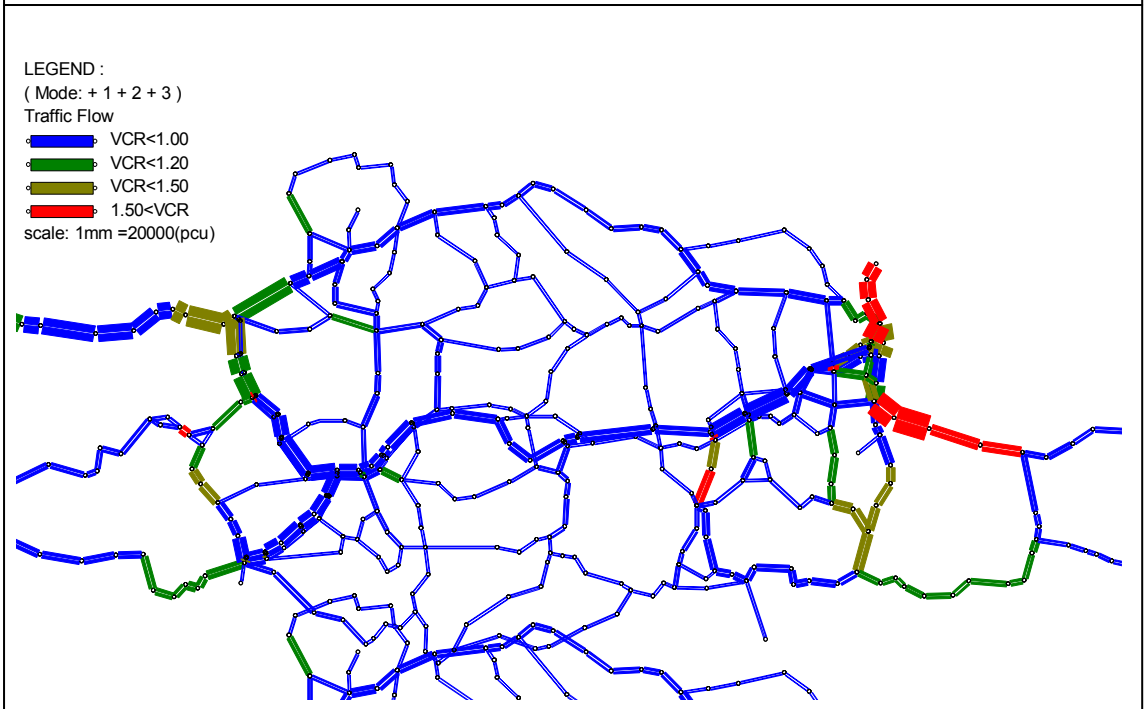
Section Name		Yogaya - Solo				
Segment No.		1	2	3	4	5
Segment Name		Yogya - Pramb.	Pramb.- Klaten	Klaten - Delanggu	Delanggu - Kartosuro	Kartosuro- Solo
Distance (km)		8.42	12.20	11.65	7.52	13.45
Case2-10S	Grp-I	8,989	11,143	10,584	10,606	8,584
	Grp-IIA	4,275	5,531	5,382	5,392	4,243
	Grp-IIB	411	652	652	652	536
	Total	13,675	17,326	16,618	16,650	13,363
Case2-20S	Grp-I	15,659	18,928	15,786	15,805	10,052
	Grp-IIA	6,647	8,456	6,817	6,829	4,393
	Grp-IIB	920	1,409	943	943	704
	Total	23,226	28,793	23,546	23,577	15,149
Case2-30S	Grp-I	51,063	50,422	49,417	49,830	47,294
	Grp-IIA	21,673	21,136	20,127	20,287	19,159
	Grp-IIB	2,406	2,457	2,675	2,687	2,336
	Total	75,142	74,015	72,219	72,804	68,789

Table 3.4-9 Future Traffic Volume of Case 3

Section Name		Solo - Mantingan		Mantingan - Ngawi	Ngawi - Kertosono			
Segment No.		6	7	8	9	10	11	12
Segment Name		Solo - K. Anyar	K. Anyar - Sragen	Sragen - Ngawi	Ngawi - Madiun	Madiun - Caruban	Caruban - Nganjuk	Nganjuk - Kertosono
Distance (km)		10.45	13.76	50.75	23.49	8.54	35.61	23.19
Case3-10S	Grp-I	10,781	10,872	6,370	5,998	7,358	7,183	7,395
	Grp-IIA	5,120	5,214	3,286	3,203	3,856	3,945	4,138
	Grp-IIB	857	857	622	607	762	759	735
	Total	16,758	16,943	10,278	9,808	11,976	11,887	12,268
Case3-20S	Grp-I	26,578	26,774	16,145	11,564	13,949	13,625	19,030
	Grp-IIA	9,615	9,770	8,354	6,506	7,537	7,667	9,787
	Grp-IIB	1,637	1,637	1,591	1,372	1,635	1,625	2,174
	Total	37,830	38,181	26,090	19,442	23,121	22,917	30,991
Case3-30S	Grp-I	58,124	61,393	29,062	30,444	40,048	36,692	40,608
	Grp-IIA	18,669	19,285	14,371	15,348	18,183	18,596	20,377
	Grp-IIB	2,704	2,715	2,569	3,176	3,884	3,829	5,885
	Total	79,497	83,393	46,002	48,968	62,115	59,117	66,870



(a) Year 2006



(b) Year 2010

Figure 3.4-10 Assigned Traffic Volumes in 2006 and 2010

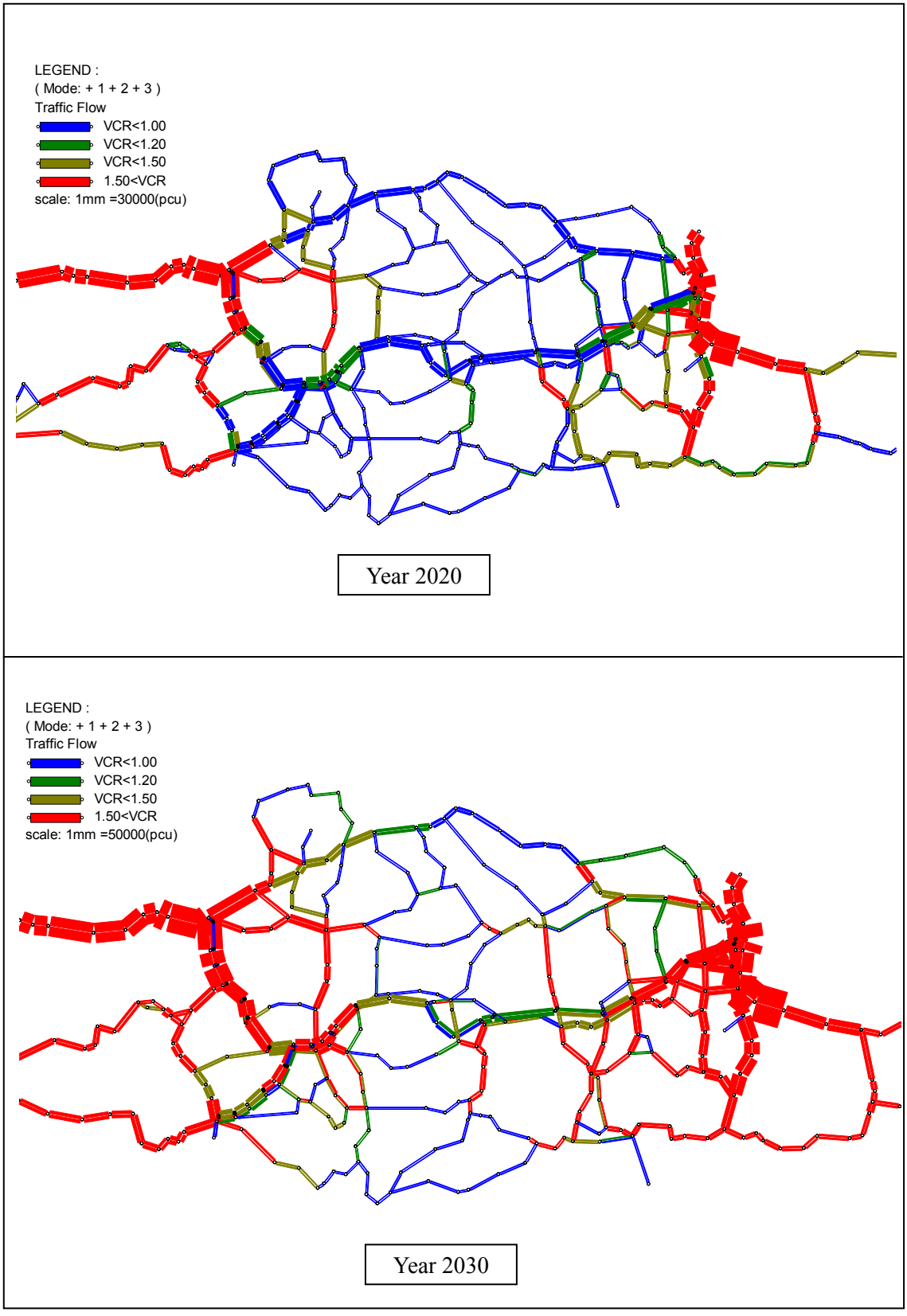


Figure 3.4-11 Assigned Traffic Volumes in 2020 and 2030

CHAPTER 4

COST ESTIMATION AND ECONOMIC ANALYSIS

CHAPTER 4

COST ESTIMATION AND ECONOMIC ANALYSIS

4.1 REVIEW OF PROJECT COST

To recognize the required investments for project implementation and to conduct both the economic and financial analysis, the project costs should be accurately estimated. The investment cost is estimated based on the engineering design of the different project components and the payment for main construction equipment required for earth works and structure works. The unit price for each item and component are based on latest data received from the local government's Basic Prices Guidelines and from the Journal of Building Construction and Interior Material Prices. These obtained unit prices are first compared with unit prices applied in the Feasibility Study reports for each section of the toll road, then they were checked by the market prices of similar projects considering the difference between supplier, dealer and distributor. In addition, the cost for both routine and periodic maintenance works and that of toll road operation is considered in this study based on information obtained from different toll road operators, especially those applied by Jasa Marga as the biggest toll road operator in Indonesia.

The other main component, beside construction, maintenance and operation costs, is land acquisition cost which plays very significant role in supporting the project construction. This cost is determined and evaluated based on various external factors including applied laws and regulation, biro crates experiences, socio community culture, agrarian aspects etc.

In general, the applied unit costs in the Feasibility Study reports are reasonable when compared with collected and analyzed unit costs of other resources. In addition, quantities estimated based on the preliminary design of the Feasibility Study to be used in constructing the project are accepted for the carriageway road sections only. As for the structures along the toll road, including bridges and interchanges, information in the preliminary design are not enough to accept their estimated costs as many items and soil characteristics are not considered or underestimated.

It should be noted here that the project cost is estimated in the Feasibility Study for two stages; an initial stage in which the toll road has a carriage way of two lanes for each direction, while in the final stage the carriageway is composed of three lanes in each direction.

4.1.1 Construction Cost

Under the Feasibility Study estimations, the quantities of major construction items are calculated based on the design data, which are presented in the preliminary engineering design drawings, including the existing road conditions. The main work items for quantity calculation, among others, are described as follows:

- Clearing the working site:
  This work covers clearing, demolished, banishment of bushes and burns clearance of the working site, undertaken within ROW.

- Drainage Works
  This work's quantity is generally calculated based on its types, lengths and the type of works.

- Asphalt Pavement
  The asphalt treated base, asphalt concrete binder course and the asphalt concrete wearing course pavement are used and calculated in *ton* unit weight. The quantity is computed by width of cross section and the length time's thickness of the design pavement.

- Concrete Pavement
  The volumes is calculated by multiplying width of cross sections time the distance between those two cross sections, thickness 27 cm and 10 cm for lean concrete comply with the typical cross section drawing.

- Structure Works
  The concrete quantities are calculated based on the dimension and the structure component forms the drawings design and the pay items.

- Toll Plaza and Toll Facility
  At entrance and exit approach of interchange, toll plaza and toll facility are planned.

A summary of the construction cost estimated by the Feasibility Study for each of the main items is presented in Table 4.1-1 for the 4 sections of the toll road.

4.1-1 F/S Construction Cost (Rp million)

No.	Item	Jogjakarta -Solo	Solo-Mantingan	Mantingan -Ngawi	Ngawi-Kertosono	Total
	Length (km)	*41.9*	*56.1*	*34.0*	*87.0*	*219.0*
1	General	12,326	17,464	8,942	22,238	60,970
2	Cleaning of site	6,202	6,086	3,642	9,085	25,015
3	Demolition	-	-	-	-	-
4	Earth Works	64,889	319,379	153,755	532,869	1,070,892
5	Structure Excavation	3,133	9,352	2,878	7,225	22,588
6	Drainage	19,087	56,842	32,468	80,113	188,510
7	Sub-grade	-	-	-	-	-
8	Base Course	45,541	20,630	8,750	22,094	97,015
9	Pavement	348,453	415,683	227,247	468,552	1,459,935
10	Structure Concrete	346,966	418,168	196,814	436,835	1,398,783
11	Structure Steel	-	-	-	-	-
12	Other Works	134,909	169,944	94,266	243,293	642,412
13	Lighting	22,899	27,626	15,879	41,473	107,877
14	Toll Plaza Works	16,538	7,296	2,432	7,296	33,562
15	Protection of Utilities	-	-	-	-	-
16	Toll Facility Works	18,567	4,323	7,039	4,323	34,252
	Total	1,472,793	1,472,793	754,112	1,875,396	5,141,811

4.1.2 Land Acquisition Cost

(1) Method

A land value and prices survey is conducted to obtain the land value based on the land use, through out the entire planned toll road and the adjacent area (if needed), with the purpose of estimating the present value of land to be acquired for the construction of the toll road. Coverage of the work for this task of the land price survey is a compilation of land use price data, i.e.:

- Inventory and building investigation
- Mapping the land use value.
- Inventory of plantation and others goods

The working methods of the surveys can be grouped as follows:

- Collection of secondary data
- Survey of land use and land prices.

(2) Price Estimation of land Procurement

Analysis and calculation made based on seconded and field surveyed data were for the price estimate of the lands, building, plantation and other goods that will be acquired. These analytical results were put in the Land Value Map, which presents the information regarding the land-use, and photo's presenting actual land-use. The above price estimates was presented in table form classified "Estimasi NJOP" (Tax Object Selling Value Estimate) and "Estimasi Pasar" (Market Price Estimate).

Table 4.1-2 presents a summary for the estimated land acquisition costs for the four sections of the toll road based on the four major items of land-use activities of lands, buildings, trees/plants and utilities. It should be noticed that the estimated cost is the same as the market price except for lands which is treated differently with an estimated cost as the average of market price and estimated tax rate.

Table 4.1-2 Summary of Land Acquisition Cost

Yogya - Solo (Rp. 1,000)

Item	Min. Tax Rate	Max. Tax Rate	Ave. Tax Rate	Min. Market Price	Max. Market Price	Ave. Market Price	Tax Rate Est.	Market Est.	Cost Estimate
Lands	36,404,177	75,830,263	56,248,147	180,947,245	562,744,040	371,845,642	61,161,741	379,513,528	220,337,635
Buildings	246,959,219	246,959,219	246,959,219	246,959,219	246,959,219	246,959,219	246,959,219	246,959,219	246,959,219
Trees/Plants	12,931,706	12,931,706	12,931,706	12,931,706	12,931,706	12,931,706	12,931,706	12,931,706	12,931,706
Utilities	3,041,031	3,041,031	3,041,031	3,041,031	3,041,031	3,041,031	3,041,031	3,041,031	3,041,031
Sub Total	299,336,133	338,762,219	319,180,103	443,879,201	825,675,996	634,777,598	324,093,697	642,445,484	483,269,591
Contingency	29,933,613	33,876,222	31,918,010	44,387,920	82,567,600	63,477,760	32,409,370	64,244,548	48,326,959
Total Cost	329,269,746	372,638,441	351,098,113	488,267,121	908,243,596	698,255,358	356,503,067	706,690,032	**531,596,550**

Solo - Mantingan (Rp. 1,000)

Item	Min. Tax Rate	Max. Tax Rate	Ave. Tax Rate	Min. Market Price	Max. Market Price	Ave. Market Price	Tax Rate Est.	Market Est.	Cost Estimate
Lands	48,345,922	66,422,038	57,383,980	408,020,307	1,348,699,258	878,359,783	56,947,075	786,965,235	421,956,155
Buildings	174,900,136	174,900,136	174,900,136	174,900,136	174,900,136	174,900,136	174,900,136	174,900,136	174,900,136
Trees/Plants	1,915,670	1,915,670	1,915,670	1,915,670	1,915,670	1,915,670	1,915,670	1,915,670	1,915,670
Utilities	230,491	230,491	230,491	230,491	230,491	230,491	230,491	230,491	230,491
Sub Total	225,392,219	243,468,335	234,430,277	585,066,604	1,525,745,555	1,055,406,080	233,993,372	964,011,532	599,002,452
Contingency	22,539,222	24,346,834	23,443,028	58,506,660	152,574,556	105,540,608	23,399,337	96,401,153	59,900,245
Total Cost	247,931,441	267,815,169	257,873,305	643,573,264	1,678,320,111	1,160,946,688	257,392,709	1,060,412,685	**658,902,697**

Mantingan - Ngawi (Rp. 1,000)

Item	Min. Tax Rate	Max. Tax Rate	Ave. Tax Rate	Min. Market Price	Max. Market Price	Ave. Market Price	Tax Rate Est.	Market Est.	Cost Estimate
Lands	16,640,823	100,977,046	58,808,934	253,948,894	360,429,840	307,189,367	59,369,550	306,442,667	182,906,108
Buildings	97,855,540	97,855,540	97,855,540	97,855,540	97,855,540	97,855,540	97,855,540	97,855,540	97,855,540
Trees/Plants	3,912,149	3,912,149	3,912,149	3,912,149	3,912,149	3,912,149	3,912,149	3,912,149	3,912,149
Utilities	118,513	118,513	118,513	118,513	118,513	118,513	118,513	118,513	118,513
Sub Total	118,527,025	202,863,248	160,695,136	355,835,096	462,316,042	409,075,569	161,255,752	408,328,869	284,792,310
Contingency	11,852,703	20,286,325	16,069,514	35,583,510	46,231,604	40,907,557	16,125,575	40,832,887	28,479,231
Total Cost	130,379,728	223,149,573	176,764,650	391,418,606	508,547,646	449,983,126	177,381,327	449,161,756	**313,271,541**

Ngawi - Kertosono (Rp. 1,000)

Item	Min. Tax Rate	Max. Tax Rate	Ave. Tax Rate	Min. Market Price	Max. Market Price	Ave. Market Price	Tax Rate Est.	Market Est.	Cost Estimate
Lands	41,270,306	227,957,040	134,958,527	543,687,900	1,357,884,000	950,785,950	112,947,812	941,070,000	527,322,106
Buildings	165,475,500	165,475,500	165,475,500	165,475,500	165,475,500	165,475,500	165,475,500	165,475,500	165,475,500
Trees/Plants	13,616,653	13,616,653	13,616,653	13,616,653	13,616,653	13,616,653	13,616,653	13,616,653	13,616,653
Utilities	204,600	204,600	204,600	204,600	204,600	204,600	204,600	204,600	204,600
Teak Trees	228,979	228,979	228,979	228,979	228,979	228,979	228,979	228,979	228,979
Sub Total	220,796,038	407,482,772	314,484,259	723,213,632	1,537,409,732	1,130,311,682	292,473,544	1,120,595,732	706,847,838
Contingency	22,079,604	40,748,277	31,448,426	72,321,363	153,740,973	113,031,168	29,247,354	112,059,573	70,684,784
Total Cost	242,875,642	448,231,049	345,932,685	795,534,995	1,691,150,705	1,243,342,850	321,720,898	1,232,655,305	**777,532,622**

4.2 REVISED PROJECT COST

4.2.1 Major Items for Cost Estimate

(1) Work Items

The revised project costs under this study on the toll road are estimated basically based on reviewing F/S cost estimation. In order to support the construction of the toll road project under the formulated different options of PPP schemes, the project cost is aggregated by new groups of works coinciding options of PPP schemes and on intervals or segments between interchanges. The work groups are roughly divided into structure works such as interchanges and bridges or other works related to the road sections such as sub-base, base, pavement and the rest of works for the main road.

1) Bridge

The bridge is further divided into two types; the bridge of the main toll road, mainly over river as shown in Figure 4.2-1, and flyover for crossing roads, as shown in Figure 4.2-2. Bridges are counted separately for main road and flyover for each segment. The cost is estimated in such an aggregated in term of bridge area in square-meters for every segment, and multiplied by the average unit cost of Rp 7.5 million/m^2, which is the average value derived from currently constructed bridges works in the project regions in Java Island. The following Section 4.2.2 provides detailed information on the bridge issue regarding the preliminary design and cost estimate.

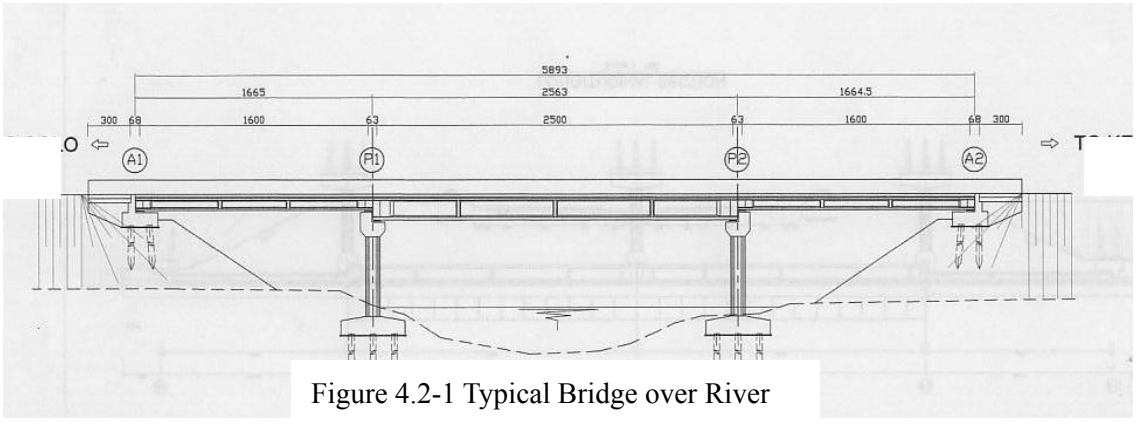


Figure 4.2-1 Typical Bridge over River

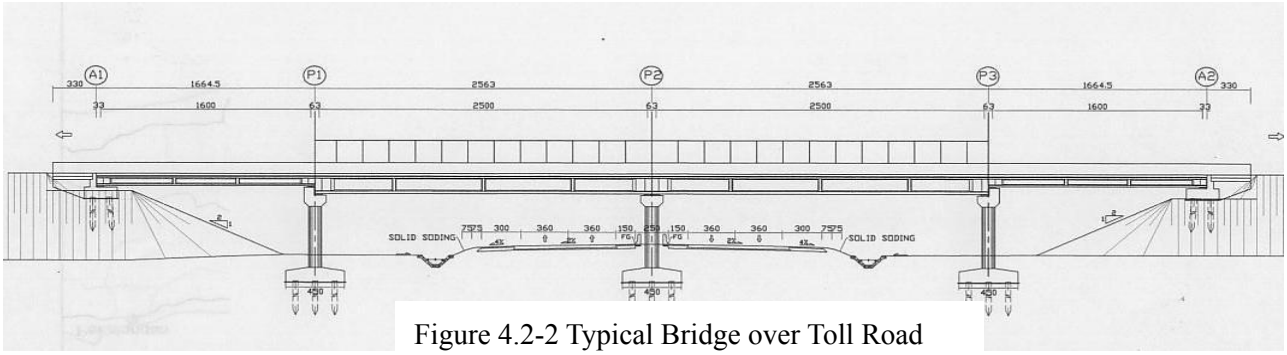


Figure 4.2-2 Typical Bridge over Toll Road

2) Pavement

The pavement includes all components of works above sub-grade, such as pavement of 27 m thickness concrete, 10cm lean concrete and aggregate base at shoulder. Standard Cross Section is shown in Figure 4.2-3.

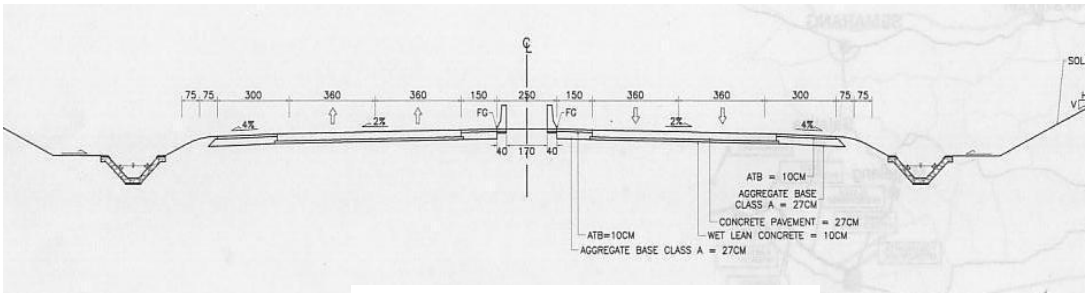


Figure 4.2-3 Standard Cross Section

3) Interchange

The interchange includes over bridges, tollbooths and toll facility. A typical interchange is shown in Figure 4.2-4.

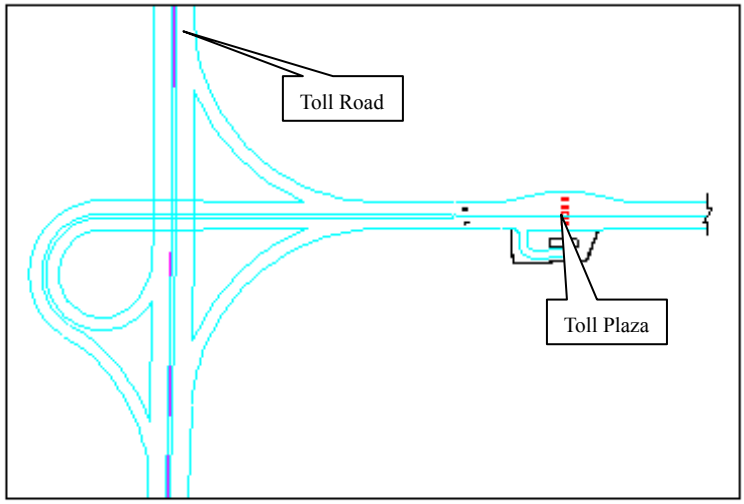


Figure 4.2-4 Typical Interchange

4) Works for main road

For the main road construction works, the rest of items in the cost estimation in Table 4.1-1, such as General, Earth Works and Lighting are aggregated. The construction costs are also segregated by segment. The estimated land acquisition cost in the F/S is calculated as average for NJOP and the market price.

5) Total Cost

The revised cost estimation results are summarized as shown in Table 4.2-4. The estimated total cost is Rp 5,777,985 million, which is 12.4% higher than the cost of Rp 5,141,811 million that was obtained in the F/S. The reason may be attributed to duplication items in estimating construction cost. The bridge unit cost of Rp 7.5 million /m^2 includes all works pertaining bridge construction, such as mobilization and traffic control during construction period, there must be some duplication in those items which are included in the works for main road. These items can not be separated for main works and bridge construction.

The results are adopted as construction cost for our further study with a difference of 12.4% in the total construction cost.

4.2.2 Review of Bridge Construction Cost

In the review of bridge construction costs, as presented in Figure 4.2-5, a unit cost of Rp 7.5 million per square meter was taken based on the construction cost experiences of the same type bridges in Indonesia as bridges of this study from the following reasons.

- It is very difficult for the review to identify the construction costs for bridges, since there are no descriptions on the construction costs one by one in the report.
- There are a few borehole drilling data comparing to the number of the bridges, as shown in Table 4.2-5. Construction cost estimate without enough soil investigation data tends to be under estimation for the bridge foundation costs.
- According to the bridge list in Appendix 4-1, many of piers do not have pile foundations. Piers without piles especially in river areas tend to be easily damaged due to scouring during flood even in relatively good ground conditions.
- With the depths of bearing strata indicated in Table 4.2-5, bridge substructures usually require pile foundations.
- Bridge construction costs per square meter for bridges with PCI-Girder in Figure 4.2-5 are scattered around Rp 7.5 million /m^2 level, costs of which shall be taken from the conservative side view point because of the above situations.

Details of the bridges along the toll road, with a total of 67 bridges as components of the toll road and another required 302 bridges for road crossings over the toll road, are presented in Appendix 4-1 of the Bridge List.

Table 4.2-1 Summary of Revised Project Cost (Rp million)

	Jogjakarta – Solo							Solo – Seragen	
Segment	**1**		**2**	**3**	**4**	**5**		**6**	**7**
Segment	Starting - Jogyakarta IC	Jogyakarta IC - Pranmanan IC	Pranmanan IC - Klaten IC	Klaten IC - Delanggu IC	Delanggu IC - Kartosuro IC	Kartosuro IC - Kertosuro Jct	Kertosuro Jct - Solo IC	Solo IC - Krang Ayar IC	Krang Ayar IC - Seragen IC
Length (km)	8.42		12.20	11.65	7.52	13.45		10.45	13.76
Length (km)	3.41	5.01	12.20	11.65	7.52	2.11	11.34	10.45	13.76
Main road	1,166	43,912	70,093	74,425	40,770	29,947	135,963	110,858	147,435
Pavement	1,838	68,576	104,688	106,175	81,890	30,827	82,445	83,174	112,772
Bridge	29,130	94,290	187,815	153,105	79,410	34,020	96,938	149,250	109,170
Over bridge	13,508	50,918	121,755	97,335	53,775	7,193	64,170	35,768	74,828
On river	15,623	43,373	66,060	55,770	25,635	26,828	32,768	113,483	34,343
Interchange	7,039	15,572	17,986	17,986	17,986	3,387	0	15,086	15,086
Total (000,000Rp)	39,176	222,354	380,594	351,702	220,064	98,183	315,357	358,378	384,476
Land Acquisition	43,264	63,563	154,785	147,807	95,408	26,770	132,364	121,976	160,611
Grand Total	82,439	285,918	535,379	499,509	315,472	124,953	447,721	480,353	545,088

	Seragen – Ngawi		Ngawi – Kertosono				Total
Code	**8**		**9**	**10**	**11**	**12**	
Segment	Seragen IC - Mantingan	Mantingan - Ngawi IC	Ngawi IC - Madigan IC	Madiun IC - Caruban IC	Caruban IC - Nganjuk IC	Nganjuk IC - Kertosono	
Length (km)	50.75		23.49	8.54	35.61	23.19	219.03
Length (km)	20.90	29.85	23.49	8.54	35.61	23.19	219.03
Main road	203,085	271,199	235,306	81,494	427,099	222,925	2,095,677
Pavement	157,922	211,273	163,872	65,927	171,942	113,631	1,556,951
Bridge	202,065	187,635	208,800	36,630	214,253	151,695	1,934,205
Over bridge	99,683	144,203	126,698	25,808	160,305	78,128	1,154,070
On river	102,383	43,433	82,103	10,823	53,948	73,568	780,135
Interchange	15,086	0	20,683	15,086	15,086	15,086	191,152
Total (000,000Rp)	578,179	670,137	628,685	199,145	828,414	503,360	5,777,985
Land Acquisition	243,952	277,813	211,322	76,315	318,216	207,140	2,281,304
Grand Total	822,130	947,950	973,791	275,460	1,146,630	710,499	8,059,289

Table 4.2-2 Number of Bridges and Boring Investigation Data

	Yogya Solo		Solo - Mantingan (Solo – Seragen)					Mantingan (Seragen) - Ngawi			Ngawi – Kertosono								
Distance	53.24km		24.21 km					50.75 km			90.83 km								
Bridges on the Toll Road	39		11					7			10								
Bridges over the Toll Road	85		74					46			97								
Boring No.	B1	B2	B1	B2	B3	B4	B5	B1	B2	B3	B1	B2	B3	B4	B5	B6	B7	B8	B9
Boring Depth	30 m	30 m	30 m	30 m	30 m	30 m	30 m	30 m	30 m	30 m	31 m	31 m	31 m	31 m	31 m	31 m	31 m	31 m	31 m
Bearing Layer Depth	13 m	1.0 m	6 m	2 m	9 m	16 m	2 m	6 m	2 m	8 m	11 m	8 m	16 m	16 m	20 m	22 m	28 m	12 m	16 m

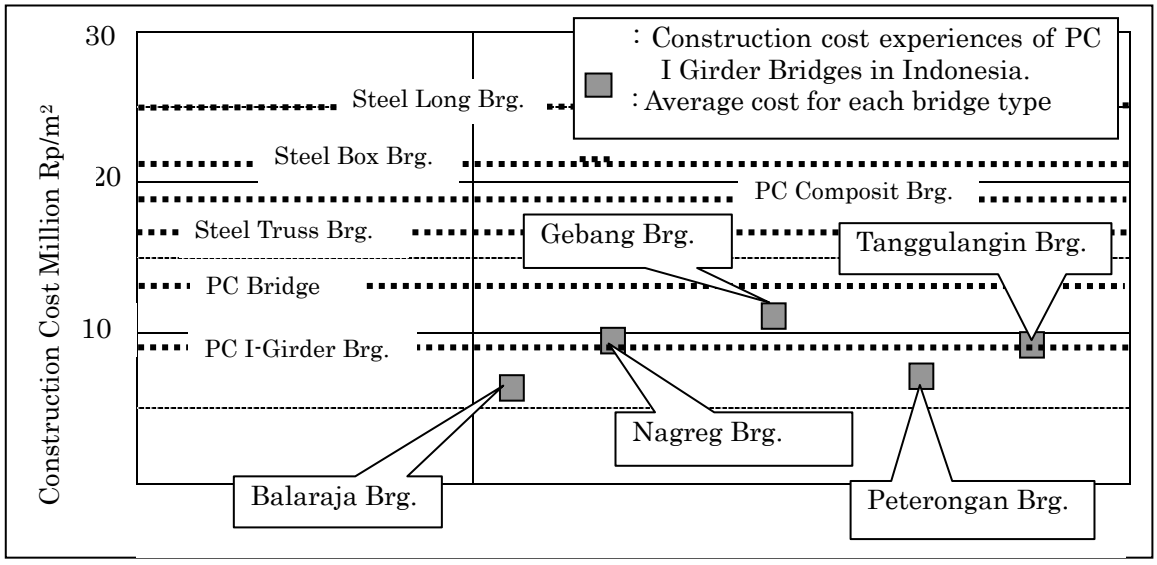


Figure 4.2-5 Rough Standard of Bridge Construction Cost by Bridge Type in Indonesia

4.3 ECONOMIC ANALYSIS

4.3.1 Review of F/S Economic Analysis

The Feasibility Study estimated the economic parameters of Benefit/Cost ratio (B/C), Economic Internal Rate of Return % (EIRR) and Net Present Value (NPV) based on the costs estimated as presented in Section 4.1 of this Chapter and the benefits expected to be gained by the implementation of the toll road project, as presented in the following sections.

(1) Cost

1) Construction Cost
Construction cost summarized in the previous section and land acquisition cast were included in the toll road construction cost.
2) Engineering cost for design and construction supervision is not included
3) Operation and Maintenance Cost
Operation and maintenance cost covering the operation and the runtime and the periodic maintenance works.

- The runtime maintenance cost was used for clearing the area, cutting plantation, and overlay and for the similar types works. The cost amount was estimated 5% from the construction cost.
- Operation and periodic maintenance cost such as structure rehabilitation works (overlay), and the similar types, and its implementation once in ten (10) years, 10% of construction cost.
- Road upgrading cost was a cost for toll roads widening works to final stage.

(2) Benefit

1) Reduction of Vehicle Operation Cost
Economic benefit, which can be derived by toll roads construction, is increasing efficiency of vehicle operation cost. VOC on the arterial roads for different vehicle categories are follows:

- Passenger car (Group I): Rp 1,294/km with a speed of 30 km/hour
- Class IIA vehicle: Rp 5,678/km with a speed of 25 km/hour
- Class IIB vehicle: Rp 4,189/km with a speed of 25 km/hour

Whiles the VOC on the toll roads are as follows:

- Passenger car (Group I) : Rp 1,000/km with a speed of 80 km/hour
- Class IIA vehicle: Rp 5,348/km with a speed of 65 km/hour

- Class IIB vehicle: Rp 3,675/km with a speed of 60 km/hour

2) Travel Time Cost Saving

By using toll road, travel time can be saved. The saved travel times were converted to monetary value using time evaluation. This is Travel Time Cost (TTC) saving merit. The time evaluation is estimated as follows:

- Passenger car (Group I): time value is Rp 21,002/hour
- Class IIA vehicle: time value is Rp 98,097/hour
- Class IIB vehicle: time value is Rp 19,604/hour

The adopted time values are those of "Heavy Loaded Road Improvement Project Master Plan Review Study" by Bina Marga in 2001, for Bus and Passenger Car and JARNS (Java Arterial Road Network Study) in 2001 for trucks. The values are adjusted to 2005 price based on the latest five (5) years average inflation rate, 8% per annum.

3) The assumption

The assumption used for the evaluation is as follows:

- Basic Year Operation: 2009
- Observation time period: 35 years
- Price level: 2005
- Alternatives of Discount Rate : 12.75%, 15%, and 20%

(3) Result of Economic Analysis

The three economic parameters of B/C Ratio, NPV and EIRR are summarized in Table 4.3-1.

discount rate	Yogya - Solo	Solo - Mantingan	Mantingan-Ngawi	Ngawi - Kertosono
B/C Ratio				
12.75%	2.04	2.45	2.21	2.60
15.00%	1.87	2.03	1.83	2.15
20.00%	1.53	1.43	1.29	1.52
NVP				
12.75%	3,822,547	3,638,136	1,452,214	4,767,380
15.00%	2,712,618	1,200,091	931,964	3,210,856
20.00%	1,279,644	896,761	293,031	1,289,254
IRR	32.98%	26.74%	24.69%	27.62%

Table 4.3-1 Economic Parameters of Economic Analysis

(4) Examination of the Analysis

The above analysis is examined by checking O&M cost, VOC benefit and TTC benefit for the years of 2010, 2025 and 2040. The result is shown in Table 4.3-2.

Table 4.3-2 Main Items Applied in Economic Analysis

Item	Yogya - Solo		Solo - Mantingan		Mantingan- Ngawi		Ngawi - Kertosono	
Traffic Volume (million)								
2010	402	v-km	339	v-km	144	v-km	355	v-km
2025	1,213	v-km	1,019	v-km	435	v-km	1,071	v-km
2040	2,778	v-km	2,335	v-km	995	v-km	2,090	v-km
O&M (Rp million)		/v-km		/v-km		/v-km		/v-km
2010	97,498	243	73,640	217	37,706	262	93,137	262
2025	415,582	343	103,618	102	53,056	122	131,053	122
2040	1,318,296	475	138,858	59	71,100	71	175,624	84
Benefit VOC (Rp million)		/v-km		/v-km		/v-km		/v-km
2010	381,196	948	231,696	683	118,327	822	350,599	988
2025	1,126,069	928	694,468	682	356,448	819	1,055,374	985
2040	2,198,864	792	1,590,474	681	816,348	820	2,417,009	1,156
Benefit TTC Rp million)		/v-km		/v-km		/v-km		/v-km
2010	230,735	574	261,889	773	94,173	654	270,155	761
2025	685,935	565	779,520	765	279,896	643	803,729	750
2040	1,339,408	482	1,785,315	765	641,040	644	1,840,723	881

These three components are considered to be interrelated to traffic volume in terms of vehicle-kilometer. For O&M cost the coefficients are decreasing for future years, except Yogya – Solo section.Therefore, for this section O&M cost is inflated using 8% per annum.

Including the section the average cost for O&M is Rp 196.8 /v-km. This is considered as a unit cost for O&M, proportional to traffic volume (v-km).

VOC benefit figures are not so fluctuated, as they must be related closely to traffic volume (v-km), but it varies by section. Solo – Mantingan section is the lowest with 682 and Ngawi – Kertosono section is highest of 988.

As for TTC benefit, the figures are also not fluctuated. But, the tendency is rather different. The lowest figure is that of Yogya – Solo section and it suddenly reduced to 482. The highest is for Solo – Mantingan section followed by Ngawi – Kertosono section. For the latter section it raised up to 881 in 2040.

The examination shows those figures are favorable for Ngawi – Kertosono section and adverse for Yogya – Solo section. If the figures were same as the other sections the economic indices will become higher for this section.

In addition, the engineering cost for the detailed design of the project and construction supervision is not considered in the economic analysis, which can be estimated as about 4% for detailed design and 4% for construction supervision.

4.3.2 Revised Economic Analysis

(1) Case set up

Three cases are set up for economic analysis in order to compare economic viability of the section of toll road under operation. It is assumed that The Trans Java Toll Road outside of the Study Area will be operated by traffic by the year when the study Toll Road will be open. The sections of Semarang – Solo and Kertosono – Surabaya will be connected to the Study Toll Road to complete the Trans Java Toll Road. A section of toll road in the Study area between Yogya and Solo is branched outside of Trans Java Toll Road. Therefore, in addition to the case of constructed the whole of the Study Road between Yogyakarta and Kertosono, the two sections of the Study Road Yogyakarta – Solo and Solo – Kertosono sections are considered independently, as presented in Table 4.3-3.

Table 4.3-3 Case Set Up

Case	Yogyakarta – Solo	Solo – Kertosono
1	Open	Open
2	Open	-
3	-	Open

(2) Cost

1) Construction cost

The construction cost summarized in Table 4.2-4 is used, but land acquisition cost is not included.

2) Operation and maintenance cost

Routine maintenance works such as cleaning of roadway; bush cutting and toll road operation cost are considered to be proportional to traffic volume (vehicle-km). A coefficient of 196.8 derived from F/S is used. For major maintenance and repair works, 5% of construction cost for every 5 year is included.

3) Engineering Cost

The engineering cost for the detailed design of the project and construction supervision is considered as about 4% for detailed design and 4% for construction supervision.

(3) Benefit

Traffic flow diverted to toll expressway can enjoy benefit by improved traffic flow. The remaining traffic on ordinary roads can also enjoy merit by improved traffic flow due to reduction of traffic volume attained by diversion to toll expressway. To simulate such a situation traffic assignment procedure is employed. Traffic volume along the study road is obtained by traffic assignment procedure using OD tables, road network. Changes of traffic condition through out study area is compared by "with and without" the project road basis. Quantitative amount of vehicle-km (v-km) and vehicle-hour (v-hr) are accumulated during assignment process.

1) VOC reduction

To obtain VOC reduction merit, unit VOC cost as used in F/S is applied to average speed calculated v-km divided by v-hr for toll road and non toll road for 3 vehicle categories, with and without cases.

2) TTC savings

Total accumulated amount of veh-hr for without case subtracted by with each case is a total save travel time within study area. This amount of saved time multiplied by time evaluation of each vehicle categories is monetary conversion of saved time. This is a procedure to get the savings in TTC.

4.3.3 Revised Economic Parameters

(1) Presumptions for Economic Analysis

The applied values of veh-km and veh-hr as well traffic parameters for each of the three cases are estimated through the traffic assignments applying JICA STRADA programs. The following presumptions are applied for the economic analysis:

- Implementation Schedule

Year 2007:	Land acquisition and detailed engineering design
Year 2008:	Construction of 40% of the project
Year 2009:	Construction of 60% of the project
Year 2010:	Operation

- Evaluation Period

This period is considered as 30 years of operation from the year 2010 to 2039.

- Widening Cost

Additional widening cost is added to increase the number of lanes from 2 lanes in each direction to 3 lanes when the traffic volumes reach the level of 64,100 veh/day. Widening costs are:

Yogyakarta – Solo: Rp 352,528 million in year 2027

Solo – Kertsono: Rp 1,272,416 million in year 2031

(2) Results of Economic Analysis

Tables 4.3-4, 4.3-5 and 4.3-6 present the estimated economic parameters for the cases of:

Case 1: Yogyakarta - Kertosono

Case 2: Yogyakarta – Solo

Case 3: Solo - Kertosono

Table 4.3-4 Economic Parameters (Yogyakarta – Kertosono)

Discount Rate	12.75%	15.00%	20.00%
B/C	2.161	1.887	1.437
NPV (Rp million)	10,491,465	7,1562,916	2,907,368
EIRR %	28.18	28.18	28.18

Table 4.3-5 Economic Parameters (Yogyakarta – Solo)

Discount Rate	12.75%	15.00%	20.00%
B/C	2.038	1.779	1.353
NPV (Rp million)	2,122,829	1,418,426	531,195
EIRR %	26.73	26.73	26.73

Table 4.3-6 Economic Parameters (Solo - Kertosono)

Discount Rate	12.75%	15.00%	20.00%
B/C	1.904	1.655	1.246
NPV (Rp million)	6,047,488	3,917,406	1,223,617
EIRR %	24.51	24.51	24.51

The results show that Case 1 of implementing the whole Study Road from Yogyakarta to Kertosono gives the highest economic parameters compared with implementing only a section of the road.

(3) Sensitivity Analysis

A sensitivity analysis is carried out on the three cases of project implementation to take into account the uncertainty of assumptions and to determine the potential of each project road for unexpected increase in construction costs or decrease in benefits.

The cases considered in this sensitivity analysis are those of unexpected increase or decrease in the project costs or benefits by 10% and 20% under the three applied discount rates of 12.75%, 15% and 20%.

Results of the sensitivity analysis are presented in Tables 4.3-7, 4.3-8 and 4.3-9 for the different three cases of project implementation of:

1. Yogyakarta – Kertosono
2. Yogyakarta – Solo
3. Solo - Kertosono

The results show that the Project is economically feasible and give the indication that, from the economic point of view, the whole road should be implemented from Yogyakarta to Kertosono, which is the case that gives higher economic parameters.

Table 4.3-7 Revised Sensitivity Analysis Result (Yogyakarta - Kertosono)

Map of Sensibility Analysis

cost -10%	cost 0	cost +10%
benefit +10%	benefit +10%	benefit +10%
cost -10%	cost 0	cost +10%
benefit 0	benefit 0	benefit 0
cost -10%	cost 0	cost +10%
benefit -10%	benefit -10%	benefit -10%

Results of Analysis

	discount rate 12.75%	discount rate 15.00%	discount rate 20.00%	discount rate 12.75%	discount rate 15.00%	discount rate 20.00%	discount rate 12.75%	discount rate 15.00%	discount rate 20.00%
B/C	2.386	2.082	1.584	2.377	2.076	1.580	2.532	2.222	1.705
NPV	12,477,957	8,699,230	3,877,386	12,444,321	8,674,419	3,863,750	12,997,886	9,203,998	4,351,198
EIRR	30.75%	30.75%	30.75%	30.73%	30.73%	30.73%	33.24%	33.24%	33.24%
B/C	2.302	2.020	1.550	2.161	1.887	1.437	2.272	1.995	1.532
NPV	11,045,030	7,682,495	3,394,817	10,491,465	7,152,916	2,907,368	10,931,532	7,586,647	3,321,319
EIRR	30.47%	30.47%	30.47%	28.18%	28.18%	28.18%	30.14%	30.14%	30.14%
B/C	2.072	1.818	1.395	1.945	1.699	1.293	2.044	1.795	1.379
NPV	9,092,175	6,160,993	2,438,435	8,538,609	5,631,413	1,950,986	8,978,676	6,065,144	2,364,937
EIRR	27.64%	27.64%	27.64%	25.58%	25.58%	25.58%	27.33%	27.33%	27.33%

cost -20%	cost 0	cost +20%
benefit +20%	benefit +20%	benefit +20%
cost -20%	cost 0	cost +20%
benefit 0	benefit 0	benefit 0
cost -20%	cost 0	cost +20%
benefit -20%	benefit -20%	benefit -20%

	discount rate 12.75%	discount rate 15.00%	discount rate 20.00%	discount rate 12.75%	discount rate 15.00%	discount rate 20.00%	discount rate 12.75%	discount rate 15.00%	discount rate 20.00%
B/C	2.955	2.607	2.020	2.593	2.265	1.724	2.310	2.002	1.504
NPV	15,504,307	11,255,081	5,795,029	14,397,176	10,195,922	4,820,131	13,290,045	9,136,762	3,845,234
EIRR	39.28%	0.00%	0.00%	33.22%	33.22%	33.22%	29.00%	29.00%	29.00%
B/C	2.463	2.173	1.683	2.161	1.887	1.437	1.925	1.668	1.253
NPV	11,598,596	8,212,075	3,882,265	10,491,465	7,152,916	2,907,368	9,384,334	6,093,757	1,932,470
EIRR	34.76%	0	0	28.18%	28.18%	28.18%	24.64%	24.64%	24.64%
B/C	1.970	1.738	1.347	1.729	1.510	1.149	1.540	1.334	1.003
NPV	7,692,885	5,169,069	1,969,502	6,585,753	4,109,910	994,605	5,478,622	3,050,751	19,707
EIRR	26.95%	26.95%	26.95%	22.90%	22.90%	22.90%	20.05%	20.05%	20.05%

Table 4.3-8 Revised Sensitivity Analysis Result (Yogyakarta - Solo)

Map of Sensibility Analysis

cost -10%	cost 0	cost +10%
benefit +10%	benefit +10%	benefit +10%
cost -10%	cost 0	cost +10%
benefit 0	benefit 0	benefit 0
cost -10%	cost 0	cost +10%
benefit -10%	benefit -10%	benefit -10%

Results of Analysis

	discount rate 12.75%	discount rate 15.00%	discount rate 20.00%	discount rate 12.75%	discount rate 15.00%	discount rate 20.00%	discount rate 12.75%	discount rate 15.00%	discount rate 20.00%
B/C	2.388	2.094	1.607	2.241	1.956	1.489	2.388	2.094	1.607
NPV	2,665,141	1,862,514	845,197	2,539,691	1,742,453	734,612	2,665,141	1,862,514	845,197
EIRR	31.62%	31.62%	31.62%	29.19%	29.19%	29.19%	31.62%	31.62%	31.62%
B/C	2.171	1.904	1.461	2.038	1.779	1.353	2.143	1.880	1.444
NPV	2,248,279	1,538,487	641,780	2,122,829	1,418,426	531,195	2,223,006	1,517,108	625,294
EIRR	28.92%	28.92%	28.92%	26.73%	26.73%	26.73%	28.61%	28.61%	28.61%
B/C	1.954	1.714	1.315	1.834	1.601	1.218	1.928	1.692	1.299
NPV	1,831,417	1,214,461	438,363	1,705,967	1,094,399	327,778	1,806,144	1,193,081	421,877
EIRR	26.18%	26.18%	26.18%	24.21%	24.21%	24.21%	25.89%	25.89%	25.89%

cost -20%	cost 0	cost +20%
benefit +20%	benefit +20%	benefit +20%
cost -20%	cost 0	cost +20%
benefit 0	benefit 0	benefit 0
cost -20%	cost 0	cost +20%
benefit -20%	benefit -20%	benefit -20%

	discount rate 12.75%	discount rate 15.00%	discount rate 20.00%	discount rate 12.75%	discount rate 15.00%	discount rate 20.00%	discount rate 12.75%	discount rate 15.00%	discount rate 20.00%
B/C	2.787	2.458	1.904	2.445	2.134	1.624	2.178	1.886	1.416
NPV	3,207,454	2,306,602	1,159,199	2,956,553	2,066,480	938,029	2,705,651	1,826,357	716,859
EIRR	37.50%	37.50%	37.50%	31.62%	31.62%	31.62%	27.55%	27.55%	27.55%
B/C	2.322	2.049	1.587	2.038	1.779	1.353	1.815	1.571	1.180
NPV	2,373,730	1,658,549	752,365	2,122,829	1,418,426	531,195	1,871,927	1,178,304	310,025
EIRR	33.04%	33.04%	33.04%	26.73%	26.73%	26.73%	23.34%	23.34%	23.34%
B/C	1.858	1.639	1.270	1.630	1.423	1.083	1.452	1.257	0.944
NPV	1,540,006	1,010,495	345,531	1,289,105	770,373	124,361	1,038,203	530,250	-96,809
EIRR	25.49%	25.49%	25.49%	21.62%	21.62%	21.62%	18.92%	18.92%	18.92%

Table 4.3-9 Revised Sensitivity Analysis Result (Solo - Kertosono)

Map of Sensibility Analysis

cost -10%	cost 0	cost +10%
benefit +10%	benefit +10%	benefit +10%
cost -10%	cost 0	cost +10%
benefit 0	benefit 0	benefit 0
cost -10%	cost 0	cost +10%
benefit -10%	benefit -10%	benefit -10%

Results of Analysis

	discount rate 12.75%	discount rate 15.00%	discount rate 20.00%	discount rate 12.75%	discount rate 15.00%	discount rate 20.00%	discount rate 12.75%	discount rate 15.00%	discount rate 20.00%
B/C	2.238	1.954	1.483	2.095	1.820	1.371	2.238	1.954	1.483
NPV	7,747,977	5,316,208	2,219,601	7,320,962	4,907,538	1,843,187	7,747,977	5,316,208	2,219,601
EIRR	28.82%	28.82%	28.82%	26.69%	26.69%	26.69%	28.82%	28.82%	28.82%
B/C	2.034	1.776	1.348	1.904	1.655	1.246	2.007	1.753	1.332
NPV	6,474,504	4,326,076	1,600,032	6,047,488	3,917,406	1,223,617	6,388,478	4,253,303	1,543,918
EIRR	26.46%	26.46%	26.46%	24.51%	24.51%	24.51%	26.17%	26.17%	26.17%
B/C	1.831	1.598	1.213	1.714	1.489	1.121	1.806	1.578	1.199
NPV	5,201,030	3,335,944	980,462	4,774,015	2,927,274	604,048	5,115,004	3,263,171	924,349
EIRR	24.03%	24.03%	24.03%	22.27%	22.27%	22.27%	23.76%	23.76%	23.76%

cost -20%	cost 0	cost +20%
benefit +20%	benefit +20%	benefit +20%
cost -20%	cost 0	cost +20%
benefit 0	benefit 0	benefit 0
cost -20%	cost 0	cost +20%
benefit -20%	benefit -20%	benefit -20%

	discount rate 12.75%	discount rate 15.00%	discount rate 20.00%	discount rate 12.75%	discount rate 15.00%	discount rate 20.00%	discount rate 12.75%	discount rate 15.00%	discount rate 20.00%
B/C	2.620	2.300	1.762	2.285	1.986	1.495	2.026	1.747	1.299
NPV	9,448,466	6,715,011	3,215,586	8,594,436	5,897,670	2,462,756	7,740,405	5,080,329	1,709,927
EIRR	33.95%	33.95%	33.95%	28.82%	28.82%	28.82%	25.24%	25.24%	25.24%
B/C	2.183	1.916	1.468	1.904	1.655	1.246	1.689	1.456	1.082
NPV	6,901,519	4,734,747	1,976,447	6,047,488	3,917,406	1,223,617	5,193,458	3,100,065	470,788
EIRR	30.02%	30.02%	30.02%	24.51%	24.51%	24.51%	21.49%	0	0
B/C	1.747	1.533	1.175	1.523	1.324	0.997	1.351	1.165	0.866
NPV	4,354,572	2,754,483	737,308	3,500,541	1,937,142	-15,522	2,646,511	1,119,801	-768,351
EIRR	23.42%	23.42%	23.42%	19.94%	19.94%	19.94%	17.47%	17.47%	17.47%