No.

THE STUDY
ON
MEASURING THE POSSIBILITY
OF
PRIVATE INVESTMENT IN EXPRESSWAY PROJECTS
IN
SOUTHERN VIETNAM

FINAL REPORT

Volume II (Bien Hoa – Vung Tau Expressway)

June 2011

Japan International Cooperation Agency (JICA)

Study Team constituted by

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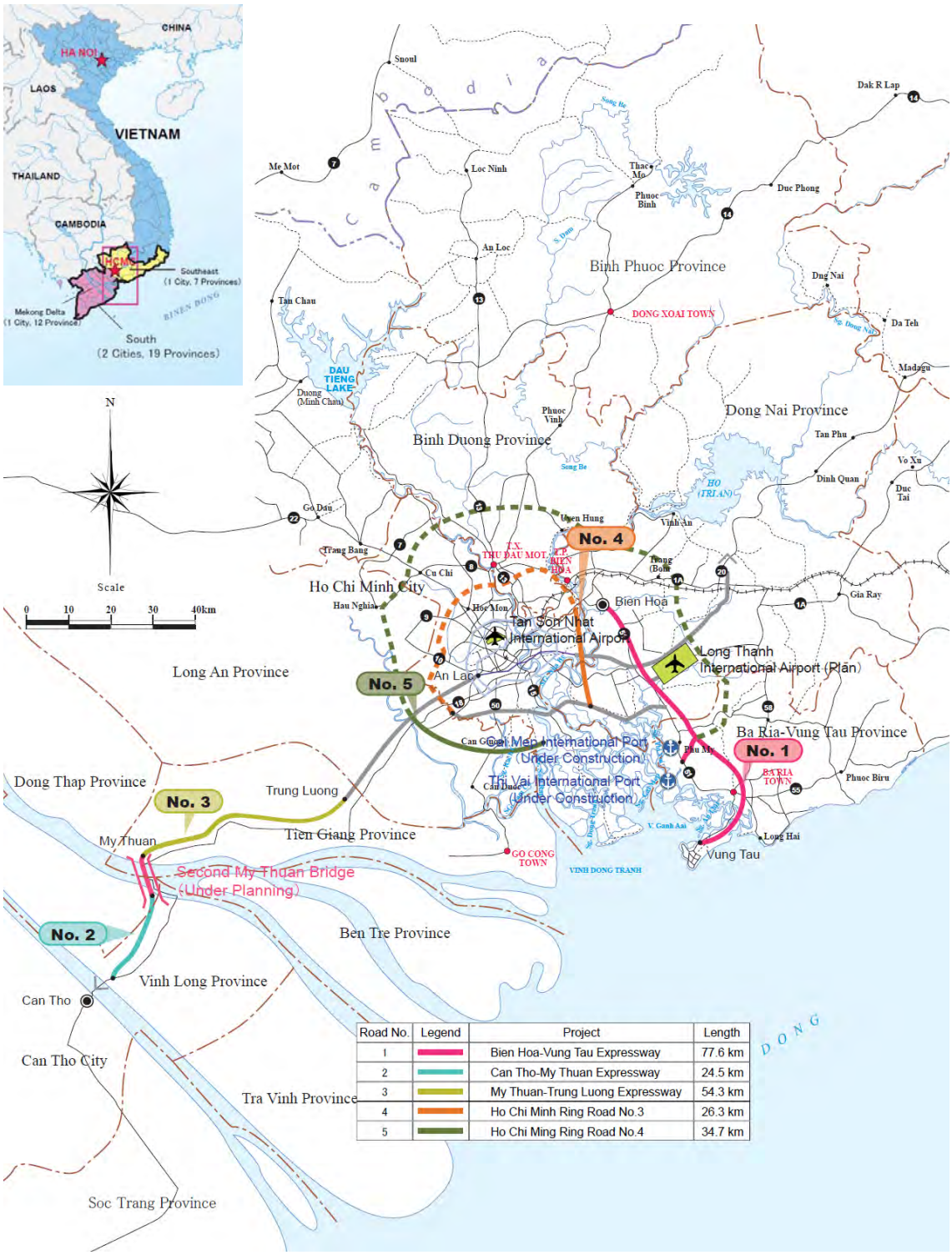

Road No.	Legend	Project	Length
1		Bien Hoa-Vung Tau Expressway	77.6 km
2		Can Tho-My Thuan Expressway	24.5 km
3		My Thuan-Trung Luong Expressway	54.3 km
4		Ho Chi Minh Ring Road No.3	26.3 km
5		Ho Chi Ming Ring Road No.4	34.7 km

STUDY LOCATION MAP

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
B/C	Cost Benefit Ratio
BEDC	BIDV Expressway Development Company
BIDV	Bank for Investment and Development of Vietnam
BOD	Biochemical oxygen demand
BOT	Build Operate Transfer
BOTA	Build Operate Transfer Agreement
BT	Build Transfer
BTO	Build Transfer Own
BVE	Bien Hoa- Vung Tau Expressway
BVEC	Bien Hoa- Vung Tau Expressway Company
CAPEX	Capital Expenditure
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
DD	Detailed Design
D/E	Debt and Equity
DPI	Department of Planning and Investment
DRVN	Directorate for Roads of Vietnam
DSCR	Debt Service Coverage Ratio
DSRA	Debt Service Reserve Account
DSRC	Dedicated Short Range Communications
ECA	Export credit agency
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EPC	Engineering, Procurement and Construction
EPC	Engineering, Procurement and Construction
Equity IRR	Equity Internal Rate of Return
ETC	Electric Toll Collection
F/C	Foreign Currency
FDI	Foreign Direct Investment
FIRR	Financial Internal Rate of Return
F/S	Feasibility Study
FX	Foreign Exchange
GDP	Gross Domestic Product
GGU	Government Guarantee and Undertaking
GRDP	Gross Regional Domestic Product
HCMC	Ho Chi Minh City
IC	Investment Certificate
IC	Interchange
IDC	Interest During Construction
IDICO	Vietnam Urban and Industrial Zone Development Investment Corporation
IFI	International Financial Institution
IRR	Internal Rate of Return
ITS	Intelligent Transport Systems
JBIC	Japan Bank for International Cooperation
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
JPY	Japanese Yen
JSC	Joint Stock Company

L/A	Loan Agreement
L/C	Local Currency
LLC	Limited Liability Company
LOS	Level of Service
METI	Ministry of Economy Trade & Industry
MOF	Ministry of Finance
MOJ	Ministry of Justice
MOT	Ministry of Transport
MPI	Ministry of Planning and Investment
NEXI	Nippon Export and Investment Insurance
NGOs	Non-Governmental Organizations
NH51	National Highway 51
NO_2	Nitrogen Dioxide
NPV	Net Present Value
NPV	Net Present Value
OBU	On Board Unit
OCR	Ordinary Capital Resources
O&M	Operation and Maintenance
OD	Origin and Destination
ODA	Official Development Aid
OPEX	Operational Expenditure
PAPs	Project Affected Persons
PC-I	Precast Concrete I Girder
PC-HS	Precast Concrete Hollow Slab Girder
PCU	Passenger Car Unit
PM	Prime Minister
PM-10	Particulate Matter-10
PMU	Project Management Unit
PMUMT	My Thuan Project Management Unit
PPP	Public and Private Partnership
PPTA	Project Preparatory Technical Assistance
PQ	Pre-qualification
Project IRR	Project Internal Rate of Return
PSIF	Private Sector Investment Finance
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
SA	Service Area
SAC	South Aviation Company
SB	State Bond
SBV	State Bank of Vietnam
SKEZ	Southern Key Economic Zone
SO_2	Sulfur Dioxide
SOE	State Owned Enterprise
SPC	Special Purpose Company
Super-T	Super Tee Girder
TEDI	Transport Engineering Design Incorporated
TSP	Total Suspended Particles
USD	United States Dollar
VAT	Value Added Tax
VEC	Vietnam Expressway Company
VGF	Viability Gap Funding
VITRANSS	The Comprehensive Study on the Sustainable Development of Transport System in Vietnam
VOC	Vehicle Operation Cost

VRA	Vietnam Road Administration
WACC	Weighted Average Cost of Capital

CHAPTER 1 INTRODUCTION

1.1 Background of the Study

Road plays an important role in the transportation system in Vietnam. According to transport statistics on different transport modes (road, railway, inland water transport, coastal service, air service) in 2008, road transportation accounts for 69.8% of all freight transport and 90.8% of all passenger transport. However, existing road network is not sufficient to accommodate rapid increase in traffic volume, generated by the recent economic growth in the country. The Government of Vietnam (GOV) gives priority transport infrastructure development as the most important subject in "the 8th social economic development 5-year plan (2006-2010)". Accordingly, development projects on large-scale transport infrastructures such as airports, seaports, expressway, urban railways, have been implemented.

As for the expressway, "Expressway Development Plan (master plan)" established by Ministry of Transport (MOT) was approved by the Prime Minister (PM) in December 2008. In the master plan, implementation plan of 39 sections (5,873 km in total) of expressways were established, while 2,235 km of 5,873 km were planned to be completed before 2020. Also, Vietnam Expressway Corporation (VEC), dealing with the development of expressway and its corresponding investment, was established in 2004. Subsequently, VEC has tried to formulate a model of commercial-based transportation system.

In this way, GOV has strengthened its effort for expressway development, especially for the North-South Expressway development. The North-South Expressway connects the capital city of Hanoi and Can Tho City, which is the commercial center of Mekong Delta, along National Highway No.1. On its length of 3,226 km, the implementation priority is given to sections near big cities (Hanoi, Ho Chi Minh City or HCMC, Da Nang, Can Tho).

In accordance with the present status and development policy for the transport infrastructure development mentioned above, Japan International Cooperation Agency (JICA) conducted “The Comprehensive Study on the Sustainable Development of Transport System in Vietnam (VITRANSS 2)”(November 2007 – May 2010) to support the development of the overall transport sector master plan covering all transportation sectors in Vietnam. For the expressway development sector, VITRANSS 2 supported the formulation of “North-South Expressway master plan”. Consequently, its preliminary feasibility study was carried out.

As a result of the preliminary feasibility study by VITRANSS 2, necessary budget for the development of North-South Expressway network was estimated to be about USD 66 billion. Projects for implementation which has been approved by GOV are estimated to be about USD 12 billion and most of the required funding needs support from ODA of Japanese government, World Bank, ADB and so on. The rest of the USD 54 billion should be secured from various financial sources. Since it is difficult for the project to be subsidized only by the public funds from GOV and ODAs, it is strongly expected to mobilize private sector investment.

For the introduction of private sector investment, it is necessary to study the case of 100% private investment (Build-Operate-Transfer or BOT) and public-private-partnership (PPP) investment. VITRANSS 2 suggested the possibility of implementing many projects through PPP, and emphasized that further detailed study is necessary in order to materialize a concrete business model of PPP and its practical implementation process.

In connection with the above, GOV and project implementation authorities requested JICA to support important expressway projects in southern Vietnam, such as Bien Hoa – Vung Tau Expressway project, Can Tho – My Thuan Expressway project, My Thuan – Trung Luong Expressway project, HCMC Ring Road No. 3 and No.4, through the development and

application of PPP project delivery scheme. It is especially noted that Bien Hoa – Vung Tau Expressway project and HCMC Ring Road No. 3 are prioritized as the most important projects, and their early implementation is necessary. These projects, which were planned as BOT scheme projects, have already selected the implementing bodies long time ago. However, there has been insufficient money collected, considering the absence of provision for appropriate investment model for PPP, and the lack of information for the general investor's to decide on investment such as legislation of related law, system of concession grant, road development condition.

This study will (i) examine possibility of 100% of private investment for five projects mentioned above, and consider other schemes under PPP finance system if 100% private investment is not possible (ii) carefully review the feasibility study for Bien Hoa – Vung Tau Expressway project being prepared by Bien Hoa – Vung Tau Expressway Development Company (BVEC), in order to enable application of PPP model.

1.2 Objectives of the Study

The objective of the study is to realize expressway development project, utilizing private investment. In order to achieve the objective, collection and analysis of basic information regarding expressway PPP projects, expressway development in Vietnam, expressway projects of target five routes, and establishment of project implementation plan will be conducted. These are also intended to measure the possibility of private investment in expressway projects.

Target projects were selected in consideration of (i) strong request from Vietnamese governmental agencies, (ii) rapid increment of freight and passenger traffic volume in and around HCMC, and (iii) many private investments are expected in and around HCMC.

The selected five expressway projects in southern Vietnam and around HCMC are Bien Hoa – Vung Tau Expressway, Can Tho – My Thuan Expressway, My Thuan – Trung Luong Expressway, HCMC Ring Road No. 3 and No.4.

1.3 Study Area

During the first study in Vietnam in January 2011, scope of the study was updated for HCMC Ring Road No.3 and Ring Road No.4 as shown in Table 1.3.1 through discussion with BVEC.

Table 1.3.1 Updated of Scope of Study

No.	Route Name	Original	Updated	Remarks
1	Bien Hoa – Vung Tau	77.6km	77.6km	
2	Can Tho – My Thuan	24.5km	24.5km	
3	My Thuan – Trung Luong	54.3km	54.3km	
4	HCMC RR3	90.6km	26.3km	Tan Van – Nhon Trach Component
5	HCMC RR4	151km	34.7km	Ben Luc – Hiep Phuoc Component
Note: Trang Bom – Phu My Component (45km) was listed by PMU My Thuan during the meeting on 20 January 2011. However, this segment was eliminated because there is no available traffic data and EIRR/FIRR.				

Source: JICA Study Team

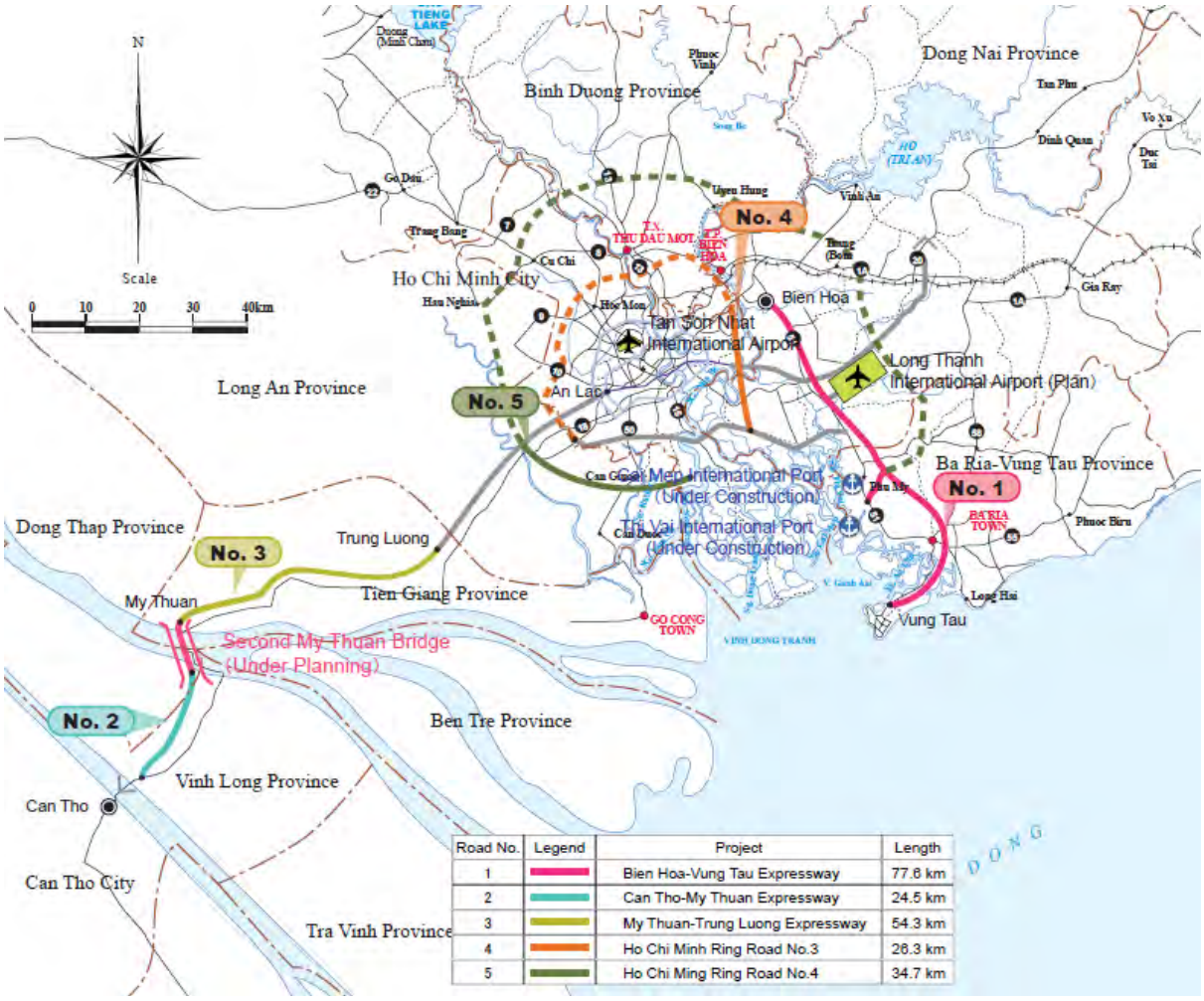
Updated present condition of each expressway project in relation to the project purpose, project outline, project plan, and status of implementation with reference to "The Review Survey of Transportation Infrastructure Projects in the Socialist Republic of Vietnam (hereinafter referred to as "The Review Survey") are summarized in Table 1.3.2.

Updated locations of five projects for the study are as shown in Figure 1.3.1.

Table 1.3.2 Updated Outline of Subject Project under the Study (Updated)

Project		Bien Hoa – Bung Tau	Can Tho – My Thuan	My Thuan – Trung Luong	Ring Road 3 (HCMC) Tan Van – Nhon Trach	Ring Road 4 (HCMC) Ben Luc – Hiep Phuoc
Implementation Agency		BVEC	PMU My Thuan	BEDC	PMU My Thuan	PMU My Thuan
Length		77.6km	24.5km	54.3km	26.3km	34.7km
Feasibility Study (F/S)		On-going	Approved (BOTBasis)	Approved (BOTBasis)	Pre F/S in 2010	F/S ongoing Draft Final Report in June 2011
EIA		On-going	Approved (BOTBasis)	Approved (BOTBasis)		
Basic Design		On-going	Completed March 2009	Completed March 2009		
Present Status (May 2011)		F/S	Not Approved	Construction Suspended D/D on-going	ADB PPTA commenced in April 2011	
Project Scheme		BOT	PPP	BOT	BOT/PPP	BOT/PPP
Open Year		2015	2015	2014	2016	2016
Highway Classification		Expressway A Class120	Expressway A Class120	Expressway A Class120	Urban Expressway	Urban Expressway
Design Speed		120 km/h	120 km/h	120 km/h	80-100 km/h	80-100 km/h
Forecasted Traffic	2015	21,697pcu/d	–	–	–	–
	2020	46,399pcu/d	37,432pcu/d	58,088pcu/d	47,486-55,865pcu/d	36,566-54,855pcu/d
	2025	54,931pcu/d	42,722pcu/d	73,654pcu/d	–	–
	2030	–	48,759pcu/d	93,392pcu/d	69,977-82,325pcu/d	53,886-83,893pcu/d
Nos of Lane	Open	4	4	4	6	6
	Ultimate	6 (After 2015)	6 (After 2030)	6 (After 2030)		
Width	Thru way	22.5-27.5m	25.5m	25.5m	34.5m	34.5m
	ROW	33.0-35.0m	33.0m	33.0m	68.5m	68.5m
Major Structure	Bridge	49	21	34	15	20
	Interchange	13	3	4	11	16
	Other	Softground	Softground	Softground		
Traffic Management	Center					
	Toll Gate		2			
	SA/PA		2PA			
Investment Cost	Total	15,757Bil.VND (808Mil.USD)	8,495Bil.VND (436Mil.USD)	19,841Bil.VND	41,616Bil.VND (2.13Bil.USD)	61,501Bil.VND (3.16Bil.USD)
	Construction	8,782Bil.VND (450Mil. USD)	5,570Bil.VND (283Mil. USD)	13,024Bil.VND	31,840Bil.VND (1.63Bil. USD)	46,762Bil.VND (2.39Bil. USD)
EIRR		19.38%	12.50%	-	-	-
FIRR		7.30%	6.00%	-		

Source: Infra Review Survey



Source: JICA Study Team

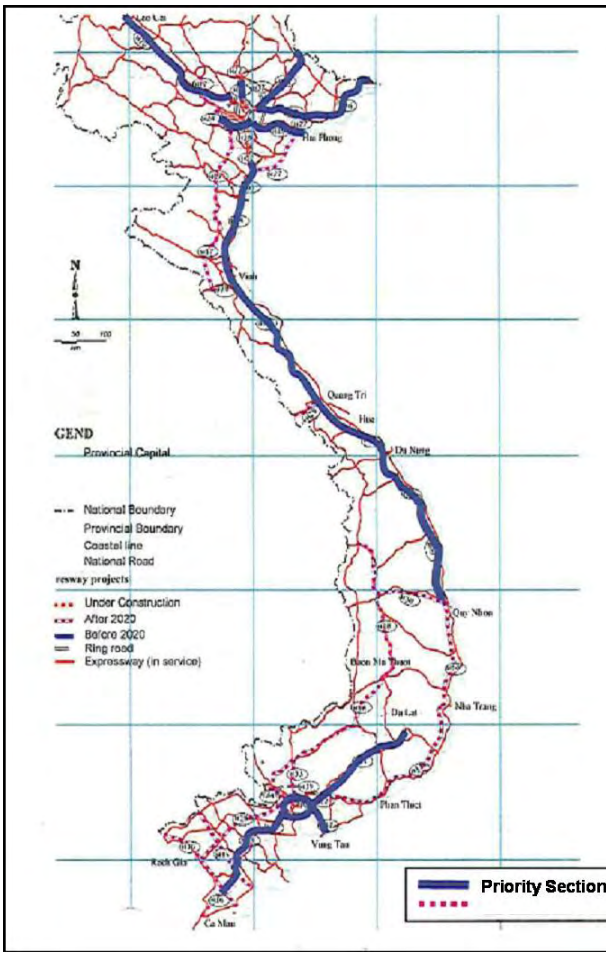
Figure 1.3.1 Study Area (Updated)

CHAPTER 2 PRESENT STATUS OF EXPRESSWAY DEVELOPMENT IN VIETNAM

2.1 Present Status of Expressway Development in Vietnam

2.1.1 Status of legislation on expressway development

The expressway development plan, issued through Prime Minister Decision No.1734/QD-TTg dated 1st December 2008, is shown in Figure 2.1.1. Outline of the approved expressway development plan is as follows.



- Number of planned route : 22
- Total length of planned route : 5,873 km (including 120 km operated sections. About 2,512 km will be constructed until 2020, and 3,241 km will be constructed after 2020.)
- Project costs : USD 20.6 billion until 2020; USD 23.5 billion after 2020.

After Decision No. 71, subsequently Decision No. 35 (2009), Decision No.1327 (2009), and Decision No.140 (2010) have been issued and thus, development of expressways is actively conducted in Vietnam.

Source: No.1734/QD-TTg dated 1 December 2008

Figure 2.1.1 Expressway Development Plan (Decision 1734)

JICA conducted VITRANSS 2 to support the development of the master plan covering the transportation sectors in Vietnam. As for the expressway development sector, VITRANSS 2 supported the formulation of "North-South expressway master plan" with corresponding preliminary feasibility study carried out.

The legislation of related law about expressway development in Vietnam is shown in Table 2.1.1, based on updated status obtained in the Study.

Table 2.1.1 Related Laws on Vietnam Expressway Development Plan

No.	Related Laws of Vietnam Expressway Development Plan		Date of Issue
1	Decision No.140/2010/QD-TTg	Detailed Plan of North-South Expressway in the East, Expressway from Hanoi to Can Tho province	2010/01/21
2	Decision No.1327/2009/QD-TTg	Road Transportation Development Plan by 2020 and vision toward 2030	2009/08/24
3	Decision No.35/2009/QD-TTg	Transport Development Strategy up to 2020 and Vision toward 2030	2009/03/03
4	Decision No.1734/2008/QD-TTg	Expressway Network Developing and Planning until 2020 and View for after 2020	2008/12/01
5	Decision No.344/2005/QD-TTg	Transport Development Plan of Mekong River Delta up to 2010 and vision toward 2020	2005/12/26
6	Decision No.1290/2007/QD-TTg	List of Projects Calling for Foreign Investment during 2006-2010	2007/09/29
7	Decision No.412/2007/QD-TTg	Investment of Transport Infrastructure Construction Projects Making Important Role until 2020	2007/04/11

Source: JICA Study Team

2.1.2 Present Status of Development of North-South Expressway

Cooperation for the North–South Expressway was agreed between Vietnam and Japan in October 2006. Since then, the master plan was developed and approved. Consequently, Decision No.140/QD-TTg was issued on 21 January 2010. Several design consultants namely, TEDI and TEDI South, are conducting the detailed survey on the basis of 1:10,000 topographic survey. It is confirmed that most of the coordination among the stakeholders are being completed for the whole of 1,817 km.

The present status of the development was updated in this Study as shown in Table 2.1.2.

Table 2.1.2 North-South Expressway Development Plan (No.140/2010/QD-TTg)

No	Section	Length (km)	Nos of lanes	Cost (Bil. VND)	Finance	Project Owner	Status (as of Dec 2010)	Cost (Bil. VND)		
								Short Term (-2015)	Medium Term (-2020)	Long Term (-2030)
1	Phap Van - Cau Gie (Widening)	30	6	1,350	N/A	VEC	F/S			
2	Cau Gie – Ninh Binh	50	6	9,650	SB, CB	VEC	U/C	9,650		
3	Ninh Binh – Thanh Hoa (Nghi Son)	126.8	6	32,012	PPP(WB)	PMU1/DRVN	F/S	32,012		
4	Thanh Hoa – Ha Tinh (Hong Linh)	97	4-6	20,000	N/A	PMU6/DRVN	F/S	20,000		
5	Ha Tinh – Quang Binh (Bung)	145	4	25,362	N/A	N/A	P F/S		10,145	15,217
6	Quang Binh – Quang Tri (Cam Lo)	117	4	12,051	N/A	N/A	P F/S		4,820	7,231
7	Quang Tri – Da Nang (Tuy Long)	182	4	24,591	N/A	N/A	P F/S		24,591	
8	Da Nang – Quang Ngai	130	4-6	25,035	ODA (WB+JICA)	PMU85/VEC	F/S	25,035		
9	Quang Ngai – Binh Dinh	170	4	29,750	N/A	N/A	P F/S		29,750	
10	Binh Dinh – Nha Trang	215	4	35,905	N/A	N/A	P F/S		35,905	
11	Nha Trang – Phan Thiet	226	4	35,708	N/A	PMU6/DRVN	P F/S	15,870	19,838	
12	Phan Thiet - Dau Giay	98	4-6	16,170	PPP(WB)	BITEXCO	F/S	16,170		
13	Dau Giay – Long Thanh	43	6-8	16,340	ODA (ADB+JICA)	VEC	U/C	16,340		
14	Long Thanh – Ben Luc	58	6-8	22,620	ODA (ADB+JICA)	VEC	D/D	18,096	4,524	
13	Ben Luc - Trung Luong (Widening)	37	8	14,970	BOT	BDEC	U/C	14,970		
14	Trung Luong – My Thuan – Can Tho	92	6	26,700	BOT	BIDV (IDICO)	F/S	26,700		
	Total	1,817		348,214				194,843	129,573	22,448

Notes: F/S = Feasibility Study; PF/S = Pre-Feasibility Study; D/D = Detailed Design: U/C = Under Construction

SB = State Budget; Gov = Government Budget; CB = Construction Bond; ODA = Official Development Assistance; BOT = Build-Operation-Transfer

Source: Decision No. 140/2010/QD-TTg

2.2 Expressway Development Projects in Southern Vietnam

2.2.1 Development Status of Southern Vietnam

The on-going socio-economic development strategy (2006-2010) sets the national development orientation as "Finish low-income country in 2010, Jump to Industrialized country in 2020". To realize the five-year rolling program, infrastructure development is given the highest priority. This policy was confirmed in the 11th Communist General Meeting in January 2011, and has been transferred to a new strategy (2011-2020). The new five-year rolling program (2011-2015) has drafted and promotes the development of remote areas in order to increase employment opportunities and raise their income.

Southern Vietnam comprises of two cities and 19 provinces with 30 million people, which is 35 % of the country's population. About 57% of GDP (2008) and 51% of foreign direct investment (FDI) in 2009 are produced in this region. Especially, HCMC and its neighboring areas are being developed remarkably and the extents are spreading to every direction. However, the Mekong Delta (consists of one city and 12 provinces) produce only 4% of FDI although its population 20 million. In order to develop this frontier region, necessary infrastructure should be timely provided, road network in general, and expressway in particular.

2.2.2 Present Status of Expressway Development in Southern Vietnam

The master plan stipulates 15 routes with a total length of 1,226 km, including HCMC Ring Road No.3 and No.4. Among these, five expressways were requested to JICA for mobilization of Japanese ODA. These include: i) Bien Hoa – Vung Tau Expressway, ii) Can Tho – My Thuan Expressway, iii) My Thuan – Trung Luong Expressway, iv) HCMC Ring Road No. 3, v) HCMC Ring Road No. 4.

Especially, Bien Hoa – Vung Tau Expressway and HCMC-Ring Road No. 3 are the highest priority projects and their early realization is strongly expected.

Legend
: Provincial Border
: Mekong River Delta Area
: North-South Expressway (Eastern, under Operation)
: North-South Expressway (Eastern, before Operation)
: Southern Regional Expresway (before Operation)
: Southern Regional Expresways (after 2020)
: HCMC Ring Road No.3(before Operation)
: HCMC Ring Road No.4(before Operation)
: National Highway No.1(Existing)

Statistics in Mekong River Delta Area

Province/City	Population (1000)	GDP (Mill USD)	GDP/Capita (USD)	FDI (1988-2009) (Mill USD)
①Long Anh	1,439	1,098	763	3,002
②Dong Thap	1,668	985	585	45
③Tien Giang	1,674	1,134	651	368
④Ben Tre	1,256	794	584	145
⑤Vinh Long	1,030	710	664	86
⑥Tra Vinh	1,004	569	536	96
⑦An Giang	2,149	1,668	741	30
⑧Can Tho	1,190	1,334	1,139	816
⑨Kien Giang	1,688	1,452	840	2,816
⑩Hau Giang	758	439	543	632
⑪Soc Trang	1,293	831	638	42
⑫Bac Lieu	858	674	813	48
⑬Ca Mau	1,207	982	785	21
Total	17,214	12,670	714	8,147

Source: General Statistics Office of Vietnam

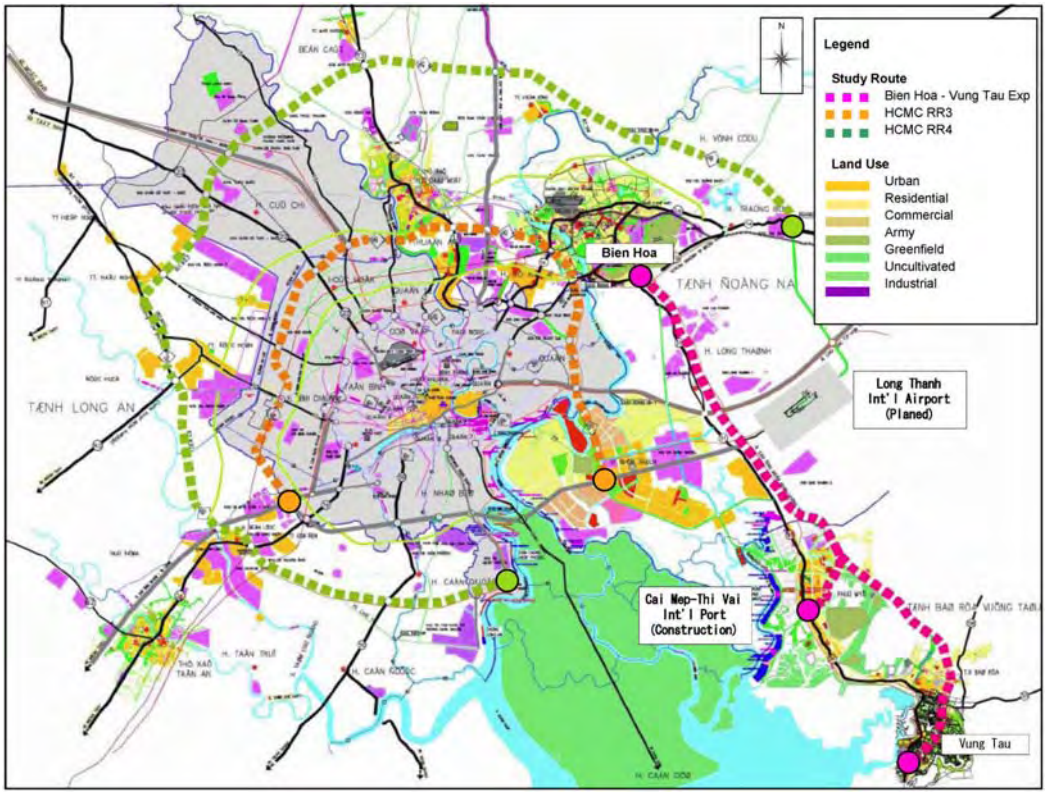
Source: JICA Study Team

Figure 2.2.1 Expressway Development Plan in Southern Vietnam

2.2.3 Expressway Developments around HCMC

(1) Urban Development Master Plan of HCMC (2020)

Urban development master plan (2020) of HCMC has been established in 2005. Many transport sector projects are being listed as the highest priority. Bien Hoa – Vung Tau Expressway and HCMC Ring Road No. 3 and 4are also listed as the top priority projects in the master plan.



Source: HCMC Master Plan 2020

Figure 2.2.2 Urban Development Plan of HCMC (2020)

(2) Developed and ongoing expressway projects

Expressway development projects in and around HCMC are shown in Table 2.2.1.

Table 2.2.1 Developed / Ongoing Main Trunk Roads Including Expressways

No.	Project name	Present condition	Completed year	Note
1	East – West Highway	Completed	2008	JBIC(JICA)
2	Thu Thiem Bridge	Completed	2008	HCMC
3	Phu My Bridge	Completed	2008	BOT
4	Ring Road No.2 (East Part)	Under Construction	2008	HCMC
5	Ho Chi Minh – Trung Luong expressway	Completed	2010	SB
6	Ho Chi Minh – Dau Giay expressway	Under Construction	2014	JICA
7	Ben Luc – Long Thanh expressway (RR3 South section)	D/D ongoing	2015	ADB+JICA
8	Bien Hoa – Vung Tau expressway	BOT F/S ongoing	2015	BOT
9	My Thuan – Trung Luong expressway	BOT-F/S approved	2014	BOT
10	Can Tho – My Thuan expressway	F/S completed (Not Approved)	2015	Undecided
11	Ho Chi Minh Ring Road No.3	Pre-F/S done	2016	Undecided
12	Ho Chi Minh Ring Road No.4	Pre-F/S done	2016	Undecided

Source: JICA Study Team

2.2.4 Importance of Bien Hoa – Vung Tau Expressway in the Southern Key Economic Zone

The Southern Key Economic Zone (SKEZ) consisting of eight localities (HCMC, Binh Duong, Dong Nai, Ba Ria-Vung Tau, Binh Phuoc, Tay Ninh, Long An and Tien Giang provinces) is considered to be the engine of growth for Vietnam. The average annual economic growth in SKEZ is around 12 percent, accounting for 60% of the country's industrial production by value, 70 percent of the country's export revenue and 40% of the country's gross domestic product (GDP). Per capita GDP in HCMC was USD 2,850 in 2010, which was 2.4 times the national average.

SKEZ has been a principal area for investment. Over the past 20 years, 54% of the country's investment capital was invested in SKEZ. Although FDI flow in year 2009 decreased to one-third of that in the previous year, due mainly to world financial crisis, SKEZ attracted FDI in Vietnam in 2009. Baria-Vung Tau was the top province attracting USD 6.73 billion, followed by Binh Duong (USD 2.5 billion; ranked third). HCMC meanwhile ranked seventh. Japan ranked fourth among the top 20 foreign investors in Vietnam in terms of total investment capital during 1990-2010. However, the year 2009 earmarked decline of Japan's investment, down to the ninth ranking of FDI in the country. Nevertheless, Japan's FDI resurged in the year 2010. At present, the members registered in the Japan Commerce Association of Ho Chi Minh account for 423 enterprises. Japanese companies invested in SKEZ, including the members of the Japan Commerce Association of Ho Chi Minh, which are reported to be around 700.

The Japan External Trade Organization (JETRO) recently updated a comprehensive map showing the major infrastructure and industrial parks in HCMC including neighboring localities, shown in Figure 2.2.3. Industrial parks are scattered in the provinces of Binh Duong, Tay Ninh, HCMC, Tien Giang, Long An, Dong Nai and Ba Ria - Vung Tau. These provinces account for 98 industrial parks.

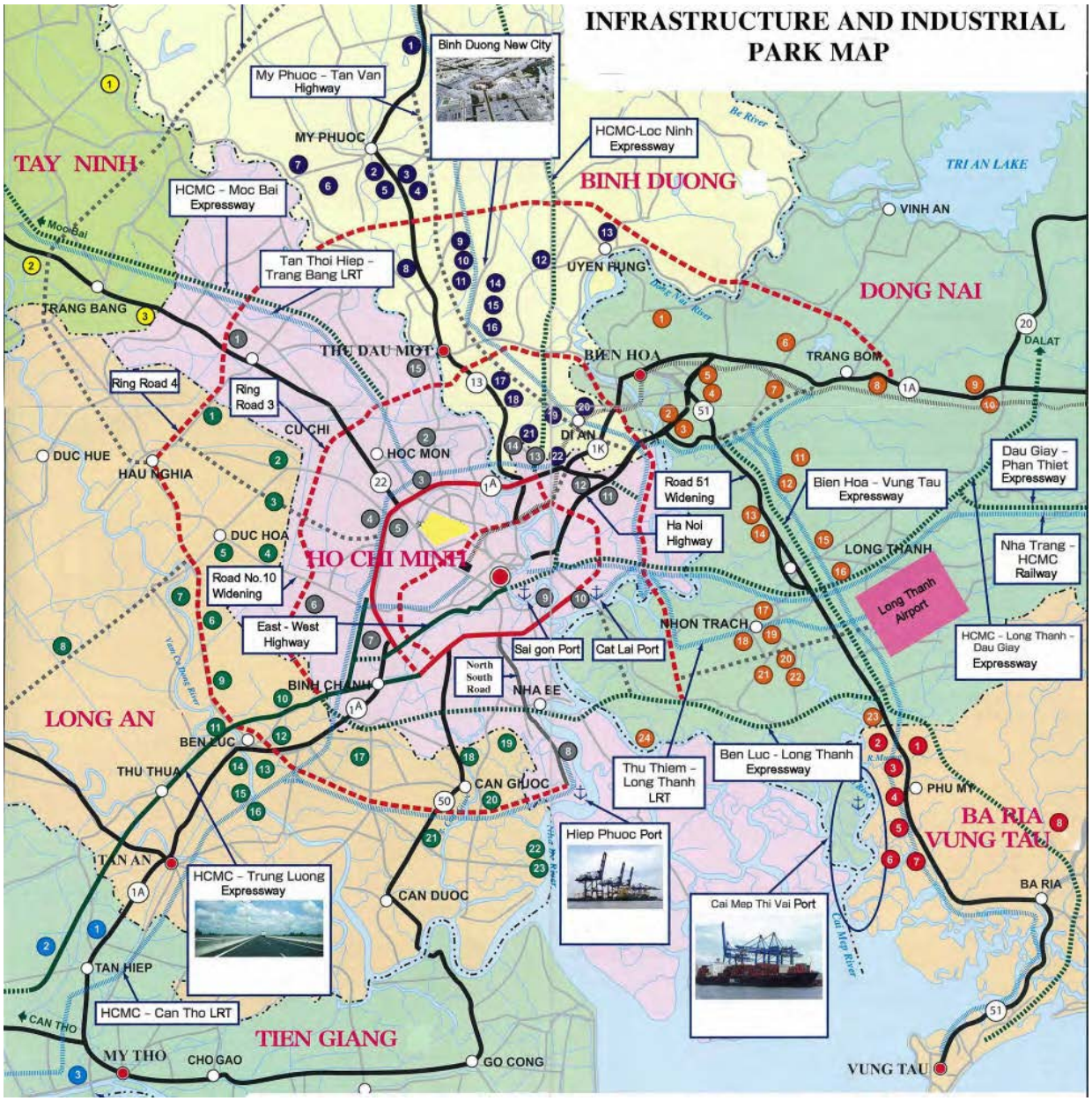
Table 2.2.2 Industrial Parks in SKEZ

Provinces	Industrial parks	Remarks
Dong Nai	24 parks are scattered along Road 51 and 1. Those are concentrated in Bien Hoa, Nhon Trach and Long Thanh.	About 830 companies are operating in 24 parks, where 81 Japanese companies are operating.
Ba Ria Vung Tau	8 parks are scattered in Phy My area along the Road 51. These in Phy My, adjacent to Cai Mep Thi Vai Deepwater Ports are featured by resource based industry such as processed steel products.	About 170 companies are operating in 8 parks, where 4 Japanese companies are operating.
Ho Chi Minh	15 parks are located in the city. Industrial parks in the City are almost in a saturated condition. Japanese companies concentrate on Tan Tuan Export Processing Zone.	JETRO statistics cover 7 parks. About 620 companies are operating in 7 parks, where 68 Japanese companies are operating.
Binh Duong	22 parks are scattered along the Road 13. Parks are used to be constructed in the provincial capital (Thu Dau Mot). Binh Duong New Town recently attracts construction of industrial parks.	About 1,640 companies are operating in 15 parks, where 160 Japanese companies are operating.
Tay Ninh	There exist 4 parks in Tay Ninh Province, with two parks located along the Road 22. Linh Trung EPZ is the biggest park in Tay Ninh.	There are 128 companies including 3 Japanese firms operating in Linh Trung EPZ.
Long An	There exist 23 parks in Long An Province, which has been less attractive for Japanese companies because transportation to Saigon Port or Cai Mep Ports has to pass through Ho Chi Minh.	JETRO statistics cover 11 parks. About 100 companies including 10 Japanese firms are operating.

Source: Industrial Parks Survey (JETRO, 2011)

Strategic importance of the Bien Hoa-Vung Tau Expressway is closely linked to Cai Mep - Thi Vai Deepwater Ports. These recently attracted highly interested private transportation sectors including forwarders, marine shipment and trucking service companies. Because of the high level of saturation of cargo handling capacity at Saigon and Cat Lai ports, the role of Cai Mep - Thi Vai Deepwater Port will be increasingly highlighted as a trans-shipment hub port. Enterprises in industrial parks located in Ba Ria-Vung Tau, Dong Nai, Binh Duong, Tay Ninh and part of them in parks located in Ho Chi Minh would use the Bien Hoa-Vung Tau Expressway to transport finish products/materials from and to Cai - Mep Thi Vai Deepwater Port. About 2,770 companies including 240 Japanese firms in parks located in the provinces of Dong Nai, Ba Ria Vung Tau, Binh Duong and Tay Ninh will benefit from using the Bien Hoa-Vung Tau Expressway in the future. The likely cross border trucking service to Cambodia through Cai Mep Thi Vai Deepwater Port and further planning of industrial parks in SKEZ would accelerate the use of the Bien Hoa-Vung Tau Expressway as well.

Long Thanh International airport in Dong Nai Province, 50 km northeast of HCMC, and 70 km west of the off-shore petroleum base city of Vung Tau, will handle long-distance international passengers and cargoes. Tan So Nhat Airport has recently accounted for nearly two thirds of the international arrivals and departures in all of Vietnam’s airports. Long Thanh International Airport will compliment Tan So Nhat Airport in international arrivals and departures. The Bien Hoa-Vung Tau Expressway will be the main route for passengers and cargo traffic between Long Thanh International Airport and Dong Nai, Binh Duong, Tay Ninh and Binh Phuoc.



Source: Industrial Parks Survey (JETRO, 2011)

Figure 2.2.3 Industrial Development in SKEZ

CHAPTER 3 PRESENT STATUS OF BOT/PPP PROJECTS IN EXPRESSWAY DEVELOPMENT IN VIETNAM

3.1 Present Status of Legal Framework for BOT/PPP Scheme in Vietnam

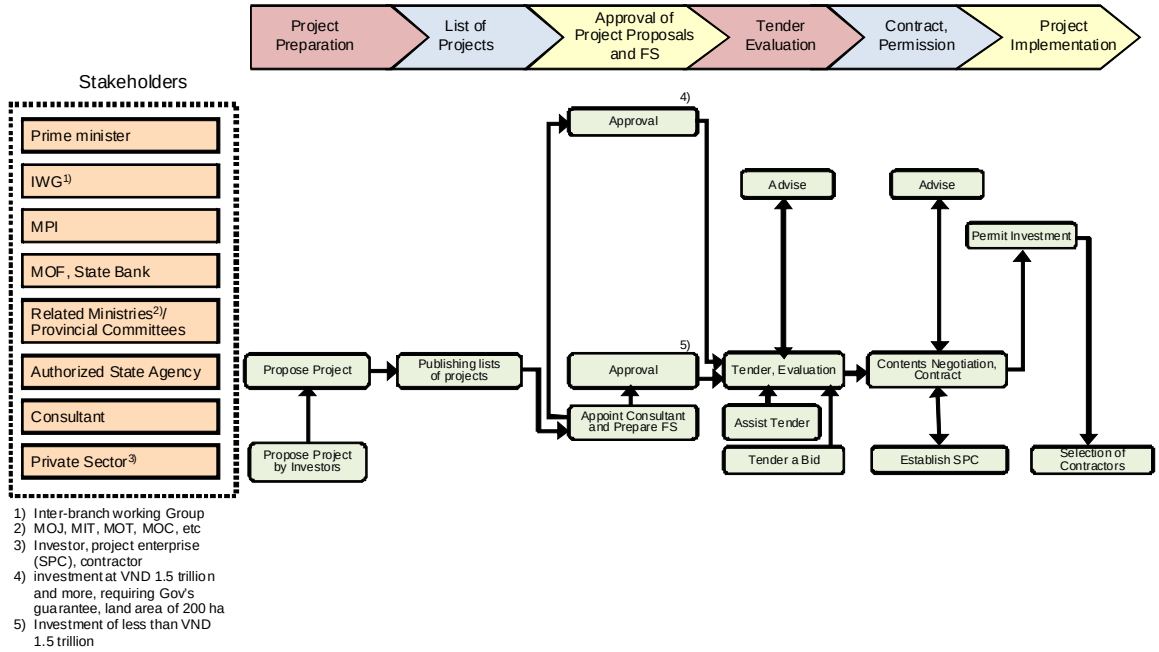
3.1.1 Existing Laws for BOT/PPP Scheme

(3) BOT Law

Vietnam first enacted regulations for BOT projects in 1994 within the framework of the Foreign Investment Law (FIL). These initial regulations left many questions unanswered, especially in the area of financing. In August 1998, the GOV issued Decree 62 to regulate the implementation and financing of BOT projects. Partly in response to concerns raised by foreign investors and lenders after the Asian financial crisis, the GOV further liberalized the BOT regime by issuing Decree 02 in January 1999, amending Decree 62. The FIL, Decree 62 and Decree 02 are the first components of Vietnam BOT law.

Then, the government issued a decree on "Investment on the Basis of Build-Operate-Transfer (BOT), Build-Transfer-Operate (BTO), and Build-Transfer (BT) Contracts", which is called Decree No.78 enacted in 2007. The said decree consists of i) General Provisions, ii) Formulation and Publication of Lists of Projects, iii) Selection of Investors for Project Contract Negotiation, iv) Negotiation and Signing of Project Contracts, v) Implementation of Projects, vi) Transfer of Facilities and Termination of Project Contracts, vii) Investment Incentives and Guarantees in respect of Investors and Project Enterprises, and viii) Implementation Provisions. Decree 78 is the first BOT Law enacted in Vietnam, stipulating i) definitions of BOT/BTO/BT schemes, ii) conditions and regulations required for state contribution and equity-debt ratio, iii) procedures from project preparation to implementation, and vi) incentives such as income tax and export/import duties.

Nevertheless, Decree 78 needed to be improved and clarified for private investors in respect of conditions and regulations for state contribution and equity-debt ratio, procedure and requirements (who does what). The government initially intended to supplement Decree 78 in the form of a circular, but instead decided to issue the new Decree 108, which was enacted in 2009. The latter decree which is on investment in the form of BOT, BTO and BT Contracts (No.108) comprised of i) General Provisions, ii) Establishment and Announcement of Project Lists, iii) Selection of Investors for Contract Negotiation, iv) Project Contract, v) Procedures to Issue Investment Certificates and Project Implementation, vi) Transfer of Works and Termination of Project Contracts, vii) Incentives and Investment Security for Investors and Project Enterprises, and viii) State Management for Investment Projects for BOT/BTO/BT Schemes. Decree 108 was improved and clarified in the light of the procedure and requirements (who and what). Its procedure is illustrated in Figure 3.1.1.



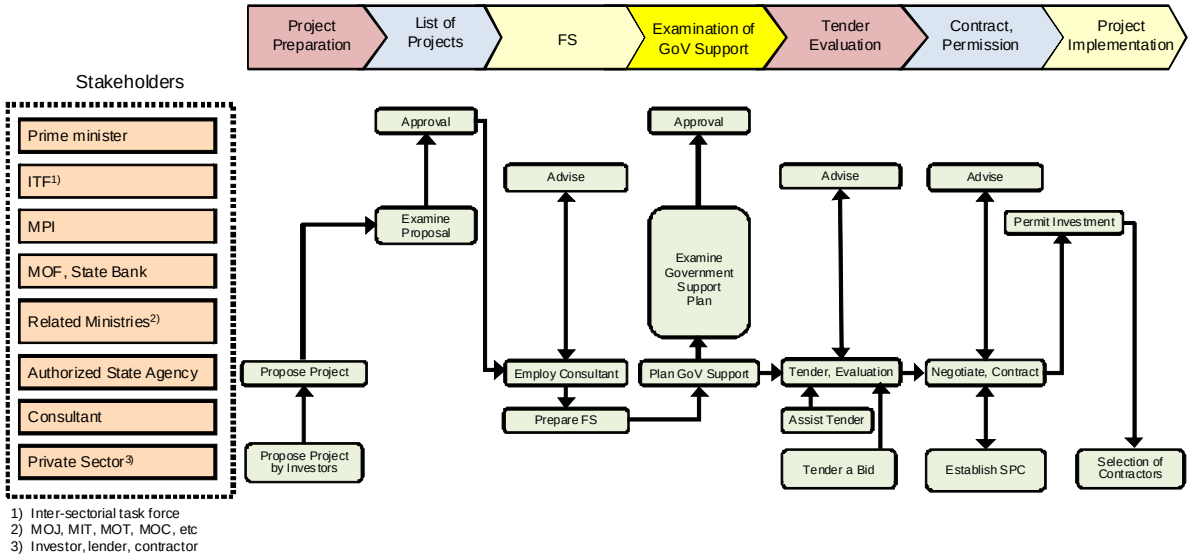
Source: JICA Study Team

Figure 3.1.1 Procedures based on Decree 108

The authorized state agency (i.e. the Ministry of Transport for expressway development project) is primarily responsible for the entire procedure from project preparation to project contract. The Prime Minister's approval is needed for projects costing more than VND 1.5 trillion at the stage of F/S report preparation. Ministry of Planning and Investment (MPI) is liable for the issuance of Investment Certificate (IC) to investors/project companies after a project contract is made. Further amendment of Decree 108 will be issued in the form of Circular No.03.

(4) PPP Regulation

Vietnam recently paved the way for a pilot PPP legal framework. The pilot PPP legal framework took the form of Prime Minister Decision 71 on the regulation for pilot Investment under PPP scheme. Decision 71, issued in 2010. is not a law but a pilot regulation subject to amendment. It is almost identical with the BOT law in terms of procedure and contents. Decision 71 comprised of i) General Provisions, ii) Public Participation, iii) Project Preparation, iv) Selection of Private Partners, v) Project Contract, vi) Investment Certificate and Project Implementation, vii) Financial Statement and Transfer of Project Work, viii) Incentives and Guarantee of Investments, and xv) Organization of Implementation. Procedure based on Decision 71 is illustrated in Figure 3.1.2.



Source: JICA Study Team

Figure 3.1.2 Procedure based on PM Decision 71

Decision 71 empowers authority to MPI, say, virtual approval of list of projects before Prime Minister's approval, and MPI initiative-based inter-sector task force that gives advice to approval of the F/S, selection of investors (tender evaluation) and project contract. The chapter on public participation is highlighted, stipulating a maximum ratio of 30% of the state capital contribution. The PPP regulation became effective in January, 2011; however, it is just intended for pilot PPP projects and thus, a comprehensive PPP framework would be adopted upon pilot projects' post-implementation phase.

3.1.2 Legal Support for Private Fund Mobilization

The government has suffered from a chronic shortage of public funds. Thus, reduction of state capital contribution on infrastructure development has now a categorical policy shared among the government sectors. Under such circumstance, private fund mobilization will be the key approach to infrastructure development in Vietnam. There is a question raised on the newly launched PPP legal framework, if such is supportive to private fund mobilization. Table 3.1.1 shows a comparison of the PPP Regulation and the BOT Law (Decree 108).

Table 3.1.1 Comparison between Decision 71 and Decree 108

	Regulation on pilot investment under PPP (PM Decision 71/2010/QD-TTg)	Decree on investment in BOT, BTO and BT (No 108/2009/ND-CP)
Business method	PPP	BOT, BTO and BT
State capital	Not exceed 30% of total project investment cost (Article 9) and included in total investment cost (Article 2).	For the urgent and important projects. Not exceed 49% of total investment cost and is not included in total project investment cost (Article 6).
Use of state capital	Auxiliary facilities, compensation cost, land acquisition, clearance, resettlement and others	The same as PM71
Equity/debt ratio	30% of the total private sector's investment at least and the remaining financed by commercial and other sources of fund without government guarantee (Article 3).	1) A project capitalized at up to VND 1.5 trillion: not lower than 15% of the total private investment. 2) A project capitalized at more than VND 1.5 trillion: not lower than 15% of capital up to VND 1.5 trillion and not lower than 10% of capital over VND 1.5 trillion (Article 5).
Investment area	Road, railway, urban transport, airport, water supply, power plant, hospital, disposal treatment plant (Article 4). The underlined is the new investment area.	Road, railway, airport, water supply, power supply, others
Project portfolio and feasibility report	A list of projects is monitored and evaluated by MPI and decided by PM (Article 14). A feasibility report is submitted to PM to consult public participation and guarantee and approved by MPI in cooperation with MOF (Article 18). Cost of feasibility study is to be financed by the state (Article 6).	A list of projects is monitored/evaluated/decided by the relevant state agencies. PM may approve feasibility reports of projects requiring investment of more than VND 1.5 trillion, land area of more than 200 ha and government guarantee (Article 12). Feasibility study of projects to be financed by private sector itself (Article 8).
Land acquisition		Compensation/land acquisition/resettlement costs to be financed by private sectors except for projects in Article 6 (Article 30)
Toll rate	To be determined based on cost, profits, users and the state policy, and adjusting of toll rate to be noticed to the state agency (Article 37)	The same as PM 71 (Article 33). The government support for toll revenue (Article 34).
Preferential treatment	Preferential taxes for corporate income and import duties, and exemption of land use fees for the area controlled by the state (Article 41)	The same as PM 71 (Article 38).

Source: JICA Study Team

The comparison between Decision 71 and Decree 108 is summarized as follows.

1) State capital contribution is 30% at the maximum for the PPP regulation while Decision 108 allows state contribution to finance 49% of investment cost at the maximum. Further state contribution is not counted in project investment cost in BOT projects.
2) The PPP regulation does not allow private investors to apply the government guarantee while Decision 108 paves the way for government guarantee.
3) The PPP regulation imposes a fixed equity-debt ratio (30:70) while Decree 108 gives a flexible ratio, 15% at the maximum depending on scale of investment.

As a whole, the PPP regulation appears to be veering away from adopting a business-friendly scheme compared to the existing BOT Law. Further review of the PPP regulation is needed from the viewpoint of private fund mobilization.

The Circular No.90 issued in 2004 is a regulation on toll rates and has not been amended yet. Although amendment of toll rates can be stipulated in a project contract (Decree 108 and

Decision 71), toll rates are virtually regulated by Circular No.90. If tariff does not increase according to tariff amendment stipulated in a project contract, a project enterprise could not gain toll revenue expected. The Ministry of Finance (MoF) currently examines a fund mobilization method, particularly a private fund. Toll revenue is an important fund source for project finance. Amendment of Circular 90 expected in 2011 will be supportive to the mobilization of private investment and financing for BOT/PPP projects (as of March 2011)**.**

3.2 Present Status of BOT/PPP Projects in Expressway Development

After the issuance of the BOT Law (the Decree 78) three years ago, several BOT expressway projects have been identified on the list of MOT's projects. Nevertheless, there is only one project (the Trung Luong-My Thuan expressway) that concluded a BOT contract with MOT. On the other hand, most PPP projects are currently at the stage of project preparation. So far, no expressway project has been proposed under a PPP scheme.

According to "Public-Private Partnership (PPP) in the Road Sector (September 2008)" by World Bank, the following are identified as BOT/PPP projects in expressway development:

Projects in operation

a) Hanoi - Cau Gie Expressway Toll Collection

Projects being implemented

a) Cau Gie - Ninh Binh Expressway

b) Hanoi - Hai Phong Expressway

c) HCMC - Trung Luong Expressway

d) Trung Luong - My Thuan-Can Tho Expressway

e) HCMC-Long Thanh - Dau Giay Expressway

f) Noi Bai - Lao Cai Expressway

CHAPTER 4 STUDY ON RISK AND SECURITY PACKAGE IN GENERAL ASPECT

4.1 Synthesis of Risks Involved in Expressway Development (General)

One of the fundamental elements of private investor and lender's project feasibility assessment is to analyze the risks involved in the project. Table 4.1.1 describes the general categories of risks involved in large infrastructure projects. In this section, the general risks involved specifically for Expressway Development is synthesized. Subsequently in Section 8.4, preliminary assessment of risks involved in Bien Hoa - Vung Tau Expressway Project will be described.

The four large categories of risks are:

1. Project design/construction/operation and maintenance (O&M) risks
2. Project finance risks
3. Market risks
4. Project external risks

4.1.1 Project Design/Construction/O&M Risks

Land acquisition risk: Land acquisition cost will be a risk factor, especially if the cost will be borne by the private sector. In general, land prices along the expressway can experience price hikes due to speculative land transactions. Typically, the government freezes land transaction along the alignment to prevent such phenomenon. Also, the implementation of land acquisition (typically by the local government) can take time due to compensation and resettlement plan negotiation gridlocks. This could lead to delays in construction, which is a large cost factor for the private investor.

Environment/ Social risk: This is about fulfilling EIA requirements and other environment/social related guidelines involved in expressway project. The project must comply with regulations set by the country as well as guidelines of donors and other related stakeholders. The procedures on obtaining appropriate approvals could trigger delays or sometimes require changes to the plan of the project.

Technical risk: This gets into the engineering areas of the project. In general, structures such as tunnels and bridges require extra attention, because there are more potential technical factors that can cause delays in these areas.

Project completion risk: This is about construction management and supervision. In general, quality, cost, delivery and safety features require tight control for expressway projects. If any of these dimensions are off track, these pose as risks to the completion of the project.

O&M risk: This is about the O&M of expressway after its operation commenced. Requirements for expressway O&M will be different from ordinary road. Therefore, a dedicated organization with the right sets of skills and experience will be required. Otherwise, there will be risks leading to poorly managed expressway or cost overruns.

4.1.2 Project finance risks

Sponsor Risk: Expressway project is structurally difficult to attract investors that are genuinely interested in long-term returns from toll revenues. Therefore, there are general risks on whether a

reliable sponsor could be found. Sometimes, there are investors that look for other financial benefits and may not fully commit to long-term expressway business.

Financing risk:

Expressway projects can very often stall because of investor's difficulty in reaching financial closure with the lender. Concession agreement maybe signed but the investor may fail to convince the lender on project profile and security aspects.

4.1.3 Market Risk

Traffic demand risk: Traffic demand risk is related to whether the demand forecast levels of traffic can be achieved under a certain road network and tariff scenario. This is also a function of how to make assumptions on the future traffic needs of industrial users, as well as general road users along the alignment.

Tariff risk: Tariff levels and adjustments have extremely high sensitivity to the Project IRR. Therefore, if tariff adjustments are not made according to agreed scenario, it will have huge consequences on the revenue and profitability of the project. Investors and lenders are extremely cautious about public infrastructure, especially when it involves tariff risks, which are out of their control.

Network Risk: Expressway is a network business. Other roads and expressway either supplement each other or compete with each other. Therefore, scenario changes to the network plan can significantly affect the traffic for a given expressway. In general, the network plans are written in the BOT contract with the line ministry that will be responsible for the plans of other network nodes.

4.1.4 Project External Risks

FX Risk: The revenue base of expressway project will be based on local currency tariff. Therefore, for overseas investors and lenders, the FX risk will be an important element to consider. In general, long-term movement of FX rates should be driven by the long-term outlook of economic fundamentals of the country. FX risk cannot be managed and therefore it is a matter of risk allocation and hedging between investors, lenders and government.

Interest Rate: The project's cost of debt will be subject to changes in interest rate, for the portion that is linked to market interest rate movements. Investors will need to take this into account when they plan for equity return.

Currency Conversion: Overseas investors and lenders would want to convert local currency to hard currency and send cross borders. Some countries change guidelines related to the restriction of such monetary movements.

Regulatory Risk: Expressway projects are implemented under various legal structures, including the BOT/PPP law, expressway construction regulations, tariff regulations and O&M regulations. Changes in these regulations can sometimes negatively affect the profitability of the project. Hence, investors will typically discuss this matter in detail with the local government.

Political risk/Force majeure: This is related to labor disputes, political instability, natural disasters and other unforeseen events that may negatively affect the project. Typically, export credit agencies (ECAs) provide basic guarantee packages in hedging this type of risk.

Table 4.1.1 List of Risks

	Name	Description
Project design/construction/O&M risks	Land acquisition risk	・Land acquisition cost exceeds estimated budget
		・Land acquisition is delayed
	Environment/Social risk	・Project is denied/delayed due to environmental/social impact
	Technical risk	・Project is delayed due to technical bottleneck
	Project Completion risk	・Project is delayed due to mismanagement of construction
		・Project construction cost exceeds budget
		・Project is delayed or has cost overrun due to design defects
	O&M risk	・O&M cannot be carried out as planned or exceeds estimated cost
Project finance risks	Sponsor risk	・Sponsor is unable to pay required capital
		・Alternative sponsor cannot be found
	Financing risk	・Qualified lender cannot be found
		・Loan amount is not sufficient
Market risks	Traffic demand risk	・Traffic demand is lower than forecast
	Tariff risk	・Tariff adjustments are not made according to agreed formula
	Network risk	・Traffic demand is lower due to alternative road development and/or delays in adjacent feeder connections
Project external risks	FX rate risk	・FX rate fluctuation negatively affects project return
	Interest rate risk	・Interest rate fluctuation negatively affects project cost of debt
	Currency conversion, overseas transaction risk	・Currency conversion and/or overseas transaction cannot be made
	Regulatory risk	・Changes in regulation negatively affects project (e.g. permits)
	Political risk	・Project is negatively affected due to political instability
		・Terrorism or labor strike
	Force majeure	・Natural disaster, accidents and other unforeseen events

Source: JICA Study Team

4.2 Risk Management/hedge Approach (General)

In general, investors and lenders will manage/hedge above risk types through the following process:

4.2.1 Risk allocation

Allocate each risk to organization that can best control and manage risks. In this way, projects can establish fundamental basis in minimizing the total sum of project risks. The process methodology for this is to start with the identification all organizations involved in expressway development, including government contracting agency, sponsor, lender, Special Purpose Company (SPC) and contractor. Allocate risks to each identified organization. Allocation of market risk is the most important point to consider. For this, there are cases allocated to both the private and/or government. It could be argued that from a control point of view, government is in a much better position to control tariff and network risk because this is a government's decision matter. However, not many governments realize this point and try to allocate risks to the private sector.

4.2.2 Risk management

Enhance risk mitigating actions taken by each organization responsible in managing risk. This action includes policy/regulatory improvements, high quality F/S implementation, qualified contractor deployment and other project management measures. If each organization takes appropriate mitigating actions, then, the total sum of project risk is minimized. It is very important to differentiate this with **(1)** or **(3)**. This is not zero-sum. Management of risk can be a win-win situation for all parties involved.

4.2.3 Risk insurance/guarantee

Risks will remain even after risk mitigation is executed. The residual risks can however be shared among organizations such as the international agency, ECA and private insurance company. Also, contractual negotiation will allow balancing of risks among organizations involved in the project. For expressway, tariff guarantee will be an important element for private investor. Furthermore, it is noted that minimum revenue guarantee scheme has been quite effective in Korea. There is also a movement to use the "breach of contract" guarantee against BOT contract. It is realized that obtaining this from the government will have positive impact in terms of attracting private investors.

4.3 Consideration of Security Package for Lender (General)

4.3.1 Overview of Security Package

Security is typically given by way of the following.

- A mortgage of land use rights and structures on land if permitted. The law prohibits the granting land mortgages to foreigners. In the past, there have been exceptions to allow land mortgages to foreign lenders for projects that are of national importance. However recently, the GOV seemed reluctant on this issue.
- A mortgage of the shares or capital in the project company. Because there is no security under Vietnamese law which can be taken over all the assets of the project company, foreign lenders typically require security over sponsors' interests in the project company.
- A mortgage over plant and equipment.
- Security over key project contracts and insurances with consent from relevant counterparties in typical form.
- A project account structure which ensures net revenues are held offshore in USD accounts, together with security over both onshore and offshore project accounts. The account structure would often be supported by a conversion bank agreement under which mechanisms for conversion of VND to USD would be agreed.
- The government guarantees obligations of the Vietnamese participants in the project company, and government supports other issues such as conversion and convertibility of the project company's revenues into foreign currency, provision of infrastructure facilities, no nationalization, stability of laws, etc.
- A guarantee given by the sponsors until completion of the project and other sponsors' undertakings – such as to contribute capital.
- A Ministry of Justice (MOJ) legal opinion.
- Political risk insurance.
- International Financial Institutions (IFI) and ECA support.

Note that in the absence of a charge over all the assets of the project company (which is not a feature of the Vietnamese law), there will be some assets over which security cannot be taken (e.g. licenses). Hence, security over the shares or capital in the project company is important.

In addition, it is worth noting a few ancillary points. Security over assets in Vietnam should be registered in order to ensure priority. This is done with the National Register of Security Interests.

Foreign loans of more than 12 months must be registered with the State Bank of Vietnam (SBV). This is important because otherwise, remitting the proceeds of security enforcement out of the country will likely be impossible.

Since security taken over assets in Vietnam is assumed by an onshore security agent (not as trustee), it is likely that if the bank syndicate changes, this requires changes to the documents and the registrations. The benefits of the security trusteeship, which include the ability to replace lenders from time to time while the security trustee continues to hold all the securities on behalf of the lenders, are difficult to replicate in Vietnam. Consequently, it is best if all lenders are on board at the time the documentation is signed.

4.3.2 Security over Key Project Contracts and Insurances

In any infrastructure project, there are project contracts where without such, the project is not bankable. For example, a turnkey construction contract with a reputable contractor with appropriate provisions on liquidated damages and indemnities, etc. is a basic requirement for a green fields project. Depending on the nature of the project, there could be supplier or offtake contracts. There will invariably be insurance policies for property damage.

The lenders will want security over the project company's rights under these project contracts. Depending on the jurisdiction wherein these contracts are likely to be enforced, security might be taken over such contracts in a number of ways, including by way of mortgage, charge or assignment. In addition to the security itself, it is conventional for the lenders, the project company and the counterparty to the contract (e.g. the construction contractor) to enter into an agreement sometimes called a "Consent Deed" or a "Tripartite Agreement". The purposes of this agreement are to ensure the counterparty consents to the security being taken and to suspend certain rights (e.g. the right to terminate the contract) while the lenders attempt to enforce or remedy a problem. If the contract has defects, which are rendered unbankable, these can be remedied in this agreement.

Insurance policies have been seen to be dealt with in this way. However, more commonly, the lenders will be made a loss payee subject to conditions concerning the uses to which proceeds may be put. The loan documentation would include basic requirements as to the terms of the policies designed to protect lender interests, and an insurance consultant to the lenders would normally check compliance with these requirements.

4.3.3 Support by Vietnamese Government

Government support to projects of this type comes in three broad categories:

- Incentives provided under an Investment Certificate (IC);
- Incentives available under the laws; and
- Government guarantees

If possible, above three items should be addressed while the project company is being established. This is the time of greatest influence for the project sponsors. It is sometimes difficult to extract concessions once the project company has been established.

Investment incentives are those granted to the company on its establishment and appearing in its constituent documents, mostly in the IC. These may include statements on tax holidays, provision of infrastructure, rights to land, etc. Note that some incentives are granted by law (i.e. the project receives them whether or not they are written into the project company's constituent documents). Nevertheless, it tends to be the practice where sponsors prefer confirmation of

these incentives. Moreover, due to the ambiguity of the laws, the sponsors usually prefer those incentives in the laws further clarified in the government guarantees. Sometimes, the laws only provide principles, whereas the project sponsors require that the procedures on how to obtain the incentives be stated in a bilateral contractual arrangement in a project document, such as BOT Contract or a "Government Guarantee and Undertaking" (GGU). These two types of contract documents so far used to record agreements with the state in some very large-scale infrastructure investments (mostly energy-related) in Vietnam.

(1) Incentives Provided under an IC

Subject to (i) applicable law relating to change in law and (ii) any binding agreement that may have been made with the state in relation to change in law, sponsors will be entitled to the incentives specified in the IC.

The Law on Investment (LOI) states that where a newly issued law contains more favorable treatment than those that the sponsors are enjoying, the sponsors are entitled to the more favorable treatment.[1]

Where a new law or policy changes adversely affects the sponsors, the sponsors will still be able to continue enjoying the incentives as stipulated in the IC.[2] In case of discontinuance in granting such incentives, the article provides that one or more of the following measures should be applied:

(a) Continuation of enjoyment of benefits and incentives;

(b) Deduction of the loss from taxable income;

(c) Change of the operational objective of the project; and

(d) Consideration shall be given to payment of compensation in certain necessary circumstances.

The article also states that the government will provide specific provisions on guarantee of interests of sponsors in the case where a change in law or policy affects adversely the interests of sponsors. It is noted however that no such regulations have been enacted. The only mention of change in law in the government's Decree 108 dated 22 September 2006, which implements the LOI (Decree 108 on LOI) is in relation to the measure specified in (d) above. Decree 108 on LOI merely states that the interchange issuing body will recommend to the Prime Minister to issue a decision on guarantee of the investor's interests as a consequence of the change in law or policy affecting adversely the interests of such investor. Thus, there is no certainty of outcome in case of adverse change of law.

In approximately five large-scale infrastructure projects, the sponsors overcame this uncertainty in relation to change of law by putting it clearly in the contract with the Government in a GGU for suitable protection, including compensation.

In current projects, the Government is resisting any such certainty as the subject of contractual arrangements.

(2) Incentives Available under the Laws Applying to Different Investment Structures

1) LOI

The incentives provided for in the LOI apply to all investment structures: investment in the form of a BOT project, a BT project, a PPP project or an ordinary company in the form of a limited

[1] The LOI, Article 11.1.
[2] The LOI, Article 11.2.

liability company or a shareholding company.

2) Decree 108 on LOI

Decree 108 on LOI provides specific provisions on incentives stipulated in the LOI. However, basically it is just a repetition of the incentives stated in the LOI.

3) Decree 108 on BOT Contracts

Decree 108 of the Government dated 27 November 2009 on BOT, BTO and BT projects provides for the incentives applicable to these projects.

4) Decision 71

Decision 71 of the Prime Minister dated 9 November 2010 promulgating regulations on pilot PPP projects reiterates the incentives stipulated in Decree 108 on BOT Contracts.

Note that from a technical legal perspective, these regulations may be invalid as being ultra vires of the Prime Minister.

5) Incentives Provided

Under aforementioned applicable laws, a project company is entitled to several incentives such as:

- Preferential treatment depending on sectors and localities;
- Tax incentives;
- Incentives on land use;
- Extension of Incentives;
- Government guarantees;
- Right to mortgage assets and land use right;
- Assurance of provision of public services; and
- Protection of capital and assets from expropriation/ nationalization.

6) Ad hoc contractual government guarantees

In about six cases, the government has signed a GGU (or BOT Contract) in support of specific issues such as:

- Availability of foreign currency, convertibility of local currency, and remittablity of foreign currency;
- Performance (payment) guarantees of state enterprises such as electricity offtakers and coal suppliers;
- Stability of law including tax law (change in law provisions);
- Compensation for nationalization; and
- Provision of land and infrastructure facilities.

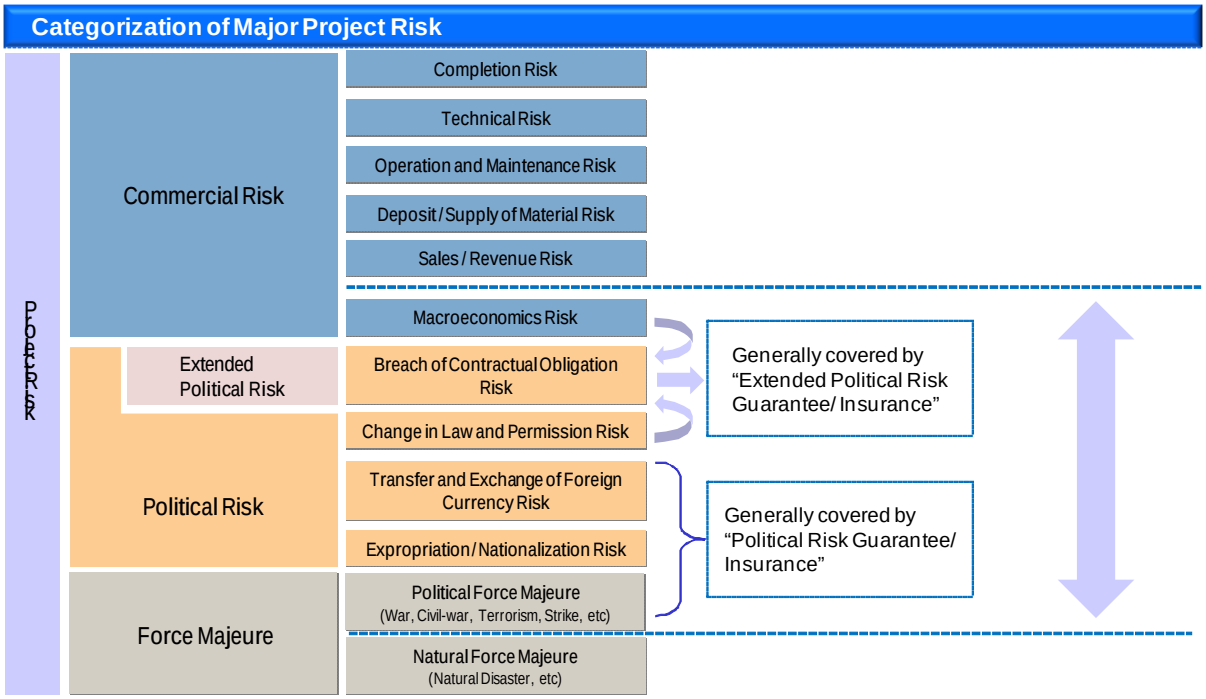
As indicated in Item 2) above, some incentives are already stipulated in Decree 108 on BOT Contracts. However, how these incentives are applied in practice is unclear. In the past, in large-scale infrastructure projects as well as projects under negotiation, sponsors have tried to clarify the incentives that the BOT company and the sponsors are entitled to under the law, and put them in the GGU for more certainty. Recently, the government has been resisting such attempts.

4.3.4 Support by IFI and ECA

(1) Risks covered by IFI and ECA

1) Overview of the Categorization of Project Risks

General categorization of project risks is described in the following figure. The risks covered under programs by IFI and ECA are explained in detail in the following sections.



Source: JICA Study Team

Figure 4.3.1 Categorization of project risk

2) Macroeconomic-Related Risks

Macroeconomic-related risks categorized in commercial risks can be covered indirectly by IFI and ECA programs, through the following "breach of contractual obligation" cover. Risks of fluctuation of interest rate, inflation, and foreign exchange rate are included in this category.

3) Political Risks

a) Breach of Contractual Obligation

This is a risk that government of the project host country or the governmental organizations might breach obligations stipulated in project contracts. This is called the "extended political risk" in some IFI and ECA programs.

b) Change in Law and Permission by authority

Government or the governmental organizations might change the laws related to the project or withdraw the permission once issued.

c) Transfer and Exchange of Foreign Currency

Government or the central bank of the project host country might promulgate regulation for exchange of the project cash flow in local currency to foreign currency such as US dollars, or transfer of the project cash flow to offshore accounts.

d) Expropriation or Nationalization of the Project

Government of the project host country might expropriate or nationalize the project owned by the project sponsor.

e) Political Force Majeure

Procurement of materials of the project or product and service provision might be directly or indirectly affected by occurrence of war, civil-war, terrorism, strike, and so on.

(2) Major IFI and ECA and Their Program

The following table shows the major IFI and ECA, and their program briefly. The coverage of risks depends on the IFI/ECA and the program.

Major Support Programs by ECAs for Infrastructure Development Project in Developing Countries

	Name of the Organization	Category	Support Program				
			Equity	Loan	Investment Insurance	Loan Guarantee /Insurance	Coverage of guarantee/insurance
ADB	Asian Development Bank	International Financial Institutions	○	○	○	○ (Guarantee)	◆ Political risk guarantee and partial credit guarantee ◆ Political risk guarantee covering four major political risk (*)
MIGA	Multilateral Investment Guarantee Agency	International Financial Institutions			○	○ (Guarantee)	◆ Political risk guarantee covering four major political risk (*)
IFC	International Finance Corporation	International Financial Institutions	○	○		○ (Guarantee)	◆ Partial risk guarantee
OPIC	Overseas Private Investment Corporation	Export Credit Agencies (US)		○	○	○ (Insurance)	◆ Political risk insurance ◆ Covering political violence, expropriation /nationalization, regulation on transfer or exchange of foreign currencies, generally
JBIC	Japan Bank for International Cooperation	Export Credit Agencies (Japan)	○	○	(**)	○ (Guarantee)	◆ Political risk guarantee is common in project finance. ◆ Covering four major political risk
NEXI	Nippon Export and Investment Insurance	Export Credit Agencies (Japan)			○	○ (Insurance)	◆ Loan insurance covering credit risk in addition to political risk ◆ Covering four major political risk

(*) ①Political violence such as War and Civil-war (although coverage depends on agencies, ②Expropriation/ nationalization, ③Regulation on transfer or exchange of foreign currencies, ④Breach of contract (whose coverage depends on agencies)
(**) As for the equity back finance, "Political risk immunized" loan program is available which indulgence of loan repayment when nonpayment of dividend occurs.

Source: JICA Study Team

Figure 4.3.2 Support Program by IFI and ECA

(3) Expectation on the Resumption of Private Sector Investment Facility (PSIF) by JICA

JICA used to have a program for funding to private sector (PSIF) in order to contribute in resolving development challenges in developing countries. However, the Government of Japan decided to freeze PSIF, which has not been applied to new projects since 2002.

The Government of Japan officially formulated the "New Growth Strategy" in June 2010 which mentions PSIF. According to said strategy "it is intended that JICA's private sector funding scheme should resume in order to prioritize the most needed development projects which have difficulties in securing funding from existing commercial financial institutions". For the resumption of PSIF, it is necessary to build a system for analyzing and managing risk, based on enough study and evaluation of existing successful and failed projects that PSIF applied in the past.

Thus, once resumed, PSIF, the JICA scheme, should also be considered as one of the funding channels.

4.4 Potential Structure for Road Projects in Vietnam

The risk management/hedging actions and security package structure for Vietnam would be the essence of project scheme design for expressway project. Here, design structures for specific scenario considerations are provided in Chapter 8.

The design structure would be in the following three categories.

4.4.1 Subsidy from Vietnamese Government

Attractive Project IRR will be the basis of assessment for both investor and lender. Therefore, subsidy structures are quite important to bring up the project IRR to acceptable levels. There is several subsidy potential for Vietnam.

- First, there is land cost subsidy. This can be considered part of a basic plan for road project structure. It was learned that there were several cases where land cost subsidy has been approved.
- Second, there is potential subsidy for supporting facilities of expressway such as the intersection surroundings and potential parking area/service area developments. In BOT Decree 108, it states the potential subsidy approval for high priority projects. This can be considered an advanced menu of subsidy required if project IRR cannot reach target levels after land subsidy.
- Third, there is the main construction cost subsidy. This is not easy to obtain and should be considered as last resort. However, Decree 108 can provide up to 49% subsidy, which means it is not against the law. Also, there are discussions inside MPI on Viability Gap Funding scheme. Variations could be considered by a leasing model, which is for the government to develop part of the expressway and lease the portion to private at fixed subsidized fees.
-

4.4.2 Guarantee from Vietnamese Government

This is the area of contingent support. Here, there are several categories to be further designed.

- First, there is a minimum revenue guarantee. This scheme has been successful in South Korea and Chile. Based on our research, there are 13 cases in South Korea and more than 10 cases in Chile. For example, Incheon International Airport Expressway has set minimum revenue line at 80% and maximum revenue line at 110%. Recently, Brazil, Mexico, Argentina and African countries have introduced this scheme as well. It is becoming increasingly common in developing country PPP toll road. We have also learned that Route 51 also has a similar guarantee clause included. Based on preliminary discussions, this could be considered part of basic plan to attract investment.
- Second, ways to design tariff guarantee should be considered. Multi-year approvals to adjust tariff based on a pre-defined formula could be obtained. Also, tariff guarantee could be considered in the form of breach of BOT contract.
- Third, discuss “buy-out” guarantee by government could be discussed. In this way, lenders could minimize downside risk in case of SPC default.
-

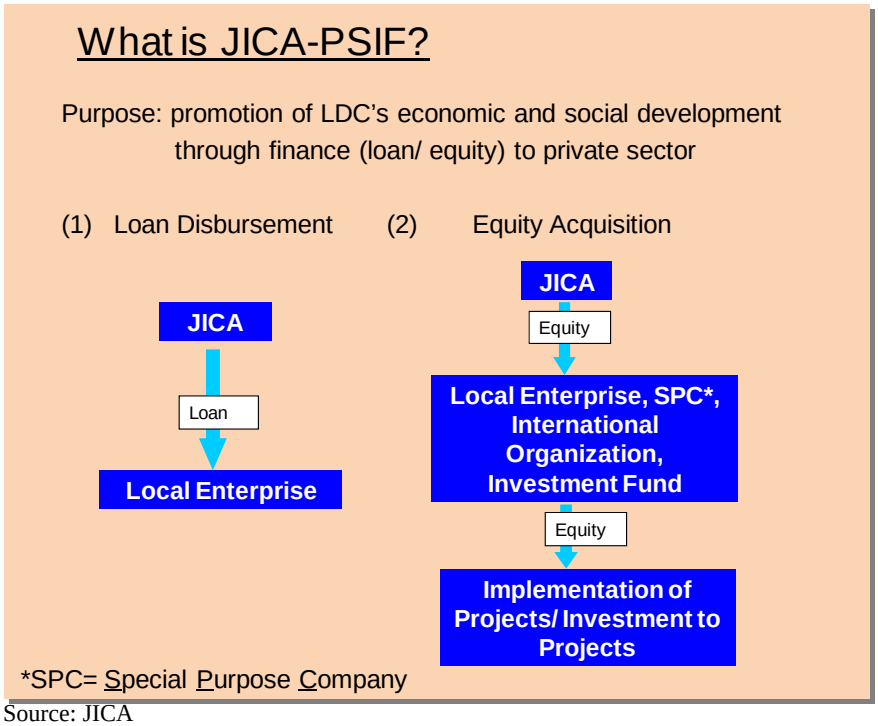
4.4.3 Security between sponsor/contractors:

- First, there is a basic security package to be included in the project contract. This includes step-in rights for lenders to take control of operations. Also, there are contract clauses to ensure mortgage of land use rights, fixed assets, shares or capital in SPC. This also includes clause to ensure security over onshore and offshore accounts.
- Second, additional security from shareholders can be considered. This is to obtain shareholder commitment on the long-term success of expressway business. For example, setting up escrow account by the shareholders could be discussed. This account will act as the liquidity buffer just in case the SPC reaches working capital shortage in the initial stages of operation.

CHAPTER 5 NECESSITY FOR RESUMING PSIF

In the "North-South Expressway master plan" for which JICA supported to formulate, necessary budget for development of North-South Expressway network was estimated about 66 billion USD. Projects which has been approved its implementation by GOV are estimated about 12 billion USD, and most of its finance will be needed to be financed from ODA of Japanese government, World Bank, ADB and so on. The rest of 54 billion USD should be secured from various financial sources. It's difficult to be supplied by only public fund of Vietnam government and ODAs, it is strongly expected to mobilize private sector investment and the GOV has addressed the same policy.

To facilitate private sector investment in the sector, it is necessary to provide appropriate financing to the private sector based on the knowledge and experience of the country and the sector. In this context JICA has an competitive advantage in providing JICA's PSIF to the private sector based on its substantial knowledge and experience in the country and especially in the expressway sector.
JICA-PSIF is a financial support system for promoting LDC's economic and social development through finance (loan/equity) to private sector as illustrated in the following figure.



Source: JICA

Figure 5.0.1 Purpose of JICA-PSIF

5.1 Project Facilitation for Foreign Investors

5.1.1 Implementation of PPP Preparatory Survey

Together with JICA-PSIF, JICA has a system called "Preparatory Survey Scheme for PPP Infrastructure". The purpose of this survey is to promote the identification and preparation of PPP infrastructure projects that are candidates for JICA's ODA assistance including Japanese Yen Loan and PSIF.

JICA has two roles in the implementation of a PPP infrastructure project in developing countries, namely, as "project promoter" and "lender". This preparatory survey scheme is very important for

JICA to play the role of the project promoter as it has sector and policy expertise in the subject country and would serve as a coordinator among relevant government agencies during the course of this PPP preparatory survey. This role is especially valuable as participation of foreign investors in the subject countries could be enhanced; hence, the country could benefit from various resources including financial, which the foreign investors could bring about.

The following is the outline of the PPP preparatory survey scheme:

<OVERVIEW>
- JICA has started PPP Feasibility Study support program in March 2010.
- JICA invites private companies to submit study proposals on PPP infrastructure. Selection is made by JICA and third party committee.

1. Applicant
Private companies (registered in Japan) or their group, which intend to invest in PPP infrastructure after the study is completed.

2. JICA's Support
Max. JPY 150 mil. (aprx. USD 1.80mil.) to cover part of study costs.
(e.g. remuneration, travel costs, other expenses.)

3. Selection

4. Targeted countries
All the countries JICA ODA loan can be provided

5. The eligible projects have to satisfy the following criteria:
- Development effect:
The proposed projects should contribute to economic and social development, economic reconstruction and economic stabilization of developing countries
- Possibilities of utilizing JICA ODA assistance:
The proposed projects should have possibilities that recipient governments would submit "ODA assistance requests" to GOJ. They should also be aligned to GOJ and JICA policies.
- Types of Private Participation:
They should include construction as well as management (i.e. contract-out of operation or privatization of the completed projects is not eligible).

6. Eligible companies that can submit proposals
Companies that submit proposals should have the plan to participate in PPP projects as potential investors (Note: the associations with consulting firms are possible).

7. Final products of the survey
Preparatory Survey reports (feasibility study level)

8. Expected use of products
- Like the ordinary JICA's Preparatory Surveys, they are expected to be used by the recipient countries
  - ➢ to consider feasibility of the proposed projects
  - ➢ as project documents for requesting Japan's ODA assistance

Note: Private concessionaires of the proposed projects will be solely selected by recipients (i.e. no linkage between selection of concessionaires after the study and selection of firms doing JICA studies.

Source: JICA

Figure 5.1.1 Outline of PPP Preparatory Survey Scheme

5.1.2 Coordination with GOV

JICA has a mandate to contribute to economic development of developing countries as a development agency. It has strong relationships of trust and networks with governments of developing countries by providing continuous assistance such as TA (master plan, F/S, institutional reform, capacity building) and Japanese yen loan. By utilization TA and ODA loans, JICA-PSIF is able to add more value to projects. For example, as a form of assistance to PPP infrastructure projects, JICA supports institutional and legal framework, if target countries lack the rules and regulations related to PPP projects.

5.1.3 Coordination with Investors

JICA-PSIF shares project risks with private companies by participating in projects with equity investment in case of PPP infrastructure projects. JICA reduces performance risks of governments of developing countries by participating in negotiations with the government through policy recommendations or PPP policy planning. In addition, JICA monitors the overall implementation of major PPP projects. JICA could play a significant role as a coordinator when potential investors are Japanese.

5.1.4 Coordination with Other Stakeholders

JICA-PSIF could have a co-financing arrangement with other financing institution such as World Bank and ADB. It could also play a catalytic role in orchestrating the loan syndication with various development agencies, international financial institutions and commercial banks.

5.2 Risk Sharing as Investor

5.2.1 Risk Sharing by Equity Investment

As described earlier, JICA-PSIF has a facility of equity investment. Although its equity injection is limited to one quarter of the total equity, JICA could share project risks with other private sector investors and could play an important role as project promoter, by discussing with GOV and mitigating policy related risks and performance risks of government related agencies. JICA could also play an important role in facilitating discussions with the investor consortium especially between the local investors and Japanese investors. This is intended in order to form a working group in the consortium and start discussions with relevant government agencies for securing necessary government supports and guarantees for the project, before establishing a SPC.

The following is the outline of PSIF- equity finance.

<TENTATIVE>

EQUITY FINANCE

- **Investees**
  JICA invests in commercially viable projects (or fund)
  e.g. PPP infrastructure project company (SPC), individual project sponsors (Japanese/non-Japanese, J/Vs or single entity)
- **Share**
  JICA cannot take majority stakes.
- **Exit Policy**
  Pre-arrangement of exit plan required for successful transition to sustainable private business.

Source: JICA

Figure 5.2.1 Outline of PSIF - Equity Finance

5.2.2 Provision of Expertise and Experiences in Vietnamese PPP and Expressway Sector

JICA has conducted VITRANSS 2 from 2007 to 2009 in which the master planning of expressway in the country was executed, the expressway administration set up was reviewed and the PPP and privatization policies in the transport sector was reviewed. JICA has also experience in funding expressway projects in the country such as the HCMC – Long Thanh – Dau Giay Expressway and the Hanoi – Thai Nguyen Expressway. These are all relevant and important expertise and experiences for implementing the Bien Hoa – Vung Tau Expressway Project. JICA is in a strategic position of providing such expertise and experience to promote and implement said expressway project.

5.3 Provision of Long-Term Soft Loan as Lender

5.3.1 Provision of Ultimate Long-Term Soft Loan

JICA-PSIF loan has similar terms and conditions as Japanese ODA yen loan, which are described in the following outline.

<TENTATIVE>

DEBT FINANCE
- Fixed rate (Base rate :GoJ Bond plus)*, JPY-denominated*, Long Tenor (up to approximately. 20 yrs) with grace period

* Future possibilities to provide other currencies, variable rate loans.

Source: JICA

Figure 5.3.1 Outline of PSIF - Debt Finance

JICA-PSIF loan would help the both domestic and foreign private sectors in financing the project in the LDC's where long term and low interest rate loan is not available, which is in most cases are the critical funding sources for a PPP infrastructure project. Unlike ODA loan, PSIF loan would not require sovereign guarantee from GOV and would be managed in the same manner as limited recourse project finance.

5.3.2 Impact of PSIF Loan

Impact of JICA-PSIF loan could be considered as interest rate is very low (Government of Japan Bond rate plus risk premium including foreign exchange depreciation risk) as compared to the current interest rate of long-term commercial borrowing in Vietnam, say 15-year tenor loan is more than 15% per annum. Long term tenor (as much as 30 years including grace period) of PSIF loan would also offer good matching with long-term investment recovery of an expressway project. JICA PSIF loan has dual effects for both the investor and government. Application of JICA-PSIF loan would raise project profitability for private investor, namely equity IRR of the project. At the same time, from the view point of the government, it could reduce the amount of subsidy which the government would need to assume to make the project afloat. Specific effects of the application of JICA PSIF for Bien Hoa – Vung Tau Expressway project loan are analyzed and assessed in Chapter 8 of this report.

CHAPTER 6 STUDY ON BOT/PPP SCHEME FOR FIVE EXPRESSWAY DEVELOPMENT PROJECTS IN SOUTHERN VIETNAM

6.1 Present Status of Five Expressway Development Projects for BOT/PPP Scheme Study

6.1.1 Stakeholders for Five Expressway Development Projects

(1) Bien Hoa-Vung Tau Expressway Development Joint Stock Company (BVEC)

BVEC was established in 2008 as the company developing the Bien Hoa-Vung Tau Expressway. The major shareholders are i) Vietnam Urban and Industrial Zones Development Investment Corporation (IDICO), ii) Bank of Investment and Development of Vietnam (BIDV), and iii) Song Da Corporation. The rates of capital contribution from the shareholders are 49% from IDICO, 30% from Song Da Corporation, and 21% from BIDV. BVEC was also given the business license to upgrade and widen National Highway 51 (NH51) and made a concession contract with MOT (the state contracting agency). Widening of NH51 is currently on-going and BVEC imposes a toll on vehicles using the NH51. For the Bien Hoa-Vung Tau expressway, BVEC acts as the investor and is going to establish a project company for said expressway (as of April 2011).

(2) BIDV Expressway Development Company (BEDC)

BEDC was established in 2007 as the company managing HCMC-Trung Luong-My Thuan – Can Tho expressway. BEDC is a joint stock company invested by eight shareholders of which BIDV is the biggest shareholder holding 25% of equity capital. BEDC was given the toll collection right on HCMC-Trung Luong section (about 40 km) which was constructed by MOT. It is expected to repay the investment cost (VND 10,000 billion) to MOT through its toll revenue for 25 years. BEDC was also given the business license over construction and toll collection on Trung Luong-My Thuan expressway section, which awaits its construction (as of April 2011).

(3) Project Management Unit My Thuan (PMUMT)

PMU My Thuan (PMUMT) is the project management unit under MOT responsible for My Thuan-Can Tho Expressway, Ring Road No. 3 and No.4. PMUMT plans to become a corporation and submitted its corporatized plan to MOT for approval. PMUMT will become the company called Cuu Long Corporation for Investment, Development and Project Management of Transport Infrastructure (Cuu Long CIPM) (as of April 2011).

6.1.2 Study Method

(1) Bien Hoa-Vung Tau expressway project

Study on BOT/PPP scheme for Bien Hoa-Vung Tau expressway project is carried out as shown in Table 6.1.1. Since this project is given the highest priority, several times of intensive discussions were held with BVEC. In addition, we had meeting with MOF, MOT, MPI, BIDV in Hanoi in order to confirm investment environment of this project.

Table 6.1.1 Study Method for Bien Hoa-Vung Tau expressway project

No.	Item	Study Method
1	Present Status	- Discussion with BVEC - Field Investigation - Review of F/S report - Review of other relevant documents
2	Technical	- Field Investigation - Supplemental Traffic Survey - Review of F/S report - Discussion with TEDI for F/S - Review of other relevant documents
3	Environmental	- Field Investigation - Review of F/S report - Discussion with TEDI for F/S - Review of other relevant documents
4	Investment	- Discussion with BVEC - Field Investigation - Review of F/S report - Discussion with TEDI for F/S - Review of other relevant documents - Discussion with MOF/MOT/MPI/BIDV - Discussion with local low offices - Interview with Japanese companies in Vietnam
5	Other	- Workshop (23April 2011)

Source: JICA Study Team

(2) Trung Luong-My Thuan expressway project

Study on BOT/PPP scheme for Trung Luong-My Thuan expressway project is carried out as shown in Table 6.1.2.

Several times of discussion was held with BEDC through the study period. BEDC provided to the study team a CDROM which, was used for calling of investors, contains project information for investors(March 2011).

Table 6.1.2 Study Method for Trung Luong-My Thuan expressway project

No.	Item	Study Method
1	Present Status	- Discussion with BEDC - Review of other relevant documents
2	Technical	- General review
3	Environmental	- General review
4	Investment	- Discussion with BEDC - Review of other relevant documents - Interview with Japanese companies in Vietnam

Source: JICA Study Team

(3) My Thuan-Can Tho expressway and Ring Roads of No.3 and No.4 projects

Study on BOT/PPP scheme for My Thuan-Can Tho expressway and Ring Roads of No.3 and No.4 projects is carried out as shown in Table 6.1.3.

Several times of discussion was held with PMU My Thuan (PMUMT) through the study period. PMUMT provided to the study team several documents for each component time to time.

Table 6.1.3 Study Method for My Thuan-Can Tho expressway and Ring Roads of No.3 and No.4 projects

No.	Item	Study Method
1	Present Status	- Discussion with PMUMT - Review of other relevant documents
2	Technical	- General review
3	Environmental	- General review
4	Investment	- Discussion with PMUMT - Review of other relevant documents - Interview with Japanese companies in Vietnam

Source: JICA Study Team

6.1.3 Status Quo and Issues of Five Expressway Projects

(1) Bien Hoa-Vung Tau Expressway project

The Bien Hoa-Vung Tau expressway project is now under F/S subcontracted to TEDI (the transport engineering consulting company). It is expected to complete at the end of March, 2011 and will be reviewed by the JICA Study Team until June 2011. Finally the F/S report will be submitted to the prime minister for his approval (as of May 2011).

The Bien Hoa-Vung Tau Expressway is proposed to be a BOT project subject to Decree 108. BVEC plans implementation schedule of the project as: Phase I (Bien Hoa-Phu My, 46km): design and construction from 2013-2016, operation from 2017, and Phase II (the remaining section, 22 km): operation from 2027. The project would take the form of a joint venture between Japanese and Vietnamese capital, and may be the first case of receiving direct lending of JICA (PSIF) loan. Two issues are primarily expected. One is that land acquisition including EIA and RAP clearing the JICA guidelines is to be implemented over a short period. The other is a financial plan on equity and debt involving investors and lenders based on due diligence. It would take time to finalize such a financial agreement among stakeholders. Accordingly, a comprehensive implementation schedule encompassing the tasks required will be urgently needed for the project.

(2) Trung Luong-My Thuan Expressway project

The Trung Luong-My Thuan Expressway section is currently at the stage of temporary suspension of construction work due to shortage of fund. The total paid-in capital so far is VND 30 billion for F/S and basic design while the remaining capital (VND 18 trillion) required is so large that BEDC plans to change the project scheme from BOT (BEDC already made a BOT contract with MOT) to PPP. Nevertheless, whether a PPP scheme would attract private fund is quite questionable because of regulations stipulated in Decision 71 (as of May 2011).

BEDC may have an alternative choice of requesting the government to finance construction cost of the Trung Luong-My Thuan Expressway section as MOT did for the expressway section between HCMC and Trung Luong. BEDC is entitled to operate the HCMC-Trung Luong section based on an O&M concession contract and is scheduled to repay USD 500 million to MOT through the toll revenue collected. The same method would be applied to the Trung Luong-My Thuan section (as of March 2011).

(3) My Thuan-Can Tho Expressway project

The My Thuan-Can Tho Expressway project is currently nominated in project list in ADB. It was informed that PPTA by ADB will be carried out soon. The My Thuan-Can Tho section is part of the southern expressway from HCMC to Can Tho. Accordingly, this section is constrained by the implementation progress of the other sections such as Trung Luong-My Thuan. The project scheme of said expressway is still unknown and subject to further study. The PMUMT is

planning to raise its investment fund on a mortgage of fee revenue collected from the Can Tho Bridge and OCR loan from ADB. Those funds will be the source of equity capital and lending money to a project enterprise for the expressway. Further step to detailed design and construction of My Thuan-Can Tho expressway depends on the resumption of the construction of Trung Luong-My Thuan expressway section (as of April 2011).

(4) Ring Road No.3 and No.4

Both Ring Road No.3 and No.4 were examined under the previous JICA study entitled "The Review Survey of Transportation Infrastructure Projects in the Socialist Republic of Vietnam" (as of October 2010).

Tan Van-Nhon Trach section (26.3km) in Ring Road No.3, Ben Luc-Hiep Phuoc section (37.4km) and Trang Bom-Phu My section (45km) in Ring Road No.4 are being studied by PPTA of ADB from April 2011.

Although priority on ring roads in the transport network in HCMC is high, however their implementation will be expected to be at the same timing of the southern expressway from HCMC to Can Tho.

6.2 Evaluation of Five Expressway Development Projects (MCA)

To assess investment priority for five expressway projects mentioned above, required validity measures are examined. Evaluation criteria applied in VITRANSS2 include demand, EIRR, FIRR, network connectivity, environmental burdens, maturity and consistency of upper level plan.

In this study, to expand evaluation aspects, Multi-Criteria Analysis (MCA)[3] which is recommended by Public-Private Infrastructure Advisory Facility (PPIAF)/WB, is adopted. Criteria which are adopted in this method are financial feasibility/fiscal support (FIRR), readiness and risk, socio-economic benefit (EIRR), regional development/contribution to GDP, sector network role/importance in sector plan, national security/national integration, land acquisition, environmental impact (a)/involuntary resettlement (b), impact in export earnings, safety, project cost, demand growth (a)/traffic volume (b) as explained in the following table.
Evaluation effort about items for review of this study such as land acquisition, environmental impact /involuntary resettlement, project cost, demand growth/traffic volume are implemented based on collaboration with concerned engineers of the study team and TEDI.

[3] Multi-Criteria Analysis has started in late 1990's in UK as a complementary method for evaluating public sector projects. It has been widely adopted in UK and Holland using its own evaluation manuals. Nevertheless, it is normally used to complement the cost-benefit analysis. The method is said to have a tendency to reflect arbitrariness of assessor in terms of weighting, therefore in this survey, the weighting of criteria is simplified to have only two grades. The criteria themselves are based on the ones for the Multi-Criteria Analysis adopted in PPIAF (Public-Private Infrastructure Advisory Facility) of World Bank.

Table 6.2.1 Evaluation Criteria and Scoring Rule (MCA)

Multi-Criteria Analysis: Scoring Rule					
	Criteria/assessment Score: 10 to 0	**High score Score: 10 to 8**	**Moderate score Score: 7 to 4**	**Lower score Score: 3 to 0**	**Weigting (Average: 10)**
1	Financial feasibility/ fiscal support	Highly viable: FIRR>20% No fiscal support	Likely viable: FIRR; 20-14% No fiscal support	Not viable: FIRR<14% High fiscal support	15
2	Readiness and risk	Few major issues/risks and project 'ready'	Identified risks but largely can be mitigated and project can be made 'ready'	Many risks, few can be mitigated sufficiently and project not ready	15
3	Socio-economic benefits	EIRR>15% Major macro impact	EIRR; 12%-15% Moderate macro impact	EIRR<12% Minor macro impact	10
4	Regional development/ Contribution to GDP	Impact on low GRDP provinces	Impact on low-medium GRDP provinces	Impact on high GRDP provinces	10
5	Sector network role/ importance in sector plan	Forms integral part and already included	Part of sector plan	Ad-hoc project, but not in conflict with sector plan	10
6	National security/ national integration	Strengthens national security/integration	Medium impact	Low impact	10
7	Land acquisition	Most land acquired (say over 80%)	Some land acquired (25%-80%)	Little land acquired (< 25%)	15
8	Environmental impact (a)/ involuntary resettlement (b)	Few issues: a. low impact b. few affected	Some issues: a. mid impact b. mid affected	Many issues: a. sever impact b. many affected	15
9	Impact in export earnings	Major overseas trade and/or tourism impact	Limited overseas trade and/or tourism impact	Little overseas trade and/or tourism impact	10
10	Safety	High safety focus	Moderate safety focus	Low safety focus	10
11	Project cost	>US$ 100m	US$ 100m-US$ 50m	<US$ 50m	10
12	Demand growth (a)/ traffic volume (b)	a. >15% pa b. >20,000 vdp	a. 15%-5% pa b. 10-20,000 vdp	a. <5% pa b. <10,000 vdp	15

Source: JICA Study Team

Table 6.2.2 Evaluation of Five Expressway Development Projects (MCA)

Multi-Criteria Analysis: Application to expressway projects in Southern Vietnam																				
	Project	Bien Hoa - Vung Tau				Can Tho - My Thuan				My Thuan - Trung Luong				Ring Road 3 (HCMC)				Ring Road 4 (HCMC)			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	Criteria	Score in words	Score	Weight (Average 10)	Score X weight/14.5	Score in words	Score	Weight	Score X weight/14.5	Score in words	Score	Weight	Score X weight/14.5	Score in words	Score	Weight	Score X weight/14.5	Score in words	Score	Weight	Score X weight/14.5
1	Financial feasibility/fiscal support	Med	5	15	5.2	Low	2	15	2.1	Low	2	15	2.1	Low	2	15	2.1	Low	0	15	0.0
2	Readiness and risk	Med	7	15	7.2	Med	5	15	5.2	Med	7	15	7.2	Low	3	15	3.1	Low	3	15	3.1
3	Socio-economic benefits	High	9	10	6.2	Med	4	10	2.8	Med	4	10	2.8	High	8	10	5.5	Med	5	10	3.4
4	Regional development/Contribution to GDP	**High**	**8**	10	**5.5**	**Med**	**7**	10	**4.8**	**Med**	**7**	10	**4.8**	**Med**	**7**	10	**4.8**	**Med**	**6**	10	**4.1**
5	Sector network role/ importance in sector plan	**High**	**9**	10	**6.2**	**High**	**8**	10	**5.5**	**Med**	**6**	10	**4.1**	**Med**	**7**	10	**4.8**	**Med**	**7**	10	**4.8**
6	National security/national integration	High	8	10	5.5	Med	4	10	2.8	Med	4	10	2.8	Med	4	10	2.8	Med	4	10	2.8
7	Land acquisition	Low	0	15	0.0	Low	0	15	0.0	Low	0	15	0.0	Low	0	15	0.0	Low	0	15	0.0
8	Environmental impact (a) /involuntary resettlement (b)	Med	5	15	5.2	Med	7	15	7.2	Med	6	15	6.2	Med	5	15	5.2	Med	4	15	4.1
9	Impact in export earnings	Med	7	10	4.8	Low	2	10	1.4	Med	4	10	2.8	Med	4	10	2.8	Med	4	10	2.8
10	Safety	Med	5	10	3.4	Med	5	10	3.4	Med	5	10	3.4	Med	5	10	3.4	Med	5	10	3.4
11	Project cost	High	10	10	6.9	High	10	10	6.9	High	10	10	6.9	High	10	10	6.9	High	10	10	6.9
12	Demand growth (a) /traffic volume (b)	High	9	15	9.3	High	9	15	9.3	High	9	15	9.3	High	9	15	9.3	High	9	15	9.3
	Total score (out of 100)				**65.5**				**51.4**				**52.4**				**50.7**				**44.8**

Note:
(1) Safety: Scored Med (5 points) for criteria as there is no information for all the projects
(2) Please refer to evaluation criteria table for scoring rules
(3) EIRR and FIRR for My Thuan - Trung Luong are unknown and assumed same level as the Can Tho - My Thuan project

Source: JICA Study Team

6.3 Investment Priority of Five Expressway Development Projects

Based on the MCA evaluation shown in Table 6.2.2, the scores of five expressways development projects were determined as shown in the following table.

It is evaluated that Bien Hoa – Vung Tau Expressway project is the first investment priority followed by My Thuan – Trung Luong Expressway project.

Table 6.3.1 Investment Priority of Five Expressway Development Projects

Expressway	Score	Ranking
Bien Hoa - Vung Tau	65.5	1
Can Tho - My Thuan	51.4	3
My Thuan - Trung Luong	52.4	2
Ring Road 3 (HCMC)	50.7	4
Ring Road 4 (HCMC)	44.8	5

Source: JICA Study Team

6.4 Tentative Implementation Plan for Can Tho - My Thuan Expressway

6.4.1 General

Project profile of Can Tho - My Thuan Expressway is as follows:

- Total length: Approximately 31km
- Stage 1: 4 traffic lanes, 2 emergency parking lanes, design speed 120 km/h, with connector road design speed of 80 km/h
- Stage 2: Expansion to six lanes; design speed 120 km/h
- Total investment for stage 1: Estimated to be around USD 441 million
- Breakdown of investment cost: Construction + Equipment: USD 286 million, Other Costs: USD 29 million, Land Acquisition: USD 37 million, Contingencies: USD 90 million.

Currently, PMUMT is trying to develop a feasible funding plan to implement the project. They are however open to suggestions. In this context, the study team held several discussions with PMUMT on potential capital structure and organization for BOT/PPP scheme. On May 19, 2010, MOT submitted the Statement No.3183/BGTVT-TCCB to the Prime Minister for the establishment of Cuu Long CIPM (CLCIPM) as a key enterprise for management, investment and development, and operation organization for the southern economic zone in order to fulfill development requirements of the transport infrastructure. The decision by the Prime Minister is expected to be issued within the first quarter of 2011. CLCIPM will establish an SPC for the Project.

6.4.2 Capital Structure Plan

(1) Capital Structure Plan Prepared by PMUMT

Discussions on capital structure were held with the assumption that SPC will be formed as an entity for project implementation. Table 6.4.1 below describes SPC's hypothetical capital structure prepared by PMUMT. This structure is based on the limitation described in the PM Decision No.71 for the state capital contribution of up to 30% of the total project cost. Differentiation is made only between state capital and private capital with no assumption on debt and equity structure.

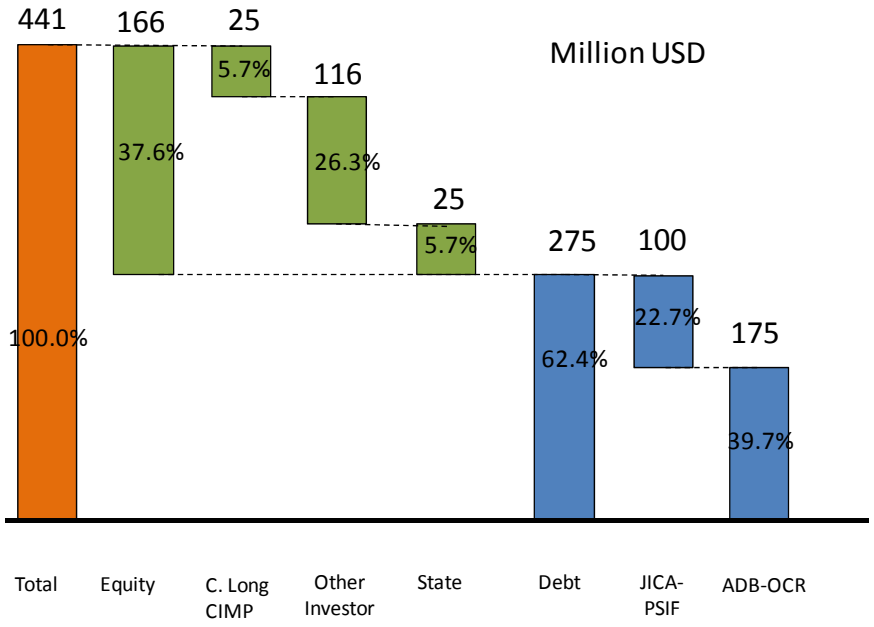
Table 6.4.1 Composition of Capital Structure prepared by PMUMT

Unit: Thousand USD (1USD=20,865 VND)

No	Items	Capital Sector	Total Cost		State Capital		Private Capital	
			Value	%	Value	%	Value	%
1	Civil Work and Equipment	State + Private	286	64.8	79	17.9	207	46.9
2	Land Acquisition	State	37	8.3	37	8.3	0	0
3	Consultant for F/S	State	0	0.1	0	0.1	0	0
4	Consultant for DD and Supervision	State	15	3.3	15	3.3	0	0
5	Management Project	State	2	0.4	2	0.4	0	0
6	Other Costs	Private	12	2.7	0	0	12	2.7
7	Contingency	Private	90	20.4	0	0	90	20.4
	Total		441	100.0	132	30.0	309	70.0

Source: PMUMT

Figure 6.4.1 shows debt and equity capital structure prepared by PMUMT; however, there is some confusion on the notion of equity, debt and subsidy.

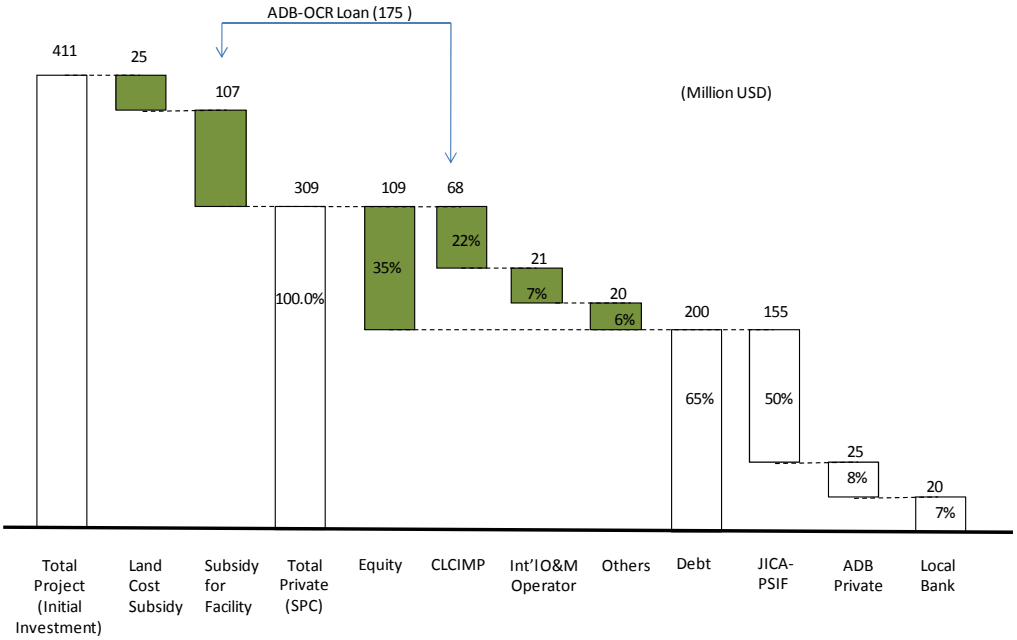


Source: PMUMT

Figure 6.4.1 Hypothetical Capital Structure prepared by PMUMT

(2) Recommended Option for Capital Structure (One Example)

Therefore, based on the discussion held with PMUMT, recommendation is made on the capital structure option as shown in Figure 6.4.2 below. The values in the figures are all tentative and should be considered to possibly vary.



Source: JICA Study Team

Figure 6.4.2 Recommended Capital Structure

Usage of ADB-OCR Loan: According to PMUMT, commitment of USD 175 million of OCR loan has been already made by ADB for this project. The intention of PMUMT is to use the funding for the capital grant from GOV (MOF) injected to CLCIMP. The suggestion to inject large sum of capital grant from GOV to a SOE is inconsistent with the current government policy, and that the funding should be used for a part equity injection to CLCIMP from GOV. The subsidy for facility construction is illustrated in Figure 6.4.2 above.

Government subsidy: According to PMUMT, GOV has already agreed in principle the provision of land cost subsidy to CLCIMP, which would be around USD 25 million. Part of facility construction cost would be covered as a subsidy utilizing the ADB OCR loan. This funding would be an OCR loan from ADB to GOV and in turn capital subsidy from GOV directly extended to the SPC. The total subsidy amount from GOV to the SPC would be around 30% of the total project cost.

Equity: After the subsidy injection, total project cost to be funded by the private sector is about USD 307 million, of which 35% is financed by the equity and 65% by debt. More than 60% of the equity would be held by CLCIMP and the balance by other investor such as international O&M operator. The equity to be injected by CLCIMP would be financed by the ADB OCR loan which is to be on-granted by GOV to CLCIMP.

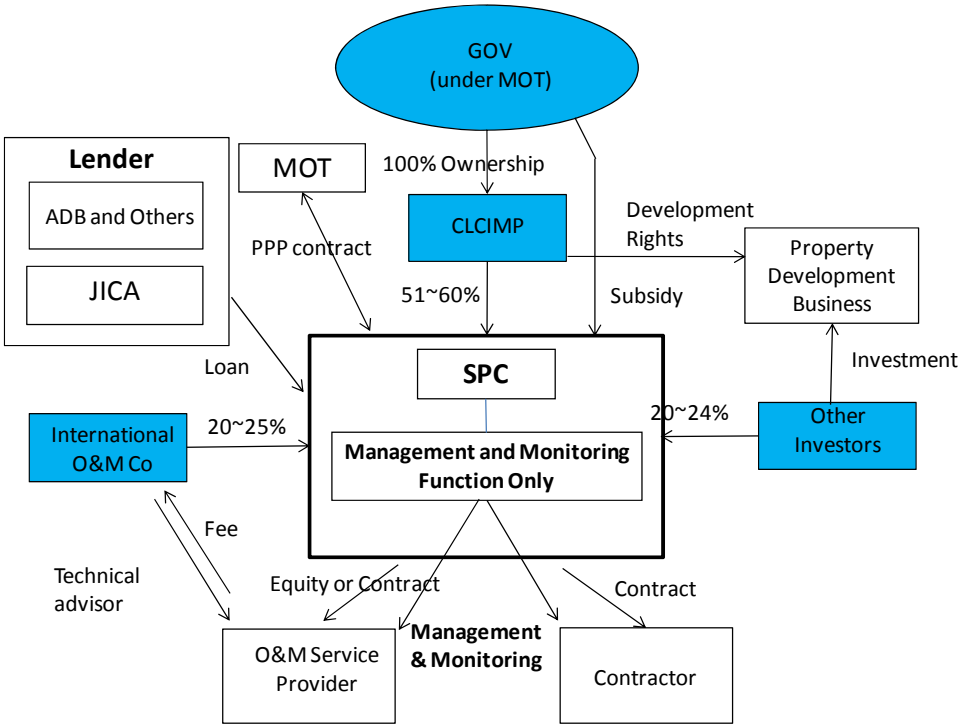
Debt: The debt portion is 65% of the private sector investment. Majority of this would be financed by JICA PSIF loan, and the rest by ADB private sector loan and others.

6.4.3 Organization Plan

Figure 6.4.3 describes the organization structure discussed with PMUMT. It was confirmed that expressway development rights would shift to SPC upon its establishment. Necessary legal arrangements will need to be further clarified in order to move forward.

In terms of O&M, PMUMT was open to discuss “in-house” versus “outsource” option. It was confirmed that the investor should choose whichever option provides the most efficient solution.

In terms of development rights, such as property development, this is positioned outside the SPC’s business scope to ensure consistency with JICA PSIF guidelines. Development rights could be discussed separately but packaged discussion, depending on the needs of potential overseas investor, should be initiated.



Source: JICA Study Team

Figure 6.4.3 Organization Structure (Hypothetical)

6.4.4 Key Issues and Consideration Points

In order to move forward, it is suggested that the following key issues and consideration points be verified:

Structurally low project IRR: It is viewed that project IRR would be relatively low given the high cost structure stemming from alignment on soft ground. This will need to be reviewed with top priority to assess the degree of subsidy required from the government.

Behavior of heavy truck user segment: Revenue attractiveness will heavily depend on whether heavy truck users will select the expressway over Route 1. One could argue that heavy truck users prefer to cut down on travel time, given the increasing trend of just-in-time commercial delivery requirements. This should be verified by analyzing the traffic profile of adjacent section (Ho Chi Minh-Trung Luong), which will start toll operation soon.

Usage of ADB OCR loan: Possibility of using the ADB OCR loan for the purpose of CLCIMP's equity injection to the SPC and the subsidy from GOV could be one of the critical elements in structuring this PPP project. It is recommended that thorough assessment of the recommended structure should be conducted in the forthcoming ADB PPTA.

6.5 Tentative Implementation Plan for Trung Luong - My Thuan Expressway

6.5.1 General

Project profile of Trung Luong-My Thuan Expressway is as follows:

- Total length: Approximately 54 km
- Stage 1: 4 traffic lanes, 2 emergency parking lanes, design speed 120 km/h
- Stage 2: Expansion to 6 lanes, design speed 120 km/h
- Total investment for Stage1: Estimated to be around VND 19,200 billion

Currently, BEDC is trying to develop a feasible funding plan to implement the project. These are however open to suggestions. In this context, the study team held several discussions with BEDC on potential capital structures and organization for BOT/PPP scheme. For the purpose of discussion, it was tentatively agreed to round the total investment figure to around USD 1 billion.

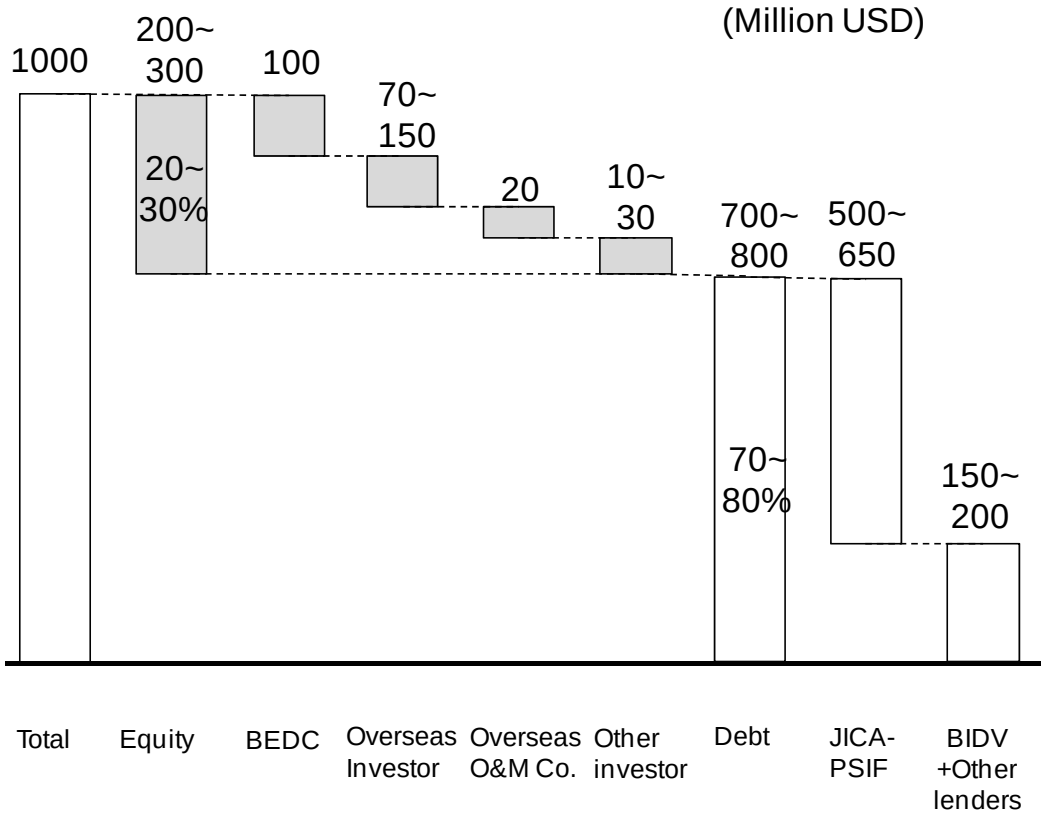
6.5.2 Capital Structure Plan

Discussions were held regarding capital structure, with the assumption that SPC will be formed as an entity for project implementation. Figure 6.5.1 describes SPC's hypothetical capital structure used for discussion purposes.

Equity: BEDC plans to provide equity for approximately 10% of the total investment. As BEDC's major shareholder, BIDV will be indirectly placing considerable amount of equity into the project. Although the BOT law requires equity only slightly higher than 10%, it was discussed that a total of 20~30% equity portion would be desired for a balanced capital structure. BEDC's preference would be to retain majority shareholding. However, it was acknowledged that this will need to be discussed with other investor candidates. Considering other investment, BEDC is in the process of inviting other local investors. Result of F/S will then be discussed with them to speed up the discussion. BEDC is also open to inviting overseas investors. This could be an overseas O&M stakeholder and/or Japanese trading company.

Debt: BEDC's original plan was to receive all debt financing from BIDV. In this original plan, BIDV would source the fund from various other banks (including ODA on-lending) and re-loan to BEDC. BEDC is now looking for an alternative debt structure, which could potentially involve JICA's PSIF as a direct loan to SPC. In this option, BIDV would be the co-lender. BIDV has committed to provide a minimum of 15% of total investment as their loan portion.

Phasing: In Figure 6.5.1, the total investment amount of approximately USD 1 billion translates into asking the major investors to commit close to USD 100 million in equity. It was discussed that this could be too big, especially for a toll road BOT project. It was then discussed the possibility of reducing the project scope by phasing into two sections: Phase1: Trung Luong- Cai Be (30 km) and Phase2: Cai Be-My Thuan (24 km). In this way, the total investment amount could be reduced by 30-40%. Trung Luong-Cai Be section would serve as a natural extension to the existing Ho Chi Minh-Trung Luong expressway. Route 1, which runs parallel to the expressway, will be quite close to the Cai Be exit. This allows expressway users to conveniently use Route 1, while waiting for the completion of phase 2 section.



Source: JICA Study Team

Figure 6.5.1 Capital Structure (Hypothetical, Without Phasing, Without Subsidy)

The BOT scheme was also discussed in case the project IRR does not reach the feasible level. Since this expressway passes through soft ground, requiring soft ground treatment and additional civil structures, it was assumed that project IRR would likely be low compared to other lines of similar demand profile.

Figure 6.5.2 was used as a framework to discuss options in improving project attractiveness from an investor's point of view.

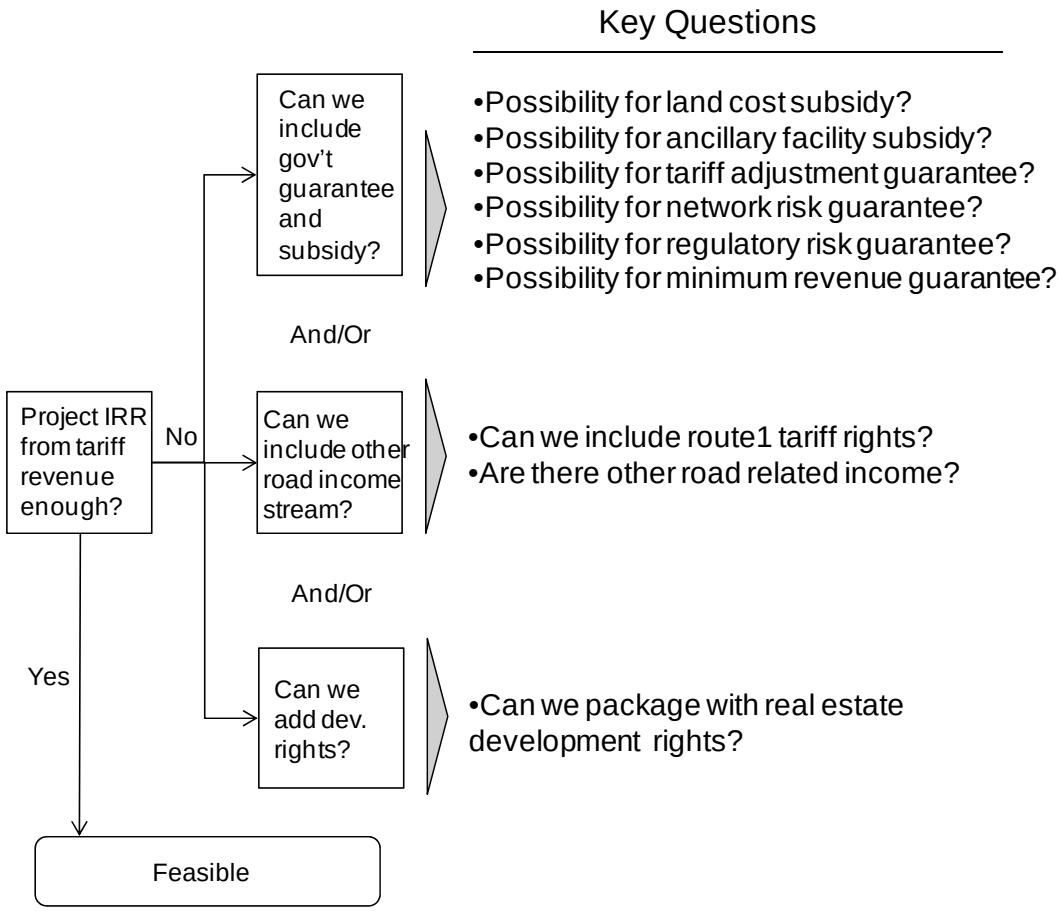
Government subsidy: Historically, the government's method of providing subsidy has been limited to granting extension of concession period. While this has a positive effect on investor's return, the actual sensitivity to project IRR is not that high. Therefore, the possibility of requesting for direct cost subsidy in areas such as land and ancillary facilities was discussed. Moreover, it was also discussed about the possibility of receiving subsidy for soft ground treatment. BEDC has indicated its willingness to propose various subsidy options to MOT.

Government guarantee: It was acknowledged that tariff, demand and network risks would be of large concerns to the investor. The potential for tariff adjustment guarantee, which is for government to compensate for losses due to government's delay in adjusting tariff levels, was discussed. Tariff is scheduled to increase by 30% every 5 years. The potential for minimum revenue guarantee was also discussed. Its aim is for the government to pay for the gap with minimum level of revenue (e.g. to pay for debt service) in case SPC's actual revenue falls short. BEDC also mentioned the possibility of including a non-compete clause as part of the BOT contract.

Other road income streams: SPC may need other forms of income stream to become profitable.

BEDC has mentioned that tariff right for Route 1 (for section between Trung Luong-My Thuan or Trung Luong-Cai Be, in case of phasing) was originally designed to fund the expressway. Therefore, it seemed as a viable option to include in the BOT scheme. Also, it is important to mention that this arrangement will reduce the network risk significantly from the investor's view point. This is because SPC will be able to capture the total revenue of the section, regardless of the driver's choice between Route 1 and expressway.

Adding development rights: The option to include real estate development rights and other rights along the expressway was also discussed. This was acknowledged to be one of the options for further discussion.

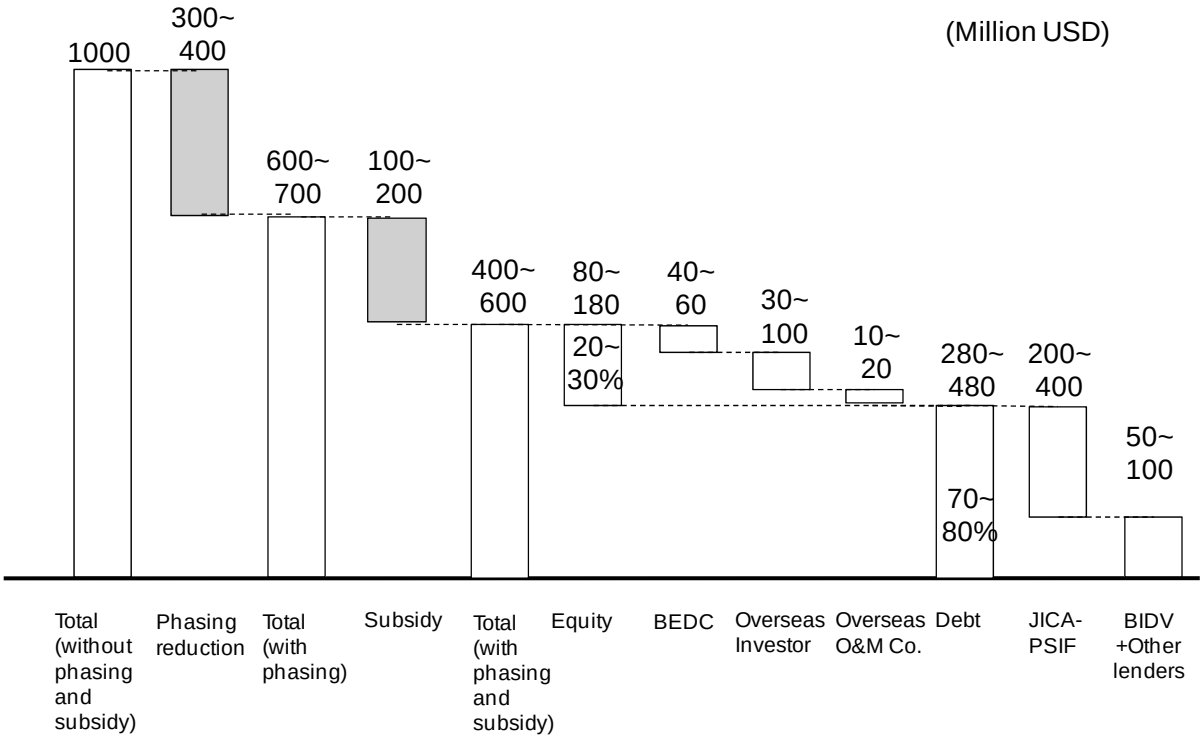


Source: JICA Study Team

Figure 6.5.2 BOT/PPP Scheme Discussion Framework

Based on above discussion, the study team summarized the capital structure implications, including phasing and subsidy. Figure 6.5.3 provides the hypothetical structure. It is assumed that phasing can reduce the investment amount by USD 300-400 million, and subsidy amount would be USD 100-200 million USD. This includes land, ancillary and potentially soft ground treatment cost. This brings down the total investment amount to USD 400-600 million.

It is deemed that this capital structure, combined with additional revenue streams, development rights and various government guarantees, could potentially set the basis for a constructive discussion with potential overseas investors and lenders.



Source: JICA Study Team

Figure 6.5.3 Capital Structure (Hypothetical, With phasing and Subsidy)

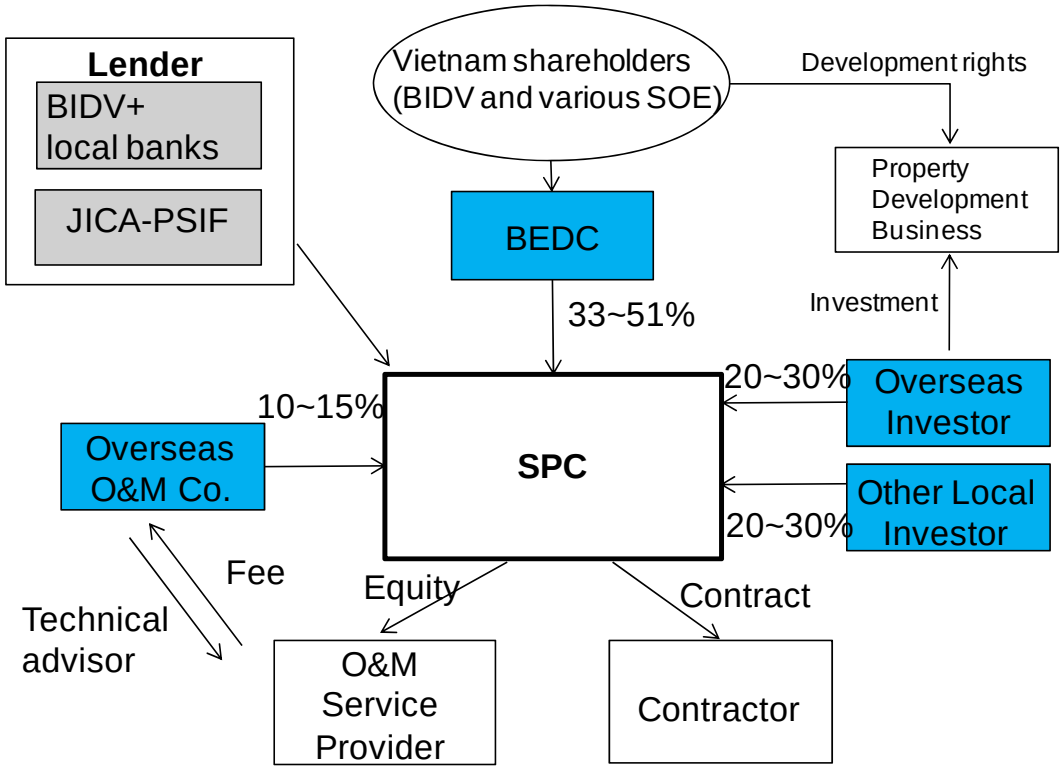
6.5.3 Organization Plan

Figure 6.5.4 describes the organization structure discussed with BEDC. It was confirmed that expressway development rights, which currently belongs to BEDC, would shift to SPC upon its establishment. Necessary legal arrangements will need to be further clarified to move forward.

In terms of O&M, BEDC was open to discuss the “in-house” versus “outsource” option. It was confirmed that the investor should choose which option will provide the most efficient solution.

In this organization, BIDV plays the role of both lender and shareholder. It was confirmed that this was written in the support policy, which was agreed with the government.

In terms of development rights, such as property development, this was positioned to be outside of SPC’s business scope. This is to ensure consistency with JICA PSIF guidelines. Development rights could be discussed as separately but packaged discussion, depending on the needs for potential overseas investor, should be initiated.



Source: JICA Study Team

Figure 6.5.4 Organization Structure (Hypothetical)

6.5.4 Key Issues and Consideration Points

In order to go forward, the following key issues and consideration points to be verified were suggested:

Structurally low project IRR: It is viewed that project IRR would be relatively low given the high cost structure stemming from alignment on soft ground. This will need to be reviewed with top priority to assess the degree of subsidy required from the government.

Behavior of heavy truck user segment: Revenue attractiveness will heavily depend on whether heavy truck users will select the expressway over Route 1. One could argue that heavy truck users prefer to cut down on travel time, given the increasing trend of just-in-time commercial delivery requirements. This should be verified by analyzing the traffic profile of the adjacent section (HCMC-Trung Luong), which will start toll operation soon.

Packaging with route1 tariff rights: As mentioned above, expressway and Route 1 will compete for the same traffic demand. Fluctuation in the relative tariff gap between expressway and Route 1 may swing the traffic demand. If SPC can also receive revenue from Route 1, this will significantly reduce the demand/network risk. The government's policy for this should be verified with high priority.

BIDV plan: Given the latest external factors surrounding local banking sector, BIDV's plans for funding may change. It is quite important to clarify this both from an investor's perspective as well as lender's perspective.

6.6 Tentative Implementation Plan for Ring Road No.4 - Ben Luc – Hiep Phuoc Component

6.6.1 General

Project profile of Ring Road No. 4 – Ben Luc-Hiep Phuoc Component is as follows:

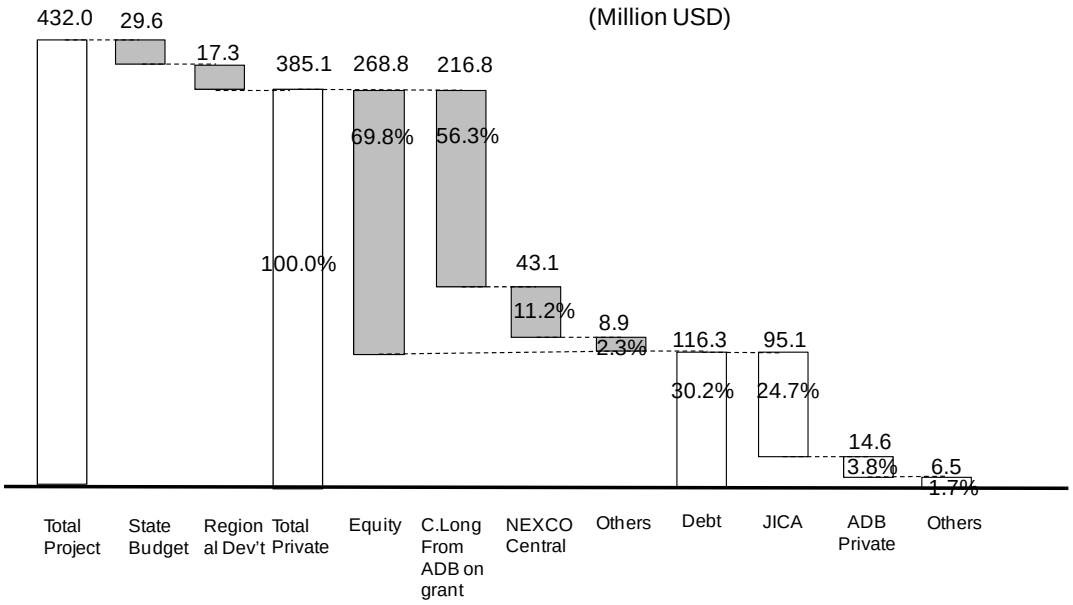
- Total length: Approximately 34.7 km
- 4 traffic lanes, 2 emergency parking lanes, design speed 120 km/h
- Total investment : Estimated to be around USD 422 million
- Breakdown of investment cost: Construction + Equipment: USD 293 million, Other Costs: USD 44 million, Land Acquisition: USD 47 million, Contingencies: USD 38 million.

Currently, PMUMT is preparing an F/S by its own funding and is trying to develop a feasible funding plan to implement the project. These are however open to suggestions. In this context, the study team held several discussion sessions with PMUMT on potential capital structure and organization for BOT/PPP scheme. On May 19, 2010, MOT submitted the Statement No.3183/BGTVT-TCCB to the Prime Minister for the establishment of CLCIPM as the key enterprise for management, investment and development, and operation organization for the southern economic zone, in order to fulfill development requirements for transport infrastructure. The decision by the Prime Minister is expected to be issued in the first quarter of 2011. CLCIPM will establish an SPC for the Project. PPTA by ADB has been conducted from April 2011.

6.6.2 Capital Structure Plan

(1) Capital Structure Plan Prepared by PMUMT

Discussions were held on capital structure with the assumption that SPC will be formed as an entity for project implementation. Figure 6.6.1 shows the debt and equity capital structure prepared by PMUMT; however, there is some confusion on the notion of equity, debt and subsidy.

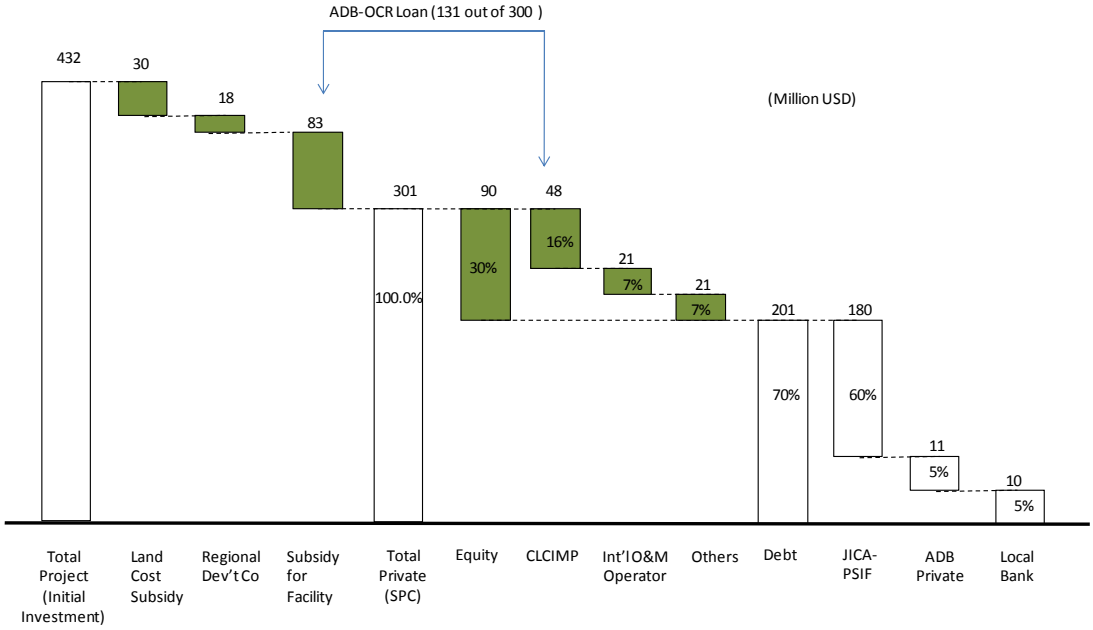


Source: PMUMT & JICA Study Team

Figure 6.6.1 Hypothetical Capital Structure prepared by PMUMT

(2) Recommended Option for Capital Structure (One Example)

Based on the discussion held with PMUMT, recommendation was therefore made for the capital structure option as shown in Figure 6.6.2 below. The values in the figure are all tentative and should be considered to possibly vary.



Source: JICA Study Team

Figure 6.6.2 Recommended Capital Structure

Usage of ADB-OCR Loan: According to PMUMT, commitment for USD 300 million OCR loan has been already made by ADB for this project. PMUMT intends to use the funding for the capital grant from GOV (MOF) injected to CLCIMP. It is suggested that the injection of large sum of capital grant from GOV to a SOE is inconsistent with the current government policy, and that the funding should be used for a part equity injection to CLCIMP from GOV, and subsidy for facility construction as illustrated in Figure 6.6.2 above.

Government subsidy: According to PMUMT, GOV has already agreed in principle, on the provision for land cost subsidy to CLCIMP. This would be around USD 30 million, together with the land cost sharing to be done by the regional development company, which would collaborate with CLCIMP for specific property development. Part of facility construction cost would be covered as a subsidy, also utilizing the ADB OCR loan. This funding would be an OCR loan from ADB to GOV and in turn, capital subsidy from GOV directly extended to SPC. The total subsidy amount from GOV to SPC would be around 30% of the total project cost.

Equity: After the subsidy injection, total project cost to be funded by the private sector is about USD 301 million, of which 30% is financed by equity and 70% by debt. More than 50% of the equity would be held by CLCIMP and the balance by other investor such as international O&M operator and local investors. The equity to be injected by CLCIMP would be financed by the ADB OCR loan, which is to be on-granted by GOV to CLCIMP.

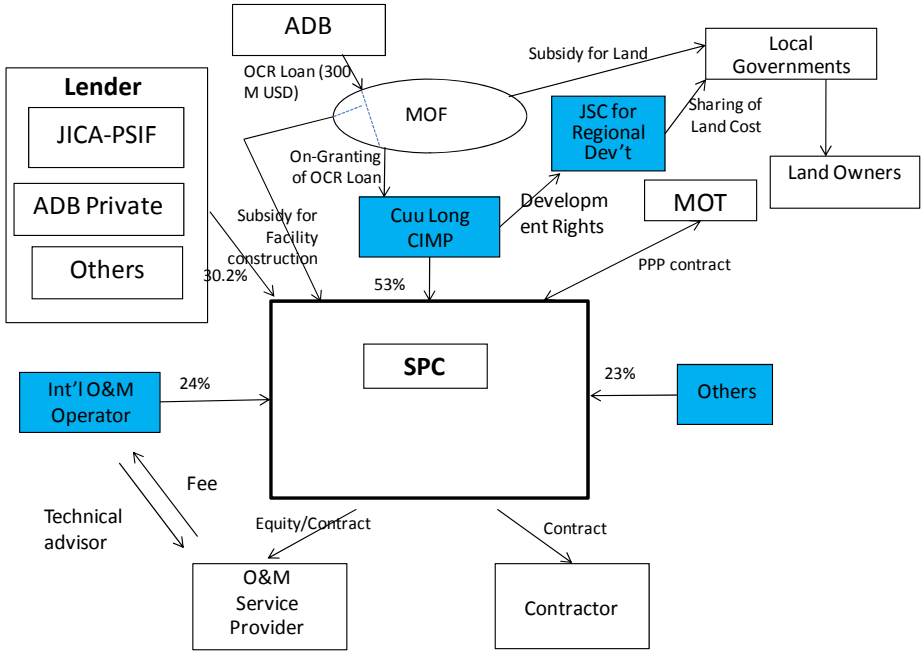
Debt: The debt portion is 70% of the private sector investment, of which majority would be financed by JICA PSIF loan and the rest by ADB private sector loan and others.

6.6.3 Organization Plan

Figure 6.6.3 describes the organization structure discussed with PMUMT. It was confirmed that expressway development rights would shift to SPC upon establishment of SPC. Necessary legal arrangements will need to be further clarified in order to go forward.

In terms of O&M, PMUMT was open to discuss the “in-house” versus “outsource” option. It was confirmed that the investor should choose which option will provide the most efficient solution.

In terms of development rights, such as property development, this to be positioned outside of SPC’s business scope. This is to ensure consistency with JICA PSIF guidelines. Development rights could be discussed separately but packaged discussion, depending on the needs of potential overseas investor, should be initiated.



Source: JICA Study Team

Figure 6.6.3 Organization Structure (Hypothetical)

6.6.4 Key Issues and Consideration Points

In order to go forward, the following key issues and consideration points to be verified are suggested:

Structurally low project IRR: It is viewed that project IRR would be relatively low given the high cost structure stemming from alignment on soft ground. This will need to be reviewed with top priority to assess the degree of subsidy required from the government.

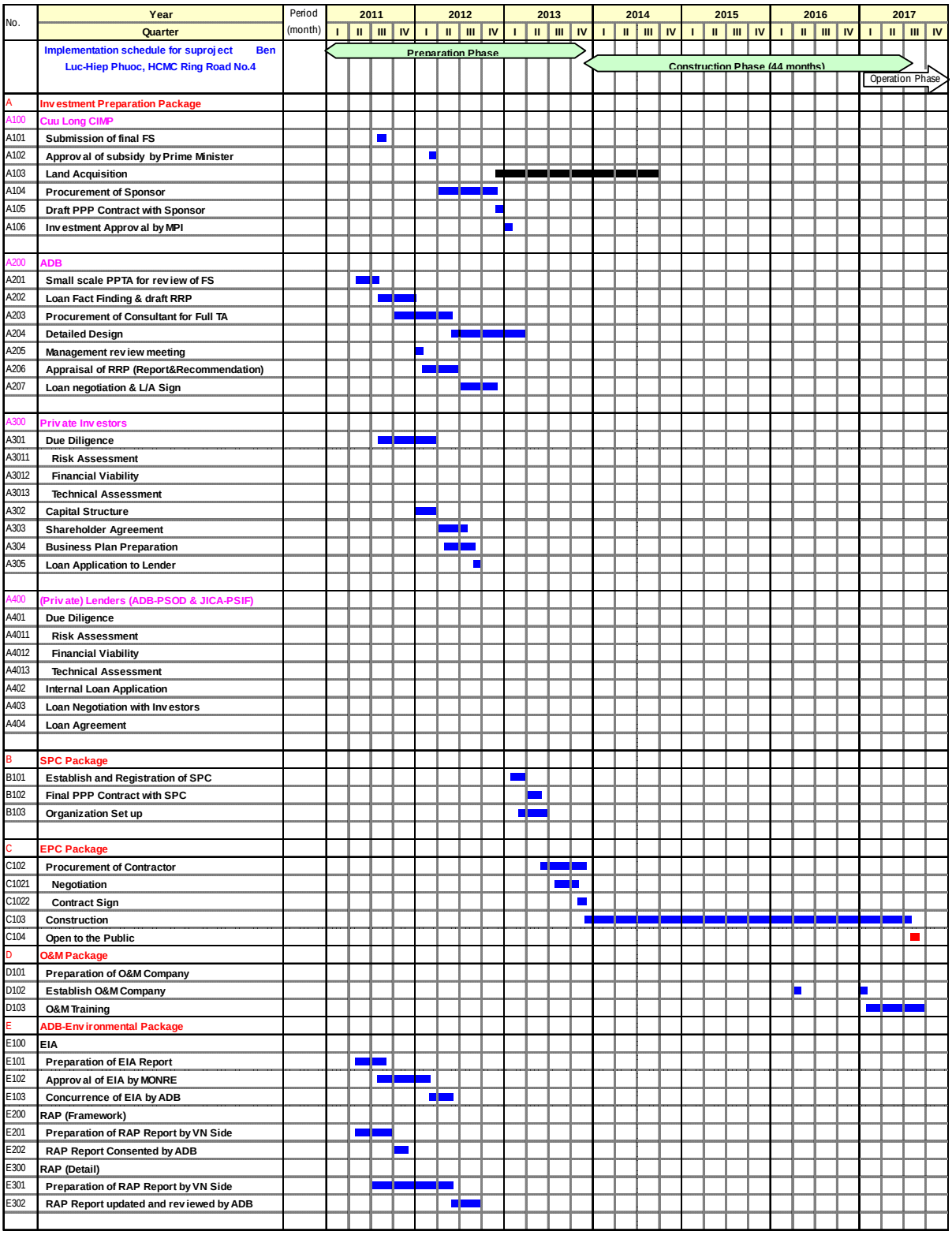
Behavior of heavy truck user segment: Revenue attractiveness will heavily depend on whether heavy truck users will select expressway over Route 1. One could argue that heavy truck users prefer to cut down on travel time, given the increasing trend of just-in-time commercial delivery requirements. This should be verified by analyzing the traffic profile of adjacent section (HCMC-Trung Luong) , which will start toll operation soon.

Packaging with route1 tariff rights: As mentioned above, expressway and Route 1 will compete for the same traffic demand. Fluctuation in the relative tariff gap between expressway and Route 1 may swing the traffic demand. If SPC can also receive revenue from Route 1, this will significantly reduce the demand/network risk. The government's policy for this should be verified with high priority.

Usage of ADB OCR loan: Possibility of using the ADB OCR loan for the purpose of CLCIMP's equity injection to SPC, and the subsidy from GOV could be among the critical elements in structuring this PPP project. It is recommended that thorough assessment of the recommended structure should be conducted in the forthcoming ADB PPTA.

6.6.5 Tentative Implementation Program

Tentative implementation program of Ben Luc-Hiep Phuoc section (37.4km) in Ring Road No.4 was provided by PMUMT as shown in Figure 6.6.4.



Source: PMU MT

Figure 6.6.4 Tentative Implementation Program (RR4 : Ben Luc-Hiep Phuc Section)

CHAPTER 7 REVIEW OF F/S FOR BIEN HOA – VUNG TAU EXPRESSWAY PROJECT

7.1 General

7.1.1 F/S carried out by BVEC

F/S for Bien Hoe – Vung Tan Expressway construction project was carried out by BVEC. BVEC contracted out the study to TEDI, which carried it out from August 2010 until March 2011. TEDI completed the final report and submitted to BVEC in March 2011.

Meanwhile, the study team received the following documents for review:

- Interim Report Summary Report (January 2011)
- Interim Report Drawings (November 2010)
- F/S Final Report (March 2011)
- F/S Final Report Drawings (March 2011)

Table 7.1.1 Composition of F/S Final Reports (March 2011)

Volume I	Final Report: Project Presentation Appendix: Total Investment Cost
Volume II	Basic Design: Drawings of Route & Work Design
	Book II-1-1: Typical drawing, Alignment Plan, Longitudinal Profile, Intersection Design (km0+000-km37+000) Book II-1-2: Drawings of Bridge & Work Design (km0+000-km37+000) Book II-1-3-1: Detail of Cross Section (km0+000-km12+000) Book II-1-3-2: Detail of Cross Section (km12+000-km24+000) Book II-1-3-3: Detail of Cross Section (km24+000-km37+000) Book II-2-1: Typical drawing, Alignment Plan, Longitudinal Intersection Design (km37+000-km68+653.42) Book II-2-2: Drawings of Bridge & Work Design (km37+000-km68+653.42) Book II-2-3: Detail of Cross Section (km37+000-km68+653.42) Book III-3-1: Drawings of Route & Bridge Phu My-NH51 section (km37+600-km46+800) Book III-3-2: Detail of Cross Section Phu My-NH51 section (km37+600-km46+800)

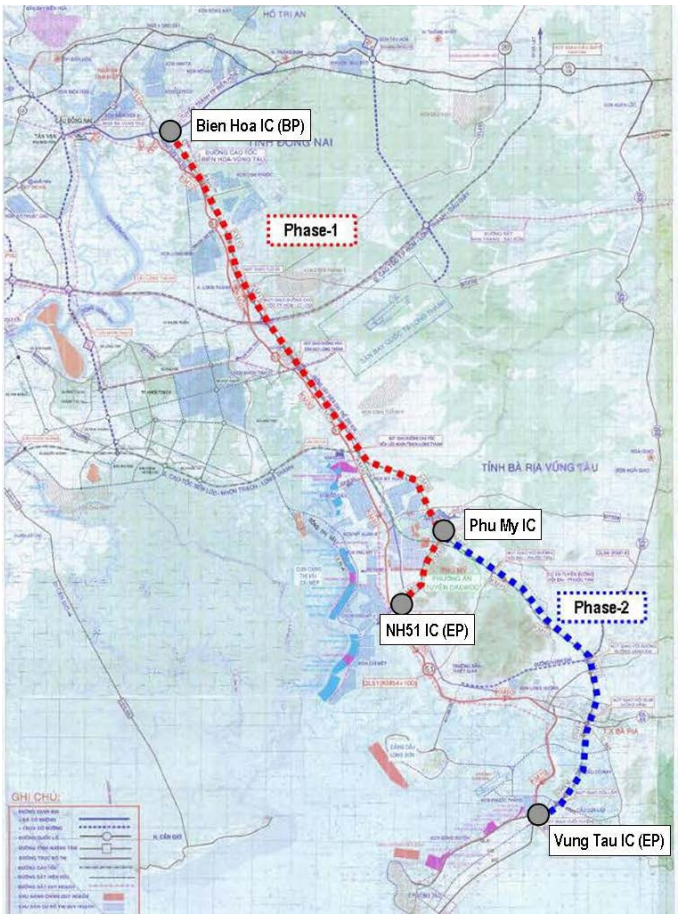
Source: JICA Study Team

7.1.2 Two-Phased Construction proposed in the F/S

In the F/S, two construction phases were proposed for Bien Hoe – Vung Tan Expressway as shown in Figure 7.1.1.

Phase 1: Bien Hoa IC (KM 0+000) – Phu My IC (KM 37+600)– NH51 Intersection (KM 46+800, Connection to CM-TV Port)

Phase 2: Phu My IC (KM 37+600) – Vung Tau Intersection (KM 68+600)



Source: F/S

Figure 7.1.1 Two Phases of Bien Hoa – Vung Tau Expressway Construction Project

7.1.3 Scope of Review of the F/S

As mentioned in foregoing section, Bien Hoa – Vung Tau Expressway project is divided into Phase 1 and Phase 2. Bien Hoa – Vung Tau Expressway play industrial trunk road which connects between HCMC and suburban industrial parks, international ports, and formulate national expressway network as intercity expressway in the region. Therefore, development of whole section of Bien Hoa – Vung Tau is essential. However, the Study Team found that appropriate profitability for private financed project will not be secured in case that the project incorporate Phu My – Vung Tau section (Phase 2 section) according to preliminary F/S review and preliminary financial analysis.

- Bien Hoa – Phu My section is connected to Long Thanh international airport, Cai Mep – Thi Vai international port, Phu My industrial park, and other industrial parks, and huge traffic demand can be expected.
- Tourism purpose traffic is dominant on Phu My – Vung Tau section due to less scale of road side industrial park comparing with Bien Hoa – Phu My section.
- According to F/S, traffic demand of Phu My – Vung Tau section in year 2030 and 2035 are 55.8% and 60.5% of the traffic demand of Bien Hoa – Phu My section, and huge revenue gap between Bien Hoa – Phu My and Phu My – Vung Tau is anticipated.
- Preliminary Project IRR (before tax) of Phu My – Vung Tau section is estimated as 7.5% by the Study Team. This result is much smaller than the one of Bien Hoa – Phu My of 14.3% (see appendix-2).
- Construction cost of Phu My – Vung Tau section is 88.2% of the construction cost of Bien Hoa – Phu My section.

- Estimated FIRR for Bien Hoa – Phu My section in F/S is 9.85% even in expectation of income from road side development right.Since large revenue gap and similar project cost between Bien Hoa – Phu My and Phu My – Vung Tau and low financial viability of Phu My – Vung Tau (Project IRR(before tax):7.5%) as private investment project, necessary financial viability level for private investment project (Project IRR: 14% to 16%) can not be secured for whole section of Bien Hoa – Vung Tau.

Therefore, the Study Team judge that Phu My – Vung Tau section should not incorporate into scope of private investment project from the aspect of sound financial viability, and scope of the private investment project is decided as Bien Hoa – Phu My section through discussion with BVEC. As for Phu My – Vung Tau section, only implementation plan on the premise of governmental finance is examined in this study.

The study team decided that the scope of F/S review for the BOT/PPP project is limited to the expressway section between Bein Hoa – Phu My IC – NH51 Intersection including both phase-1 and phase-2, after consultation with JICA and BVEC. Subsequently, the F/S for said section was reviewed considering the following aspects. Review results are also reported in this chapter.

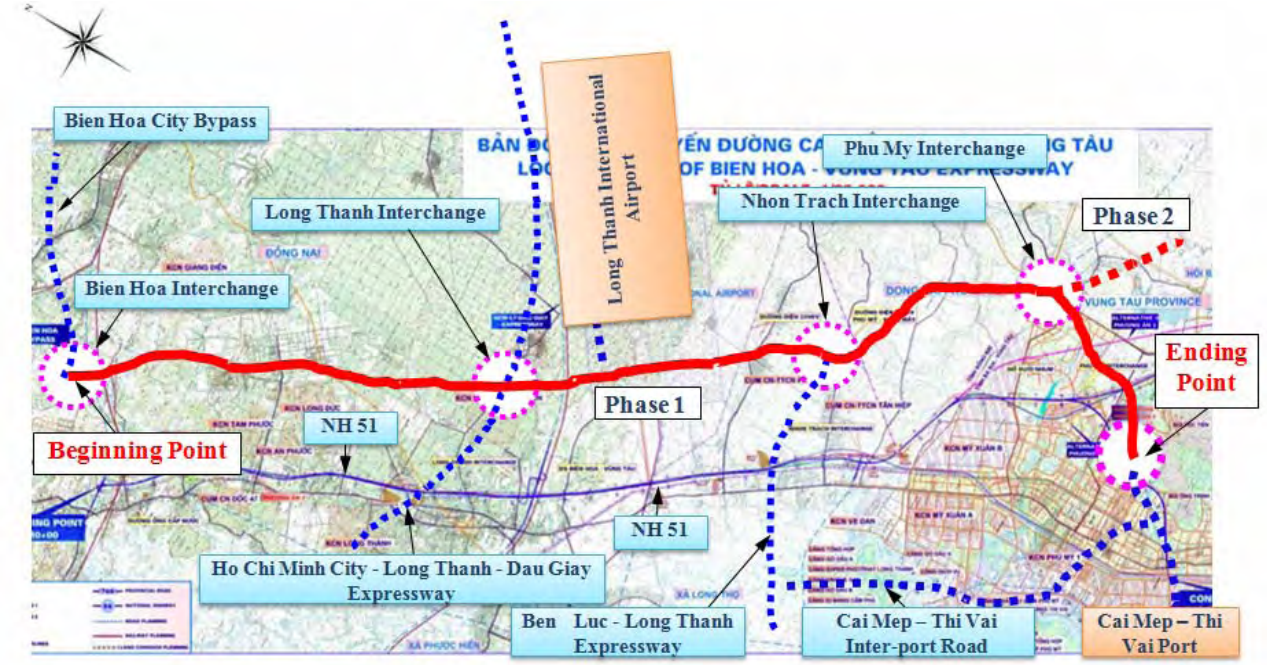
- Traffic Demand Forecast;
- Highway Planning and Design;
- Bridge Design;
- Road Structure Design;
- Construction Planning;
- Construction Cost Estimate;
- O&M Plan;
- Social and Environmental Consideration;
- Implementation Program; and
- Economic and Financial Analysis

7.2 Project Outline

7.2.1 General

Bien Hoa-Vung Tau Expressway is planned for the section from Bien Hoa City in Dong Nai Province to Vung Tau City in Ba Ria-Vung Tau Province, including the national highway leading to Cai Mep - Thi Vai port access road.

Phase-1 consists of an expressway segment of 37.6 km long from Bien Hoa IC connecting from Bien Hoa City bypass to Phu My IC, and a national highway segment of 9.2 km long from Phu My IC to NH51 Intersection, which is the entrance to the Cai Mep - Thi Vai Port area. The project location and outline of phase-1 are shown in **Figure 7.2.1** and **Table 7.2.1**, respectively**.**



Source: JICA Study Team

Figure 7.2.1 Project Location of Phase-1

Table 7.2.1 Outline of Phase 1

Section	Bien Hoa IC (Bien Hoa City Bypass) -Phu My IC	Phu My IC - NH51 Intersection (connecting to Cai Mep-Thi Bai port)
Section	KM 0+000~37+600 (37.6km)	KM 37+600~48+600 (9.2km)
Road Class	Expressway Class A	National Hwy Class II
Design Standard	TCVN5729 (1997)	TCVN4054 (2005)
Design Speed	120km/hr	100km/hr
Road width (Nos.of Lane)	25.5-27.5m (4)	23.5-25.0m (4)
Length	37.6 km (100%)	9.2 km (100%)
Embankment Cutting Bridge	29.4 km (78.2%) 4.8 km (13.0%) 3.3 km (8.8%)	7.0 km (76.1%) 2.2 km (23.9%) 0 km
Interchange/ Intersection	Bien Hoa IC (KM 0+000) Long Thanh IC (KM 16+570)	NH51 Intersection (KM 46+300)
Service Area	Phu My SA (KM 36+500)	None
Toll Gate	Thruway (KM 1+200) Long Thanh IC	Thruway (KM 45+250)

Source: JICA Study Team

7.2.2 Expected Role of Bien Hoa – Vung Tau Expressway

Although an expressway has various socio-economic roles in the country in general, Bien Hoan – Vung Tau Expressway may have the following four important roles in particular:

1. Access to Cai Mep – Thi Vai International Port area;

2. Access to New Long Thanh International Airport;

3. Linkage between HLD Expressway and BL Expressway; and

4. Form an major industrial development corridor between Bien Hoa City and Phu My City.

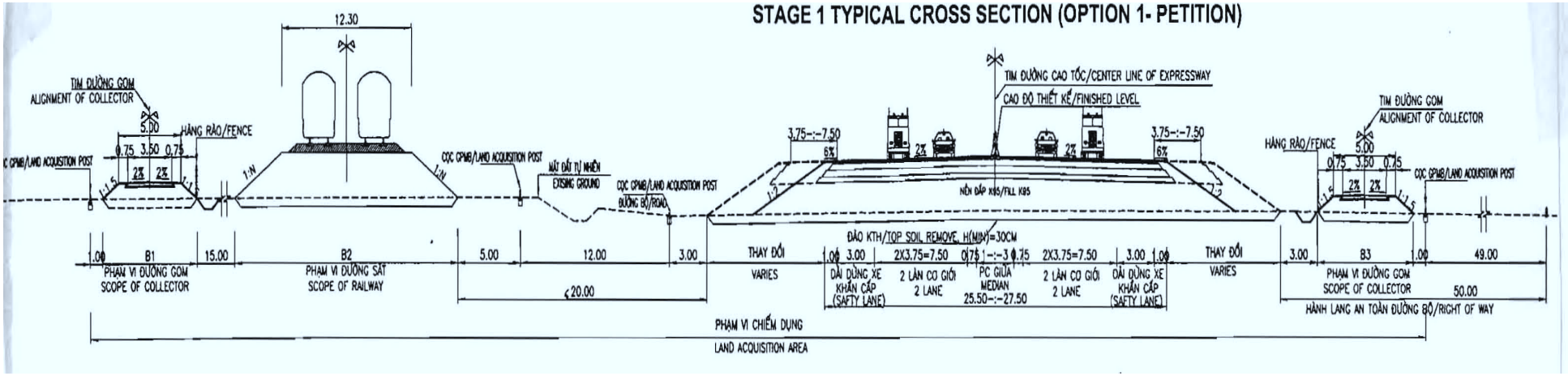
7.2.3 Typical Cross-section

(1) Bien Hoa IC - Phu My IC Section

The expressway is planned as four lanes for phase-1 and six to eight lanes for phase-2 as shown in the cross section below.

The planned Bien Hoa - Vung Tau Railway runs parallel to the expressway, which is 47 m away from Bien Hoa to the boundary of Dong Nai Province and Ba Ria-Vung Tau Province.

Railway | Expressway



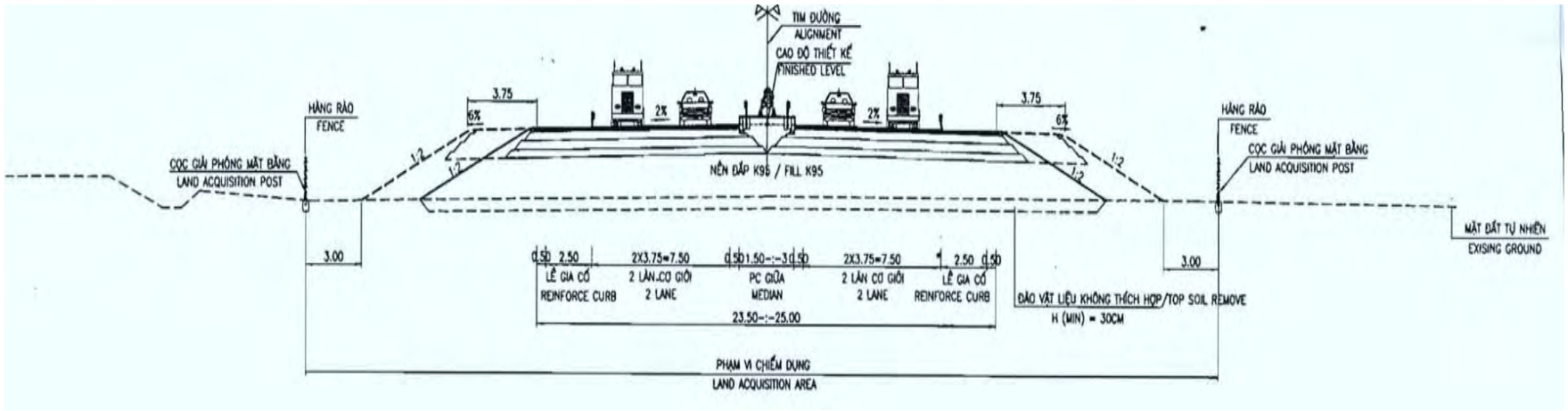
Source: F/S

Figure 7.2.2 Typical Cross-Section (1/2), Bien Hoa IC – Phu My IC Section

(2) Phu My IC - NH51 Intersection (connecting to Cai Mep - Thi Vai Port) Section

The national highway is planned as 4 lanes for phase-1 and six lanes for phase-2 as shown in the cross section below.

National Highway



Source: F/S

Figure 7.2.3 Typical Cross-Section (2/2), Phu My IC – NH51 Intersection Section

7.3 Traffic Demand Forecast

7.3.1 Basic Data Collected in the F/S

(1) Traffic Survey in the F/S

In the F/S, traffic surveys for Bien Hoa – Vung Tau Expressway were carried out at nine survey stations on NH51 on 29 August 2010 (Sunday). The survey consisted of the following two components:

1) Classified traffic counting (24 hours at 9 stations, one day survey)

2) Roadside Origin-Destination (OD) interview survey (16 hours at 3 stations)

(2) Past Traffic Data

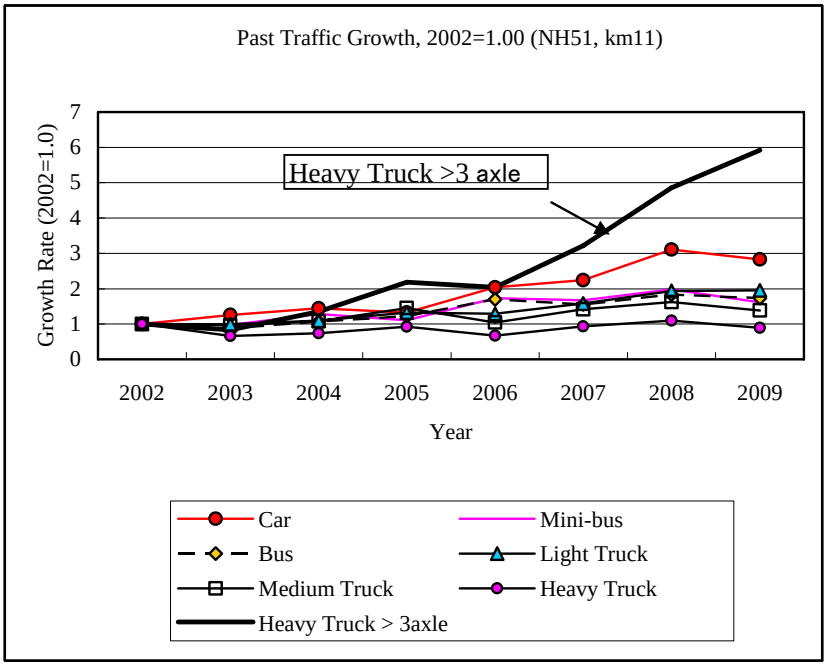
The F/S contains collected past traffic data from the Directorate for Roads of Vietnam (DRVN) at KM 11 on NH51 for the year 2002 – 2009, as shown in Table 7.3.1 and Figure 7.3.1.

Heavy trucks of more than three axles and cars show the highest growth rates.

Table 7.3.1 Past Traffic Data at KM 11 on NH51

Vehicle Type	2002	2003	2004	2005	2006	2007	2008	2009	Growth rate per year
Motorcycle (M/C)	8,737	10,734	11,185	6,057	13,733	12,527	29,027	31,355	20.0%
Car	2,213	2,784	3,203	2,924	4,503	4,961	6,889	6,268	16.0%
Mini-bus	1,689	1,653	2,161	1,869	2,927	2,827	3,341	2,721	7.0%
Bus	524	464	560	639	892	815	960	906	8.1%
Bus total	2,213	2,117	2,721	2,508	3,819	3,642	4,301	3,627	7.3%
Light truck	2,213	2,200	2,433	2,932	2,864	3,491	4,293	4,316	10.0%
Medium truck	1,215	1,170	1,314	1,768	1,266	1,725	1,973	1,678	4.7%
Heavy truck	1,538	1,014	1,132	1,419	1,034	1,433	1,687	1,374	-1.6%
Truck > 3 axles	228	189	307	497	464	735	1,108	1,350	28.9%
Truck total	5,194	4,573	5,186	6,616	5,628	7,384	9,061	8,718	7.7%
All vehicles (excl.M/C	9,620	9,474	11,110	12,048	13,950	15,987	20,251	18,613	9.9%

Source: F/S, Interim Report, Nov.2010



Source: From Table 7.3.1

Figure 7.3.1 Past Traffic Growth, NH51, KM 11 (2002=1.0)

(3) GDP Data

The real GDP data at 1994 prices was collected for the year 1998 to 2009 for the purpose of regression analyses (correlation analyses) between traffic and GDP.

7.3.2 Methodology for Traffic Demand Forecast Applied in this Review Study

(1) Process for Forecasting

Overall flow chart for traffic demand forecast applied in the F/S is shown in Figure 7.3.2, and summarized below:

Step 1: Creation of present OD matrices based on the results of traffic surveys (traffic counting and OD interview surveys).

Step 2: Preparation of present road network (2010) and future road network (2015 and 2020) including the Bien Hoa – Vung Tao Expressway for the traffic assignment simulations.

Step 3: Confirmation of validity of present OD matrices and network conditions through the traffic assignment of the present OD matrices to the present road network, and comparing the assigned traffic volume with the actual volume (counted traffic volume).

Step 4: Regression analyses to explain yearly traffic volume on the NH51 with the real GDP data (2002-2009).

Step 5: Forecast of future GDP growth rate up to 2035

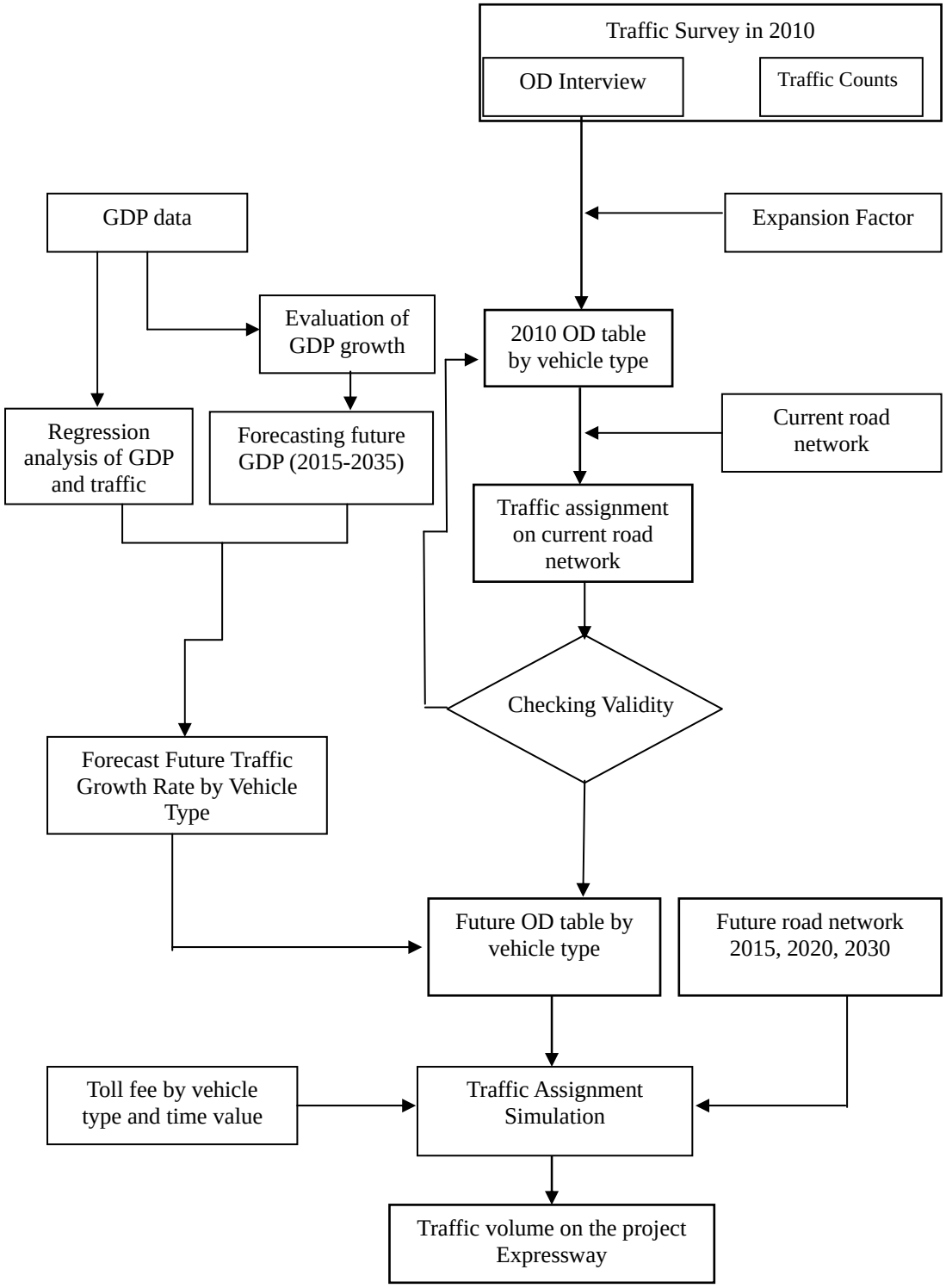
Step 6: Forecast of future traffic growth rates by applying the future GDP to the results of regression analyses.

Step 7: Forecast of future OD matrices (2015, 2020, 2025, 2030 and 2035) by applying the future traffic growth rates to the present OD matrices.

Step 8: Setting of toll fee by vehicle type (cars, buses and trucks) for the years 2015, 2020, 2025, 2030 and 2035 by referring to circular 90/2004/TT-BTC.

Step 9: Determination of time value by vehicle type referring to the results of other studies on the North-South Expressway.

Step10: Forecast of future traffic demand on the Bien Hoa – Vung Tao Expressway through the traffic assignment simulations, converting toll fees into equivalent time cost and applying the JICA STRADA demand forecasting system.



Source: F/S, Interim Report, Nov.2010

Figure 7.3.2 Flowchart of Traffic Demand Forecast

(2) Pre-conditions/ Premises adopted in the F/S

1) Traffic Zone

The F/S has prepared the traffic zone system, which is composed of 17 zones covering all provinces, districts and sub-districts in and outside the study area.

2) Influence of the Future Railway Line

It is assumed in the F/S that the Bien Hoa – Vung Tao Railway line will be completed and put into operation in 2020. After 2020, this railway line is assumed to share 10% of all trips along the corridor based on the results of studies of North – South High Speed Railway and HCMC's urban railway.

3) Future Transport Network

In addition to national highways developments such as NH1A, NH51, NH55, NH56 and NH13, The following stage wise development scenario was assumed in the F/S:

Table 7.3.2 Future Transport Network in the F/S

Year	Components incorporated in Network
2015	- Long Thanh – Dau Giay Expressway - Bien Hoa – Vung Tau Expressway (Stage 1): Bien Hoa – Phu My section
2020	- Bien Hoa – Vung Tau Railway Line
2030	- Bien Hoa – Vung Tau Expressway (Stage 2): Section from Phu My to the end point shall be completed in 2030.

Source: F/S, Interim Report, Nov.2010

4) Toll Rates by Vehicle Type

The following toll rates were assumed in the F/S to be applied to the Bien Hoa – Vung Tau Expressway:

Table 7.3.3 Tariff Setting in the F/S

Vehicle Type	Toll Rate (VND/km)
Car	500
Bus	1000
Truck	1000

Source: F/S, Interim Report, Nov.2010

7.3.3 Traffic Demand Forecast in the F/S

The results of future traffic demand forecast for Bien Hoa – Vung Tau Expressway are presented up to the year 2035, both in terms of number of vehicles and in PCU, for the following four sections:

Section 1: form Bien Hoa City (Bien Hoa IC) to Long Thanh – Dau Giay Expressway (Long Thanh IC)
Section 2: from Expressway Long Thanh – Dau Giay (Long Thanh IC) to Ben Luc – Long Thanh Expressway (Nhon Trach IC)
Section 3: from Ben Luc – Long Thanh Expressway (Nhon Trach IC) to Road linking to Thi Vai Port group (Phu My IC)
Section 4: from Road linking to Thi Vai Port group (Phu My IC) to the end (NH 51 Intersection)

Table 7.3.4 Future Traffic Demand on Bien Hoa – Vung Tau Expressway Based on F/S (Vehicles/ day)

(Vehicles/day)

Section	2015	2020	2025	2030	2035	Yearly Growth %
1. From Bien Hoa City to Long Thanh to Dau Giay Expressway	11,726	17,555	24,355	28,564	33,549	5.4%
2. From Long Thanh - Dau Giay Expressway to Ben Luc - Long Thanh Expressway	17,087	30,013	39,682	41,537	43,975	4.8%
3. From Ben Luc - Long Thanh Expressway to Link Road to Thi Vai Port Group	14,956	21,740	25,924	31,102	37,355	4.7%
4. From Link Road to Thi Vai Port Group to the end				19,767	24,628	4.5%

Source: F/S, Interim Report, Nov.2010

Table 7.3.5 Future Traffic Demand on Bien Hoa – Vung Tau Expressway Based on F/S (PCU/day)

(PCU/day)

Section	2015	2020	2025	2030	2035	Yearly Growth %
1. From Bien Hoa City to Long Thanh to Dau Giay Expressway	19,006	28,171	39,236	46,154	54,386	5.4%
2. From Long Thanh - Dau Giay Expressway to Ben Luc - Long Thanh Expressway	26,808	48,418	64,774	69,278	74,905	5.3%
3. From Ben Luc - Long Thanh Expressway to Link Road to Thi Vai Port Group	24,745	35,367	42,243	50,429	60,275	4.6%
4. From Link Road to Thi Vai Port Group to the end				30,852	38,259	4.4%

Source: F/S, Interim Report, Nov.2010

7.3.4 Update of Traffic Demand Forecast in this Study

Based on the results of above review of the F/S, traffic demand forecast of the Bien Hoa – Vung Tau Expressway was updated, classifying the type of traffic into the following two components:

- ***Normal Traffic*****:** Normal traffic is the traffic which currently uses the existing NH51 and other existing related roads, which would be expected to grow due to daily/yearly economic activities (reflected/ explained by GDP/ GRDP growth).

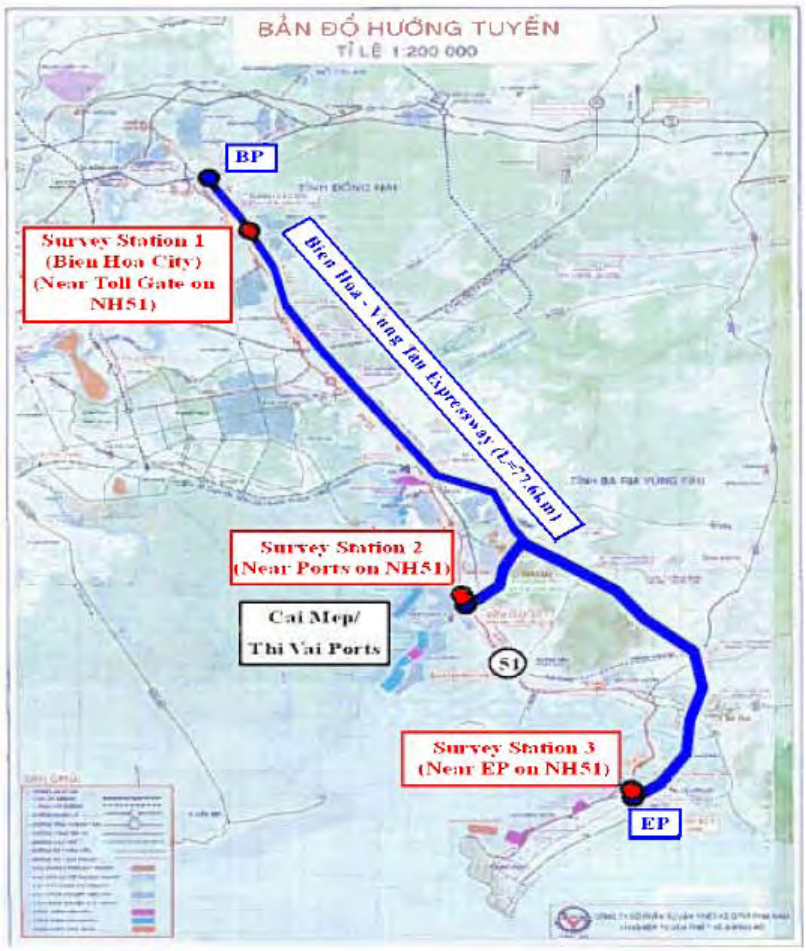
- ***Development Traffic*****:** Development traffic is defined in this Study as the traffic which will be generated from specific large development projects such as the Long Thanh New International Airport, which does not exist at present, and the Cai Mep – Thi Vai Port. Traffic volume of this kind depends on the planned expansion size and implementation schedule, not directly related to the GDP and GRDP growth.

(1) Supplemental Traffic Survey in This Study

As the traffic surveys in the F/S were conducted on Sunday, additional supplemental traffic surveys were carried out on a weekday (9 March 2011). The surveys covered the following contents:

1) Locations of Survey Stations

- Station 1: Near the toll gate no.1 on NH51
- Station 2: Near the Cai Mep/Thi Vai Port on NH51
- Station 3: Near the toll gate no.2 on NH51



Source: JICA Study Team

Figure 7.3.3 Traffic Survey Stations

2) Survey Contents

■ Traffic Count Survey:

- Two stations (Station No.1 and 3): 16-hour count on one weekday (From 07:00 to 23:00)
- Station No.2: 24 hours on one weekday (From 07:00 to 07:00 in the following morning)

Categories of vehicle type are classified as follows:

a) Car (Passenger car, Jeep)
b) Taxi
c) Van
d) Mini Bus (<16 seats)
e) Medium Bus (<35 seats)
f) Heavy Bus (>35 seats)
g) Light Truck (Pickup truck)
h) Medium Truck (2-axle Truck)
i) 3-axle Truck
j) 4 and more axle Truck
k) Motorcycle

■ Roadside OD Interview Survey

Survey stations for OD interview were the same as the traffic count survey stations (three stations). All OD surveys were carried out for 12 hours (from 07:00 to 19:00) on the same day of traffic count.

3) Summary of Traffic Count Survey

The results of traffic count survey at the three stations are summarized below:

Table 7.3.6 Traffic Volume at Survey Stations (Vehicles/day, 2011)

	1	2	3	4	5	6	7	8	9	
Vehicle Type	Car	Mini Bus <16 seats	Medium Bus 17-35 seats	Heavy Bus > 36 seats	Pickup Truck	2-Axle Truck	3-Axle Truck	4 & more Axcle Truck	Motor-cycles	Total (Excl.M/C)
Survey Station	(Car)	(Bus)			(Truck)					
1	6,010	1,694	511	602	3,229	2,671	2,185	2,390	21,087	19,292
	31.2%	8.8%	2.6%	3.1%	16.7%	13.8%	11.3%	12.4%		100%
	(31.2%)	(14.5%)			(54.2%)					
2	4,039	1,613	563	421	1,499	1,611	1,506	1,628	26,214	12,880
	31.4%	12.5%	4.4%	3.3%	11.6%	12.5%	11.7%	12.6%		100%
	(31.4%)	(20.2%)			(48.4%)					
3	4,242	1,231	561	249	1,158	1,240	897	282	24,502	9,860
	43.0%	12.5%	5.7%	2.5%	11.7%	12.6%	9.1%	2.9%		100%
	(43.0%)	(20.7%)			(36.3%)					

Source: JICA Study Team

(2) Preparation of Additional Separate/ Independent Traffic Zones

There are many on-going and planned development projects along the Bien Hoa –Vung Tau Expressway, which will affect its traffic demand. These include the Cai Mep Thi Vai port group and the new Long Thanh Airport as among the biggest projects. In addition, industrial parks along the corridor are also planned, and some of which are already operational. Although 17 traffic zones were prepared in the F/S, separate and independent traffic zones for these special development areas are necessary to estimate traffic volume on access roads to/from these development areas. Furthermore, in order to forecast the development traffic from these areas, it is necessary to treat those using the method different from that for normal traffic. In this Study, the following two independent traffic zones were newly established and incorporated with the 17 zones in the F/S.

1) Zone No.18: Cai Mep – Thi Vai Port Group
2) Zone No.19 : Long Thanh New International Airport

(3) Updated Future Transport Network

Traffic demand of the Bien Hoa – Vung Tau Expressway is affected by other competitive roads and railways. Therefore, it is necessary to take into account the implementation schedule of other related expressways and their conditions (number of lanes). The following development scenario was assumed in this Study.

Table 7.3.7 Network Development Scenario

No.	Segment	Open Year
1	BH-VT Expressway (4-lane)	2016
2	BH-VT Expressway (6-lane)	2030
3	BH-VT Expressway extension to Vung Tau	2030
4	Long Thanh New International Airport	2020
5	Cai Mep – Thi Vai Port (26 berths)	2030
6	HCMC-LT-DG Expressway (4-lane)	2015
7	HCMC-LT-DG Expressway (8-lane)	2030
8	BL-LT Expressway (4-lane)	2015
9	BL-LT Expressway (8-lane)	2030
10	HCMC RR4 extend to Phu My	2030
11	BH-VT Railway	2020

Source: JICA Study Team

(4) Updated Toll Rate Setting

Toll rates by nine vehicle types were set below considering the periodic revision of about 30% up at every five-year interval based on structural proportion of CircularNo.90/2004/TT-BTC.

Table 7.3.8 Applied Toll Rates

		Toll Rate (VND/km)				
No.	Vehicle Type	2016	2020	2025	2030	2035
1	Car	1,300	1,800	2,400	3,100	3,900
2	Mini Bus	1,300	1,800	2,400	3,100	3,900
3	Medium Bus	2,000	2,800	3,800	4,900	6,200
4	Heavy Bus	2,900	4,000	5,400	7,000	8,900
5	Pickup Truck	1,300	1,800	2,400	3,100	3,900
6	2-Axle Truck	2,000	2,800	3,800	4,900	6,200
7	3-Axle Truck	2,900	4,000	5,400	7,000	8,900
8	Truck 10-18 tons, 20ft container	5,400	7,500	10,100	13,200	16,800
9	Truck over 18 tons, 40ft container	10,400	14,400	19,200	24,800	31,200

Source: JICA Study Team

(5) Producing the Present OD Matrices (Normal Traffic)

The present OD matrices were produced based on the results of the roadside OD interview survey and traffic counts at the three survey stations on NH51, in accordance with the following steps:

1) Step 1: Calculation of expansion factors (to expand 12 hours sample interview data to 24-hour basis) by direction and by vehicle type. The results of 24 hours traffic counts at survey station no.2 were applied (24 hour traffic/ 16 hour traffic).

2) Step 2: Expansion of OD interview data to 24-hour basis by direction and by vehicle type.

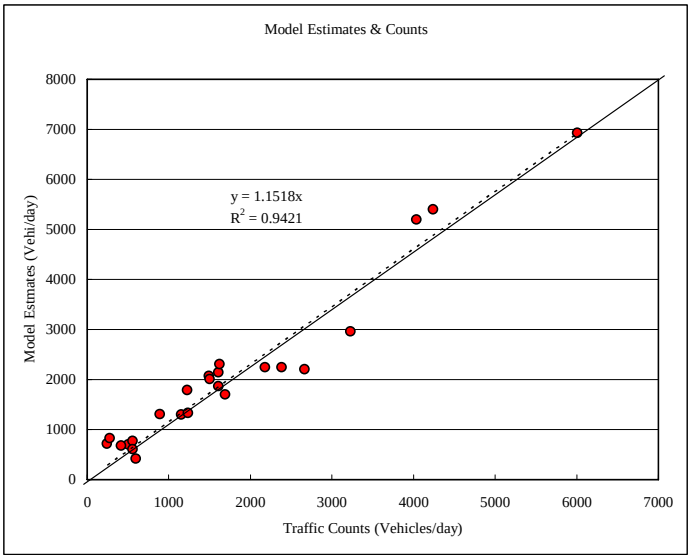
3) Step 3: Consolidation/ combination of three OD matrices into one OD matrix.

4) Step 4: Confirmation of validity of produced present OD matrices by vehicle type.

In order to confirm the validity of the produced OD matrices, the present OD matrices were

assigned on to the present road network. Consequently, assigned traffic volumes with the counted traffic volume at the three survey stations were compared. The results of comparison are shown below (eight vehicle types at three survey stations excluding motorcycles):

The traffic volume estimated from the present OD matrices seems to match with the counted traffic volume with a correlation coefficient (R) at 0.9701



Source: JICA Study Team

Figure 7.3.4 Comparison of Traffic Volume between Counting and Model Estimates

(6) Forecast of Future OD Matrices

1) Future Economic Growth and Traffic Growth (Normal Traffic)

The traffic demand (normal traffic) increases with regional and national economic growth. The past economic performance in HCMC, Dong Nai, and Ba Ria-Vung Tau provinces showed higher GRDP growth than national GDP, as shown in Table 7.3.9.

Table 7.3.9 GRDP of HCMC and Adjoining Provinces (in VND Billion at 1994 constant prices)

	2002	2003	2004	2005	2006	2007	2008	2009	Average Growth Rate (2002-07)
Ho Chi Minh City	63,670	70,947	79,237	88,866	99,672	112,258	124,220	132,294	12.0%
Dong Nai Province	13,058	14,798	16,813	19,179	21,941	24,850	N/A	N/A	13.7%
Ba Ria-Vung Tau Province	27,844	30,836	36,903	39,235	42,244	48,045	N/A	N/A	11.5%
Regional Total	104,572	116,581	132,953	147,280	163,857	185,153	N/A	N/A	12.1%
GDP	313,247	336,242	362,435	393,031	425,372	461,344	489,833	515,892	8.1%

Source: "Preparing the Ben Luc – Long Thanh Expressway Project", Final Report, Feb.2010, ADB (TA7155-VIE).
Original Source: Statistical book and Plan 2005-2010 of all provinces in southeast key economic zone (Development strategy institute in the South of MPI).

The total GRDP of HCMC, Dong Nai Province and Ba Ria-Vung Tau Province has grown at 12.1% of the average increase rate for the period 2002-2007, which is about 4% higher than GDP.

As the HCMC and surrounding provinces serve as the economic center in Vietnam, this growth tendency higher than GDP will continue in the future.

At the same time, a study on the Ben Luc – Long Thanh Expressway Project (ADB assisted) assumed future GRDP growth rate as below:

Table 7.3.10 Future GRDP Growth Rate by ADB Study

	2010 - 2020	2020 - 2030	2030 - 2036
Ho Chi Minh City	8.5%	7.8%	7.0%
Adjoining Provinces	8.5%	7.8%	7.0%

Source: "Preparing the Ben Luc – Long Thanh Expressway Project", Final Report, Feb.2010, ADB (TA7155-VIE).

2) Future GRDP Forecast

Although the HCMC area has still high growth potential in the future, an alternative and conservative growth scenario was established for this demand forecast as presented in Table 7.3.11.

Table 7.3.11 Future GRDP Forecast in this Study

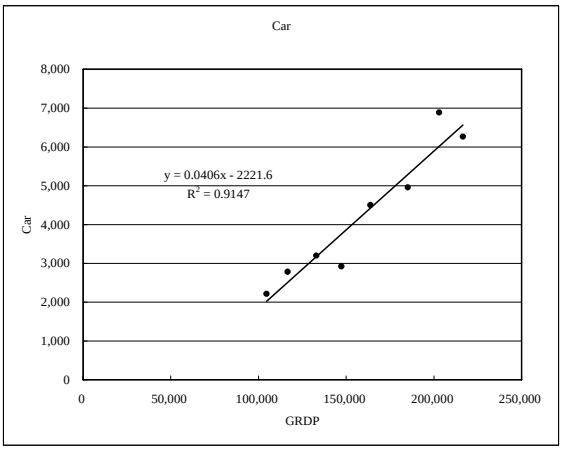
Year	Growth Rate (% p.a.)
2011-2015	8.5%
2016-2020	8.0%
2021-2025	7.5%
2026-2030	7.0%
2031-2035	6.5%

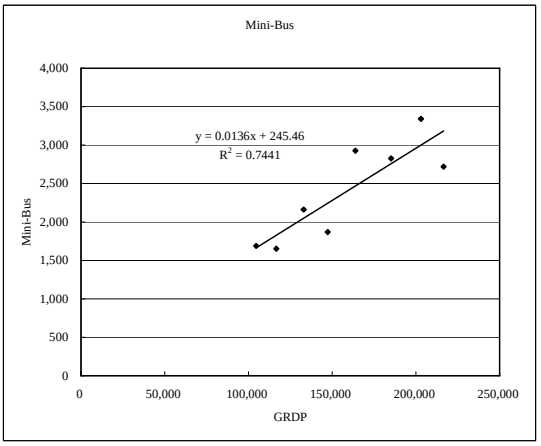
Source: JICA Study Team

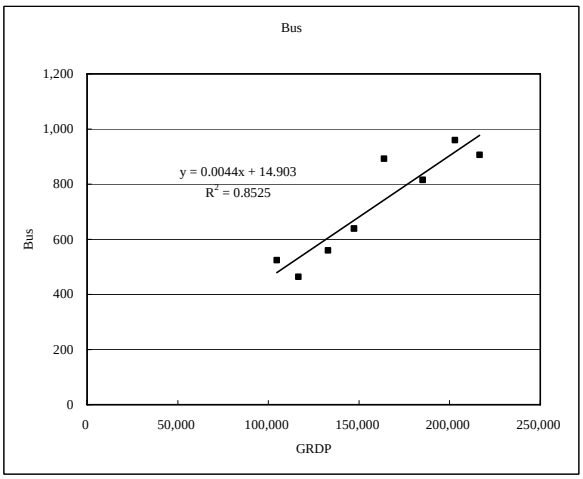
3) Relationship between GRDP and Traffic Demand (Normal Traffic)

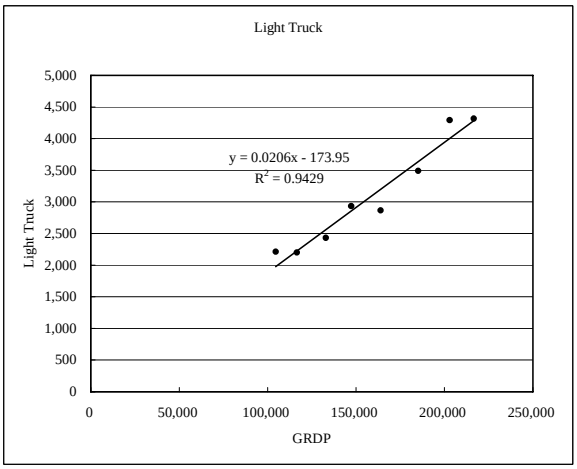
The correlation analyses were carried out by applying the past traffic data on NH51 (refer to Table 7.3.1) and GRDP shown in Table 7.3.9.

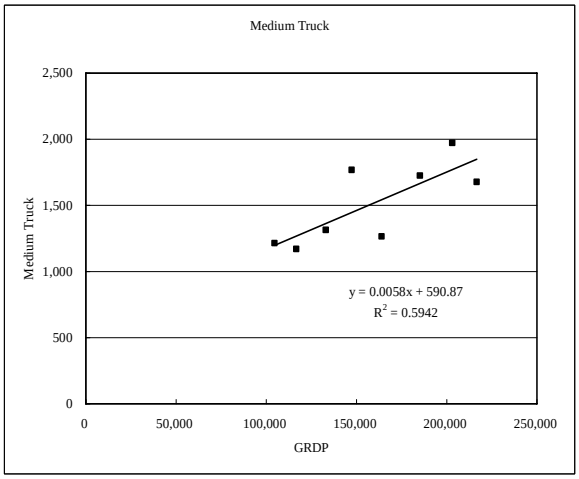
The results of correlation analyses are presented as below.

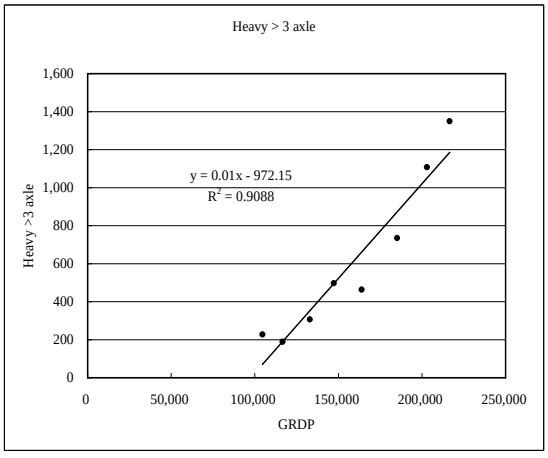












Source: JICA Study Team

Figure 7.3.5 Regression Analysis (GRDP and Traffic)

4) Forecast of Future Traffic Growth Rate for Normal Traffic

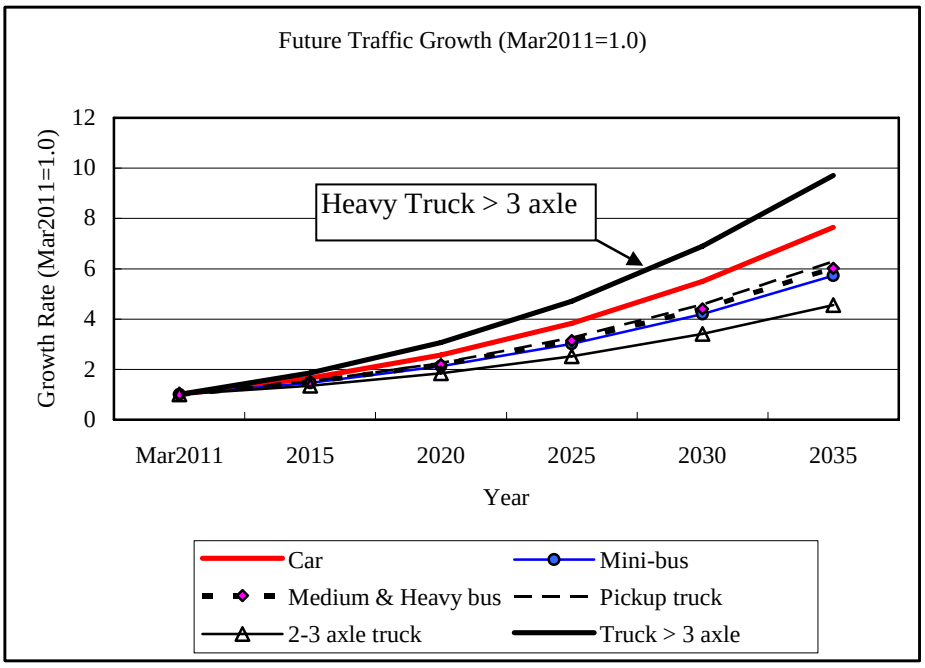
Future traffic growth rates per vehicle type were estimated by applying the future GRDP to the formulas above. Forecasted growth rates are shown in Table 7.3.12 and Figure 7.3.6.

Traffic caused by heavy trucks with four and more axles will grow about 10 times, and cars by about eight times compared to the volume in March 2011.

Table 7.3.12 Future Traffic Growth Rate of Normal Traffic (% per year, Normal Traffic)

No.	Year Vehicle Type	2011-2015	2016-2020	2021-2025	2026-2030	2031-2035
1	Car	10.62	9.24	8.26	7.48	6.82
2	Mini Bus	7.98	7.66	7.28	6.85	6.40
3	Medium Bus	8.40	7.94	7.46	6.97	6.48
4	Heavy Bus					
5	Pickup Truck	8.77	8.17	7.61	7.07	6.55
6	2-Axle Truck	6.21	6.41	6.41	6.25	5.99
7	3-Axle Truck					
8	4 & more axle	13.23	10.51	8.97	7.91	7.09

Source: JICA Study Team



Source: JICA Study Team

Figure 7.3.6 Future Traffic Growth of Normal Traffic (Mar.2011=1.0)

5) Forecast of Development Traffic to/from the Cai Mep – Thi Vai Port

VITRANSS2 has forecast the total volume of imports and exports for the whole country of Vietnam and by province in 2020 and 2030 including the Ba Rio Vung Tau province (Source: Technical Report No.4, Main Commodity Analysis, May 2010, JICA). Summary of the forecast is presented as below:

a) Future Socio-Economic Framework

VITRANSS2 has established the future socio-economic framework as shown in the table below for pre-conditions of forecasting future commodity volume.

Table 7.3.13 Future Socio-Economic Framework by VITRANSS2

	Past Record		Projection		
Period	1995	2005	2010	2020	2030
Factor					
Total Population ('000)	77,635	83,120	88,971	101,439	113,954
(Average Growth Rate, % p.a.)	(1.52)	(1.37)	(1.37)	(1.32)	(1.17)
GDP (VND Billion, 1994 prices)	275,918	393,028	574,253	1,082,983	1,858,609
GDP per Capita (VND Million)	3.55	4.73	6.45	10.68	16.31
	1995-2000	2001-2005	2006-2010	2011-2020	2021-2030
Average Growth of GDP (% p.a.)	7.1	7.3	7.9	6.5	5.5
Average Growth of GDP per Capita	5.5	6.3	6.4	5.2	4.3

Source: VITRANSS2, Technical Report No.4, Main Commodity Analysis, May 2010, JICA

b) Methodology for Forecast of Future Cargo Demand by VITRANSS2

Future cargo demand was forecasted for the years 2020 and 2030 by 13 commodity type and results were presented as the total volume of production, imports, exports and consumption. Procedures for the forecasts are explained with the following 7 steps:

Step 1: Review the record of production and trade in the past for each commodity and commodity group from 1995 or 1997 up to 2005 or 2007 depending on the availability of relevant statistical data.

Step 2: As for the agricultural products, the projection of production volume toward the future from 2007 was carried out based on the trend of per-capita consumption of subject items, which was able to obtain by a regression analysis.

Step 3: As for the industrial and mineral products, the projection volume toward the future from 2007 was carried out based on the relevant information obtained from respective sources and concerned decrees issued for such production plan to the future.

Step 4: Distribution of goods of which production volume was projected through preceding process was carried out by respective factors such as population distribution by province for the agriculture products and GDP distribution either in the form of total GDP or in the form of secondary industry by province for each industrial products.

Step 5: The trend of export was analyzed based on the past records and the projection of exports was carried out based on the trend of changes of volume, which was able to obtain by regression analysis.

Step 6: The trend of import was analyzed based on the past records and projection of imports based on the balance between the production volume and consumption volume.

Step 7: The distribution of export volume was carried out based on the production volume of item for export by each province, which was based on the average share of such production up to 2007.

c) Results of Forecasts of Future Import/Export Volume, Truck Volume of Ba Ria Vung Tau Province

Based on the above procedures, future import and export volumes of Ba Ria Vung Tau Province in 2020 and 203 forecasted by VITRANSS2 are shown in the table below:

Table 7.3.14 Forecast of Import and Export, Ba Ria - Vung Tau Province (1000 tons/ year)

	2020	2030
Import	29,552	77,041
Export	39,970	92,726
Total	69,522	169,767
Containerized		
Imports	22,475	63,285
Exports	20,105	55,351
Total	42,580	118,636
Non-Containerized		
Imports	7,077	13,756
Exports	19,865	37,375
Total	26,942	51,131

Source: VITRANSS2

Applying the average loading per vehicle (20 tons/container trailer, 6 tons/common truck), number of vehicles to/from the Ba Ria Vung Tau Province were forecasted as follows:

Table 7.3.15 Number of Cargo Vehicles to/from Ba Ria - Vung Tau Province (1000 vehicles/day)

No. of Vehicles	2020	2030
Container Trailers	6.2	17.3
Truck	6.5	12.6
Total	12.6	29.9

Source: VITRANSS2

d) Traffic Volume of Trucks to/from Cai Mep Thi Vai Port

Share of containerized cargo in Cai Mep-Thi Vai Port is 2/3 while non-containerized cargo is 3/4 of total cargos. Applying these shares, number of cargo vehicles in the Cai Mep-Thi Vai Port and Vung Tau Port were forecasted as shown in Table 7.3.16.

Table 7.3.16 Number of Cargo Vehicles to/from Ports (Vehicles/day)

Port	Cai Mep-Thi Vai Port		Vung Tau Port	
Year	2020	2030	2020	2030
Container Trailer	4,100	11,600	2,100	5,800
Truck	4,800	9,400	1,600	3,100
Total	9,000	21,000	3,700	8,900

Source: VITRANSS2

Above Development Traffic volume to/from the Cai Mep-Thi Vai Port were incorporated in the future OD matrices of Normal Traffic with the same distribution pattern of Zone 11 where the Cai Mep-Thi Vai Port is located.

6) Forecast of Development Traffic to/from the Long Thanh New International Airport

According to the Master Plan for the Long Thanh New Airport (Source: Overall Plan for Long Thanh International Airport, Final Report, Southern Airports Corporation (SAC), February 2011), construction and expansion plan of this new airport was formulated in 3 phases, and the capacity of handling passengers and cargos are estimated as follows:

- Phase 1 (2020): No. of passengers: 25 million/year, Cargo: 1.2 million ton/year

- Phase 2 (2030): No. of passengers: 50 million/year, Cargo: 1.5 million ton/year

- Phase 3 (after 2030, final phase): Passengers: 100 million/year, Cargo: 5.0 million ton/year

The above volumes show the capacity and the existing Tan Son Nhat Airport and Long Thanh Airport will share the roles each other until the all functions of the Tan Son Nhat Airport move to the New Airport. In that case, the roles of the two airports are reported that the Long Thanh Airport will handle 90% of international flights and 20% of domestic flights, and the Tan Son Nhat Airport will handle 10% of international flights and 80% of domestic flights. At present (2010), the existing Tan Son Nhat Airport is handling about 12 million passengers (6 million of international and 6 million of domestic) and 278,000 tons cargo per year. In addition, SAC estimates that the total air traffic demand in the HCMC area will reach 44.5 million/year and 1.2 million cargo by 2030.

Based on the above conditions, passengers and cargo traffic demand of the Long Thanh New International Airport were forecasted as shown in the table below:

Table 7.3.17 Forecasted Volume of Passengers and Cargos at Long Thanh Airport

year	2020	2030	2035
Passengers (million/year)	16.08	24.5	100
Cargo (million tons/year)	0.33	0.66	5.00

Source: 2035; Southern Airports Corporation, Vietnam (SAC), 2020 and 2030; JICA Study Team

Another supplemental data necessary to estimate the development traffic to/from the New Long Thanh Airport is the distribution pattern of passengers between cars and buses, which is the average occupancy by vehicle type. Unfortunately, there is no data available on the access/egress modes to/from the existing Tan Son Nhat Airport. Therefore, alternatively, distribution patterns of passengers between cars and buses and the average occupancy by vehicle type were applied from the results of the traffic survey on the road to Noi Bai Airport (construction of road links Nhat Tan Bridge and Noi Bai Airport project, TEDI, 2008). Results of forecast of traffic volume to/from the New Long Thanh Airport are shown in Table 7.3.18.

The development traffic below was distributed to each traffic zone in accordance with the same distribution pattern of population in traffic zones.

Table 7.3.18 Future Traffic Volume to/from Long Thanh Airport (Vehicles/day)

year	2020	2025	2030	2035
Car	6852	8454	10431	42618
Mini-bus	581	717	884	3611
Medium-bus	129	159	196	802
Heavy-bus	406	501	619	2528
Pickup truck	127	240	453	1889
2-axle truck	20	38	71	296
3-axle truck	8	15	29	120
Truck>3-axle	11	20	38	159

Source: JICA Study Team

7) Influence Bien Hoa – Vung Tau Railway Line

The Bien Hoa – Vung Tau Railway Line is planned to be completed and put into operation in 2020 and a study on this railway line is on-going by TEDI South (Source: Setting up Investment Project for Bien Hoa – Vung Tau Railway). This railway line is planned to operate both passenger and cargo trains. The cargo alignment links Trang Bom station with Cai Mep-Thi Vai station and passenger's alignment links Bien Hoa station with Vung Tau station. Total 17 stations are planned along the NH51 and the design speed is at 200km/hour with the length of 120km.

The Feasibility Study on Bien Hoa – Vung Tau Expressway (Source: Bien Hoa-Vung Tau Expressway Construction Project, TEDI, November 2010) estimated the share of this railway line around 10% of total traffic referring to the study results of NS expressway, HCMC urban railways and the Overall Transport Plan for Dong Nai Province. After 2020, 10% of total trips for all vehicle types are estimated to be diverted to the Bien Hoa – Vung Tau railway in this Study.

(7) Traffic Assignment of Future OD matrices

1) Methodology of Traffic Assignment

Methodologies for forecasting the traffic demand on expressways are usually classified into two types: "Diversion Rate Method (Diversion Formula Method)" and "Incremental Assignment Method".

The former method estimates diversion rates to expressways by each OD pair with the diversion formula, and multiply such rates to the total trips of each OD pair. The former requires the estimation of the diversion curve explained by a variable of fare/time difference between via existing road and via toll expressway. However, the necessary actual data are not available in Vietnam for estimating the parameters of the diversion curve and, therefore, this method was not applied.

The latter is a network simulation method dividing the input OD traffic data into small increment, say 10% of OD traffic, and assigns each increment to the minimum route wherein the toll fare is converted to time by the time value (minutes/VND). This is then added to the proper travel time using the following formula:

$$GCij = Tij + WFij$$

Where, GC: Generalized Cost between Oi and Dj
Tij: Travel time (in minutes)
W: Time Value = minutes/VND
Fij: Toll Fare between Oi and Dj in VND

In the above process, travel speed is adjusted using Q-V formula (relationship between traffic volume assigned and travel speed). This assignment is repeated, say 10 times, until all OD trips are assigned. Therefore, this methodology does not require the diversion curve, and the diversion rate is estimated after all traffic volumes of all OD pairs are assigned, comparing the assigned traffic volume on each expressway section and the parallel existing road section.

In this simulation, the maximum speed on the Bien Hoa – Vung Tau Expressway was set at 120 km/hour, while 60 km/hour is applied for NH51 considering the road conditions along the corridor passing through many towns. The capacity of the six-lane expressway and six-lane NH51 was set at 72,000 PCU/day. Average speed on the expressway is estimated to be around 85 km/hour and 40 km/hour on NH51 in 2030, after being adjusted by the Q-V formula through the traffic assignment simulation.

2) Passenger Travel Time Value

The travel time values of passengers of cars and buses were estimated based on the basic data taken from VITRANSS2, as shown below:

Table 7.3.19 Future Time Value From VITRANSS2

Item	Mode	2008	2010	2020	2030
Average Income (USD/month)	Car/Air	400	422	694	1,057
	Bus/Rail	200	211	347	529
Passenger Time Cost (USD/hour/ person)	Car/Air	2.50	2.63	4.34	6.61
	Bus/Rail	1.25	1.32	2.17	3.30

Source: VITRANSS2

Note: 160 working hours per month, 2) Income growth in proportion to per capita GDP, 3) Official salary of government employee is VND1.7 million for a month (21 days). This was doubled for demand forecast.

Applying the above results from VITRANSS2, the time values of passengers in this Study were estimated as shown below:

Table 7.3.20 Time Value by Vehicle Type

Vehicle Type	2008 (VND/hour per person)	2010 (VND/hour per person)	(**) Average occupancy (Persons)	Time Value per vehicle				
				2010	2015	2025	2030	2035
				VND/hour/vehicle				
Car	42,500	46,856	2.85	133,540	173,377	280,915	350,574	426,527
Mini Bus	21,250 (*)	23,428	10.39	243,418	316,033	512,054	639,028	777,476
Medi. Bus	21,250	23,428	19.5	456,848	593,131	961,025	1,199,332	1,459,170
Heavy Bus	21,250	23,428	32.98	772,660	1,003,153	1,625,364	2,028,408	2,467,868

Source: JICA Study Team

Note: (*): USD1.25 x 17000VND/USD, (**): from OD survey of this study.
Time values were increased in proportion to per capita GDP.

7.3.5 Results of Updated Traffic Demand

The results of traffic assignment from the year 2015 to 2035 are presented in the following tables both in terms of PCU and number of vehicles. PCU convert factor are Car: 1.0, Mini Bus: 2.0, Medi. Bus: 2.0, Heavy Bus: 2.5, Pickup: 1.5, 2-Axle: 2.0, 3-Axle: 3.0, and 4 and More: 3.0 in accordance with F/S. As Bien Hoa – Vung Tau Expressway is planned to accommodate four lanes in 2025, traffic demand on the section of the Ben Luc – Long Thanh Expressay to Ring Road No. 4 and to Port Access may exceed the four-lane capacity. In 2030, the Expressway is expanded to six lanes, which will be able to handle the expected traffic demand. The maximum traffic demand is observed at the section of Long Thanh – Dau Giay Expressway to Long Thanh Aiport with volumes of 78,400 PCU/day and 37,400 vehicles/day in 2030. In 2035, traffic volume on the section of Ben Luc Expressway to Ring Road No. 4 and Port Access may again exceed the six-lane capacity due to high demand of heavy vehicles to/from the Cai Mep – Thi Vai Port. Further and more detailed study will be necessary regarding this issue.

Table 7.3.21 Future Traffic Demand of Bien Hoa-Vung Tau Expressway (2015, PCU/day)

2015 Traffic (PCU/day, Both directions)

Section	Car	Mini Bus	Medi. Bus	Heavy Bus	Pickup	2- Axle	3-Axle	4 and More	Total	V/C(4Lane)
Bien Hoa City -	4,636	888	672	826	3,177	2,985	8,196	4,540	25,920	0.54
LT Dau Giay Exp	4,494	1,468	808	1,766	3,041	3,769	10,278	4,420	30,044	0.63
LT Dau Giay-LT Airport	4,658	5,442	2,026	1,878	3,246	3,659	11,675	4,974	37,558	0.78
LT Airport-Ben Luc Exp	3,098	5,382	2,280	2,422	1,951	1,983	6,564	2,892	26,572	0.55
Ben Luc Exp-RR4	3,098	5,382	2,280	2,422	1,951	1,983	6,564	2,892	26,572	0.55
	3,098	5,382	2,280	2,422	1,951	1,983	6,564	2,892	26,572	0.55
RR4-Port	3,098	5,382	2,280	2,422	1,951	1,983	6,564	2,892	26,572	0.55

Source: JICA Study Team

Table 7.3.22 Future Traffic Demand of Bien Hoa-Vung Tau Expressway (2020, PCU/day)

2020 Traffic (PCU/day, Both directions)

Section	Car	Mini Bus	Medi. Bus	Heavy Bus	Pickup	2- Axle	3-Axle	4 and More	Total	V/C(4Lane)
Bien Hoa City -	7,036	1,364	904	1,140	4,094	3,135	11,021	4,408	33,102	0.69
LT Dau Giay Exp	6,089	1,668	939	2,341	3,473	3,789	13,072	4,280	35,651	0.74
LT Dau Giay-LT Airport	7,368	5,604	2,067	2,638	3,573	3,652	14,818	4,674	44,394	0.92
LT Airport-Ben Luc Exp	3,751	6,466	2,764	3,278	2,715	2,612	11,005	2,678	35,269	0.73
Ben Luc Exp-RR4	4,562	7,940	3,344	4,132	3,177	3,012	11,532	4,232	41,931	0.87
	4,562	7,940	3,344	4,132	3,177	3,012	11,532	4,232	41,931	0.87
RR4-Port	4,562	7,940	3,344	4,132	3,177	3,012	11,532	4,232	41,931	0.87

Source: JICA Study Team

Table 7.3.23 Future Traffic Demand of Bien Hoa-Vung Tau Expressway (2025, PCU/day)

2025 Traffic (PCU/day, Both directions)

Section	Car	Mini Bus	Medi. Bus	Heavy Bus	Pickup	2- Axle	3-Axle	4 and More	Total	V/C(4Lane)
Bien Hoa City -	8,601	1,965	1,274	1,620	5,145	3,725	12,027	5,066	39,423	0.82
LT Dau Giay Exp	6,279	1,793	1,138	2,662	3,636	3,841	13,146	4,736	37,231	0.78
LT Dau Giay-LT Airport	7,811	5,025	1,930	2,390	3,569	3,742	14,605	6,004	45,076	0.94
LT Airport-Ben Luc Exp	6,288	7,029	3,273	4,206	4,102	3,937	15,181	7,778	51,794	1.08
Ben Luc Exp-RR4	7,222	8,762	3,820	4,219	4,458	4,515	15,829	10,202	59,027	1.23
	7,222	8,762	3,820	4,219	4,458	4,515	15,829	10,202	59,027	1.23
RR4-Port	7,222	8,762	3,820	4,219	4,458	4,515	15,829	10,202	59,027	1.23

Source: JICA Study Team

Table 7.3.24 Future Traffic Demand of Bien Hoa-Vung Tau Expressway (2030, PCU/day)

2030 Traffic (PCU/day, Both directions)

Section	Car	Mini Bus	Medi. Bus	Heavy Bus	Pickup	2- Axle	3-Axle	4 and More	Total	V/C(6Lane)
Bien Hoa City -	1,988	2,961	1,658	2,406	6,310	4,396	14,924	8,484	43,127	0.60
LT Dau Giay Exp	9,976	3,767	1,742	5,062	6,134	6,688	24,140	8,444	65,953	0.92
LT Dau Giay-LT Airport	7,724	11,029	3,996	5,700	6,365	6,601	26,809	10,170	78,394	0.82
LT Airport-Ben Luc Exp	1,205	10,825	4,088	5,456	5,720	5,721	20,603	13,640	67,258	0.70
Ben Luc Exp-RR4	2,511	12,866	5,082	6,551	6,047	5,168	17,555	13,054	68,834	0.96
	2,511	12,866	5,082	6,551	6,047	5,168	17,555	13,054	68,834	0.96
RR4-Port	4,853	4,696	2,145	1,137	6,676	5,984	26,304	14,152	65,947	0.92

Source: JICA Study Team

Table 7.3.25 Future Traffic Demand of Bien Hoa-Vung Tau Expressway (2035, PCU/day)

2035 Traffic (PCU/day, Both directions) Total

Section	Car	Mini Bus	Medi. Bus	Heavy Bus	Pickup	2- Axle	3-Axle	4 and More	Total	V/C(6Lane)
Bien Hoa City -	19,406	4,888	2,334	3,844	8,663	4,579	12,203	8,468	64,385	0.89
LT Dau Giay Exp	14,466	5,144	2,139	7,022	6,871	6,681	20,260	8,134	70,717	0.98
LT Dau Giay-LT Airport	30,176	13,026	4,112	8,534	7,024	5,947	20,594	10,290	99,703	1.04
LT Airport-Ben Luc Exp	13,350	13,299	5,306	7,503	6,231	4,771	13,951	10,299	74,710	0.78
Ben Luc Exp-RR4	18,998	16,573	6,377	8,175	8,537	6,343	16,074	17,681	98,758	1.37
	18,998	16,573	6,377	8,175	8,537	6,343	16,074	17,681	98,758	1.37
RR4-Port	7,431	6,971	3,618	2,650	9,168	7,457	29,177	20,711	87,183	1.21

Source: JICA Study Team

Table 7.3.26 Future Traffic Demand of Bien Hoa-Vung Tau Expressway (2015, vehicles/day)

2015 Traffic (Vehicles/day, Both directions)

Section	Car	Mini Bus	Medi. Bus	Heavy Bus	Pickup	2- Axle	3-Axle	4 and More	Total
Bien Hoa City -	4,636	444	336	330	2,118	1,493	2,732	1,513	13,602
LT Dau Giay Exp	4,494	734	404	706	2,027	1,885	3,426	1,473	15,150
LT Dau Giay-LT Airport	4,658	2,721	1,013	751	2,164	1,830	3,892	1,658	18,686
LT Airport-Ben Luc Exp	3,098	2,691	1,140	969	1,301	992	2,188	964	13,342
Ben Luc Exp-RR4	3,098	2,691	1,140	969	1,301	992	2,188	964	13,342
	3,098	2,691	1,140	969	1,301	992	2,188	964	13,342
RR4-Port	3,098	2,691	1,140	969	1,301	992	2,188	964	13,342

Source: JICA Study Team

Table 7.3.27 Future Traffic Demand of Bien Hoa-Vung Tau Expressway (2020, vehicles/day)

2020 Traffic (Vehicles/day, Both directions)

Section	Car	Mini Bus	Medi. Bus	Heavy Bus	Pickup	2- Axle	3-Axle	4 and More	Total
Bien Hoa City -	7,036	682	452	456	2,729	1,568	3,674	1,469	18,066
LT Dau Giay Exp	6,089	834	470	936	2,315	1,895	4,357	1,427	18,323
LT Dau Giay-LT Airport	7,368	2,802	1,034	1,055	2,382	1,826	4,939	1,558	22,964
LT Airport-Ben Luc Exp	3,751	3,233	1,382	1,311	1,810	1,306	3,668	893	17,354
Ben Luc Exp-RR4	4,562	3,970	1,672	1,653	2,118	1,506	3,844	1,411	20,735
	4,562	3,970	1,672	1,653	2,118	1,506	3,844	1,411	20,735
RR4-Port	4,562	3,970	1,672	1,653	2,118	1,506	3,844	1,411	20,735

Source: JICA Study Team

Table 7.3.28 Future Traffic Demand of Bien Hoa-Vung Tau Expressway (2025, vehicles/day)

2025 Traffic (Vehicles/day, Both directions)

Section	Car	Mini Bus	Medi. Bus	Heavy Bus	Pickup	2- Axle	3-Axle	4 and More	Total
Bien Hoa City -	8,601	983	637	648	3,430	1,863	4,009	1,689	21,859
LT Dau Giay Exp	6,279	897	569	1,065	2,424	1,921	4,382	1,579	19,114
LT Dau Giay-LT Airport	7,811	2,513	965	956	2,379	1,871	4,868	2,001	23,365
LT Airport-Ben Luc Exp	6,288	3,515	1,637	1,682	2,735	1,969	5,060	2,593	25,478
Ben Luc Exp-RR4	7,222	4,381	1,910	1,688	2,972	2,258	5,276	3,401	29,107
	7,222	4,381	1,910	1,688	2,972	2,258	5,276	3,401	29,107
RR4-Port	7,222	4,381	1,910	1,688	2,972	2,258	5,276	3,401	29,107

Source: JICA Study Team

Table 7.3.29 Future Traffic Demand of Bien Hoa-Vung Tau Expressway (2030, vehicles/day)

2030 Traffic (Vehicles/day, Both directions)

Section	Car	Mini Bus	Medi. Bus	Heavy Bus	Pickup	2- Axle	3-Axle	4 and More	Total
Bien Hoa City -	1,988	1,481	829	962	4,207	2,198	4,975	2,828	19,467
LT Dau Giay Exp	9,976	1,884	871	2,025	4,089	3,344	8,047	2,815	33,050
LT Dau Giay-LT Airport	7,724	5,515	1,998	2,280	4,243	3,301	8,936	3,390	37,387
LT Airport-Ben Luc Exp	1,205	5,413	2,044	2,182	3,813	2,861	6,868	4,547	28,932
Ben Luc Exp-RR4	2,511	6,433	2,541	2,620	4,031	2,584	5,852	4,351	30,924
	2,511	6,433	2,541	2,620	4,031	2,584	5,852	4,351	30,924
RR4-Port	4,853	2,348	1,073	455	4,451	2,992	8,768	4,717	29,656

Source: JICA Study Team

Table 7.3.30 Future Traffic Demand of Bien Hoa-Vung Tau Expressway (2035, vehicles/day)

2035 Traffic (Vehicles/day, Both directions)

Section	Car	Mini Bus	Medi. Bus	Heavy Bus	Pickup	2- Axle	3-Axle	4 and More	Total
Bien Hoa City -	19,406	2,444	1,167	1,538	5,775	2,290	4,068	2,823	39,510
LT Dau Giay Exp	14,466	2,572	1,070	2,809	4,581	3,341	6,753	2,711	38,302
LT Dau Giay-LT Airport	30,176	6,513	2,056	3,414	4,683	2,974	6,865	3,430	60,109
LT Airport-Ben Luc Exp	13,350	6,650	2,653	3,001	4,154	2,386	4,650	3,433	40,277
Ben Luc Exp-RR4	18,998	8,287	3,189	3,270	5,691	3,172	5,358	5,894	53,858
	18,998	8,287	3,189	3,270	5,691	3,172	5,358	5,894	53,858
RR4-Port	7,431	3,486	1,809	1,060	6,112	3,729	9,726	6,904	40,255

Source: JICA Study Team

Table 7.3.31 Traffic Demand of Bien Hoa-Vung Tau Expressway and NH51 (PCU/day)

	Year	2015			2020			2025			2030			2035		
	Section	B-V Exp.	NH51	Total	B-V Exp.	NH51	Total	B-V Exp.	NH51	Total	B-V Exp.	NH51	Total	B-V Exp.	NH51	Total
1	Bien Hoa City	25,920	10,738	36,658	33,102	25,492	58,594	39,423	44,049	83,472	43,127	40,157	83,284	64,385	61,832	126,217
	to Long Thanh -Dau Giay Exp.	70.7%	29.3%	100.0%	56.5%	43.5%	100.0%	47.2%	52.8%	100.0%	51.8%	48.2%	100.0%	51.0%	49.0%	100.0%
2	Long Thanh -Dau Giay Exp.	37,558	17,732	55,290	44,394	45,854	90,248	45,076	86,208	131,284	78,394	63,144	141,538	99,703	111,059	210,762
	to Long Thanh New Air Port	67.9%	32.1%	100.0%	49.2%	50.8%	100.0%	34.3%	65.7%	100.0%	55.4%	44.6%	100.0%	47.3%	52.7%	100.0%
3	Long Thanh New Air Port	26,572	32,846	59,418	35,269	53,533	88,802	51,794	73,010	124,804	67,258	56,178	123,436	74,710	82,329	157,039
	to Ben Luc - Long Tanh Exp.	44.7%	55.3%	100.0%	39.7%	60.3%	100.0%	41.5%	58.5%	100.0%	54.5%	45.5%	100.0%	47.6%	52.4%	100.0%
4	Ben Luc - Long Tanh Exp.	26,572	38,350	64,922	41,931	65,304	107,235	59,027	94,953	153,980	68,834	90,389	159,223	98,758	128,812	227,570
	to Junction with RR 4	40.9%	59.1%	100.0%	39.1%	60.9%	100.0%	38.3%	61.7%	100.0%	43.2%	56.8%	100.0%	43.4%	56.6%	100.0%
5	Junction with RR 4	26,572	38,350	64,922	41,931	65,304	107,235	59,027	94,953	153,980	65,947	90,389	156,336	87,183	128,812	215,995
	to Thi Vai Port Group	40.9%	59.1%	100.0%	39.1%	60.9%	100.0%	38.3%	61.7%	100.0%	42.2%	57.8%	100.0%	40.4%	59.6%	100.0%

Source: JICA Study Team

7.4 Phase-wise Construction

7.4.1 Phase-wise Construction in the F/S

In the F/S, the following Table 7.4.1shows the proposed phase-wise construction. .

Table 7.4.1 Phasewise Construction in the F/S (Base Case)

Phase	Earthworks	Bridge	Culvert	Others
1	4-lane	6-lane for KM 0+000-KM 16+600 4-lane for KM16+600-KM 29+400 6-lame for KM 29+400-KM 46+800	Length of Phase-2	
2 (2028-2030)	6-lane for KM 0+000-KM16+600 8-lane for KM16+600-KM 29+400 6-lame for KM 29+400-KM 46+800			Nhon Trach IC

Source: JICA Study Team

Accordingly, the following interchanges are planned:
- Bien Hoa IC (KM 0+000)
- Long Thanh IC (KM 16+570)
- Nhon Trach IC (KM 29+440)
- Phu My IC (KM 38+050)
- NH51 Intersection(KM 46+360)

7.4.2 Phase-wise Construction (1), Base Case, in this Study

Updated traffic demand in this Study is summarized in Table 7.3.28.

The phase-wise construction, same as TEDI proposed, is adopted as the base case.

7.4.3 Phase-wise Construction (2), Initial Cost-saving Case, in this Study

It was observed that the result of the base case is not attractive for investors even if some subsidy would be provided by the Government.

As a means of sensitive analysis, several options were sought to identify an attractive package for investors, as presented in Chapter 8. In terms of the phase-wise construction, the following option was examined.

In this option, four-lane bridges will be built in order to save the initial construction cost.

Table 7.4.2 Phasewised Construction (Initial Cost-saving Case)

Phase	Earthworks	Bridge	Culvert	Others
1	4-lane	**4-lane** for KM 0+000-KM 16+600 4-lane for KM 16+600-KM 29+400 **4-lane** for KM 29+400-K46+800	Length of Phase-2	
2 (2028-2030)	6-lane for KM 0+000-KM 16+600 8-lane for KM 16+600-KM 29+400 6-lane for KM 29+400-KM 46+800			Nhon Trach IC

Source: JICA Study Team

7.5 Highway Planning and Design

7.5.1 Documents / Information Received

(1) Reports and Drawings

Received reports and drawings extracted from the F/S are shown in Table 7.1.1.

(2) Site Reconnaissance

Site reconnaissance was carried out for visual confirmation of the design controls along the route of phase-1 such as existing pagodas, temples, cemeteries, and locations of planned interchanges and bridges.

(3) Information

1) <u>Route Alignment of Expressway and National Highway</u>

Route alignment of expressway was determined after the comparative study to avoid the existing facilities mentioned in the F/S such as the pumping station and factories between KM 3+500 and KM 6+100, and the cemetery between KM 14+100 and KM 15+600.

Consequently, the routes were approved by Dong Nai Province and Ba Ria - Vung Tau Province.

2) <u>Typical Cross Section for Phase-1</u>

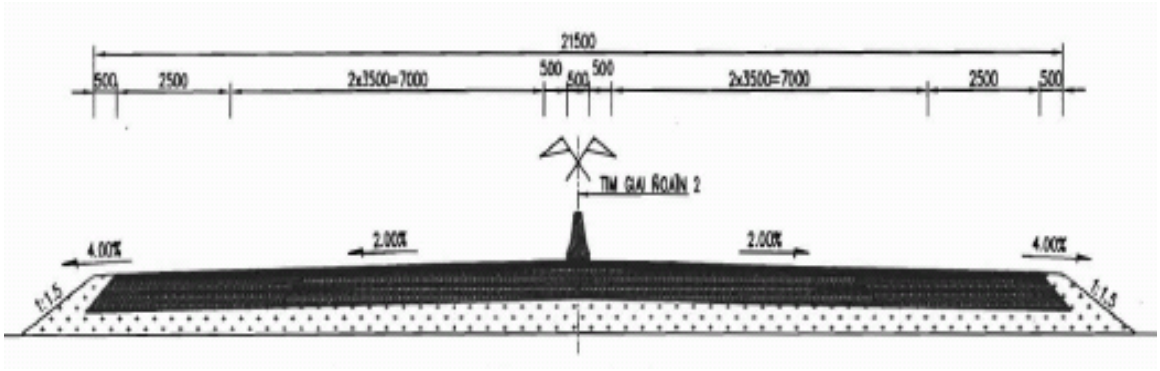
Method of exterior widening from four-lane to 6/8-lane for the embankment in Phase-2 was approved by MOT.

3) <u>Construction of Nhon Thach Interchange</u>

It was confirmed that Nhon Thach IC belongs to Ben Luc - Long Thanh Expressway project and will be constructed in Phase-2 of said project.

4) <u>Bien Hoa City Bypass (at beginning point)</u>

Bien Hoa City Bypass is planned as a highway class of national highway with four lanes, and design speed of 80 km/h. Typical cross section is shown in Figure 7.5.1.

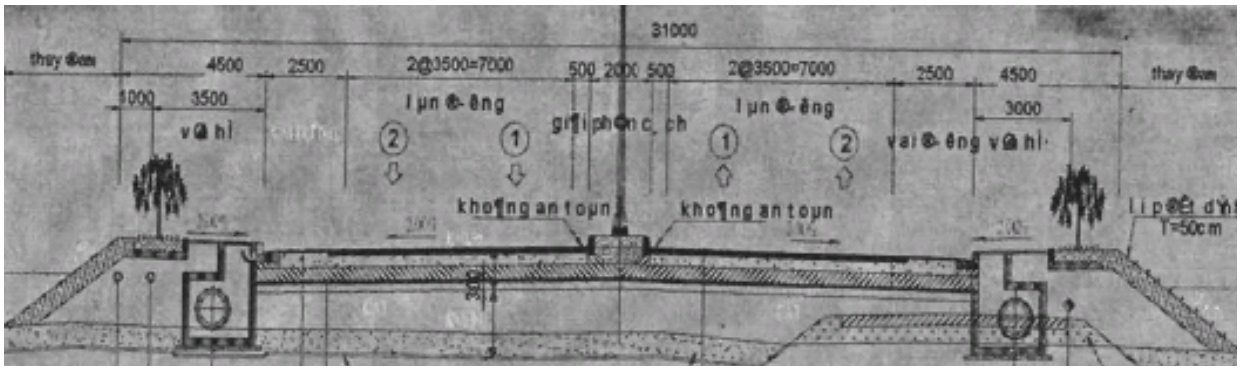


Source: F/S

Figure 7.5.1 Typical Cross Section of Bien Hoa City Bypass

5) <u>Cai Mep - Thi Vai Port access road (connect to end point)</u>

Cai Mep –Thi Vai port access road, which is under construction, is a provincial road with four lanes, and design speed of 80 km/h. Typical cross section is shown in Figure 7.5.2.



Source: F/S

Figure 7.5.2 Typical Cross Section of Cai Mep – Thi Vai Port Access Road

7.5.2 Natural Condition Survey in the F/S

(1) Topographical Survey

Plan and profile survey, cross-section survey for the main road and interchange, and topographic survey for bridge and box/pipe culverts were executed during the F/S.

(2) Geological Survey

Geological survey was executed for the design of earthwork, bridge, overpass, culvert, soft ground and pavement in the F/S.

(3) Hydrological Survey

Hydrological Survey was executed for the design of embankment, bridge and culvert. Meteorological data such as rainfalls, rainfall intensities, air temperature, and wind speed were collected.

(4) Material Survey

Survey of construction materials supply including investigation, sampling of construction materials, mines and laboratory tests were executed for the design of earthwork and pavement.

7.5.3 Design Standards and Policy/Condition in the F/S

(1) Design Standards

1) <u>Highway Design Standards</u>

TCVN 5729(1997) was applied for the expressways while TCVN4054(2005) for national highways.

2) <u>Geometric design criteria</u>

Geometric design criteria for expressways and national highways are summarized in Table 7.5.1 and Table 7.5.2.

Table 7.5.1 Geometric Design Criteria for Expressways

	Design Elements		Type/Value	Remarks	Reference
1	Expressway Classification				
	Expressway Type A		Grade 120		TCVN5729
2	Terrain		Flat		TCVN5729
3	Design Speed (km/h)		120		TCVN5729
4	Cross-Sectional Elements	Number of Travelled Way	4		F/S
		Formation Width (m)	25.5(27.5)	() is at particular	F/S
		Travelled Way Width(m)	2 x 7.5	flyover crossing	TCVN5729
		Outer Shoulder Paved Width (m)	3.0		TCVN5729
		Outer Shoulder Earthen Width (m)	1.0		TCVN5729
		Median Width (m)	1.0(3.0)		TCVN5729
		Median Marginal Strip (m)	0.75		TCVN5729
		Crossfall of Roadway (%)	2.0		TCVN5729
		Slope of Earthworks			
		Fill	V : H = 1:2.0		F/S
		Cut	V : H = 1:1.0		F/S
	Sight Dist.	Stopping Sight Distance (m)	230 (160)		TCVN5729
7	Horizontal Alignment	Horizontal Curve			
		Desirable Minimum Radii of Horizontal Curve (m)	1000		TCVN5729
		Absolute Minimum Radii of Horizontal Curve (m)	650		TCVN5729
		Superelevation (Se)			TCVN5729
		Maximum Se for Desirable Min. Radius (%)	5.0		TCVN5729
		Maximum Se for Absolute Min. Radius (%)	7.0		TCVN5729
		Minimum Radii w/o Superelevation (m)	>4000		TCVN5729
		Transition Curve			
		Minimum Length for Desirable Min. Radius (m)	210		TCVN5729
		Minimum Length for Absolute Min. Radius (m)	150		TCVN5729
8	Vertical Alignment	Maximum Grade-Up (%)	4.0		TCVN5729
		Maximum Grade-Down (%)	5.5		TCVN5729
		Minimum Grade (%)	0.5		TCVN5729
		Critical Maximum Length of Grades			
		For 4.0 % (m)	600		TCVN5729
		Minimum Length of Grade (m)	300		TCVN5729
		Vertical Curve			
		Minimum Length of Vertical Curve (m)	100		TCVN5729
		Minimum Radius of Crest Curve (m)			
		Absolute Minimum Radius (m)	12000		TCVN5729
		Desirable Minimum Radius (m)	17000		TCVN5729
		Desirable Radius (m)	20000		TCVN5729
		Minimum Radius of Sag Curve (m)			
		Absolute Minimum Radius (m)	5000		TCVN5729
		Desirable Minimum Radius (m)	6000		TCVN5729
		Desirable Radius (m)	12000		TCVN5729
9	Lateral Clearance (m)		Travelled width		TCVN5729
	Vertical Clearance (m)		4.75		TCVN5729

Source: JICA Study Team

Table 7.5.2 Geometric Design Criteria for National Highways

Design Elements			Type/Value	Remarks	Reference
1	Expressway Classification				
	Expressway Type A		Class II		TCVN4054
2	Terrain		Flat		TCVN4054
3	Design Speed (km/h)		100		TCVN4054
4	Cross-Sectional Elements	Number of Travelled Way	4		F/S
		Formation Width (m)	23.5(25.0)	() is at particular section for the	F/S
		Travelled Way Width(m)	2 x 7.5	flyover crossing	TCVN4054
		Outer Shoulder Paved Width (m)	2.5		TCVN4054
		Outer Shoulder Earthen Width (m)	0.5		TCVN4054
		Median Width (m)	1.5(3.0)		TCVN4054
		Median Marginal Strip (m)	0.5		TCVN4054
		Crossfall of Roadway (%)	2.0		TCVN4054
		Slope of Earthworks			
		Fill	V : H = 1:2.0		F/S
		Cut	V : H = 1:1.0		F/S
	Sight Dist.	Stopping Sight Distance (m)	150		TCVN4054
7	Horizontal Alignment	Horizontal Curve			
		Desirable Minimum Radii of Horizontal Curve (m)	700		TCVN4054
		Absolute Minimum Radii of Horizontal Curve (m)	400		TCVN4054
		Superelevation (Se)			TCVN4054
		Maximum Se for Desirable Min. Radius (%)	4.0		TCVN4054
		Maximum Se for Absolute Min. Radius (%)	8.0		TCVN4054
		Minimum Radii w/o Superelevation (m)	>4000		TCVN4054
		Transition Curve	shall not be smaller than		
		Minimum Length for Desirable Min. Radius (m)	length of super-elevation		TCVN4054
		Minimum Length for Absolute Min. Radius (m)	runoff		TCVN4054
8	Vertical Alignment	Maximum Grade (%)	4.0		TCVN4054
		Minimum Grade (%)	0.5(0.3)	()is in difficult situation	TCVN4054
		Critical Maximum Length of Grades			
		For 4.0 % (m)	800		TCVN4054
		Minimum Length of Grade (m)	250		TCVN4054
		Vertical Curve			
		Minimum Length of Vertical Curve (m)	85		TCVN4054
		Minimum Radius of Crest Curve (m)			
		Absolute Minimum Radius (m)	6000		TCVN4054
		Desirable Minimum Radius (m)	10000		TCVN4054
		Minimum Radius of Sag Curve (m)			
		Absolute Minimum Radius (m)	3000		TCVN4054
		Desirable Minimum Radius (m)	5000		TCVN4054
9	Lateral Clearance (m)		Travelled width		TCVN4054
	Vertical Clearance (m)		4.75		TCVN4054

Source: JICA Study Team

3) <u>Drainage design criteria</u>

TCVN 5729(1997) was applied for expressways while TCVN4054(2005) for national highways.

4) <u>Pavement design criteria</u>

22TCN211 was applied for flexible pavement (asphalt concrete) and 22 TCN233 for rigid

pavement (cement concrete).

5) Traffic safety facility design criteria

22TCN237 and 22TCN331 were applied for the traffic signs and pavement markings.

6) Lighting design criteria

TCXDVN259 was applied for the lighting design.

(2) Design Policy/Condition

The following cost reduction policy in the F/S aims to improve the profit of the toll road.

Table 7.5.3 Design Policy in the F/S

No.	Design Policy
1	Apply low embankment in order to reduce the earthwork volume, with adopting of flyover of cross-road instead of overpass of thru-way
2	Apply absolute minimum width of media strip in order to reduce the earthwork volume
3	Excavate six-lane width at cut sections in order to utilize excavated soil for embankment with short hauling distance.
4	Build six-lane bridges in phase-1 with 0.75 m wide shoulder, which does not satisfy the standard requirements.
5	Build box culverts considering the length of phase-2, in phase-1.

Source: F/S

7.5.4 Items Reviewed in this Study

(1) Horizontal Alignment of Expressway Section

The design elements of the horizontal alignment of the expressway section from KM 0+000 to KM 37+600 are shown in Table 7.5.4.

Minimum radius of horizontal curve is 1200 m and minimum length of transition curve is 133.50 m. In case of clothoid, 400.25 m parameter is applied.

These designed values satisfy the criteria.

Table 7.5.4 Horizontal Alignment of Expressway Section

No.		Station	Coordinate		Beginning Radius	Clothoid Parameter	Ending Radius	Length
			X	Y				
1	BP	0+000.00	1205416.667	407000.860	0.000		0.000	789.18
2	TS	0+789.18	1204741.812	407409.981	0.000	707.107	-2000.000	250.00
3	SC	1+039.18	1204530.812	407543.986	-2000.000		-2000.000	330.23
4	CS	1+369.41	1204276.426	407753.961	-2000.000	707.107	0.000	250.00
5	ST	1+619.41	1204104.856	407935.736	0.000		0.000	1643.37
6	TS	3+262.77	1203001.994	409154.073	0.000	400.250	1200.000	133.50
7	SC	3+396.27	1202910.595	409251354.	1200.000		1200.000	784.26
8	CS	4+180.53	1202217.823	409588.316	1200.000	400.250	0.000	133.50
9	ST	4+314.05	1202084.850	409611.952	0.000		0.000	0.0179
10	TS	4+314.05	1202084.850	409611.952	0.000	399.500	-1200.000	133.50
11	SC	4+447.05	1201952.391	409611.952	-1200.000		-1200.000	358.31
12	CS	4+805.36	1201608.829	409708.895	-1200.000	399.50	0.000	133.00
13	ST	4+938.36	1201489.744	409768.082	0.000		0.000	860.19
14	TS	5+798.54	1200726.657	410165.093	0.000	569.210	1800.000	180.00
15	SC	5+978.54	1200565.631	410245.488	1800.000		1800.000	204.00
16	CS	6+182.54	1200375.757	410319.800	1800.000	569.210	0.000	180.00
17	ST	6+362.54	1200202.949	410370.068	0.000		0.000	276.76
18	TS	6+639.30	1199935.953	410442.927	0.000	707.107	-2000.000	250.00
19	SC	6+889.30	1199696.237	410513.739	-2000.000		-2000.000	554.17
20	CS	7+443.47	1199203.095	410762.653	-2000.000	707.107	0.000	250.00
21	ST	7+693.47	1199003.754	410913.456	0.000		0.000	314.54
22	TS	8+008.02	1198756.911	411108.410	0.000	1106.80	3500.000	350.00
23	SC	8+358.02	1198478.699	411320.708	3500.000		3500.000	934.36
24	CS	9+292.35	1197654.578	411755.014	3500.000	1106.80	0.000	350.00
25	ST	9+642.35	1197322.184	411864.502	0.000		0.000	2237.18.
26	TS	11+879.56	1195185.913	412528.919	0.000	1106.80	-3500.000	350.00
27	SC	12+229.56	1194853.519	412638.407	-3500.000		-3500.000	332.23
28	CS	12+561.78	1194547.503	412767.426	-3500.000	1106.80	0.000	350.00
29	ST	12+911.78	1194237.056	412928.965	0.000		0.000	1420.60
30	SC	14+332.38	1192987.956	413605.613	0.000	632.46	2000.000	200.00
31	CS	14+532.38	1192810.558	413697.922	2000.000		2000.000	167.15
32	ST	14+699.54	1192656.948	413763.713	2000.000	632.46	0.000	200.00
33	TS	14+899.54	1192467.731	413828.429	0.000		0.000	35.60
34	SC	14+953.13	1192433.862	413839.385	0.000	632.46	-2000.000	200.00
35	CS	15+135.13	1192244.645	413904.101	-2000.000		-2000.000	184.45
36	ST	15+319.58	1192075.470	413977.426	-2000.000	632.46	0.000	200.00
37	SC	15+519.58	1191898.876	414071.265	0.000		0.000	698.76

No.		Station	Coordinate		Beginning Radius	Clothoid Parameter	Ending Radius	Length
			X	Y				
38	CS	16+218.34	1191287.375	414409.391	0.000	1732.05	-10000.000	300.00
39	ST	16+518.34	1191025.569	414555.869	-10000.000		-10000.000	421.89
40	TS	16+940.23	1190663.998	414773.194	-10000.000	1732.05	0.000	300.00
41	SC	17+240.23	1190411.801	414935.660	0.000		0.000	1200.93
42	CS	18+441.15	1189405.493	415591.072	0.000	1732.05	-10000.000	300.00
43	ST	18+741.15	1189154.934	415756.052	-10000.000		-10000.000	558.45
44	SC	19+299.60	1188700.551	416080.586	-10000.000	1732.05	0.000	300.00
45	CS	19+599.60	1188463.213	416264.077	0.000		0.000	2706.95
46	ST	22+306.56	1186329.955	417930.453	0.000	1341.64.	6000.000	300.00
47	TS	22+606.56	1186092.011	418113.149	6000.000		6000.000	18.19
48	SC	22+624.75	1186077.383	418123.964	6000.000	1341.64	0.000	300.00
49	CS	22+924.75	118532.954	418297.888	0.000		0.000	2539.76
50	ST	25+464.51	1183751.393	419753.051	0.000	935.41	-3500.000	250.00
51	SC	25+714.51	1183548.227	419898.710	-3500.000		-3500.000	20.00
52	CS	25+734.51	1183532.292	419910.789	-3500.000	935.41	0.000	250.00
53	ST	25+984.51	1183337.181	420067.071	0.000		0.000	2136.65
54	TS	28+121.16	1181685.557	421422.583	0.000	663.33	2000.000	220.00
55	SC	28+341.16	1181512.991	421558.994	2000.000		2000.000	544.30
56	CS	28+885.48	1181035.785	421817.322	2000.000	663.33	0.000	220.00
57	ST	29+105.48	1180827.219	421887.230	0.000		0.000	302.79
58	TS	29+408.27	1180538.409	421978.181	0.000	474.34	-1500.000	150.00
59	SC	29+558.27	1180396.123	422025.610	-1500.0000		-1500.000	1237.21
60	CS	30+795.45	1179530.793	422860.470	-1500.000	474.34	0.000	150.00
61	ST	30+945.45	1179478.296	423000.965	0.000		0.000	2373.34
62	TS	33+318.79	1178684.747	425237.713	0.000	600.000	1800.000	200.00
63	SC	33+518.79	1178614.406	425424.906	1800.000		1800.00	1140.96
64	CS	34+659.70	1177880.220	426273.227	1800.000	600.000	0.000	200.00
65	ST	34+859.70	1177705.058	426369.701	0.000		0.000	2480.76
66	TS	37+373.76	1175510.302	427526.077	0.000	2439.26	-7000.000	850.00
67	SC	38+223.76	1174766.590	427937.364	-7000.000		-7000.000	2339.24

Source: JICA Study Team

Remarks: TS= Tangent to Spiral Curve, SC: Spiral Curve to Circular Curve, CS: Circular Curve to Spiral Curve, ST: Spiral Curve to Tangent.

(2) Horizontal Alignment of National Highway Section

The designed elements of the horizontal alignment of the national highway section from KM 37+600 to KM 46+800 are shown in Table 7.5.5.

Minimum radius of horizontal curve is 1050 m and minimum length of transition curve is 150.00

m. In case of clothoid, a parameter of 396.863 m is applied.

These designed values satisfy the criteria.

However, the design speed is reduced to 80 km/h in the section of intersection with NH51, and thus, the following values are adopted. Minimum radius of horizontal curve is 500 m and minimum length of transition curve is 44.00 m. In case of clothoid, a parameter of 148.324 m is applied before the intersection with NH51.

Table 7.5.5 Horizontal Alignment of National Highway Section

No.		Station	Coordinate		Beginning Radius	Clothoid Parameter	Ending Radius	Length
			X	Y				
1	BP	37+600.000	1175310.146	427631.536	0.000		0.000	492.44
2	TS	38+092.437	1174874.481	427861.079	0.000	600.000	1800.000	200.00
3	SC	38+292.437	1174695.868	427951.002	1800.000		1800.000	1859.57
4	CS	40+152.012	1172924.645	427796.188	1800.000	600.000	0.000	200.00
5	ST	40+352.012	1172764.340	427675.642	0.000		0.000	1388.59
6	TS	41+740.603	1171666.758	426826.055	0.000	396.863	-1050.000	150.00
7	SC	41+890.603	1171546.067	426737.041.	-1050.000		-1050.000	569.58
8	CS	42+460.179	1171011.416	426561.860	-1050.000	396.863	0.000	150.00
9	ST	42+610.179	1170861.451	426562.192	0.000		0.000	377.54
10	TS	42+987.721	1170484.037	426572.015	0.000	396.863	1050.000	150.00
11	SC	43+137.721	1170334.071	426572.347	1050.000		1050.000	940.10
12	CS	44+077.821	1169533.337	426142.080	1050.000	396.863	0.000	150.00
13	ST	44+227.821	1169450.847	4260016.840	0.000		0.000	1938.37
14	TS	46+166.193	1168423.463	424373.134	0.000	323.265	-950.000	110.00
15	SC	46+276.193	1168363.380	424281.012	-950.000		-950.000	32.14
16	CS	46+308.234	1168344.356	424255.108	-950.000	323.265	0.000	110.00
17	ST	46+418.334	1168274.436	424170.210	0.000		0.000	146.77
18	TS	46+565.115	1168178.955	424058.731	0.000	148.324	500.000	44.00
19	SC	46+609.115	1168150.828	424024.899	500.000		500.000	43.22
20	CS	46+652.335	118125.687	423989.760	500.000	148.324	0.000	44.00
21	ST	46+696.335	1168102.748	423952.217	0.000		0.000	103.55
22	EP	46+800.000	1168050.059	423863.072				0.00

Source: JICA Study Team

Remarks: TS=Tangent to Spiral Curve, SC: Spiral Curve to Circular Curve, CS: Circular Curve to Spiral Curve, ST: Spiral Curve to Tangent.

(3) Vertical Alignment of Expressway Section

The design elements of the vertical alignment of the expressway section from KM 0+000 to KM 37+600 are shown in Table 7.5.6.

Maximum grade is 4%; minimum vertical curve radius for crest is 12000 m; and 5000 m for sag,.

These designed values satisfy the criteria.

However, design speed is reduced to 80 km/h before Bien Hoa IC, and thus, the following values

are adopted. Consequently, the maximum grade adopted is 4%, and minimum vertical curve radius for crest is 4000 m near Bien Hoa IC, which is located at the end point of the expressway.

Table 7.5.6 Vertical Alignment of Expressway Section

VIP	Station (KM)	Crest /Sag	EL (m)	Grade (%)	V. Curve	
					Length (m)	Radius (m)
	0+0.000		15.660			
VIP1	0+668.340	Crest	22.678	1.050	201.880	4000
VIP2	1+056.250	Sag	7.161	-4.000	224.920	5000
VIP3	1+590.840	Crest	9.834	0.500	200.000	20000
VIP4	2+040.840	Sag	7.584	-0.500	220.000	20000
VIP5	2+592.580	Crest	10.895	0.600	180.000	20000
VIP6	3+038.710	Sag	9.556	-0.300	197.960	6000
VIP7	3+565.840	Crest	25.370	3.000	299.900	12000
VIP8	4+065.840	Sag	27.870	0.500	194.920	6000
VIP9	4+419.110	Crest	41.118	3.750	501.900	12000
VIP10	5+142.000	Sag	38.009	-0.430	125.240	30000
VIP11	5+629.760	Crest	37.912	-0.020	216.760	20000
VIP12	6+390.840	Sag	29.540	-1.100	168.000	8000
VIP13	6+840.840	Crest	34.040	1.000	100.000	20000
VIP14	7+285.840	Crest	36.265	0.500	192.660	12000
VIP15	7+937.320	Crest	29.033	-1.110	167.280	12000
VIP16	8+527.840	Sag	14.270	-2.500	149.980	5000
VIP17	9+088.600	Sag	17.074	-0.500	205.960	10000
VIP18	9+528.820	Crest	28.344	2.560	259.160	12000
VIP19	10+343.350	Crest	31.602	0.400	180.000	20000
VIP20	10+833.350	Crest	29.152	-0.500	120.000	20000
VIP21	11+528.350	Crest	21.507	-1.100	102.240	60000
VIP22	12+297.350	Sag	11.741	-1.270	100.220	6000
VIP23	12+657.350	Crest	13.181	0.400	200.000	20000
VIP24	13+182.350	Sag	10.031	-0.600	105.000	35000
VIP25	13+936.950	Sag	7.767	-0.300	223.060	15000
VIP26	14+300.590	Crest	12.094	1.190	327.680	12000
VIP27	14+696.780	Sag	5.993	-1.540	204.360	10000
VIP28	15+648.850	Crest	10.753	0.500	100.000	20000
VIP29	16+269.670	Sag	10.753	0.000	124.980	5000
VIP30	16+770.920	Crest	23.284	2.500	600.000	12000
VIP31	17+170.390	Sag	13.298	-2.500	130.200	8000
VIP32	17+577.290	Sag	9.758	-0.870	205.820	10000
VIP33	17+988.970	Crest	14.657	1.190	286.340	12000
VIP34	18+384.620	Sag	9.908	-1.200	168.120	15000
VIP35	19+193.420	Sag	9.262	-0.080	118.860	150000
VIP36	19+699.520	Sag	9.262	0.000	171.640	15000
VIP37	20+055.690	Crest	13.322	1.140	274.620	12000
VIP38	20+355.690	Sag	9.902	-1.140	153.620	10000
VIP39	20+785.690	Crest	11.579	0.390	133.800	15000
VIP40	21+461.690	Sag	8.199	-0.500	100.000	20000
VIP41	22+061.690	Sag	8.199	0.000	100.000	50000
VIP42	22+615.690	Sag	9.307	0.200	139.460	15000
VIP43	22+924.440	Crest	12.796	1.130	269.260	12000
VIP44	23+277.440	Sag	8.878	-1.110	169.120	8000

VIP	Station (KM)	Crest /Sag	EL (m)	Grade (%)	V. Curve	
					Length (m)	Radius (m)
VIP45	23+700.410	Crest	13.107	1.000	224.880	20000
VIP46	24+336.440	Sag	12.344	-0.120	111.180	30000
VIP47	24+887.440	Crest	13.722	0.250	265.460	17000
VIP48	25+506.440	Sag	5.551	-1.320	186.920	6000
VIP49	25+806.440	Crest	10.951	1.800	324.000	12000
VIP50	26+106.440	Sag	8.251	-0.900	168.000	8000
VIP51	26+624.440	Crest	14.467	1.200	150.380	12000
VIP52	27+460.310	Sag	14.049	-0.050	123.420	50000
VIP53	27+825.310	Sag	12.954	-0.300	115.000	10000
VIP54	28+393.570	Crest	17.784	0.850	182.920	12000
VIP55	28+836.590	Sag	14.816	-0.670	293.580	25000
VIP56	29+293.470	Crest	17.100	0.500	318.460	12000
VIP57	29+740.970	Sag	7.497	-2.150	257.700	5000
VIP58	30+356.820	Crest	25.955	3.000	636.000	12000
VIP59	30+923.820	Sag	12.914	-2.300	162.800	14000
VIP60	31+391.730	Sag	7.579	-1.140	206.820	5000
VIP61	31+786.320	Crest	19.417	3.000	575.980	12000
VIP62	32+266.320	Sag	10.777	-1.800	169.520	8000
VIP63	32+796.320	Sag	12.473	0.320	140.500	12000
VIP64	33+145.320	Crest	17.673	1.490	256.960	12000
VIP65	33+601.320	Sag	14.709	-0.650	224.080	10000
VIP66	33+901.320	Crest	19.479	1.590	130.720	12000
VIP67	34+292.320	Crest	21.434	0.500	180.000	15000
VIP68	34+902.320	Sag	17.164	-0.700	152.500	5000
VIP69	35+502.320	Crest	31.262	2.350	282.000	12000
VIP70	35+802.320	Sag	31.262	0.000		
VIP71	36+308.320	Sag	32.173	0.180		
VIP72	36+643.320	Crest	33.848	0.500	241.980	12000
VIP73	37+003.300	Crest	28.376	-1.520	177.940	12000
VIP74	37+275.670	Sag	20.205	-3.000	179.960	6000
VIP75	37+692.520	Sag	20.205	0.000	128.980	6000
VIP76	38+232.940	Crest	31.825	2.150	157.680	20000
VIP77	38+779.770	Crest	39.262	1.360	388.560	17000
VIP78	39+527.610	Sag	41.496	-0.920	211.240	12000
VIP79	40+612.700		41.496.15	0.840		

Source: JICA Study Team

(4) Vertical Alignment of National Highway Section

The design elements of the vertical alignment of the national highway section from KM 37+600 to KM 46+800 are shown in Table 7.5.7.

Maximum grade is 2.62%; minimum vertical curve radius for crest is 12000 m; and 6000 m for sag.

These design value satisfy the criteria value.

However, the design speed is reduced to 80 km/h in the section of intersection with NH51, and thus, the following values are adopted. Consequently, the maximum grade is 4%; minimum

vertical curve radius for crest is 4000 m; and 4000 m for sag before the intersection with NH51.

Table 7.5.7 Vertical Alignment of the National Highway

VIP	Station (KM)	Crest /Sag	EL (m)	Grade (%)	V. Curve	
					Length (m)	Radius (m)
	37+0.000		27.890			
VIP1	37+275.670	Sag	19.620	-3000	179.960	6000
VIP2	37+692.510	Sag	19.620	0.000	128.980	6000
VIP3	38+637.000	Crest	39.926	2.150	969.000	255000
VIP4	39+453.300	Sag	26.457	-1.650	399.440	47000
VIP5	40+142.150	Sagt	20.947	-0.800	499.500	37000
VIP6	41+203.300	Sag	26.783	0.550	197.960	6000
VIP7	41+644.030	Crest	38.330	2.620	299.900	12000
VIP8	42+187.260	Crest	38.982	0.120	397.680	48500
VIP9	43+387.270	Sag	30.603	-0.700	149.98	100000
VIP10	44+449.160	Crest	24.743	-0.550	251.160	16000
VIP11	45+103.300	Sag	10.886	-2.120	202.460	12500
VIP12	45+669.620	Crest	8.055	-0.500	149.980	100000
VIP13	46+072.290	Sag	5.437	-0.650	185.940	4000
VIP14	46+338.290	Crest	16.077	4.000	320.000	4000
VIP15	46+603.020	Sag	5.488	-4.000	159.400	4000
VIP16	46+800.000		5.488	-0.010		

Source: JICA Study Team

(5) Location and type of Interchange and Intersection

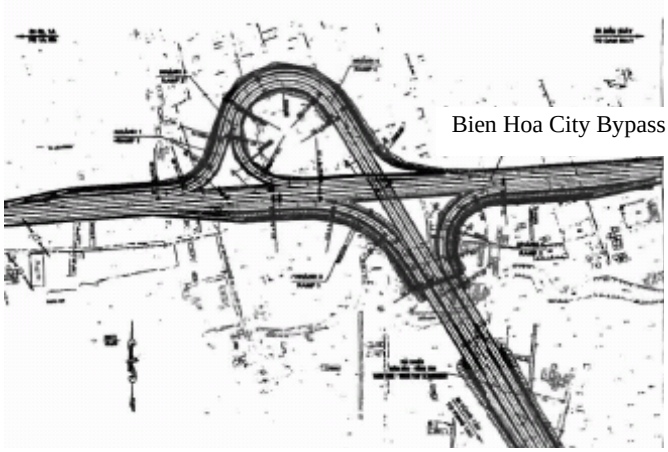
Locations and types of interchanges/intersections are summarized in **Table 7.5.8**. As shown in Table 7.5.8, interchanges are planned to connect only other expressways except Bien Hoa IC and NH51 Intersection. Connection with crossing roads shall be considered from the aspect of user-friendliness and traffic safety.

Table 7.5.8 Locations and Types of Interchanges and Intersections

No.	Interchange	Chainnage	Type	Rampway		Remarks
				Design Speed	Minimum Radius	
1	Bien Hoa IC (Connecting with Bien Hoa City Bypass)	KM 0+000	Trumpet	V=40km/h	R=60m	Constructing in Phase1
2	Long Thanh IC (Connecting with Ho Chi Minh –Long Thanh Dau Giay Expressway)	KM 16+570	Double Trumpet	V=60km/h	R=120.5m	Constructing in Phase 1
3	Nhon Trach IC (Connecting with Ben Luc-Long Thanh Expressway)	KM 29+440	Trumpet	V=60km/h	R=120.5m	Construction in Phase2 of Ben Luc-L Thanh Expressway project
4	Phu My IC (Connecting with Extension of Bien Hoa-Vung Tau Expressway)	KM 38+050	Double Trumpet	V=50km/h	R=120.5m	Constructing in Phase 2
5	NH51 Intersection (Connecting with NH51 and Cai Mep･Thi Vai Pport Access Road)	KM 46+360	Flyover	V=80km/h (Flyover)		Construction in Phase 1

Source: JICA Study Team

1) Bien Hoa IC

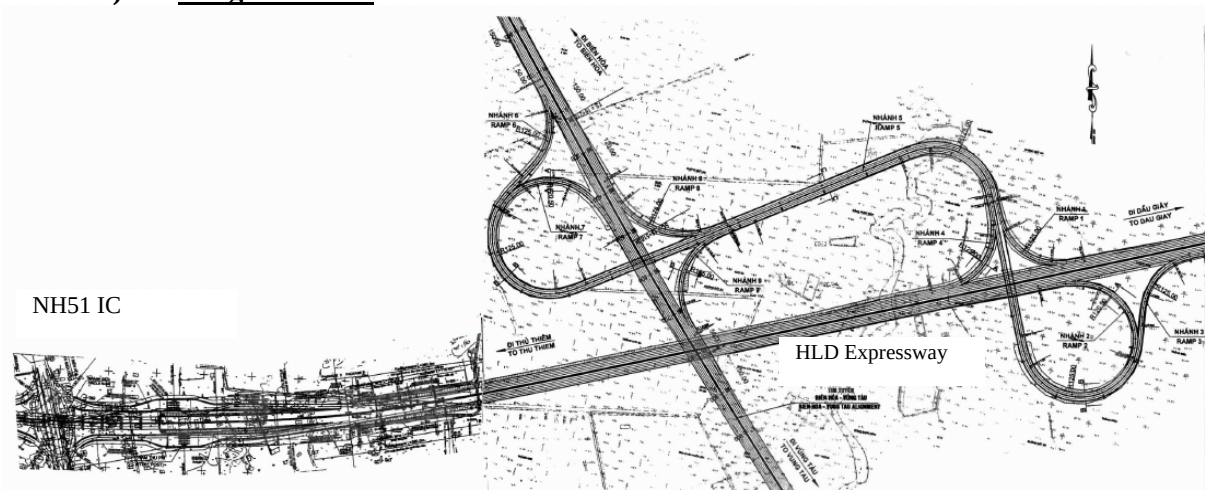


Source: F/S

Figure 7.5.3 Bien Hoa IC (F/S)

- A toll Gate is planned on the main road near Bien Hoa IC (km1+200).
- Consequently, the design speed of main road is reduced to 80 km/h.

2) Long Thanh IC

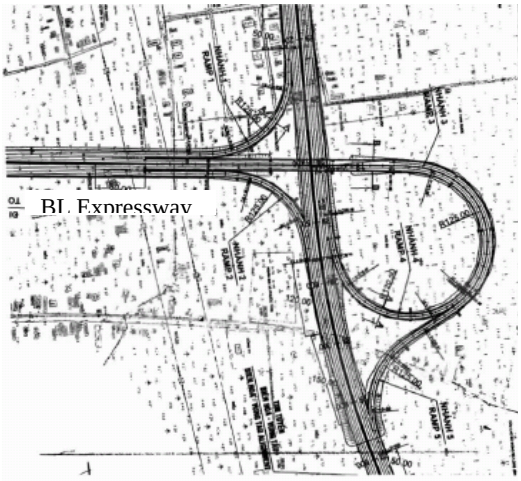


Source: F/S

Figure 7.5.4 Long Thanh IC (F/S)

- NH51 IC of HLD Expressway is located near Long Thanh IC.
- Therefore, it is necessary to study cases of weaving between these interchanges considering traffic safety and capacity.

3) Nhon Thach IC

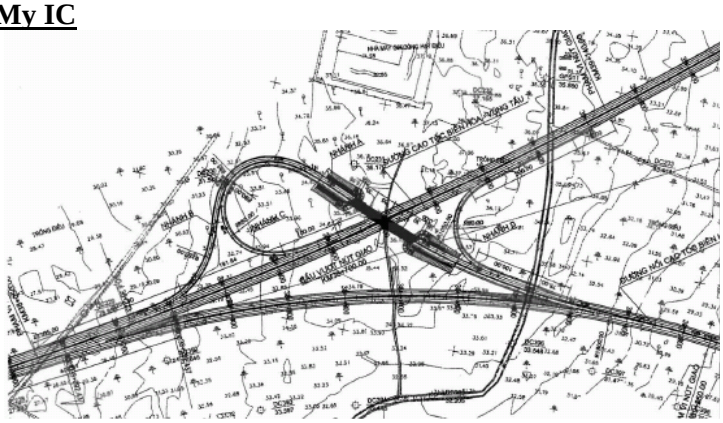


Source: F/S

Figure 7.5.5 Nhon Trach IC (F/S)

- NH51 IC and toll gate are planned along the BL Expressway near Bien Hoa IC. Therefore, it is necessary to study the rampway alignment connected to the interchanges and toll gate, considering traffic safety.

4) Phu My IC

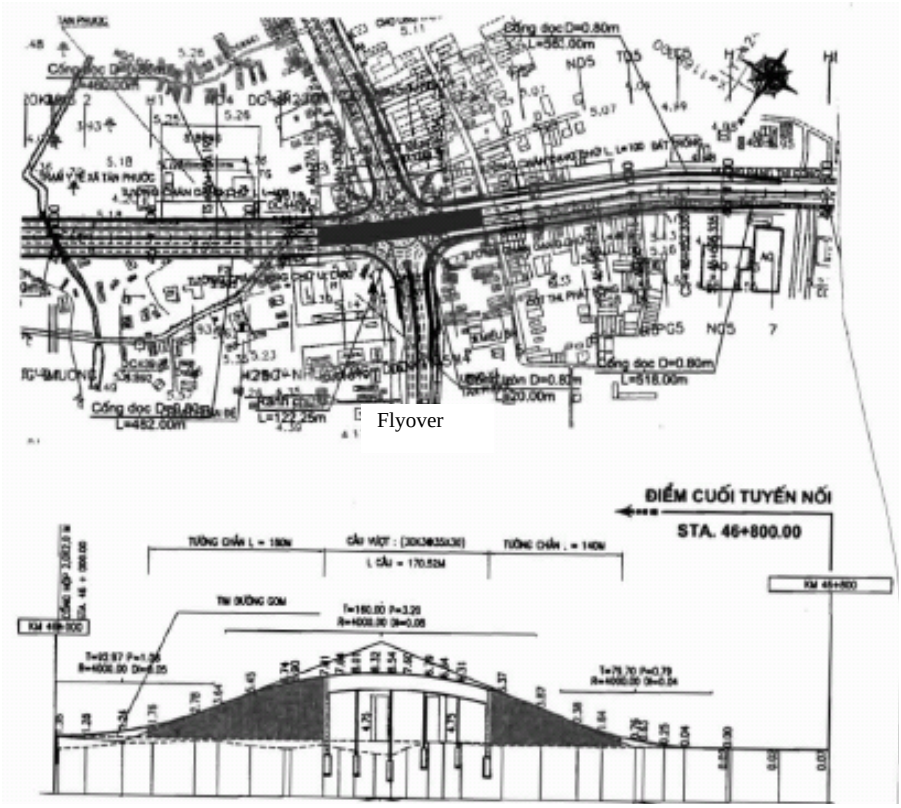


Source: F/S

Figure 7.5.6 Phu My IC (F/S)

- Phu My IC is planned on the extension of Bien Hoa-Vung Tau Expressway. Therefore, it is necessary to change the traffic (NH51 Intersection→Bien Hoa) from throughway to rampway for Phase-2.

5) NH51 Intersection (connecting to Cai Mep - Thi Vai Port)



Source: F/S

Figure 7.5.7 NH51 Interchange (F/S)

- Rotary intersection connecting NH51 and Cai Mep - Thi Vai Port access road is planned. It is necessary to make a comparative study of the signalized intersection for comparison with rotary intersection, considering traffic safety and capacity.

7.5.5 Number of Lane of Toll Gate

Number of lanes of the toll gate is calculated based on the forecasted traffic volume shown in Table 7.5.9.

When traffic volume is revised, it is necessary to perform recalculation.

Table 7.5.9 Number of Lanes of Toll Gate

	Thruway		Interchange	
	Expressway (km1+200)	National Highway (km45+250)	Long Thanh IC (km16+600)	Nhon Trach IC (km29+500)
Entrance	3	6	3	3
Exit	5	12	4	4

Source: JICA Study Team

7.5.6 Recommendations on Highway Planning

Recommendations on highway planning for the succeeding steps are summarized in Table 7.5.10.

Table 7.5.10 Recommendation on Highway Planning

No.	Recommendations
1	Unification of Road Classification Although it was informed Phu My-NH51 (Connected to Cai Mep-Thi Bai) classification was already approved by MOT, said section should be classified as expressway instead of national highway. This is recommended considering traffic volume, ease of maintenance and the unification of traffic safety facilities.
2	Access to Long Thanh International Airport Interchange serving as access to Long Thanh International Airport should be considered as part of the regional development plan for this Project.
3	Stage Construction for Phu My IC Phu My Interchange should be connected to throughway of the national highway instead of serving as expressway extending to Vung Tau, considering traffic volume. A trumpet type interchange is recommended to ease future change of traffic from expressway to rampway in Phase-2.

Source: JICA Study Team

7.5.7 Items to be Forwarded to the Detailed Design Stage

Items to be forwarded to detailed design stage are shown in Table 7.5.11.

Table 7.5.11 Item to be Forwarded to Detail design Stage

Item			Suggestion
1	Alignment	Horizontal Alignment	Short curve length between clothoid curve is not smooth handling. This causes drivers to commit mistakes by driving on a smaller radius than the actual radius.
			Horizontal alignment between km22+000 and km23+000 is Clothoid:A=1342m(L=300m)-R=6000m(L=18m)-clothoid: A=1342m (L=300m),and between km25+000 and km26+000 is Clothoid:A=935m(L=250m)-R=3500m(L=20m)-clothoid: A=1342m (L=300m) . It is better to replace the clothoid to a larger curve with a radius of say 10000 m
		Vertical Alignment	Level and small gradient section are not preferable for road surface drainage
			Vertical alignment between km 5+143~km5+630, km15+610~ km16+230, and km18+340~km19+650,km21+430~km22+570, km23+650~km24+850,km26+580~km27+430,km35+470~km36+270 ,km37+280~37+690 and km41+630~km42+180. It is better to change gradient to a value higher than 0.3%.
			Big gradient and small Vertical curve radius of Interchange section is not preferable considering traffic safety
			Vertical alignment between km16+160~km17+030(Long Thanh IC), km29+100~km30+630(Nhon Trach IC). It is better to change to small gradient and to large vertical radius considering sight distance at rampway terminal .
2	Cross Section	Median Strip	Width of shoulder(safety lane) of bridge in Phase 2 (6 lanes) does not satisfy the design criteria (TCVN5729)
			Width of shoulder of bridge in Phase 2 is 0.75 m. It should be 3.0 m in accordance with TCVN5729.
			Taper length of width of median strip from 3m to 1m is too short.
			Width of median strip change from 1m(normal section) to 3m(at the of flyover location). It is better to enlarge the taper length considering smooth handling.
		Vertical Clearance	Vertical clearance does not satisfy the height of trailer loaded with shipping container
			Vertical clearance adopted is 4.75 m based on TCVN5729. It is better to change said clearance to 5.0~5.1 m considering the height of loaded shipping container.
3	Interchange	Speed change lane	Parallel type of speed change lane does not match with the driver's usual practice in case of two-lane rampways.
			Parallel type of speed change lane is adopted for acceleration and deceleration lanes. It is better to adopt direct connecting type for two-lane rampway considering traffic safety.

Source: JICA Study Team

7.6 Bridge Design

7.6.1 List of Reviewed Bridges in this Study

The bridges were reviewed in this Study. The total length and area of each girder-type bridges are shown in Tables 7.6.1 and 7.6.2.

7.6.2 Principles of Bridge Planning and Design

The following principles of bridge planning and design in the F/S Report are acceptable:

(i) Permanent works design, consistent with scope of road route

(ii) Meet the requirements of future irrigation development planning

(iii) Ensure flood frequency at 1%, without causing flooding bridge

(iv) For river-crossing bridges, it requires ensuring navigable clearance by classification of rivers, canals or local navigation requirement

(v) Interchange bridges and tunnels must ensure vertical clearance and cross clearance for under passing vehicle in present stage as well as future expansion

(vi) The underpass shall be given appropriate space for traffic clearance, with suitable cross-section. the underpass structure and construction methods must conform to regional geological conditions.

(vii) Promote the capacity and use of domestic construction equipment and appropriately apply advanced science and technology in transport construction

(viii) Short-time construction, convenience and high mechanical rate

(ix) Convenience in O&M

(x) Pay attention to aesthetic features of architectural works, in accordance with landscape requirements

(xi) Reasonable economic indicators

Table 7.6.1 Bridges Reviewed in this Study

No.	Name of Bridge	Item	Station	Girder type	Length of bridge (m)	Width of bridge	Bridge area (m2)
	Interchange Bien Hoa	Rampway bridge	KM0+0.00				
1	Bridge on express way		KM0+177.70	Super-T	367.4	19	6,981
2	Bridge – ramp 1			PC-I	96.25	10	963
3	Bridge – ramp 2			PC-I	96.25	10	963
4	Bridge overpass Hoa Hung-Trang Bom railway	Thruway bridge	KM0+721.0	Super-T	370.4	27.5	10,186
5	Bridge Song Buong	Thruway bridge	KM2+558	PC-I	109.2	27.5	3,003
6	Bridge Tam Phuoc 1	Flyover bridge	KM4+446.1	PC-I	142.25	12.0	1,707
7	Bridge Tam Phuoc 2	Flyover bridge	KM5+071.2	PC-HS	178.45	27.0	4,818
8	Bridge Sy Quan Luc Quan 2	Flyover bridge	KM6+149.0	PC-I	175.3	12.0	2,104
9	Bridge Nuoc Trong	Thruway bridge	KM8+597.0	PC-I	52.15	27.5	1,434
10	Bridge Nha May	Flyover bridge	KM11+149.0	PC-I	274.45	7.5	2,058
11	Bridge Suoi Phen	Thruway bridge	KM12+628.0	PC-HS	64.2	27.5	1,766
12	Bridge Quan Thu	Thruway bridge	KM14+119.7	PC-I	75.2	27.5	2,068
13	Bridge Ong Lang	Thruway bridge	KM14+984.2	PC-HS	28.1	27.5	773
14	Bridge Nong Truong Binh Son	Flyover bridge	KM16+231.3	PC-I	175.3	7.5	1,315
	Interchange Long Thanh-Dau Giay	Rampway bridge	KM16+600				
15	Bridge on express way		KM16+915.1	Super T	882.3	26.0	22,940
16	Bridge ramp to Dau Giay			PC-I	66.05	10	661
17	Bridge Bung Mon river			PC-I	84.2	26	2,189
18	Bridge overpass Long Thanh-Dau Giay express way			PC-I	243.4	19	4,625
19	Bridge on express way Long Thanh-Dau Giay						
20	Bridge Da Vang	Thruway bridge	KM20+016.3	PC-I	43.1	24.5	1,056
21	Bridge Suoi Ca	Thruway bridge	KM22+888.4	PC-I	109.2	24.5	2,675
22	Bridge Bau Can	Flyover bridge	KM24+123.8	PC-I	307.5	7.5	2,306
23	Bridge overpass	Flyover bridge	KM26+907.0	PC-I	274.45	7.5	2,058
24	Bridge Tan Hiep	Flyover bridge	KM28+044.2	PC-I	241.4	7.5	1,811
25	Bridge overpass Bien Hoa-Vung Tau railway	Thruway bridge	KM30+439.2	Super-T	1160.4	27.5	31,911
26	Bridge Hac Dich 1	Flyover bridge	KM34+155.1	PC-I	142.25	12.0	1,707
27	Bridge Hac Dich 2	Flyover bridge	KM36+120.2	PC-I	175.3	12.0	2,104
28	Bridge Suoi Nhum	Thruway bridge	KM37+467.3	PC-I	208.35	27.5	5,730
29	Overpass (KM40+040)	Flyover bridge	KM40+040	PC-HS	68.1	9.0	613
	Flyover QL51 (KM46+358)	Thruway bridge	KM46+358				
30	Bridge			PC-HS	170.52	19.5	3,325

Source: F/S

Table 7.6.2 Total lengths and Area of Each Girder-type Bridges

Girder type	PC-I	PC-HS	Super-T	Total
Length of bridge (m)	3092	509	2781	6381
Bridge area (m2)	42535	11294	72017	125847

Source: F/S

7.6.3 Site Reconnaissance

In the beginning of this JICA Study, site reconnaissance was implemented. The location where site reconnaissance was conducted is shown in Figure 7.6.1. Details of site reconnaissance are as follows:

(1) Date

14^{th} and 15^{th} February 2011

(2) Location

1) Beginning point (KM 0+000)

2) Long Thanh Interchange (KM 16+600)

3) Nhon Trach Interchange (KM 29+500)

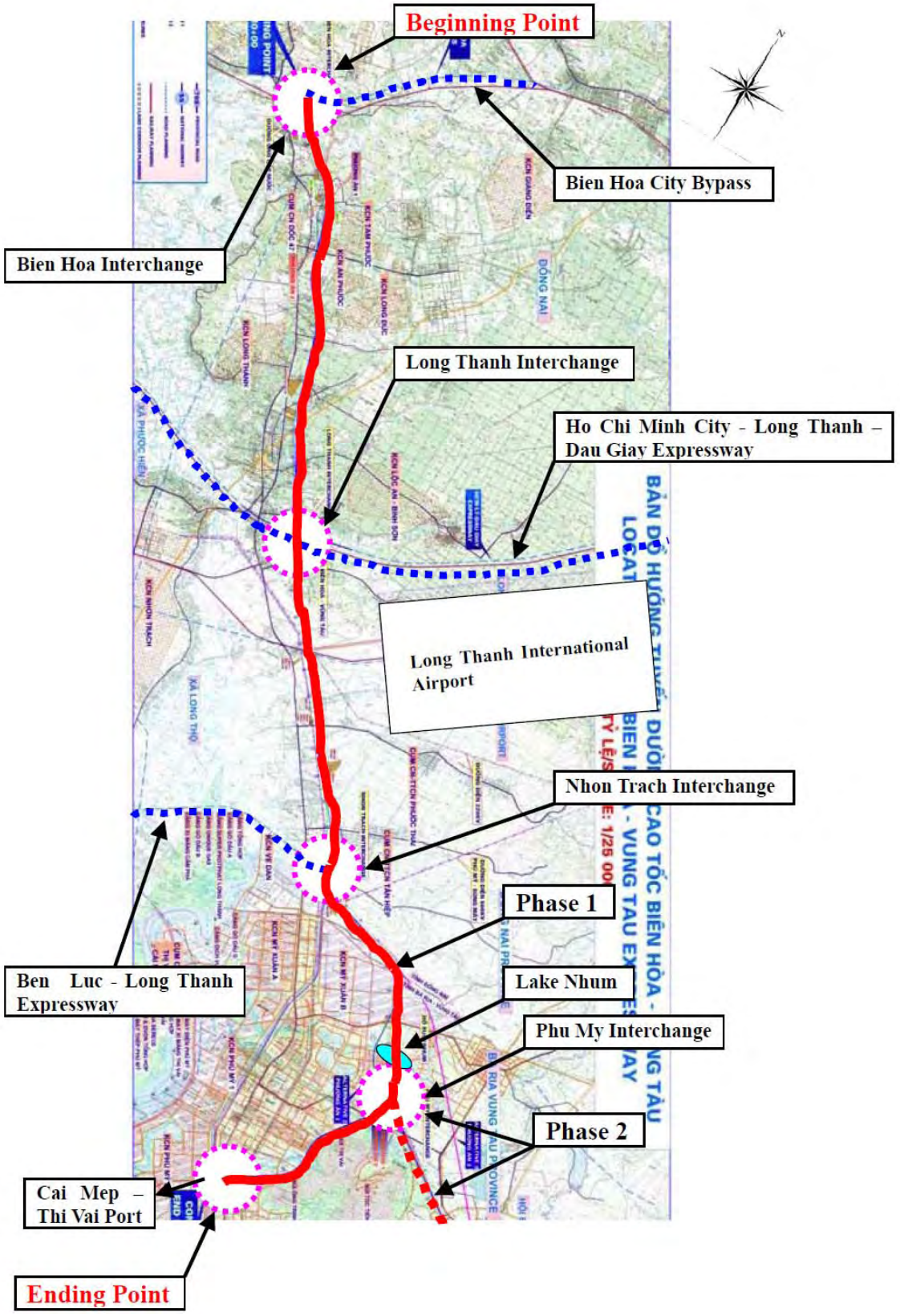
4) Lake Nhum (around KM 37+500)

5) Ending point (Phase 1: KM 46+361)

6) Ending point (Phase 2: KM 68+670)

7) Intersection of NH51 (KM 46+360)

8) Cai Mep – Thi Vai Port (near end point of Phase-1)



Source: JICA Study Team

Figure 7.6.1 Site Reconnaissance Map

7.6.4 Design Standards and Conditions

Design standards are not shown in the F/S report.

In this JICA Study, the F/S report was reviewed in accordance with the latest Vietnamese bridge design standard, 22TCN 272-05.

There are 30 bridges along the alignment. The bridges are categorized into three groups as follows:

1) Eleven thruway bridges on Bien Hoa - Vung Tau Expressway crossing over the river, lake, railway, local roads, intersection and so on

2) Eight rampway bridges located at interchanges

3) Eleven flyover bridges crossing over the Bien Hoa - Vung Tau Expressway.

Rampway bridges located at the Nhon Trach IC will be designed in the Phase-2 of Ben Luc - Nhon Trach Expressway project.

7.6.5 Bridge Location

(1) Thruway Bridges

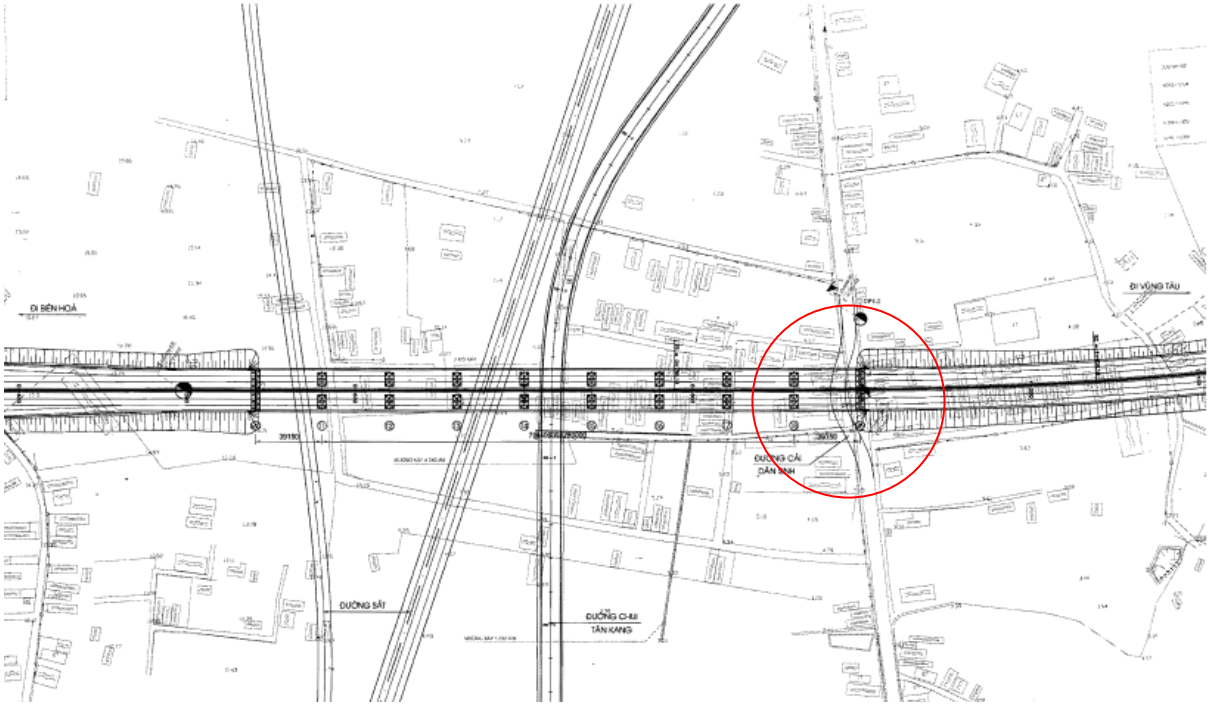
Review results on the location of thruway bridges are shown in Table 7.6.3.

Table 7.6.3 Review Results of Thruway Bridge Locations

No.	Name of Bridge	Item	Station	Review Results	Comments
1	Bridge overpass Hoa Hung-Trang Bom railway	Thruway bridge over railway	KM0+721.0	Not Recommendable	Existing road does not need to be detoured.
2	Bridge Song Buong	Thruway bridge	KM2+558	Acceptable	
3	Bridge Nuoc Trong	Thruway bridge	KM8+597.0	Acceptable	
4	Bridge Suoi Phen	Thruway bridge	KM12+628.0	Acceptable	
5	Bridge Quan Thu	Thruway bridge	KM14+119.7	Acceptable	
6	Bridge Ong Lang	Thruway bridge	KM14+984.2	Acceptable	
7	Bridge Da Vang	Thruway bridge	KM20+016.3	Acceptable	
8	Bridge Suoi Ca	Thruway bridge	KM22+888.4	Acceptable	
9	Bridge overpass Bien Hoa-Vung Tau railway	Thruway bridge over railway	KM30+439.2	Acceptable	Bridge Location shall be studied. See 7.6.10
10	Bridge Suoi Nhum	Thruway bridge	KM37+467.3	Acceptable	
11	Flyover QL51 (KM46+358)	Thruway bridge over national highway	KM46+358	Acceptable	

Source: JICA Study Team

The location of existing road under the bridge overpass Hoa Hung - Trang Bom railway is shown in Figure 7.6.2. The existing road need not be detoured. by means of shifting of the location of the ending abutment to the ending point of the expressway. And the location of the beginning abutment also shall be shifted to the ending point of the expressway for not changing of bridge length.



Source: JICA Study Team

Figure 7.6.2 Thruway Bridge over Hoa Hung - Trang Bom Railway

(2) Rampway Bridges

Review results of the rampway bridges are shown in Table 7.6.4.

Table 7.6.4 Review Results of Rampway Bridges

No.	Name of Bridge	Station	Review Results	Comments
	Interchange Bien Hoa	KM0+0.00		
1	Bridge on express way	KM0+177.70	Acceptable	Stipulated in other expressway
2	Bridge – ramp 1		Acceptable	
3	Bridge – ramp 2		Acceptable	
	Interchange Long Thanh–Dau Giay	KM16+600		
4	Bridge on express way	KM16+915.1	Acceptable	Stipulated in other expressway
5	Bridge ramp to Dau Giay		Acceptable	
6	Bridge Bung Mon river		Acceptable	
7	Bridge overpass Long Thanh–Dau Giay express way		Acceptable	
8	Bridge on express way Long Thanh–Dau Giay		Acceptable	

Source: JICA Study Team

(3) Flyover Bridges

Review results of flyover bridges are shown in Table 7.6.5.

Table 7.6.5 Review Results of Flyover Bridges

No.	Name of Bridge	Station	Review Results	Comments
1	Bridge Tam Phuoc 1	KM4+446.1	Acceptable	Stipulated in existing road
2	Bridge Tam Phuoc 2	KM5+071.2	Acceptable	Stipulated in existing road
3	Bridge Sy Quan Luc Quan 2	KM6+149.0	Acceptable	Stipulated in existing road
4	Bridge Nha May	KM11+149.0	Acceptable	Stipulated in existing road
5	Bridge Nong Truong Binh Son	KM16+231.3	Acceptable	Stipulated in existing road
6	Bridge Bau Can	KM24+123.8	Acceptable	Stipulated in existing road
7	Bridge overpass	KM26+907.0	Acceptable	Stipulated in existing road
8	Bridge Tan Hiep	KM28+044.2	Acceptable	Stipulated in existing road
9	Bridge Hac Dich 1	KM34+155.1	Acceptable	Stipulated in existing road
10	Bridge Hac Dich 2	KM36+120.2	Acceptable	Stipulated in existing road
11	Overpass (KM40+040)	KM40+040	Acceptable	Stipulated in existing road

Source: JICA Study Team

7.6.6 Bridge Typical Cross section

(1) Number of Traffic Lanes in the F/S

The number of traffic lanes of bridge on the expressway in Phase-1 and 2 of the F/S report are shown in Table 7.6.6.

Table 7.6.6 Number of Traffic Lanes of Bridges to be Constructed on the Expressway

	Phase 1	Phase 2
The beginning point – Long Thanh–Dau Giay Interchange	6	6
Long Thanh–Dau Giay Interchange – Nhon Trach Interchange	4	8
Nhon Trach Interchange – Flyover QL51 (KM46+358)	6	6

Source: F/S

(2) Alternative Study on Bridge Cross Section, Bien Hoa - Long Thanh IC (KM 16+600) and Nhon Trach IC (KM 29+500) – Phu My IC (KM 37+600)

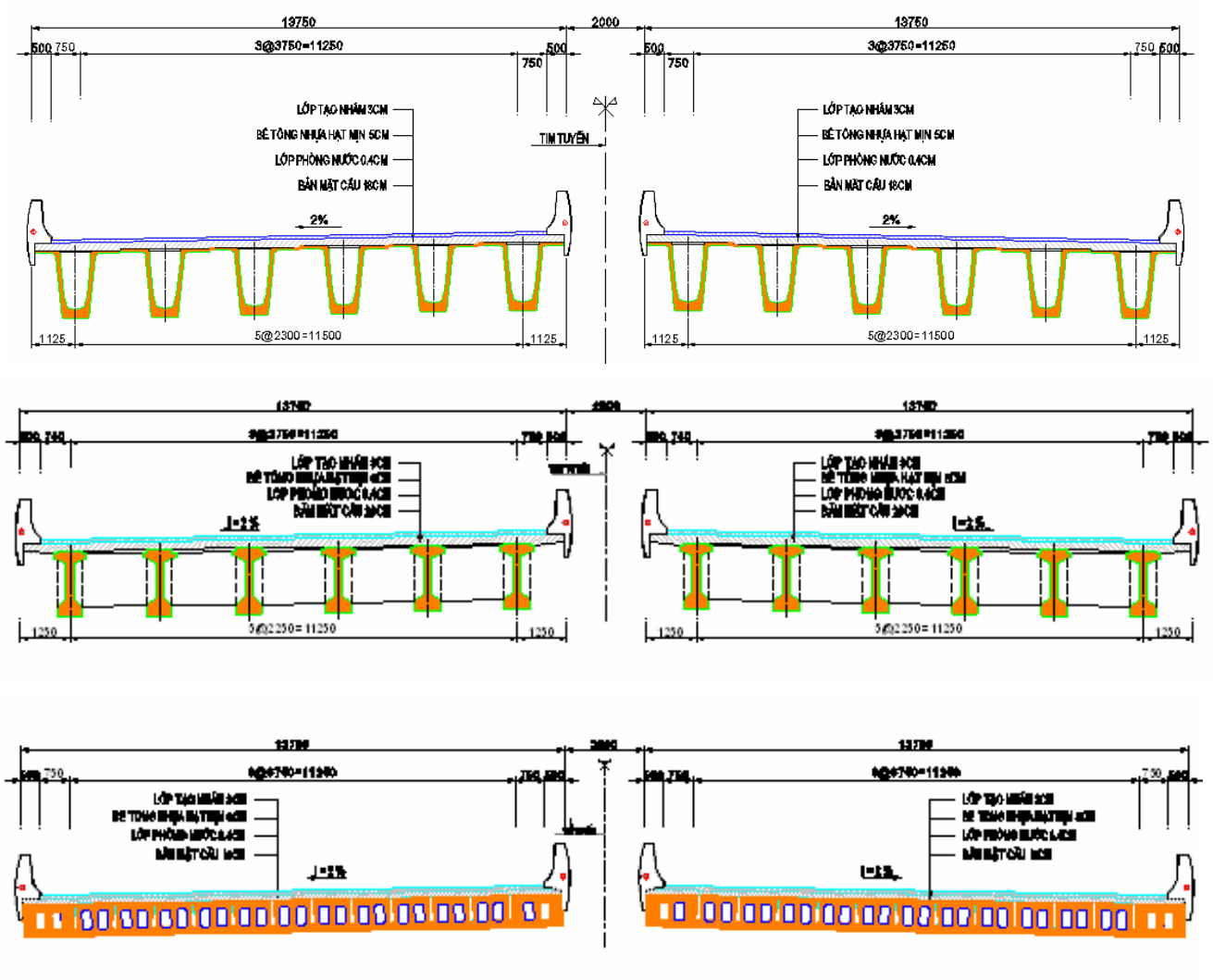
1) <u>Alternative 1 (Same as in the F/S)</u>

Bridges to be completed in Phase-1 comprise of six lanes without emergency stopping lane.

Table 7.6.7 Cross Sectional Element in Alternative 1

Cross Sectional Element	Width
Travel lane	6 x 3.75 m = 22.5 m
Inner safety strip	2 x 0.75 m = 1.5 m
Outer safety strip	2 x 0.75 m = 1.5 m
Guard rail	2 x 0.5 m = 1.0 m
Separator	1 x 1.0 = 1.0m
Total	**= 27.5 m**

Source: F/S



Source: F/S

Figure 7.6.3 Cross-section of Bridge in the Completed Stage (Alternative 1, same as in the F/S)

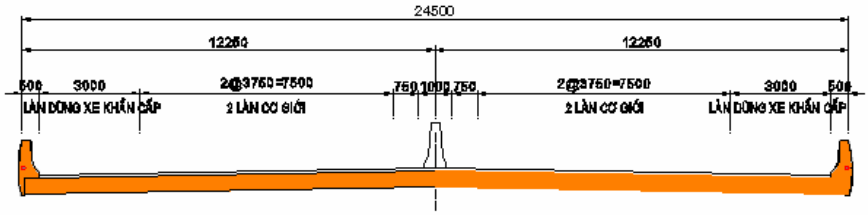
2) Alternative 2

The investment phase for cross-section: In Phase-1, bridges comprise of four lanes with emergency stopping lane. In Phase-2, these will be expanded to six lanes, also including emergency stopping lane.

Table 7.6.8 Cross Sectional Element in Alternative 2

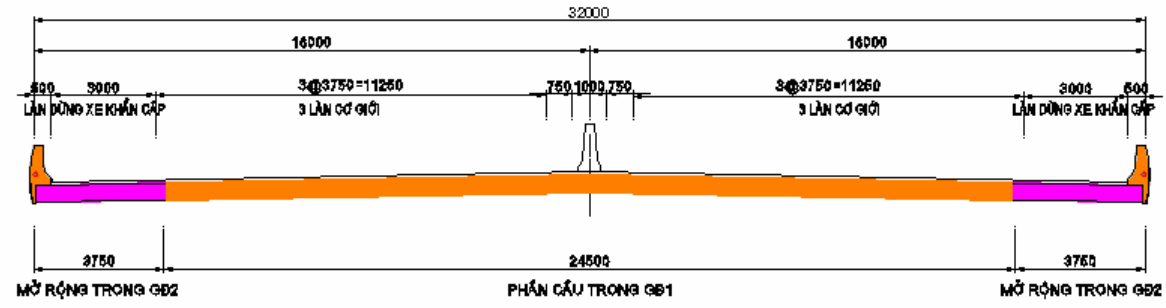
Cross Sectional Element	Width in Phase-1	Width in Phase-2
Travel lane	4 x 3.75 m = 15.00 m	6 x 3.75 m= 22.50 m
Inner safety strip	2 x 0.75 m = 1.50 m	2 x 0.75 m=1.50 m
Outer safety strip	2 x 3.0 m = 6.00 m	2 x3.0 m=6.00 m
Guard rail	2 x 0.5 m = 1.0 m	2 x 0.5 m=1.0 m
Separator	= 1.0 m	=1.0 m
Total	24.50 m	32.00 m

Source: F/S



Source: F/S

Figure 7.6.4 Cross –section of Bridges in Phase-1 (Alternative-2)



Source: F/S

Figure 7.6.5 Cross-section of Bridges in Phase-2 (Alternative 2)

3) Comparison Study

Alternative-1 and Alternative-2 are compared in Table 7.6.9.

Table 7.6.9 Comparison Among Bridge's Cross-section Alternatives

Content	Alternative 1	Alternative 2
Width of cross-section (Phase-1)	27.5m	24.5m
Width of cross-section (Phase-2)	27.5m	32.0m
Advantages	- Reasonable to be approved as proposal for the project - Cost savings in Phase-2 - Higher aesthetic value since it will not be expanded in Phase-2	- Ensure elements of cross section in two phases - Appropriate to traffic requirement in each phase - Investment cost in Phase-1 is lower than that of Alternative 1
Disadvantages	- Insufficient elements of cross-section due to lack of emergency stopping lane in Phase-2, but acceptable when the length of main-route bridges is not excessive. - Alignment plan of bridge and road is not in good condition due to a narrower section in Phase-2	- Need to be widened in Phase-2 - Complex widening bridge - Affecting operation when bridge is widened in Phase-2 - Total investment cost is higher than that of Alternative 1
Recommended	F/S Report	JICA Study Team

Source: JICA Study Team

4) <u>Review Results</u>

Width for six lanes in the F/S does not satisfy the Vietnamese standards considering the width for emergency lane.

In accordance with Vietnamese standards, Alternative 2 is recommended by the study team.

(3) Bridge Cross Section for Long Thanh IC (KM 16+600) to Nhon Trach IC (KM 29+500)

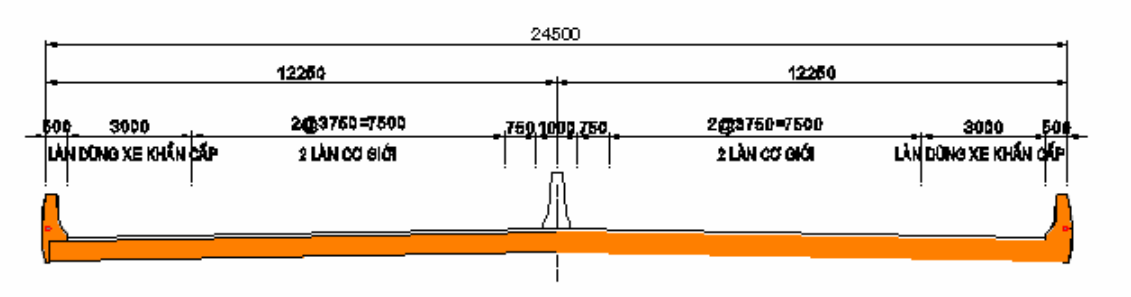
1) <u>F/S Report</u>

In the F/S, four traffic lanes with an emergency lane are proposed in Phase-1.

Table 7.6.10 Cross Sectional Element for Long Thanh IC (KM 16+600) to Nhon Trach IC (KM 29+500)

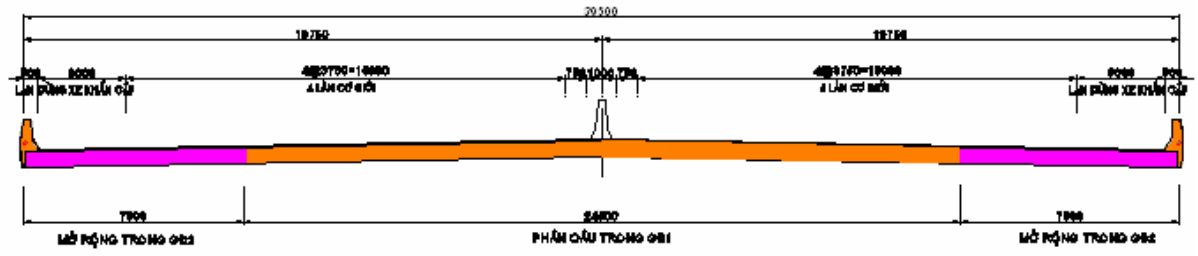
Cross Sectional Element	Width in Phase-1	Width in Phase-2
Travel lane	4 x 3.75 = 15.00 m	6 x 3.75 m = 30.00 m
Inner safety strip	2 x 0.75 = 1.50 m	2 x 0.75 m = 1.50 m
Outer safety strip		2 x 0.75 m = 1.50 m
Emergency parking lane	2 x 3.0m = 6.00 m	
Railing	2 x 0.5m =1.0 m	2 x 0.5 m = 1.00 m
Median Separator	=1.0m	=1.00m
Total	**= 24.50 m**	**= 35.00 m**

Source: F/S



Source: F/S

Figure 7.6.6 Cross-section of Bridge (Phase-1)



Source: F/S

Figure 7.6.7 Cross-section of Bridge (Phase-2)

2) <u>Review Results</u>

The study team has no objection with regards to this arrangement.

(4) Bridge Cross Section for Flyover Bridges

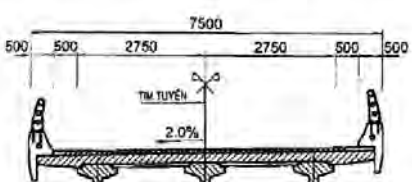
1) <u>In the F/S</u>

The cross-section width depends on the number of traffic lanes, i.e. B = 7.5 m, B = 9.0m and B= 27.0 m. Specific elements on cross-section are as follows:

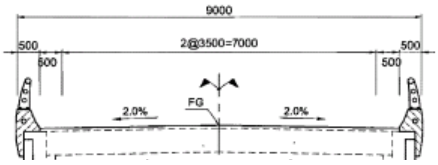
Table 7.6.11 Cross Sectional Element for Flyover Bridges

No	Including	Corresponding Dimensions			
		B = 7.5 m	B = 9.0 m	B = 12.0 m	B = 27.0 m
1	Motorized vehicle	2 x 2.75 m	2 x3.5 m	2 x 3.5 m	6 x 3.5 m
2	Safety strip and mixed lane	2 x 0.5 m	2 x 5.0 m	2 x 2.0 m	2 x 1.5 m
3	Inner safety strip	-	-	-	2 x 0.5 m
4	Median strip	-	-	-	1 x 1.0 m
5	Rail	2 x 0.5 m	2 x 0.5 m	2 x 0.5 m	2 x 0.5 m

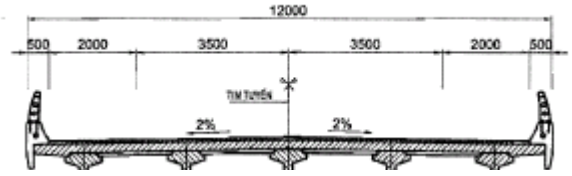
Source: F/S



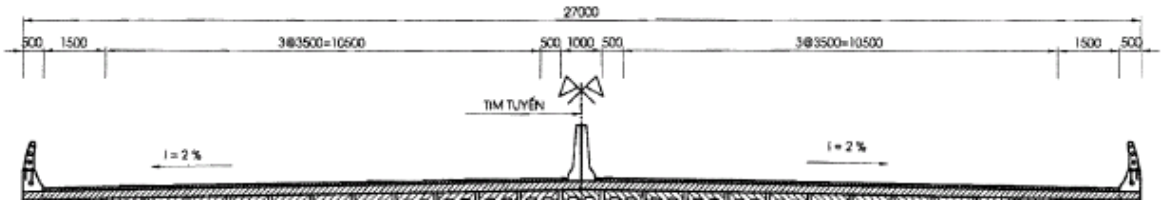
B=7.5m



B=9.0m



B=12.0m



B=27.0m

Source: F/S

Figure 7.6.8 Cross-section of Bridges Over Cross-roads

2) <u>Review Results</u>

The study team has no objection on this arrangement.

7.6.7 Bridge Superstructure Type

(1) Thruway Bridge

Review results of thruway bridge superstructure type are shown in Table 7.6.12.

Table 7.6.12 Review Results of Thruway Bridge Superstructure Type

No.	Name of Bridge	Station	Span arrangement	Girder type	Length (m)	Width (m)	Area (m2)	Review Results	Comments
1	Bridge overpass Hoa Hung-Trang Bom railway	KM0+721.0	39.15+7x40+39.15	Super-T	370.4	27.5	10,186	Acceptable	
2	Bridge Song Buong	KM2+558	3x33	PC-I	109.2	27.5	3,003	Acceptable	
3	Bridge Nuoc Trong	KM8+597.0	2x21	PC-I	52.15	27.5	1,434	Acceptable	
4	Bridge Suoi Phen	KM12+628.0	3x18	PC-HS	64.2	27.5	1,766	Acceptable	
5	Bridge Quan Thu	KM14+119.7	3x21	PC-I	75.2	27.5	2,068	Acceptable	
6	Bridge Ong Lang	KM14+984.2	1x18	PC-HS	28.1	27.5	773	Acceptable	
7	Bridge Da Vang	KM20+016.3	1x33	PC-I	43.1	24.5	1,056	Acceptable	
8	Bridge Suoi Ca	KM22+888.4	3x33	PC-I	109.2	24.5	2,675	Acceptable	
9	Bridge overpass Bien Hoa-Vung Tau railway	KM30+439.2	39.15+11x40+30+ 15x40+39.15	Super-T	1160.4	27.5	31,911	Acceptable	
10	Bridge Suoi Nhum	KM37+467.3	6x33	PC-I	208.35	27.5	5,730	Span arrangement and Girder type shall be studied.	The number of piers in a river shall be reduced. The number of piers in a river shall be reduced.
11	Flyover QL51 (KM46+358)	KM46+358	30+3x35+30	PC-HS	170.52	19.5	3,325	Span arrangement shall be studied.	Flyover with 1 span shall be planed for traffic safety.
	Total				2391		63926		

Source: JICA Study Team

(2) Rampway Bridge

Review results of rampway bridge superstructure type are shown in Table 7.6.13.

Table 7.6.13 Review Results of Rampway Bridge Superstructure Type

No.	Name of Bridge	Station	Span arrangement	Girder Type	Length (m)	Width (m)	Area (m2)	Review Results	Comments
	Interchange Bien Hoa	KM0+0.00							
1	Bridge on express way	KM0+177.70	39.15+37+6x40+39.15	Super-T	367.4	19	6,981	Span arrangement and Girder type shall be studied.	Span arrangement and Girder type of Curve shall be planed to resist twist.
2	Bridge - ramp 1		4x21	PC-I	96.25	10	963	Acceptable	
3	Bridge - ramp 2		4x21	PC-I	96.25	10	963	Acceptable	
	Interchange Long Thanh-Dau Giay	KM16+600							
4	Bridge on express way	KM16+915.1	39.15+2x40+3x30+40 +32.5+2x35.75+10x40 +3x30+39.15	Super T	882.3	26.0	22,940	Acceptable	
5	Bridge ramp to Dau Giay		2x30	PC-I	66.05	10	661	Acceptable	
6	Bridge Bung Mon river		3x24	PC-I	84.2	26	2,189	Acceptable	
7	Bridge overpass Long Thanh-Dau Giay express way		7x33	PC-I	243.4	19	4,625	Acceptable	
8	Bridge on express way Long Thanh-Dau Giay		No Detail Plan						
	Total				1836		39320		

Source: JICA Study Team

(3) Flyover Bridge

Review results of flyover bridge superstructure type are shown in Table 7.6.14.

Table 7.6.14 Review Results of Flyover Bridge Superstructure Type

No.	Name of Bridge	Station	Span arrangement	Type	Length (m)	Width (m)	Area (m2)	Review Results	Comments
1	Bridge Tam Phuoc 1	KM4+446.1	4x33	PC-I	142.25	12.0	1,707	Acceptable	Span arrangement and Length of bridge are stipulated in Bien Hoa – Vung Tau Expressway. Width of bridge are stipulated in existing road.
2	Bridge Tam Phuoc 2	KM5+071.2	8x21	PC-HS	178.45	27.0	4,818	Acceptable	
3	Bridge Sy Quan Luc Quan 2	KM6+149.0	5x33	PC-I	175.3	12.0	2,104	Acceptable	
4	Bridge Nha May	KM11+149.0	8x33	PC-I	274.45	7.5	2,058	Acceptable	
5	Bridge Nong Truong Binh Son	KM16+231.3	5x33	PC-I	175.3	7.5	1,315	Acceptable	
6	Bridge Bau Can	KM24+123.8	9x33	PC-I	307.5	7.5	2,306	Acceptable	
7	Bridge overpass	KM26+907.0	8x33	PC-I	274.45	7.5	2,058	Acceptable	
8	Bridge Tan Hiep	KM28+044.2	7x33	PC-I	241.4	7.5	1,811	Acceptable	
9	Bridge Hac Dich 1	KM34+155.1	4x33	PC-I	142.25	12.0	1,707	Acceptable	
10	Bridge Hac Dich 2	KM36+120.2	5x33	PC-I	175.3	12.0	2,104	Acceptable	
11	Overpass (KM40+040)	KM40+040	13+33+13	PC-HS	68.1	9.0	613	Acceptable	
	Total				2155		22601		

Source: JICA Study Team

7.6.8 Bridge Substructure Type

(1) Thruway Bridge

Review results of thruway bridge substructure type are shown in Table 7.6.15.

Table 7.6.15 Review Results of Thruway Bridge Substructure Type

No.	Name of Bridge	Station	Abutment type	Pier type	Width of Pier(m)	Thickness of Pier (m)	Review Results	Comments
1	Bridge overpass Hoa Hung-Trang Bom railway	KM0+721.0	Reversed T-type	T-type	4.0	Not shown	Acceptable	Nothing paticular
2	Bridge Song Buong	KM2+558	Reversed T-type	T-type	4.8	Not shown	Acceptable	
3	Bridge Nuoc Trong	KM8+597.0	Reversed T-type	T-type	4.8	Not shown	Acceptable	
4	Bridge Suoi Phen	KM12+628.0	Reversed T-type	T-type	4.8	Not shown	Acceptable	
5	Bridge Quan Thu	KM14+119.7	Reversed T-type	T-type	4.8	Not shown	Acceptable	
6	Bridge Ong Lang	KM14+984.2	Reversed T-type	–	–	–	Acceptable	
7	Bridge Da Vang	KM20+016.3	Reversed T-type	–	–	–	Acceptable	
8	Bridge Suoi Ca	KM22+888.4	Reversed T-type	T-type	4.8	Not shown	Acceptable	
9	Bridge overpass Bien Hoa-Vung Tau railway	KM30+439.2	Reversed T-type	T-type	4.0	Not shown	Acceptable	
10	Bridge Suoi Nhum	KM37+467.3	Reversed T-type	T-type	6.0	Not shown	Acceptable	
11	Flyover QL51 (KM46+358)	KM46+358	Reversed T-type	Circle section	Circle section D=1.7		Acceptable	

Source: JICA Study Team

(2) Rampway Bridge

Review results of rampway bridge substructure type are shown in Table 7.6.16.

Table 7.6.16 Review Results of Rampway Bridge Substructure Type

No.	Name of Bridge	Station	Abutment type	Pier type	Width of Pier(m)	Thickness of Pier (m)	Review Results	Comments
	Interchange Bien Hoa	KM0+0.00						Nothing paticular
1	Bridge on express way	KM0+177.70	Reversed T-type	T-type	3.5	Not shown	Acceptable	
2	Bridge – ramp 1		Reversed T-type	T-type	4.8	Not shown	Acceptable	
3	Bridge – ramp 2						Acceptable	
	Interchange Long Thanh-Dau Giay	KM16+600						
4	Bridge on express way	KM16+915.1	Reversed T-type	T-type	4.0	Not shown	Acceptable	
5	Bridge ramp to Dau Giay		Reversed T-type	T-type	4.8	Not shown	Acceptable	
6	Bridge Bung Mon river		Reversed T-type	T-type	5.0	Not shown	Acceptable	
7	Bridge overpass Long Thanh-Dau Giay express way		Reversed T-type	T-type	3.5	Not shown	Acceptable	
8	Bridge on express way Long Thanh-Dau Giay		No Detail Plan					

Source: JICA Study Team

(3) Flyover Bridge

Review results of flyover bridge substructure type are shown in Table 7.6.17.

Table 7.6.17 Review Results of Flyover Bridge Substructure Type

No.	Name of Bridge	Station	Abutment type	Pier type	Width of Pier(m)	Thickness of Pier (m)	Review Results	Comments
1	Bridge Tam Phuoc 1	KM4+446.1	Reversed T-type	T-type	4.0	Not shown	Acceptable	
2	Bridge Tam Phuoc 2	KM5+071.2	Reversed T-type	T-type	4.8	Not shown	Acceptable	
3	Bridge Sy Quan Luc Quan 2	KM6+149.0	Reversed T-type	T-type	4.0	Not shown	Acceptable	
4	Bridge Nha May	KM11+149.0	Reversed T-type	T-type	2.2	Not shown	Acceptable	
5	Bridge Nong Truong Binh Son	KM16+231.3	Reversed T-type				Acceptable	
6	Bridge Bau Can	KM24+123.8	Reversed T-type	T-type	2.2	Not shown	Acceptable	
7	Bridge overpass	KM26+907.0	Reversed T-type	T-type	2.2	Not shown	Acceptable	
8	Bridge Tan Hiep	KM28+044.2	Reversed T-type	T-type	2.2	Not shown	Acceptable	
9	Bridge Hac Dich 1	KM34+155.1	Reversed T-type	T-type	4.0	Not shown	Acceptable	
10	Bridge Hac Dich 2	KM36+120.2	Reversed T-type	T-type	4.0	Not shown	Acceptable	
11	Overpass (KM40+040)	KM40+040	gravity type	rigid-frame	4.1-5.0	0.5-0.8	Acceptable	Pier in median of Expressway shall be studied

Source: JICA Study Team

7.6.9 Bridge Foundation Type

(1) Thruway Bridge

Review results of thruway bridge foundation type are shown in Table 7.6.18.

Table 7.6.18 Review Results of Thruway Bridge Foundation Type

No.	Name of Bridge	Station	Foundation type	Thickness of Footing (m)	Pile cross section (m)	Pile Length (m)	Review Results	Comments
1	Bridge overpass Hoa Hung-Trang Bom railway	KM0+721.0	Cast-in-place pile	1.8	D=1.0	15.0	Acceptable	Pile of D=1.2 shall be studied
2	Bridge Song Buong	KM2+558	Cast-in-place pile	1.8	D=1.0	12.0-15.0	Acceptable	Pile of D=1.2 shall be studied
3	Bridge Nuoc Trong	KM8+597.0	Driven Pile	1.5	0.4x0.4	16.0-17.0	Not Recommendable	Cast-in-place pile shall be studied
4	Bridge Suoi Phen	KM12+628.0	Driven Pile	1.5	0.4x0.4	22.0	Not Recommendable	Cast-in-place pile shall be studied
5	Bridge Quan Thu	KM14+119.7	Driven Pile	1.5	0.4x0.4	29.0	Not Recommendable	Cast-in-place pile shall be studied
6	Bridge Ong Lang	KM14+984.2	Driven Pile	1.5	0.4x0.4	24.0	Not Recommendable	Cast-in-place pile shall be studied
7	Bridge Da Vang	KM20+016.3	Cast-in-place pile	1.8	D=1.0	31.0	Acceptable	Pile of D=1.2 shall be studied
8	Bridge Suoi Ca	KM22+888.4	Cast-in-place pile	1.8	D=1.0	33.0	Acceptable	Pile of D=1.2 shall be studied
9	Bridge overpass Bien Hoa-Vung Tau railway	KM30+439.2	Cast-in-place pile	1.8	D=1.0	35.0	Acceptable	Pile of D=1.2 shall be studied
10	Bridge Suoi Nhum	KM37+467.3	Cast-in-place pile	1.8	D=1.0	18.5-20.0	Acceptable	Pile of D=1.2 shall be studied
11	Flyover QL51 (KM46+358)	KM46+358	Cast-in-place pile	1.8	D=1.0	41.0	Acceptable	Pile of D=1.2 shall be studied

Source: JICA Study Team

(2) Rampway Bridge

Review results of rampway bridge foundation type are shown in Table 7.6.19.

Table 7.6.19 Review Results of Rampway Bridge Foundation Type

No.	Name of Bridge	Station	Foundation type	Thickness of Footing (m)	Pile cross section (m)	Pile Length (m)	Review Results	Comments
	Interchange Bien Hoa	KM0+0.00						
1	Bridge on express way	KM0+177.70	Cast-in-place pile	1.8	D=1.0	15.0	Acceptable	Pile of D=1.2 shall be studied
2	Bridge - ramp 1		Cast-in-place pile	1.8	D=1.0	15.0	Acceptable	Pile of D=1.2 shall be studied
3	Bridge - ramp 2							
	Interchange Long Thanh-Dau Giay	KM16+600						
4	Bridge on express way	KM16+915.1	Cast-in-place pile	1.8	D=1.0	35.0	Acceptable	Pile of D=1.2 shall be studied
5	Bridge ramp to Dau Giay		Cast-in-place pile	1.8	D=1.0	40.0	Acceptable	Pile of D=1.2 shall be studied
6	Bridge Bung Mon river		Cast-in-place pile	1.8	D=1.0	40.0	Acceptable	Pile of D=1.2 shall be studied
7	Bridge overpass Long Thanh-Dau Giay express way		Cast-in-place pile	1.8	D=1.0	40.0	Acceptable	Pile of D=1.2 shall be studied
8	Bridge on express way Long Thanh-Dau Giay		No Detail Plan					

Source: JICA Study Team

(3) Flyover Bridge

Review results of flyover bridge foundation type are shown in Table 7.6.20.

Table 7.6.20 Review Results of Flyover Bridge Foundation Type

No.	Name of Bridge	Station	Foundation type	Thickness of Footing (m)	Pile cross section (m)	Pile Length (m)	Review Results	Comments
1	Bridge Tam Phuoc 1	KM4+446.1	Cast-in-place pile	1.8	D=1.0	36.0-38.0	Acceptable	Pile of D=1.2 shall be studied
2	Bridge Tam Phuoc 2	KM5+071.2	Cast-in-place pile	1.8	D=1.0	40.0	Acceptable	Pile of D=1.2 shall be studied
3	Bridge Sy Quan Luc Quan 2	KM6+149.0	Cast-in-place pile	1.8	D=1.0	44.0	Acceptable	Pile of D=1.2 shall be studied
4	Bridge Nha May	KM11+149.0	Driven Pile	1.5	0.4x0.4	33.0	Not Recommendable	Cast-in-place pile shall be studied
5	Bridge Nong Truong Binh Son	KM16+231.3	Driven Pile		0.4x0.4	33.0	Not Recommendable	Cast-in-place pile shall be studied
6	Bridge Bau Can	KM24+123.8	Cast-in-place pile	1.8	D=1.0	36.0	Acceptable	Pile of D=1.2 shall be studied
7	Bridge overpass	KM26+907.0	Cast-in-place pile	1.8	D=1.0	36.0	Acceptable	Pile of D=1.2 shall be studied
8	Bridge Tan Hiep	KM28+044.2	Cast-in-place pile	1.8	D=1.0	35.0	Acceptable	Pile of D=1.2 shall be studied
9	Bridge Hac Dich 1	KM34+155.1	Cast-in-place pile	1.8	D=1.0	28.0	Acceptable	Pile of D=1.2 shall be studied
10	Bridge Hac Dich 2	KM36+120.2	Cast-in-place pile	1.8	D=1.0	28.0	Acceptable	Pile of D=1.2 shall be studied
11	Overpass (KM40+040)	KM40+040	Driven Pile	-	0.4x0.4	23.5-28.0	Not Recommendable	Cast-in-place pile shall be studied

Source: JICA Study Team

7.6.10 Items to be forwarded to Detailed Design Stage

1) Widening from four to six lanes

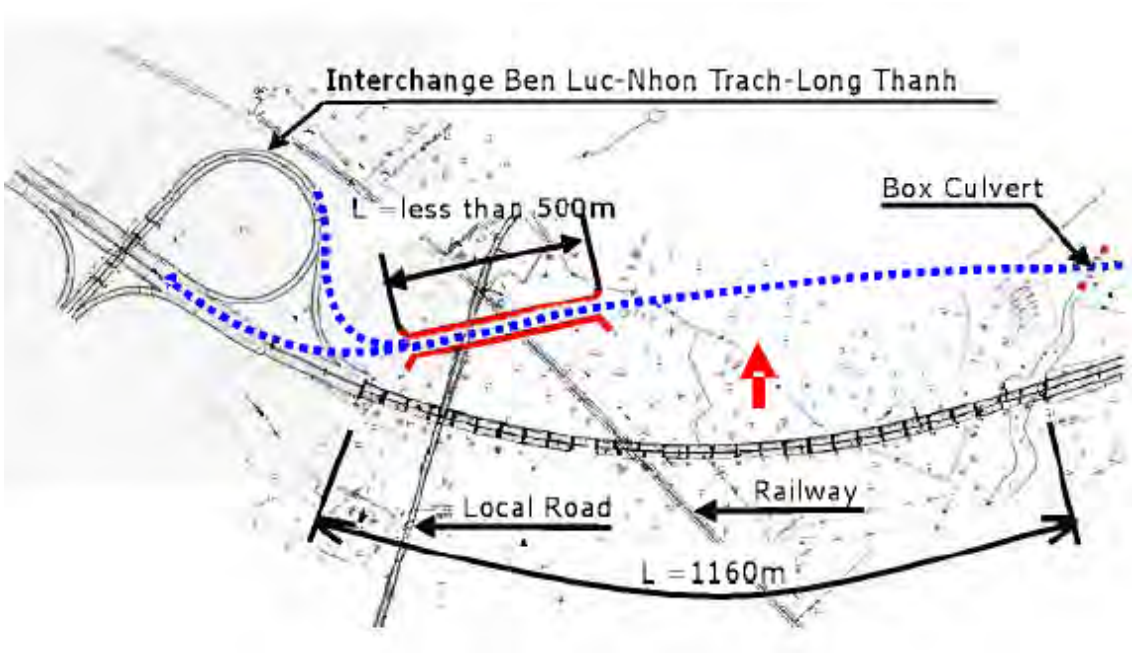
Construction methods shall be reviewed and updated in the detail design stage.

It is recommended that phase-wise construction be implemented for the section to be widened from four to six lanes, in order to reduce the initial cost. This method should also be adopted to the section for widening from 4-lane to 8-lane.

2) Railway Overpass Bridge for Bien Hoa - Vung Tau Railway (KM30+439.2)

It is recommended to study further the changing of alignment of the railway overpass bridge over Bien Hoa - Vung Tau Railway at KM 30+439.2.

An example of alignment modification is shown in Figure 7.6.9.



Source: JICA Study Team

Figure 7.6.9 Bridge Over Bien Hoa-Vung Tau Railway (KM30+439.2)

7.7 Road Structure Design

7.7.1 General

A retaining wall and some box culverts for vehicle/ pedestrian underpass are designed as part of road structures in the F/S Report.

7.7.2 Retaining Wall

(1) F/S Report

A retaining wall at KM 46+358 was designed for the thruway overpass at NH51 in the F/S Report.

Span arrangement of the retaining wall is shown in Table 7.7.1.

Table 7.7.1 Retaining Wall

No.	Name of Bridge	Item	Station	Span arrangement	Length (m)
1	Flyover QL51	Retaining wall	KM46+358	30+100+80+40+100+30	380

Source: F/S

(2) Review Result

There is no check of the sight distance at the intersection in the F/S. Retaining structure should be planned after checking the sight distance of the driver at every direction of the road.

Keeping the sight distance at intersections is crucial for vehicle maneuver. If sufficient sight distance would not be secured, the provision of the retaining structure should be reconsidered.

7.7.3 Underpass

(1) In the F/S

There are 14 underpasses crossing Bien Hoa – Vung Tau Expressway.

(2) Review Results

Review results for the underpasses are shown in Table 7.7.2.

Table 7.7.2 Review Results for the Underpasses

No.	Name of Bridge	Station	Length (m)	Width (m)	Hight (m)	Review Results	Comments
1	Overpass on ramp	KM0+123.2	23.0	4.5	3.5	Acceptable	Nothing particular
2	Underpass Tan Cang	KM0+716.0	No Detail Plan				
3	Underpass KM1+554.0	KM1+554.0	33.0	4.0	3.5	Acceptable	
4	Underpass KM3+650.0	KM3+650.0	33.0	4.0	3.5	Acceptable	
5	Underpass KM7+250.0	KM7+250.0	33.0	4.0	3.5	Acceptable	
6	Underpass Long Duc	KM9+452.0	33.0	7.0	4.5	Acceptable	
7	Underpass Binh Son	KM14+264.0	42.0	11.0	4.8	Acceptable	
8	Underpass Go Bao May	KM17+948.0	44.0	7.0	4.5	Acceptable	
9	Underpass combined with Da Vang 1	KM20+005.0	40.5	4.0	3.5	Acceptable	
10	Underpass combined with Da Vang 2	KM20+032.0	40.5	4.0	3.5	Acceptable	
11	Underpass combined with Suoi Ca 1	KM22+847.0	43.8	4.0	3.5	Acceptable	
12	Underpass combined with Suoi Ca 2	KM22+929.0	43.8	4.0	3.5	Acceptable	
13	Underpass combined with Thai Thien 1	KM31+040.0	34.8	4.0	3.5	Acceptable	
14	Underpass KM33+170	KM33+170.0	32.5	7.0	4.5	Acceptable	
	Total		476.9				

Source: JICA Study Team

7.7.4 Items to be forwarded to the Detailed Design Stage

Retaining wall at KM 46+358 shall be studied in view of sight distance requirements. The possibility of providing an alternative structure should be studied if necessary.

7.8 Other Design Features

7.8.1 General

Review of other designs was confirmed based on the result of geological survey and hydrological survey.

7.8.2 Embankment/Cutting Slope

Ratio of embankment slope is decided to be 1:2, and berm shall be installed when the height of the embankment exceeds 6 m.

Ratio of cutting slope of soil layer is decided to be 1:1, and berm shall be installed when the height of the embankment exceeds 6 m.

Ratio of cutting slope of rock layer is decided to be 1:0.75, and berm shall be installed when the height of the embankment exceeds 8m.

These values are in accordance with TCVN5729 and TCVN 4054.

7.8.3 Soft Ground Treatment

Locations of existing soft ground as shown in Table 7.8.1 based on the F/S. Hence, sand drain is adopted for 3.5~5.2 m high of embankments**.**

Residual settlement is estimated to be 0.04~0.07m.

According to the geological survey data, N-values of soft ground range from 5~10; therefore, it appears that the problem on stability due to slip failure of embankment is limited.

In case of depths lower than 4 m, it is possible to remove the soft soil and replace with good quality materials.

Table 7.8.1 Section of Soft Ground and Corresponding Treatment

No.	Location	Depth of Soft Ground(m)	Embankment Height(m)	Soft Ground Treatment	Residual settlement(m)
1	KM 1+065 - KM 2+510 (L=1445m)	7.3-10.5	4.0-5.2	Sand Drain	0.04~0.06
2	KM 19+650- KM 19+900 (L=250m)	7.9	5.0	Sand Drain	0.08
3	KM 22+500- KM 23+150 (L=650m)	14.2	4.5	Sand Drain	0.07
4	KM 31+025- KM 31+375 (L=350m)	20.0	3.5	Sand Drain	0.07

Source: JICA Study Team

7.8.4 Drainage Design

Side ditch is planned to be installed at the toe and at the berm of the cutting slope.

U-ditch with grating cover is planned to be installed at the marginal strip (safety lane) to collect rain water on the superelevated curves.

Box culverts and pipe culverts which cross the roadway are planned to be installed, considering

terrain, profile of expressway, hydrographical condition and principles of span selection.

Lengths of box culverts to be constructed are planned to accommodate six lanes of the road way in Phase-2.

Sizes of box culverts and pipe culverts are decided considering hydrological frequency for the culverts, which is 1% for expressways, and 2% for national highways, in accordance with TCVN5045.

Planned box culverts and pipe culverts are summarized in Table7.8.2.

Table 7.8.2 Summary of Planned Box Culverts and Pipe Culverts

	Box-culvert			Pipe-Culvert		
	Location	Size	length(m)	Location	Size	Length(m)
1	1+190.00	2.5x2.5	46	3+334.84	D1200	38
2	1+910.00	2.5x2.5	54	5+038.88	D1200	38
3	3+027.15	2.0x2.0	38	21+971.26	D1200	52
4	3+167.27	2.0x2.0	44	22+210.00	D1200	54
5	3;722.00	2.0x2.0	44	22+390.16	D1200	54
6	3+960.00	2.5x2.5	40	23+155.42	D1200	44
7	6+345.34	2(3.0x3.0)	76	25+466.36	D1500	48
8	7+200.00	1.2x1.2	38	27+888.16	D1200	50
9	7+811.97	1.2x1.2	34	29+933.99	D1500	48
10	9+286.50	2(2.5x2.5)	84	31+949.31	D1200	48
11	10+828.20	1.2x1.2	36	32+367.93	D1200	48
12	11+460.00	1.2x1.2	44	33+008.84	D1200	54
13	12+177.24	1.2x1.2	44	33+543.04	D1200	42
14	13+158.74	1.2x1.2	38	40+680.00	2D1250	31
15	15+904.50	1.2x1.2	36	41+260.00	D1500	43
16	18+446.29	1.2x1.2	44	42+300.00	D1250	37
17	19+180.00	1.2x1.2	42	44+300.00	D1500	27
18	21+760.00	1.2x1.2	44			
19	24;650.00	1.2x1.2	50			
20	26+016.49	2.5x2.5	48			
21	26+580.00	1.2x1.2	44			
22	27+468.63	3.5x3.5	46			
23	28+860.00	1.2x1.2	44			
24	30+491.65	1.2x1.2	42			
25	34+868.97	2(3.0x3.0)	80			
26	35+500.00	1.2x1.2	42			
27	36+321.50	1.2x1.2	44			
28	39+460.00	2.5x2.5	42			
29	40+158.00	2(3.0x3.0)	27			
30	40+380.00	2.0x2.0	26			
31	41+590.00	2.0x2.0	37			
32	42+870.00	2.0x2.0	48			
33	43+140.00	3.0x3.0	41			
34	43+938.00	2(2.0x2.0)	76			
35	45+450.00	2(2.0x2.0)	27			
36	46+000.00	2.0x2.0	48			

Source: JICA Study Team

7.8.5 Pavement Design

(1) General

Asphalt concrete pavement was designed for the expressway and the national highway based on

the forecasted traffic data, hydro-geological situation and local material sources, and by applying standard 22TCN211-06.

The design life duration for the pavement is 15 years, starting in 2015 (base year). It will end in 2030 when the design life of pavement expires (it will then proceed with improvement and overhaul of the pavement, and expansion of the number of carriage lanes).

An axle load of 120 kN is considered for expressways and national highways. For other crossroads, the design axle load is 100 kN.

Pavement structures for the expressway and the national highway are designed to meet the service duration of 15 years (2015-2030) and against an axle road of 120 kN.

(2) Design Traffic

Forecasted traffic volume on expressways and national highways in 2030 is shown in Table 7.8.3.

Table 7.8.3 Forecasted traffic volume on Expressway in 2030

Unit:Vchicle/day and night/2 directions

	Expressway		Expressway/ National Highway
	Bien Hoa IC-Long Thanh IC	Long Thanh IC-Nhon Trach IC	Nhon Trach IC -NH51 Intersection
Car	10974	13796	11775
Minibus	5164	7666	6853
Bus	3762	5584	4992
Light truck	3357	5615	2899
Heavy truck	1916	3204	1654
Heavy truck	2041	3414	1763
＞3 axles	1350	2258	1166
Total	28564	41537	31102

Source: JICA Study Team

(3) Design Elastic Modulus

Elastic modulus corresponding to section is shown in the Table 7.8.4.

Table 7.8.4 Elastic Modulus Corresponding to Section

	Expressway		Expressway/ National Highway
	Bien Hoa IC-Long Thanh IC	Long Thanh IC-Nhon Trach IC	Nhon Trach IC -NH51Intersection
Eyc (Mpa)	201	210	200

Source: JICA Study Team

(4) Design Pavement Structure

Pavement structure for expressways and national highways are calculated based on Standard 22TCN211-06 as shown in Table7.8.5 .

Pavement structure for rampway (asphalt concrete) and toll plaza (cement concrete) are also shown in said table.

Table 7.8.5 Pavement Structure

	Expressway	National Highway	Rampway	Toll Plaza
Wearing Course	3cm	3cm		
Asphalt Concrete Surface Course	5cm	5cm	5cm	
Asphalt Concrete Binder Course	7cm	7cm	7cm	
Crusher Mixed Bituminous	10cm	10cm	10cm	
Cement Concrete				25cm
Aggregate Base	35~40cm	40cm	35cm	30cm
Total	60~65cm	65cm	57cm	55cm

Source: JICA Study Team

It is necessary to review the pavement design based on the result of forecasted traffic volume when it varies to that of the F/S.

7.8.6 Frontage Road and Service Road

Frontage road connected with existing roads are planned to be provided at the left and right side of the expressway.

Frontage road is 5 m (1-lane) wide, and the standard for rural roads (class-A) is applied.

Service road for the construction of expressway is planned utilizing the national highway, provincial highway, existing local road and planned frontage road.

7.8.7 Traffic Safety Facilities

Traffic signs such as regulatory signs, warning signs and guide signs are planned to be installed on the throughways and rampways.

Road markings are planned to be provided on the throughways and rampways, and at the toll gate section.

Guard rails are planned to be provided at the shoulders and median strips of throughways and rampways.

Fences (barbed wire fence) are planned to be installed at the exterior edge of the road way along a necessary section.

7.8.8 Lighting

Lighting system is planned to be provide for large bridges, interchanges, tollgates, rest areas/service stations and operating/ maintenance centers at expressways.

7.9 Construction Planning

7.9.1 Documents / Information Received

In the F/S report, the survey of construction material supply is described in Chapter 7. Meanwhile, construction packaging, implementation program, and construction organization are described in Chapter 14. However, construction planning was not described in the F/S report.

7.9.2 Contract Packaging

(1) Quantities for Major Construction Work Items

The major construction work items for phase-1 are excavation, embankment, soft ground treatment, pavement, and bridge construction. Quantities of these items for Bien Hoa – Vung Tau Express project phase-1 are as shown in Table 7.9.1. The quantity of building work, ITS and operation work, and O&M equipment are described in Section 7.11.

There is nothing special construction method for Phase-1.

Table 7.9.1 Major Work Quantities in Phase-1

Work Item	Quantity
Excavation	786,000 m^3
Rock Excavation	57,000 m3
Embankment	3,063,000 m^3
Sand drain	247,000 m
Pavement	1,117,000 m^2
Bridge : total length	6,381 m
Bridge : total area	125,847 m^2

Source: JICA Study Team

(2) Contract Packaging in the F/S

Phase-1 contract packaging was divided into seven packages in the F/S considering the following items:

- Approach from existing road system
- Appropriate to the contractor's ability
- Main interchange location
- Administrative boundaries
- Separating supporting management and operation facilities from civil work

However, there are considerable differences in cost in the package for civil works as shown in Table 7.9.2.

Table 7.9.2 Contract Packaging in the F/S

Package	Work	Section	Road Length	Preliminary Cost (billion VND)
1	Civil Work (1)	KM0+000 - KM8+000	L= 8.0 km	1,840 (7.3 billion JPY)
2	Civil Work (2)	KM8+000 - KM17+000	L= 9.0 km	2,610 (10.4 billion JPY)
3	Civil Work (3)	KM17+000 - KM24+000	L= 7.0 km	1,080 (4.3 billion JPY)
4	Civil Work (4)	KM24+000 - KM30+000	L= 6.0 km	910 (3.6 billion JPY)
5	Civil Work (5)	KM30+000 - KM37+000	L= 7.0 km	1,780 (7.1 billion JPY)
6	Civil Work (6)	KM37+000 - KM46	L= 9.0 km	1,660 (6.6 billion JPY)
7	Supporting management and operation facilities			

Note1: All Cost is 2011 value excluding Price Escalation
Note2: Electrical Work is included in each Civil Work
Source: JICA Study Team

(3) Review of Contract Packaging

The JICA study team reviewed the contract packaging for civil works and other works. In order to make the civil construction scale equal and small, the review of packaging of civil work was planned by considering the following items.

- cost of each package to be about VDN 2,000 billion (JPY 8 billion) or less
- road alignment

Packages 7, 8, and 9 were planned to cover building works, ITS work, and O&M equipment so to facilitate planning of procurement for other works.

The results of review on contract packaging are shown in Table 7.9.3. The procurement plan for contractors and consultants are described in section 7.12.

Table 7.9.3 Results of Review on Contract Packaging

Package	Work	Section	Road Length	Preliminary Cost (billion VND)
1	Civil Work (1)	KM0+000 - KM6+000	L= 6.0 km	1,398 (5.5 billion JPY)
2	Civil Work (2)	KM6+000 - KM15+800	L= 9.8 km	1,549 (6.1 billion JPY)
3	Civil Work (3)	KM15+800 - KM19+000	L= 3.2 km	1,383 (5.5 billion JPY)
4	Civil Work (4)	KM19+000 - KM29+000	L= 10.0 km	1,555 (6.2 billion JPY)
5	Civil Work (5)	KM29+000 - KM37+600	L= 8.6 km	2,105 (8.4 billion JPY)
6	Civil Work (6)	KM37+600 - KM46+800	L= 9.2 km	1,891 (7.5 billion JPY)
7	Building Work	–	–	413 (1.6 billion JPY)
8	ITS+Operation Work	–	–	641 (2.5 billion JPY)
9	O&M Equipment	–	–	185 (0.7 billion JPY)

Note1: All Cost is 2011 value excluding Price Escalation
Note2 : Electrical Work is included in each Civil Work
Source: JICA Study Team

7.9.3 Construction Method

(1) Outline of Construction Organization in the F/S

Construction of Expressway and Interchange: The investigation of filling material, sand for soft ground treatment, and stone for bridge construction were executed in the F/S for the supply of required construction materials. In the expressway construction of Phase-1, soft ground treatment for four sections is necessary. As for this, the adoption of sand-drain method in which experiences are available in Vietnam is planned. Moreover, in the F/S report, the outline of the preparatory work, temporary and ancillary works, and the safety equipment and facilities are

described with regards to the construction of the expressway. For the interchange, the necessity for temporary road and related structure are described. The necessity for traffic management, obstacle, and environment are also described concerning the construction of connection road. However, the necessity to study these in detail at the detailed design stage was also mentioned in the F/S.

Construction of Bridge: The basic procedure of pier construction, support facilities' construction, and superstructure construction are described in the F/S report on the bridge construction. Furthermore, in the drawings included in the F/S, the procedure of bridge construction work was described.

(2) Comments on Construction Method

Since there are no long and large bridges (except for one which cross above the railway_, and large-scale soil ground treatment is not necessary in Phase-1, the JICA study team judged that the method of construction at present is almost appropriate. In the detailed design stage, investigation, and design, the following studies are necessary based on the detailed survey:

- construction organization principles
- construction sequence
- construction yard organization
- procurement of labor, construction materials, construction machinery
- plan of temporary facilities
- construction of access road during construction
- detailed planning of expressway and interchange construction
- detailed planning of bridge construction
- detailed planning of other main facilities, such as main drainage, traffic system, etc.
- safety management plan
- environmental management plan

7.9.4 Construction Schedule

(1) Construction Period in the F/S

Construction period was planned to be 48 months in the F/S report, although the reason for such duration was not described. In the discussion with the engineer of TEDI, the construction period was set to 48 months in consideration of the period for land acquisition and resettlement.

(2) Review of Construction Period

In this Study, because each civil work packaging was set to small and almost same volume, it was reviewed that construction period should be planned for 36 months as shown in Table 7.9.4 so that the expressway will be in service by 2016. The standard schedule for the civil works is shown in Table 7.9.5 on the basis of the construction schedule for other new expressways in Southern Vietnam.

The major construction schedule until completion is as follows:

- Detailed Design : middle of 2011 – middle of 2012 (12 months)
- Land Acquisition and Resettlement : middle of 2011 – end of 2013 (30 months)
- Procurement of Contractors : middle of 2012 – end of 2012 (6 months)
- Construction Works and Construction Supervision : 2013 – 2015 (36 months)

Table 7.9.4 Review of Construction Schedule for Phase-1

ACTIVITIES	CY 2011	CY 2012	CY 2013	CY 2014	CY 2015
Land Acquisition and Resettlement					
Detailed Design					
Procurement of Contractors					
Construction Supervision					
Construction Works					
Package 1 (Civil Works, 6.0km)					
Package 2 (Civil Works, 9.8km)					
Package 3 (Civil Works, 3.2km)					
Package 4 (Civil Works, 10.0km)					
Package 5 (Civil Works, 8.6km)					
Package 6 (Civil Works, 9.2km)					
Package 7 (Building Works)					
Package 8 (ITS + Operation Building Works)					
Package 9 (O&M Equipments)					

Source: JICA Study Team

Table 7.9.5 Standard Construction Schedule for Civil Works

Work Item	CY 2013		CY 2014		CY 2015	
1 Preparation Work						
1) Plan of preparation work						
2) Human resources and machinery						
3) Construction allowance						
4) Auxiliary works						
2 Express Construction						
5) Soft ground treatment and earth work						
6) Drainage						
7) Sub-grade and pavement						
8) Lighting system and traffic signal						
9) Sod and shrub						
3 Bridge and Other Structure Construction						
10) Production of super-T, pile, and other pre-cast components						
11) Bored pile and substructure						
12) Superstructure						
13) Other Structures						

Source: JICA Study Team

The construction period for future widening was assumed to be from 2028 to 2029, and thus the widened expressway can be used by 2030.

7.9.5 Items to be forwarded to the Detailed Design Stage

The JICA study team recommends minimizing the contract packaging and its scale, and assuming that construction period be for 36 months compared with that stated in the F/S. In the detailed design stage, it is necessary to study these further.

Items on construction planning to be forwarded to the detailed design stage are summarized as follows:

- Contract packaging on the basis of the result of detailed survey, investigation, design and the procurement plan
- Procurement plan of construction works and O&M equipment
- Detail plan of main and temporary construction methods
- Quality assurance and quality control plan
- Safety management plan
- Environmental management plan
- Construction period

7.10 Construction Cost

7.10.1 Estimated Cost in the F/S

Total investment cost is described in Chapter 17 of the F/S report for Bien Hoa-Vung Tau Expressway Project. The estimated cost in this F/S is as shown in Table 7.10.1. Phase-1 cost is the construction cost of the section beginning at Bien Hoa to Phu My intersection, and the connector road from Phu My to NH51. Phase-2 cost includes the construction cost of the section from Phu My to Vung Tau, and the widening cost of Phase-1 section. The cost estimate in the F/S is as of the first quarter of 2011.

Table 7.10.1 Estimated Cost in the F/S

Unit：Billion VND

No.	Item	Remarks	Cost		
			Phase-1	Phase-2	Total
Ⅰ	Construction Cost and Equipment Cost	Construction cost + Equipment cost	6,628 (26.3 bill.JPY)	6,656 (26.4 bill.JPY)	13,284 (52.7 bill.JPY)
Ⅱ	Land Acquisition Cost		1,891 (7.5 bill.JPY)	847 (3.4 bill.JPY)	2,738 (10.9 bill.JPY)
Ⅲ	Management Cost, Consultant Cost and Other Costs		837 (3.3 bill.JPY)	747 (3.0 bill.JPY)	1,584 (6.3 bill.JPY)
Ⅳ	Contingency	28% (Price 18%,Physical 10%)	2,620 (10.4 bill.JPY)	2,310 (9.2 bill.JPY)	4,929 (19.5 bill.JPY)
Total Cost (excluding loan interest)			11,976 (47.5 bill.JPY)	10,561 (41.9 bill.JPY)	22,536 (89.3 bill.JPY)

Notes:
1. Exchange Rate: 1 JPY = 252.305 VND
2. Phase-1 cost excluding the Price contingency is VND 10,292 billion

Source: F/S

The cost estimate on the existing F/S as based on the appropriate Vietnam's law and regulations is considered reliable. Based on this feasibility study, the construction cost estimate was updated in accordance with proposed expressway route, section divisions, and implementation schedule. Construction cost estimate in this "Review of Feasibility Study for Bien Hoa-Vung Tau Expressway Project"(herein referred to as the Study) was also reviewed to adapt the BOT/PPP Scheme.

7.10.2 Law and Regulations

Listed in Table 7.10.2 are the main laws and regulations related to the estimate of construction cost . The JICA Study Team confirmed the latest law and regulations were applied in the F/S.

Table 7.10.2 Related Law and Regulations

Item	Related Law and Regulations
Cost Estimate Standard	Circular No.04/2010/TT-BXD dated on 25 June 2010 issued by MOC
Norm of Construction Cost Estimate	Decision No.957/2009/QD-BXD dated on 29 September 2009 issued by MOC Decision No.1019/2010/QD-BXD dated on 16 November 2010 issued by MOC Norm No.1776/2007/BXD-VP dated on 16 August 2007 issued by MOC Norm No.38/2005/QD-BXD and No.37/2005/QD-BXD dated on 2 November 2005 issued by MOC
Unit Cost	The unit cost of construction works of Dong Nai Province – Construction investigation component, construction component, installation component The unit cost of basic repair works of Dong Nai Province The tariffs of construction machines of Dong Nai Province The unit cost of construction works of Ba Ria – Vung Tau Province – Construction investigation component, construction component, installation component Land cost by all types in Dong Nai Province in 2010 Land cost by all types in Ba Ria – Vung Tau Province in 2010 Material cost information in Dong Nai Province in 2010 Material cost information in Ba Ria – Vung Tau Province in 2010

Source: F/S

7.10.3 Construction Cost Structure for BOT/PPP Scheme

Basic construction cost structure in this Study was based on Circular No.04/2010/TT-BXD. This cost structure was carefully studied, evaluated and adjusted to conform and be consistent with a BOT/PPP Scheme. The proposed cost structure is as shown in Table 7.10.3.

In addition to the cost items in Circular 04/2010/TT-BXD, the following cost items during the construction stage were considered in the BOT/PPP Scheme.

- 1 (4) environmental monitoring cost
- 3 (8) 21) feasibility study cost
- 4 SPC setup cost

And for the operational stage, the following costs included in this Study are:

- O&M cost
- SPC Operation cost

The Construction and O&M costs are summarized in Present Value(PV). Total project cost for construction and operation stages are summarized in Section 8.1.2 “Project Cost”.

Table 7.10.3 Construction Cost Structure

Item	Description
Total Project Cost	1+2+3+4+5+6+7+8
1 Construction Cost	(1)+(2)+(3)+(4)+(5)
(1) Construction Cost	a)+b)+c)
a) Expressway	Direct Cost= Material + Labor + Equipment Costs
1) Earth Work	Other direct cost 2%
2) Soft Ground Treatment	General cost 5.5%
3) Pavement	Texable income 6%
4) Other Items	Other auxiliary 5%
5) Transport Organization	Camp yard cost 2%
6) Drainage	
b) Structure	Direct Cost= Material + Labor + Equipment Costs
7) Bridge on Expressway	Other direct cost 2%
8) Overpass	General cost 5.5%
9) Underpass	Texable income 6%
10) Bridge over Railway	Other auxiliary 10%
11) Interchange	
12) Flyover Bridge along Expressway	
c) Other Works	
13) Electrical Work	
14) O&M Building - Operation Office	
15) ITS + Operation Office	
(2) All Risk Insurance Premium	(1)*1%
(3) HIV Prevention Program Cost	(1)*0.1%
(4) Environmental Monitoring Cost	
(5) Contingency	
16) Price Contingency	((1)+..+(4))*rate%
17) Physical Contingency	((1)+..+(4)+16))*10%
2 O&M Cost	(6)+(7)
(6) O&M Equipment Cost	
18) O&M Equipment Cost	
(7) Contingency	
19) Price Contingency	18)*rate%
20) Physical Contingency	(18)+19))*10%
3 Engineering Cost	(8)+(9)
(8) Engineering Cost	
21) Feasibility Study	
22) Detailed Design	
23) Procurement Assistance	
24) Construction Supervision	
(9) Contingency	25)+26)
25) Price Contingency	(21)+..+24))*rate%
26) Physical Contingency	(21)+..+25))*10%
4 SPC Setup Cost	(10)+(11)
(10) SPC Setup Cost	
(11) Contingency	27)+28)
27) Price Contingency	(10)*rate%
28) Physical Contingency	((10)+27))*10%
5 Project Management Cost	(12)+(13)
(12) Project Management Cost	
(13) Contingency	29)+30)
29) Price Contingency	(12)*rate%
30) Physical Contingency	((12)+29)*10%
6 Other Cost	(14)+(15)
(14) Other Cost	
(15) Contingency	31)+32)
31) Price Contingency	(14)*rate%
32) Physical Contingency	((14)+31)*10%
7 Land Acquisition and Compensation Cost	(16)+(17)
(16) Land Acquisition and Compensation Cost	
(17) Contingency	33)+34)
33) Price Contingency	(16)*rate%
34) Physical Contingency	(16)+33)*10%
8 Value Added Tax	(18)
(18) Value Added Tax	sum(1-4)*10%

Source: JICA Study Team

7.10.4 Cost Estimate Methodology

(1) Basic Cost Estimate Methodology for Construction Cost

In accordance with Circular No. 04, cost-based estimate is basically applied as the methodology. The basic methodology for cost estimate in this Study is based on the general unit cost (GUC). The GUC consists of direct cost (material, labor, and equipment), other direct costs, and indirect costs as shown in Table 7.10.3. Construction cost is computed based on the GUC and estimated quantity.

(2) Environment Monitoring Cost

The costs for update of EA/EMP, report of RAP, environmental monitoring, and internal and external monitoring for land acquisition are estimated at about VND 13,900 million.

(3) O&M Cost

The conditions and result of the cost estimate for O&M are shown in Section 7.10.

(4) Land acquisition and Compensation Cost

The conditions and result of the cost estimate for land acquisition and compensation are shown in Section 7.11.

(5) SPC Setup Cost

Under the BOT/PPP Scheme, Investor's Study cost, SPC-setup cost, and SPC advisory cost are estimated at about VND 1,250 billion.

(6) Engineering Cost

Engineering cost is estimated based on the cost estimate of the F/S. The cost of the F/S undertaken by BVEC is included in engineering cost.

(7) Project Management Cost and Other Cost

Project management cost and other costs incurred during construction stage are estimated based on Circular No.04/2010/TT-BXD.

7.10.5 Conditions of Construction Cost Estimate

(1) Time reference of Cost Estimate

The Cost Estimate is as of the first quarter of 2011.

(2) Currency

The funds for the project as stated in this Study is assumed to be sourced from PSIF. In this project, JPY is used as the unit for foreign currency, and VND is used as the unit for local currency.

(3) Exchange Rate

Exchange rates used are as shown below:

1 JPY = 252.305 VND (as of 31 March 2011)

1 US$ = 20,906 VND = 82.86 JPY (as of 31 March 2011)

(4) Classification Condition of Currency

Table 7.10.4 shows the classification condition of currency in this Study.

Table 7.10.4 Classification Condition of Currency

Item	Description
1 Construction Cost	
(1) Construction Cost	The currency was divided into F/C and L/C
(2) All Risk Insurance Premium	The cost was in F/C assuming insurance at cotracotor's home country
(3) HIV Prevention Program Cost	The cost was in L/C
(4) Environmental Monitoring Cost	The cost was in L/C
(5) Contingency	The cost was divided into F/C and L/c
2 O&M Cost	
(6) O&M Equipment Cost	The currency was divided into F/C and L/C
(7) Contingency	The cost was divided into F/C and L/c
3 Engineering Cost	
(8) Engineering Cost	The cost was in L/C
(9) Contingency	The cost was in L/C
4 SPC Setup Cost	
(10) SPC Setup Cost	The cost was divided into F/C and L/C
(11) Contingency	The cost was divided into F/C and L/C
5 Project Management Cost	
(12) Project Management Cost	The cost was in L/C
(13) Contingency	The cost was in L/C
6 Other Cost	
(14) Other Cost	The cost was in L/C
(15) Contingency	The cost was in L/C
7 Land Acquisition and Compensation Cost	
(16) Land Acquisition and Compensation Cost	The cost was in L/C
(17) Contingency	The cost was in L/C
8 Value Added Tax	
(18) Value Added Tax	VAT was in L/C

Source: JICA Study Team

(5) Price Escalation Rate

Price escalation rate is described in Section 8.1.2.

(6) Physical Contingency Rate

Physical contingency rate applied is 10%.

(7) Value of Estimated Cost

The construction cost is estimated for the 2011 present value. The project cost that considers the future escalation is summarized in Section 8.1.2.

7.10.6 Updated Construction Cost

(1) Total Construction Cost

Total construction costs for Phase-1 and for road widening are shown in Table 7.10.5. Breakdown of total construction cost for Phase-1 is shown in Table 7.10.6.

Table 7.10.5 Total Construction Cost (2011 Price)

Item	by Currency		Currency Exchange	
	Foreign Currency (Million JPY)	Local Currency (Million VND)	Foreign Currency (Million JPY)	Local Currency (Million JPY)
Total Construction Cost of Phase-1	5,755	9,668,612	44,076	11,120,664
Total Construction Cost for Widening	465	994,195	4,406	1,111,617

Note: Cost is 2011 Price excluding Price Contingency
Source: JICA Study Team

Table 7.10.6 Breakdown of Total Construction Cost (2011 Price)

Item	Total Construction Cost			
	by Currency		Currency Exchange	
	Foreign Currency (Million JPY)	Local Currency (Million VND)	Foreign Currency (Million JPY)	Local Currency (Million JPY)
Total Construction Cost	5,755	9,668,612	44,076	11,120,664
1 Construction Cost	5,208	5,582,718	27,335	6,896,816
(1) Construction Cost				
a) Expressway				
1) Earth Work	242	549,117	2,418	610,130
2) Soft Ground Treatment	33	75,598	333	83,997
3) Pavement	642	1,457,479	6,419	1,619,422
4) Other Items	236	534,989	2,356	594,433
5) Transport Organization	9	20,988	92	23,320
6) Drainage	34	77,980	343	86,645
b) Structure				
7) Bridge on Expressway	234	236,589	1,172	295,736
8) Overpass	338	340,758	1,688	425,947
9) Underpass	90	91,049	451	113,811
10) Bridge over Railway	444	448,108	2,220	560,135
11) Interchange	620	625,290	3,098	781,612
12) Flyover Bridge along Expressway	151	152,363	755	190,454
c) Other Works				
13) Electrical Work	60	35,117	199	50,283
14) O&M Building - Operation Office	117	265,045	1,167	294,494
15) ITS + Operation Office	1,240	144,640	1,813	457,447
(2) All Risk Insurance Premium	245		245	61,879
(3) HIV Prevention Program Cost		6,188	25	6,188
(4) Environmental Monitoring Cost	0	13,900	55	13,900
(5) Contingency				
16) Price Contingency	0	0	0	0
17) Physical Contingency	473	507,520	2,485	626,983
2 O&M Cost	220	91,254	581	146,708
(6) O&M Equipment Cost				
18) O&M Equipment Cost	200	82,958	529	133,371
(7) Contingency				
19) Price Contingency	0	0	0	0
20) Physical Contingency	20	8,296	53	13,337
3 Engineering Cost	0	509,697	2,020	509,697
(8) Engineering Cost				
21) Feasibility Study	0	18,182	72	18,182
22) Detailed Design	0	197,798	784	197,798
23) Procurement Assistance	0	12,213	48	12,213
24) Construction Supervision	0	235,169	932	235,169
(9) Contingency				
25) Price Contingency	0	0	0	0
26) Physical Contingency	0	46,336	184	46,336
4 SPC Setup Cost	327	55,000	545	137,500
(10) SPC Setup Cost	297	50,000	495	125,000
(11) Contingency				
27) Price Contingency	0	0	0	0
28) Physical Contingency	30	5,000	50	12,500
5 Project Management Cost		30,212	120	30,212
(12) Project Management Cost		27,466	109	27,466
(13) Contingency				
29) Price Contingency		0	0	0
30) Physical Contingency		2,747	11	2,747
6 Other Cost		391,481	1,552	391,481
(14) Other Cost		355,892	1,411	355,892
(15) Contingency				
31) Price Contingency		0	0	0
32) Physical Contingency		35,589	141	35,589
7 Land Acquisition and Compensation Cost		2,239,178	8,875	2,239,178
(16) Land Acquisition and Compensation Cost		2,035,616	8,068	2,035,616
(17) Contingency				
33) Price Contingency		0	0	0
34) Physical Contingency		203,562	807	203,562
8 Value Added Tax		769,072	3,048	769,072
(18) Value Added Tax		769,072	3,048	769,072

Note: Cost is 2011 Price excluding Price Contingency
Source: JICA Study Team

(2) Annual Disbursement

Annual disbursement in this Study is shown in Table 7.10.7. Annual fund requirement is based on the construction schedule as shown in Section 7.8.4.

Table 7.10.7 Annual Disbursement (2011 Price)

Phase-1	2011年		2012年		2013年		2014年		2015年	
	FC (Million JPY)	LC (Million VND)	FC (Million JPY)	LC (Million VND)	FC (Million JPY)	LC (Million VND)	FC (Million JPY)	LC (Million VND)	FC (Million JPY)	LC (Million VND)
Annual Disbursement	27	426,129	54	1,208,347	1,287	3,121,364	1,891	2,342,169	2,495	2,570,604

Widening	2027年		2028年		2029年	
	FC (Million JPY)	LC (Million VND)	FC (Million JPY)	LC (Million VND)	FC (Million JPY)	LC (Million VND)
Annual Disbursement	22	56,440	211	451,859	232	474,154

Note: Cost is 2011 Price Excluding Price Contingency
Source: JICA Study Team

(3) Construction Cost of Section for Phase-1

Construction cost by the each section for Phase-1 in this Study is shown in Section 7.8.2. The estimate of costs of Expressway civil work and Electrical works for each package is based in proportion with the sectional distances.

(4) Comparison with the F/S

Construction cost for Phase-1 in this Study is estimated at VND 11,120 billion compared with VND 10,292 billion (excluding price escalation) in the F/S. There is an 8% increase in cost compared with the cost from F/S, which as mentioned excluded price escalation. The major reasons for the increase in cost are due to SPC set-up, bridge cost, O&M facility cost, and land acquisition cost.

7.10.7 O&M Cost

O&M cost after opening of the Bien Hoa – Vung Tau Expressway was estimated based on the O&M plan mentioned in Section 7.11.8(2). Table 7.10.8 shows the O&M cost estimate results.

Table 7.10.8 Cost Estimate Result of O&M after Opening

Class	Unit	O&M Cost (by Currency)		O&M Cost (Currency Exchange)	
		F/C ('000 JPY)	L/C (mil. VND)	F/C ('000 USD)	L/C (mil. VND)
Annual Cost from 2016 to 2025 (10 years)	Labor Cost	0	10,714	42,463	10,714
	Material Cost	0	493	1,954	493
	Vehicle Maintenance Cost	5,680	2,715	16,441	4,148
	Machine (Fuel) Cost	0	2,557	10,136	2,557
	Facility Cost	0	21,196	84,011	21,196
	Consumable Equipments	52	125	548	138
	Total Cost	5,733	37,800	155,553	39,247
Annual Cost from 2026	Labor Cost	0	10,714	42,463	10,714
	Material Cost	0	19,927	78,978	19,927
	Vehicle Maintenance Cost	5,680	2,715	16,441	4,148
	Machine (Fuel) Cost	0	6,878	27,259	6,878
	Facility Cost	0	21,196	84,011	21,196
	Consumable Equipments	52	125	548	138
	Total Cost	5,733	61,554	249,701	63,001
Every 10 years after opening	O&M Vehicle Renewal	90,426	37,301	238,268	60,116

Note: All costs are in present value
Source: JICA Study Team

The annual cost of SPC operation after opening the expressway is estimated to be about VND 2.25 billion.in consideration of three employee's costs.

Total project cost including O&M costs is summarized in Section 8.1.2.

7.10.8 Items to be forwarded to Detailed Design Stage

The difference between the cost estimates in this Study and in the F/S is not that significant.

In detailed design stage, referring to the cost structure that JICA Study Team recommended, it is essential that the estimate of the construction cost is based on the detailed results of the survey, investigation, design and BOT/PPP Scheme.

7.11 Preliminary Review of O&M Plan

7.11.1 O&M Plan in the F/S

In the F/S, contents regarding O&M are compiled in the main volume of the report and on the drawings as listed in Tables 7.11.1 to 7.11.3.

Table 7.11.1 Contents of the F/S (1/3)

Table of Contents	Contents
12.2 OPERATION AND MANAGEMENT SYSTEM	
12.2.1 Expected Operation and Management System	Component of O&M facilities
12.2.2 Expressway Operation Center	Role of operation office, O&M Organization, Outlines of management system
12.2.3 Toll collection system	Toll collection system plan (Toll type, Toll collection method, Extent of toll charging, Toll gate allocation, Toll collection equipment, Management equipment)
12.2.4 The control and operation system	Outline of traffic management system plan (CCTV system, Traffic volume measuring system, Variable message sign system, Emergency telephone system), Outline of communication system plan
12.3 SCOPE OF INVESTMENT AND CONSTRUCTION SITE	
12.3.1 Construction site	O&M facilities (Operation office, Maintenance office, Toll collection gate, Service station) layout plan
12.3.2 Scope of Investment	O&M facilities (Operation office, Maintenance office, Toll collection gate, Service station) plan (Component and necessary scale of O&M facilities)
12.4 MAIN TECHNICAL SOLUTION	
12.4.1 Architecture solution:	Solution of horizontal design of the toll gate and service station
12.4.2 Structure Options	Design option of building structure and pavement design of O&M facilities (Operation office, Maintenance office, Toll collection gate, Service station)

Source: F/S

Table 7.11.2 Contents of F/S (2/3)

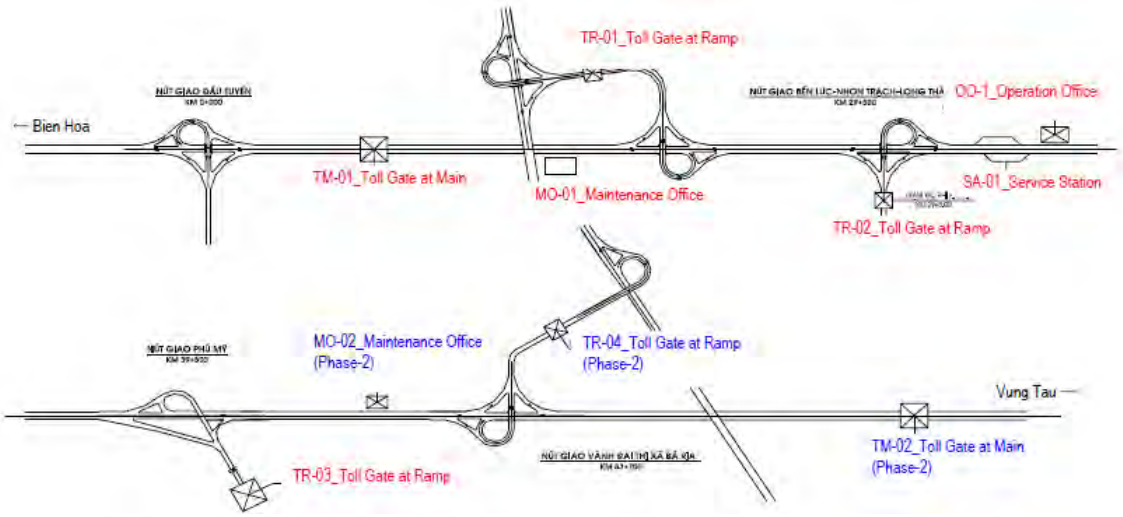
Table of Contents	Contents
CHAPTER 15 OPERATION AND MAINTENANCE PLAN 15.1 ORGANIZATION OF OPERATION AND MAINTENANCE	
15.1.1 Works for Management and Operation	Scope of O&M and component of O&M facilities
15.1.2 Intelligent Transportation Systems (ITS)	Outline of ITS system plan (CCTV system, Traffic volume measuring system, Variable message sign system, Emergency telephone system 、 Weather observation system, Communication system, Inter-phone system, Mobile radio communication system, Weighting system, Toll collection system) (Quantity, Arrangement criteria)
15.2 MANAGEMENT RESPONSIBILITIES OF AGENCIES	
15.2.1 Expressway Operation Center	Role of the operation office
15.2.2 Maintenance Center	Role of the maintenance office
15.2.3 Toll collection office at intersections	Role of the toll collection gate
15.2.4 Service Station	Role of the service station
15.3 PROPROSED ORGANIZATIONAL MODEL OF MAINTENANCE COMPANY	Role of O&M company and its organization
15.4 ESTIMATED PERSONNEL FOR MANAGEMENT AND OPERATION	Organization and staffing plan of the O&M company (Operation office, Maintenance office, Toll collection gate, Service station)

Source: F/S

Table 7.11.3 Contents of F/S (3/3)

Table of Contents	Contents
Design Outlines	
I. Design Basic	
1. Legal Document	Enacted decrees and decisions
2. Design Summary	Outline of the O&M facilities design (Operation office, Maintenance office, Toll collection gate, Service station) (Component and necessary scale of the O&M facilities)
3. Applied Design Standard and Criteria	Applied design standards (Architect, Structure, Power supply, Water supply, Geological survey)
II. Construction Description	
1. Total Land Planning	Concept of the O&M facilities arrangement plan
2. Architecture Design Consideration	Design policy of building structure and pavement of the O&M facilities (Operation office, Maintenance office, Toll collection gate, Service station)
3. Toll Station Process Line Plan	General outline of ETC system and necessary equipments
4. Infrastructure System	Note of design for reclaimed land, power supply facility and lighting, fire-fighting, information system, pollution and waste disposal
5. Structure Solution	Specification of building
6. Design Results	Contents of the O&M facilities design (Operation office, Maintenance office, Toll collection gate, Service station) (Component and design conditions (Capacity, Necessary area of each facilities))
Drawings	
General Layout Plan of O&M Buildings	General layout plan of the O&M facilities (See Figure 7.11.1)
Operation Office Design Drawings	General plan、Building (Plan, Profile, and Detail Drawings)
Service Station Design Drawings	General plan、Building (Plan, Profile, and Detail Drawings)
Toll Gate Station Design Drawings	General plan、Building and toll booth (Plan, Profile, and Detail Drawings)

Source: F/S



Source: F/S

Figure 7.11.1 General Layout Plan of O&M Facilities

7.11.2 Scope of O&M

Outline of the scope of O&M is mentioned in the F/S. However, detailed scope included in the O&M service is not clearly mentioned in the F/S.

O&M of expressway is divided roughly into the following nine aspects:

- Asset Management
- Traffic Control and Surveillance
- Information Management
- Emergency Management
- Patrols
- Heavy Loaded Vehicle Regulation
- Breakdown Service
- Equipment Operation
- Toll Collection

The O&M plan for the BVEC shall take into consideration the required Level of Service (LOS) and requirements based on laws and regulations of Vietnam, as well as good practices applied in developed countries.

Table 7.11.4 Scope of O&M Services

No.	Categories	O&M Services
1	Asset Management	
	a) Periodic Maintenance	- Routine and periodic inspections, cleaning, planting, and traffic regulations
	b) Repair	- Repair of pavement, repair of bridges and structures
	c) Fixing and Improvement	- Fixing of cavities on pavements, functional improvement of bridges and structures, ground elevation improvement for sections with settlement problems, improvement of ITS
2	Traffic Control & Surveillance	- Collection of traffic information - Traffic control
3	Information Management	- Provision of traffic information
4	Emergency Management	- Response to accidents
5	Patrol	- Traffic patrol
6	Heavy Loaded Vehicle Regulation	- Identification of offending vehicles
7	Breakdown Service	- Breakdown service
8	Equipment Operation	- Inspection of road facilities and buildings - Garage service
9	Toll Collection	- Toll collection

Source: JICA Study Team

7.11.3 Fundamental Components of O&M on Expressways

The fundamental components that are necessary in O&M implementation on expressways are: i) Institutions, ii) Standards, iii) Organization, iv) Facilities and Equipment, v) Enforcement and Regulation, vi) Intelligent Transport Systems (ITS). The appropriate planning and preparation of these components prior to expressway operation is essential.

(1) Institutions

The necessary institutions shall be set up in order to clarify and delineate responsibilities of different parties involved in O&M.

(2) Standards

O&M works on expressways mainly consists of traffic operation, road maintenance, and toll fee collection. The establishment of standards for each work is essential in the effective and efficient implementation of works.

(3) Organization

O&M of expressways requires an appropriate organizational set up suitable to the type of institutions that will be formed. Likewise, depending on the type of road structure and/or traffic characteristics; the location arrangement, organizational structure, and staff composition are considered critical factors in the effective implementation of O&M works.

(4) Facilities and Equipment

The facilities and equipment necessary for O&M activities such as office building, vehicles, communication systems, and maintenance materials and equipments shall be properly planned.

(5) Enforcement and Regulation

In order to properly implement expressway operation by the road administrator, administrative demarcation of responsibilities for traffic enforcement and regulation between the administrator and concerned regulatory authority shall be clarified.

(6) ITS

In addition to the fundamental components of O&M mentioned above, ITS should be taken into account in the overall O&M plan. ITS is a new approach in tackling the transport-related problems such as traffic congestion, traffic accident and air pollution. Unlike the conventional measures of physical improvement, ITS utilizes information and communication technologies to promote efficient, convenient and safe transport systems. Some of the applicable ITS technologies to expressways are electronic toll collection (ETC) system, traffic surveillance system, and traffic information system, etc.

The review of the feasibility study is anchored on the perspective that the proposed O&M setup is in conformity with the above fundamental components in order to ensure an effective O&M plan.

7.11.4 ITS System

The more traditional type of expressways normally has controlled access only at toll gates to maintain efficient and fast traffic flow. The occurrence of accidents, disasters, and traffic congestion on these type of expressways, which can seriously affect the traffic flow, remains poorly monitored. Therefore, traffic control system consisting of roadside data collection and

traffic information provision system is considered vital in attaining an enhanced monitoring and management of the tollway's operational activities. These communication systems process information from road side data collection system, then transmits it to the traffic information provision system and control centers.

Automatic and semi-automatic toll collection system can be applicable on sections of the expressway with high traffic volume. Adopting this collection system will result into reduction of operational cost for toll collection and stop over time. However, the analysis must take into consideration the higher investment cost needed for the procurement of a more advanced collection system.

(1) Traffic Control System Plan

The essential items in formulating a traffic control system include roadside data collection, traffic information provision and control center are reasonably proposed in the F/S and are as shown in Table 7.11.5. The arrangement criteria, general specifications and preliminary cost estimate for the proposed traffic control system were also prepared in the F/S. The results of the review of the traffic control system plan conducted by the study team are shown below:

Table 7.11.5 Traffic Control System Plan by the F/S (Phase 1+2)

Traffic Control System Plan			Contents
Traffic Control System	Roadside Data Collection System	Emergency Telephone System	Both sides for every 2 km
		Traffic Volume Measuring System	Both sides for every 2 km
		Weighing System	One at entrance gate of the each toll collection gate
		CCTV Camera System	One each at merging and branching sections
		Weather Observation System	One at operation office
		Mobile Radio Communication System	65 sets
	Traffic Information Provision System	Variable Message Sign	One each at merging sections, 3 on Thruway
	Center System	Traffic Control Center System	One at operation office
	Drawings		Not prepared
	Cost Estimate		Estimated based on above plan

Source: JICA Study Team

1) Emergency Telephone System

The proposal in the F/S is to install emergency telephones on each side of the expressway with distance intervals of 2 km. As an alternative means of communication between expressway users and O&M administrator during emergency situations, the utilization of mobile phones seems suitable due to its widespread use in Vietnam. However, the identification of potential accident locations and advertisement of emergency telephone numbers for expressway users will be addressed under emergency management guidelines.

2) Traffic Volume Measuring System and CCTV Camera

Proposed in the F/S is the installation of traffic volume measuring device on both sides for every 2 km, and one CCTV camera on each merging and branching sections. The study team proposed to install additional CCTV cameras on both sides at toll collection gates located at start and end points. The type of traffic volume measuring device is not mentioned in F/S. The study team proposed to introduce ultrasonic type due to it being inexpensive and relatively easy to maintain compared with the other types.

3) Weighing System

The proposal in the F/S is to install weighing device at entrance gates of each toll collection gate. Application of the weighing system on all toll collection gates is appropriate due to the forecast high volume of heavy vehicles. The study team recommends axle load measurement type of weighing system due to its speedy and easy measurement features.

4) Weather Observation System

The installation of one weather observation system in the operation office area is proposed in the F/S. The installation of just one weather observation system is sufficient as the weather condition of the entire expressway would almost be the same due to an expressway length of only 46 km and with terrain features which is generally plain.

5) Mobile Radio Communication System

The proposal in the F/S is to procure and utilize 65 sets of mobile radios. However, as per assessment of the study team, the number of the mobile radio seems excessive compared with the number of O&M staff that needs mobile radio communication.

6) Variable Message Sign

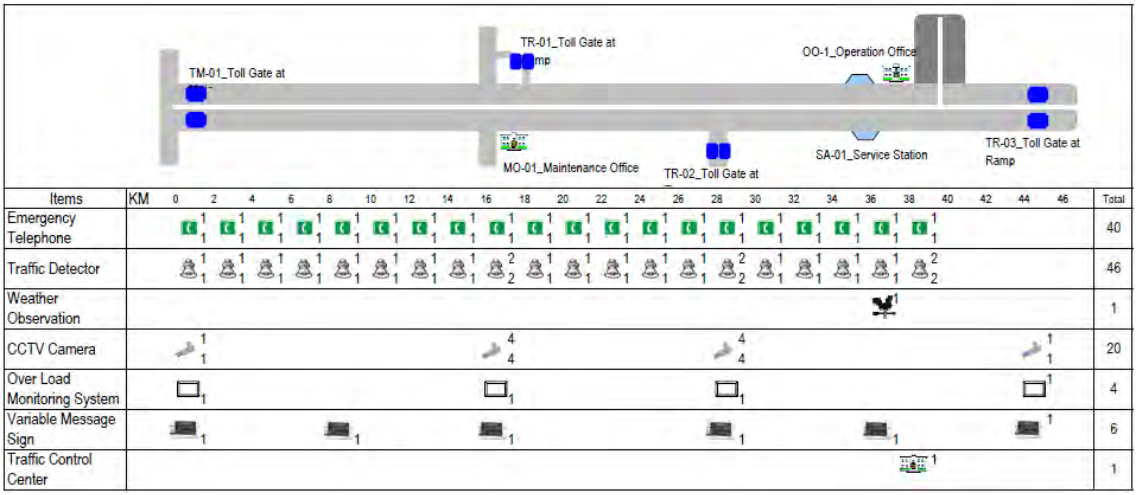
In the F/S, the proposal is to install variable message sign boards on merging sections at each interchange and 3 on thruway. The study team proposed to install additional variable message sign boards on entrances of toll collection gates located at the start and end points, as well as 2 other locations (at KM 8 and KM 36) on the thruway. This additional plan will ensure dissemination of expressway information about road and traffic conditions to users.

7) Traffic Control Center System

The proposal in the F/S is to install traffic control center system at the operations office to consolidate information related to traffic monitoring and management.

(2) Proposed Traffic Control System Arrangement Plan

Figure 7.11.2 shows the proposed traffic control system arrangement plan based on above review results by the study team. The study team suggested revision of the cost estimate of the traffic control system on the F/S based on the proposed plan.



Source: JICA Study Team

Figure 7.11.2 Proposed Traffic Control System Plan (Phase 1)

(3) Toll Collection System Plan

The proposed toll collection receiving method by the F/S is the one-stop type (toll collector provides ticket at entrance gate, and receive toll fee at exit gate), non-stop type (toll collector check monthly ticket and etc at exit gate), and automatic toll collection system (ETC). The proposed electronic type of toll collection method in the F/S is the pre-paid IC card with on-board unit (OBU). However, the type of information relay system between antenna and OBU is not planned in the F/S. In order to introduce comparison with other types, such as Passive DSRC and Infrared Ray Method, the use of Active DSRC system is recommended due to its main advantage of higher transmission speed making its application suitable to the huge traffic volume characteristic of the expressway.

Table 7.11.6 Toll Collection System Plan by the F/S (Phase 1+2)

Toll Collection System Plan			Contents
Toll Collection System	Toll Collection System	Location	2 Toll Plazas on Main (Sta. 1+200, Sta. 65+250: total area 15,090 m2) 4 Toll Plazas on Lamp (Sta. 16+600, Sta. 29+500, Sta. 45+250, Sta. 53+700: total area 14,350 m2)
		Toll Collection System	ETC gate, One-Stop gate, Gate for Axle Load Measurement
		Information Provision System	No plan
	Drawings		Toll Collection Gate Plan only
	Cost Estimate		Estimated based on above plan

Source: JICA Study Team

(4) Communication System Plan

The proposal in the F/S is to install optical fiber for communication system among traffic control systems. However, the installation length of the optical fiber is not mentioned in F/S. The study team proposed installation of double length of the optical fiber on the entire stretch of the expressway.

Table 7.11.7 Communication System Plan by the F/S

Communication System Plan		Contents
Communication System	Communication System	Optical Fiber, Metal
	Drawings	Not prepared
	Cost Estimate	Estimated, but unclear estimation basis

Source: JICA Study Team

7.11.5 O&M Office (Operation Office and Maintenance Office) and Service Station

(1) Operations Office

Operations office is planned at an intermediate location on the entire expressway (with the length including phase 2 on the F/S). The proposed location of the operations office will facilitate access from the entire length of the expressway. There should be sufficient space on the proposed operations office/facilities to accommodate the proposed number of staff.

Shown in Table 7.11.4 are the major functions of the operations office which include planning of O&M services and monitoring of O&M activities. The responsibilities of traffic monitoring and management are of primary importance in the performance of the operations office.

Table 7.11.8 Operations Office Design on the F/S (Phase 1)

Operations Office Plan		Contents
Operations Office	Location	1 location (Sta. 37+000)
	Area	Land for acquisition: 57,316m^2 Site area: 33,000 m^2
	Staff	81 people
	Facilities	Office: 1,870 m^2 Service house: 2,700 m^2 Vehicle parking and Storage: 180 m^2 Culture house :450 m^2 Parking: 72 m^2
	Equipment	- Transformer station - Wastewater treatment station - Pumping station - PC and LAN system, printer - Closed television system - Control equipment - Data storage equipment
	Drawings	Plan, Profile, and Detail Drawings
	Cost Estimate	Estimated based on above plan

Source: JICA Study Team

(2) Maintenance Office

Maintenance office is planned at an intermediate location of the entire expressway at phase 1 stage as based on the F/S. The proposed location of the maintenance office will facilitate access from the whole stretch of the expressway. There should be sufficient space on the proposed maintenance office/facilities to accommodate the proposed number of staff.

Major function of the maintenance office is to undertake routine maintenance, such as cleaning and inspection activities, in compliance with the O&M service plan.

Table 7.11.9 Maintenance Office Plan by the F/S (Phase 1)

Maintenance Office Plan		Contents
Maintenance Office	Location	1 location (Sta. 16+000)
	Area	Land for acquisition: 13,700 m^2 Site area: 5,900 m^2
	Staff	33 people
	Facilities	Office: 484 m^2 Worker's dormitory: 700 m^2 Vehicle parking and Storage: 113 m^2 Canteen: 260 m^2
	Drawings	Plan, Profile, and Detail Drawings
	Cost Estimate	Estimated based on above plan

Source: JICA Study Team

(3) Service Station

Service station is planned at an intermediate location of the entire expressway including phase 2 as based on the F/S. The organizational and staffing plan of the service station, which includes shops, hotel, gas station, etc, are proposed in the F/S. However, the management system of commercial facilities in the service station is not mentioned in F/S. The study team recommends that the management of commercial facilities be outsourced through tendering.

Table 7.11.10 Service Station Plan by the F/S

Service Station Plan		Contents
Service Station	Location	One location on both sides (Sta. 36+500)
	Area	Land for acquisition: 130,490 m^2 Site area: 92,220 m^2
	Staff	135 people (includes staff in hotel, shop, gas station)
	Facilities	Service house, Hotel, Toilets, Supermarket, Office, O&M station, Gas station
	Drawings	Plan, Profile and Detailed Drawings
	Cost Estimate	Estimated based on above plan

Source: JICA Study Team

(4) O&M Office (include Service Station) Organization and Staff

The proposal in the F/S of the organizational and staffing plan for O&M office including service station is as shown in Table 7.11.11. However, allocation of personnel on the proposed

organizational structure as well as staff for each O&M office is not clearly mentioned in F/S.

Table 7.11.11 O&M Office Personnel Plan by the F/S

O&M Office Personnel Plan		Contents
O&M Office Personnel	Organization	Director Deputy Director Administration-Personnel Dept. Planning Dept. Finance-Accounting Dept. Equipment-Technology Management Dept. Traffic Management Dept. Toll Management Dept. Service Center Toll Collection Offices Traffic Management Center Operation Office
	Number of Staff	Toll Collection Gate (Thruway): 91 people Toll Collection Gate (Ramp): 44 people × 3 locations Operation Office: 81 people Maintenance Office: 33 people Service Station 135 people
	Cost Estimate	Estimated as lump sum, but unclear estimation basis

Source: JICA Study Team

The formulation of functional O&M organization for an expressway project is essential in the constant maintenance of required road and traffic conditions. The study team proposed appropriate O&M organizational structure and staffing plan based on Japanese practice.

1) <u>Operations Office</u>

The Operations Office is composed of General Affairs division, Administration division, Toll Management division, Engineering division, Road Maintenance division, and ITS Maintenance division. Moreover, the traffic control center shall be established as part of the operations office as shown in Figure 7.11.3.

Table 7.11.12 Proposed Organizational and Staffing Plan of Operations Office

Division	People	Staffing Composition
Director General Deputy Director General	3	Director General: 1, Deputy Director General: 2（Administration, Engineering）
General Affairs Division	7	Manager: 1, General administration: 2, Finance and accounting: 2, Public affairs･External affairs: 2
Administration Division	3	Manager: 1, Assets: 1, Traffic management: 1
Toll Management Division	4	Manager : 1, Toll collection: 1, Card･OBU: 1, Service･Settlement: 1
Engineering Division	3	Manager : 1, Budget: 1, Asset: 1
Road Maintenance Division	3	Manager : 1, Planning: 2（Maintenance work: 1、Pavement + Structures: 1）
ITS Maintenance Division	3	Manager : 1, ITS: 2
Total	26	

Source: JICA Study Team

2) Maintenance Office

Maintenance office will be comprised of the general affairs section, administration section, toll management section, engineering section, road maintenance section, and ITS maintenance section. The main function of these sections/divisions is to implement O&M works in compliance with the O&M service plan. Shown in Figure 7.11.3 are the different units for traffic operation, road maintenance, ITS maintenance, service station, and ETC service that will also be established to undertake the routine O&M activities. As for service work on ETC cards and commercial facilities in service station, outsourcing through tendering is recommended.

Table 7.11.13 Proposed Organizational and Staffing Plan of Maintenance Office

Section	People	Staffing Composition
Manager Deputy Manager	3	Manager: 1, Deputy Manager: 2（Administration, Engineering）
General Affairs Section	3	Manager: 1, General administration: 1, Finance and accounting: 1
Administration Section	1	Manager : 1
Toll Management Section	1	Manager : 1
Engineering Section	2	Manager : 1, Engineering: 1
Road Maintenance Section	1	Manager : 1
ITS Maintenance Section	1	Manager : 1
Total	12	

Source: JICA Study Team

3) Service Station Unit

The total number of personnel in the service station unit is estimated based on the F/S. This total will be reduced further by the number of personnel assumed to be acquired through tendering.

4) ETC Service Unit

Service work for ETC cards is assumed to be outsourced. Therefore, only management personnel are proposed for assignment on different ETC service units such as card, OBU, service, and accountant sections.

5) Toll Collection Gate

Proposed personnel on toll collection gates are as shown in Tables 7.11.14 and 7.11.15. Number of personnel listed in Table 7.11.15 is only for a single toll collection gate.

Table 7.11.14 Proposed Organization and Staff of Toll Collection Gate (Thruway)

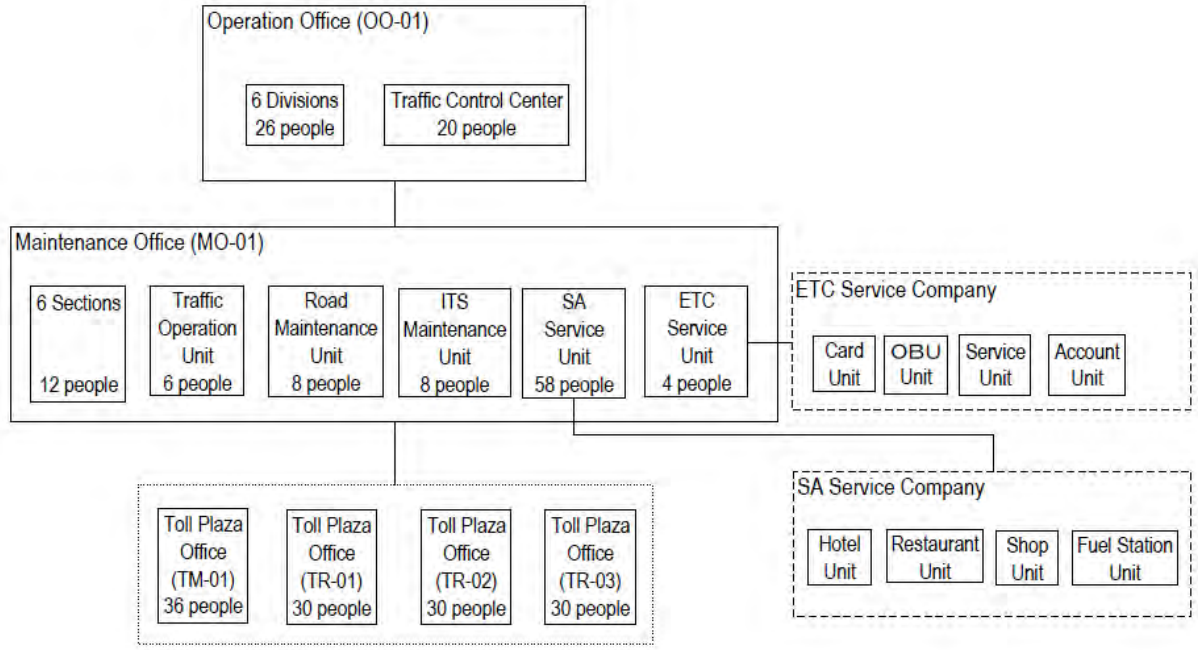
Section	People	Staffing Composition
Office Staff	9	(Chief: 1＋Staff: 2） ×3 party
Collector	27	Chief: 1×3 party, 6 booths (Other than ETC booth)×3 party, Security: 2×3 party
Total	36	

Source: JICA Study Team

Table 7.11.15 Organization and Staff of Toll Collection Gate (Ramp)

Section	People	Staffing Composition
Office Staff	9	(Chief: 1＋Staff: 2） ×3 party
Collector	21	Chief: 1×3 party, 4 booths (Other than ETC booth)×3 party, Security: 2×3 party
Total	30	

Source: JICA Study Team



Source: JICA Study Team

Figure 7.11.3 Proposed Organization and Staffing Plan of Entire O&M Facilities

(5) Vehicle Allocation at O&M Office

The proposed type and number of vehicles under the O&M vehicle allocation plan in the F/S is shown in Table 7.11.16. Based on the assessment of the study team, the vehicle allocation plan does not satisfy the requirement on type of vehicle and O&M work volume. The study team proposed a revised vehicle allocation plan to meet the estimated O&M work volume and the required level of service as shown in Table 7.11.17.

Table 7.11.16 Vehicle Allocation at O&M Office Plan by the F/S

Vehicle Allocation at O&M Office Plan		Contents
Vehicle Allocation at O&M Office	Type and Number of Vehicle	Pick-up Truck: 2 Truck (2.5t): 2
	Cost Estimate	Estimated based on above plan

Source: JICA Study Team

Table 7.11.17 Proposed O&M Vehicle Allocation Plan

Vehicle	Operation Office	Traffic Control Center	Maintenance Office	Traffic Operation Unit	Road Maintenance Unit	ITS Maintenance	Toll Collection Gate (Thruway)	Toll Collection Gate (Ramp) ×3 locations	Total
Superintendent Car	2	1	1						4
Staff Car	1	1	1				1	3	7
Patrol Car				3	1	1			5
Road Maintenance Car					2	2			4
Road Sweeper					1				1
Water Sprinkler					1				1
Sign Truck					1	1			2
Truck					1	1			2
Wrecker Truck				1					1
Cargo Truck					1				1
Aerial Platform Truck					1	1			2
Fire Fighting Car				1					1
Ambulance Car				1					1
Total	3	2	2	6	9	6	1	3	32

Source: JICA Study Team

7.11.6 Examination of O&M Standard

(1) Temporary O&M Standards for the Expressway in Vietnam

"Temporary Manual on O&M Management for HCMC-Trung Luong Expressway" was established by MOT as the first O&M standards for expressways in Vietnam. However, the method and frequency of O&M activities such as inspection, repair, cleaning, and traffic surveillance are inadequately mentioned in the manual. These activities and the corresponding review results are shown in Table 7.11.18. Therefore, method and frequency of the O&M activities as well as the required level of service for O&M works will be examined and compared if in accordance with O&M standards used in Japan and other developed countries.

Table 7.11.18 Preliminary Review Results of "Temporary Manual on O&M Management for HCMC-Trung Luong Expressway"

Review Items			Review Results
Applicable O&M Regulation			No reference in F/S
Level of Service	Inspection	Type of Inspection	As stipulated in Draft Manual*
		Inspection Items by Location	As stipulated in Draft Manual*
		Evaluation Items and reference Value for Repair	Items are stipulated in Draft Manual*, but no reference value
		Evaluation Items and reference Value for Cleaning	Items are stipulated in Draft Manual*, but only partial reference value
	Repair	Repair Plan	As stipulated in Draft Manual*
		Repair Frequency	As stipulated in Draft Manual*
	Cleaning	Cleaning Plan	Items are stipulated in Draft Manual*
		Cleaning Frequency	No frequency value and detail method
	Traffic Control	Traffic Control Frequency	As stipulated in Draft Manual*, but no detail method
		Traffic Control Organization System	Items are stipulated in Draft Manual*, but no frequency value and detail method
	ITS O&M	Type of Inspection	As stipulated in Draft Manual*
		Periodic Service and Measures against hindrance	As stipulated in Draft Manual*

*Temporary Manual on O&M Management for HCMC-Trung Luong Expressway
Source: JICA Study Team

(2) Examination of O&M Standard

The operation of the Bien Hoa – Vung Tau Expressway is schedule to start in 2016. The future traffic demand as forecasted in this study is shown in Table 7.11.19.

Table 7.11.19 Future Traffic Demand Forecast Results of Bien Hoa – Vung Tau Expressway

Year	2015	2020	2025	2030	2035
ADT (pcu)	26,000～38,000	33,000～44,000	37,000～59,000	43,000～78,000	64,000～100,000

Source: JICA Study Team

Future traffic demand forecast result shows sectional average of about 30,000 pcu in 2015 and steep traffic volume increment after 2015. Moreover, large share of heavy vehicles in the traffic is also forecasted because of the connection of Bien Hoa – Vung Tau Expressway to international sea port, large-scale industrial park and urban areas. The deterioration level of road structures is anticipated to be more serious than ordinary expressways. Therefore, the O&M service level shall be carefully studied.

On the basis of above traffic condition, the study team proposed to introduce O&M service level as shown in Table 7.11.20. This service level is applied in case the traffic volume is 50,000 pcu/day in Japanese expressways. This service level is applicable for 10 years after opening the road to traffic, and the service level shall be reviewed based on prevailing traffic conditions after 10 years. The required O&M service level for ITS equipment inspection is independent of the traffic condition.

Table 7.11.20 Proposed O&M Service Level

Item		Frequency	System
Traffic Control	Traffic Patrol	10 times/day	1 group(2 people)×3shift･24hours
Inspection Of Road Structures	Routine	3 times/week	1 group(2 people)/time
	Periodic	Once or more/year	1 group(2 people)×3 days
	Detailed	Once/5years	1 group(5 people)×24 days
Cleaning	Thruway(Machine)	30 times/year	1 group(2 people)×2.5hours/time
	Thruway(Manual)	125 times/year	1 group(2 people)×3hours/time
	Rest Facility	Once/2days	1 group(5 people)×2hours/time
	Interchange	Once/2days	1 group(1 people)×1hour/time
	Drainage System	Once/year	1 group(2 people)×1.5days/time
ITS Equipment Inspection	CCTV Camera	Once/6 months	1 group(2 people)/time
		Once/year	1 group(2 people)/time
	ETC System	Once/month	1 group(2 people)/time
		Once/year	1 group(2 people)/time
	Variable Message Sign	Once/year	1 group(2 people)/time

Source: JICA Study Team

(3) Suggestion on O&M Standard

O&M service level as proposed in previous sections are based on Japanese O&M current practices. However, Bien Hoa – Vung Tau Expressway is expected to be implemented using private financing and as such increased incentive to maintain safety levels, O&M standard and service level shall be considered. Long-term transition from frequency-based O&M service level to performance-based O&M service level shall be taken into account. This transition to performance-based service level takes into consideration future impact of O&M activities buildup and technical innovations in ensuring sound business operation of the O&M Company.

7.11.7 Toll Collection Plan

The toll collection system for the expressway, considered adequately planned in the F/S, is discussed as follows:

(1) Toll Type

Distance-Based Tariff System: Distance-based tariff system is a system in which a tariff rate is calculated and collected depending on the distance between entry in an interchange and exit to another interchange. This system sets the tariff according to the distance travelled on an expressway and is appropriate for a network-type of expressway such as this project.

(2) Toll Collection Method

Tollgates on both exit and entrance: This arrangement is a system which installs tollgates on both sides of on-ramps and off-ramps. Generally, a ticket is issued for identification at the entrance, and payment of the toll charge at exit based on the information.

(3) Extent of Toll Charging

Closed Toll System: Tolls are charged to all users of the expressway. The toll road is physically designed so that no users may escape from paying the toll.

(4) Toll Gate Allocation

For the completed tollway network, six toll gates will be constructed on locations shown in Figure 7.11.1 consisting of four on-off ramp toll gates:

Sta. 16+600, Sta. 29+500, Sta. 45+250, and Sta. 53+700 with total area of 14,350 m^2.

Seven toll booths are planned at each on-off toll gates, with three booths (one ITS booth, one one-stop booth, and one booth for heavy loaded vehicle) at entrances and four booths (two ITS booths, one one-stop booth, and one gate for heavy loaded vehicles) at exits.

Two barrier-type toll gates at:

Sta. 1+200 and Sta. 65+250 with total area of 15,090 m^2.

Eleven toll booths are planned on each barrier-type toll gates, with four booths (two ITS booths, one one-stop booth, and one booth for heavy loaded vehicle) at entrances and seven booths (three ITS booths, three one-stop booths, and one booth for heavy loaded vehicles) at exits.

(5) Tolled Vehicle Classification and Toll Rates

The toll rates for each vehicle class will be determined, primarily based on the domestic regulations and also on the business policy of the SPC.

Number of toll booth is designed based on forecasted traffic volume and processing efficiency of toll booth by the F/S. However, detail of the design process is not mentioned in F/S. The number of toll booth shall be decided based on forecasted traffic demand by the study and practical processing efficiency of toll booth in Vietnam.

7.11.8 O&M Cost

Initial and annual O&M costs after expressway opening are estimated in F/S. Initial O&M cost includes O&M facilities (building, utilities, facilities), traffic control equipment (include ITS equipment), and O&M vehicles. Annual O&M cost after opening is estimated for O&M facilities and traffic control equipment (including ITS equipment).

In this section, initial and succeeding O&M cost after opening are reviewed, and revised based on review results. The discussion on the Revised O&M cost is in Chapter 7.9. whereas the review results and the cost estimate method are mentioned below:

(1) Initial Cost for O&M

The findings of the study team showed that the Cost for O&M facilities (building, utilities, and facilities) are properly estimated. However, cost for traffic control equipment (include ITS equipment) and O&M vehicles needs to be revised due to inappropriate plan mentioned in sections 7.10.4 (2) and 7.10.5 (5). The study team revised the cost for traffic control equipment (including ITS equipment) and O&M vehicles. Moreover, ordinary O&M materials and equipment shown in Table 7.11.21 are included in the O&M initial cost.

Table 7.11.21 Proposed O&M Materials and Equipments

O&M Materials and Equipment	
Temporary Traffic Sign	Polyethylene Sheet（#3000　10m×10m）
Rubber Cone	Oil Mat（100sheets）
Asphalt Mixture（20kg）	Perlite
Sandbag（48cm×62cm）	Timber Stake（□4.5cm×60cm）
Sandy Soil	Pine Stake（ϕ 15cm×150cm

Source: JICA Study Team

Initial Cost for O&M is estimated based on the following:

1) Office Building

Estimated construction and equipment cost of office buildings by the F/S is endorsed.

2) Vehicle

Vehicle cost is estimated based on proposed O&M vehicle allocation plan shown in Table 7.11.17. The cost is verified with reference to "Consulting Services for Updating and Finalizing the Feasibility Study Report for Da Nang-Quang Ngai Expressway Construction Project" by World Bank and interview results from F/S contractor.

3) Materials and Equipments

Materials and equipment costs are estimated based on proposed O&M materials and equipment shown in Table 7.11.21. The cost is decided with reference of "Consulting Services for Updating and Finalizing the Feasibility Study Report for Da Nang-Quang Ngai Expressway Construction Project" by World Bank and interview results from F/S contractor.

(2) Annual Cost for O&M Work

Listed in Table 7.11.22 are the different work items for O&M that is implemented after opening year and cost breakdown for each work item.

Table 7.11.22 Annual O&M Work and Cost Breakdown

Work Item		Labor Cost	Machine Fuel	Material Cost	Other Cost
Traffic Control	Traffic Patrol	○	○		
Inspection of Road Structures	Routine	○	○		
	Periodic	○	○		
	Detailed	○	○		
	Vehicle Maintenance	○		○	
Maintenance Work	Pot Holes Repair	○		○	
	Side Slope Repair	○	○	○	
	Road Infrastructure Improvement	○	○	○	
	Pavement Repair or Improvement	○	○	○	
Cleaning	Expressway(Machine)	○	○	○	
	Expressway(Manual)	○	○	○	
	Rest Facility	○	○	○	
	Interchange	○	○	○	
	Drainage System	○	○	○	
ITS Equipment Inspection	CCTV Camera	○	○		
	ETC System	○	○		
	Variable Message Sign	○	○		
Facility Maintenance	Facility Maintenance(Utilities Cost)	○			○

Note: ○ - Necessary cost for the work items
Source: JICA Study Team

Annual O&M cost is estimated based on the following conditions. In the cost estimate for Items 1 to 3, reference is made to "Consulting Services for Updating and Finalizing the Feasibility Study Report for Da Nang-Quang Ngai Expressway Construction Project" by World Bank (herein referred to as the "World Bank Report").

1) Labor Cost

O&M activities on the Bien Hoa – Vung Tau expressway will be conducted by an O&M Company with proposed organizational plan shown in Figure 7.11.3. Therefore, unit cost for each work item is not prepared, instead, the number of workers in each class, from Company Director to site worker, is examined, and labor cost is calculated by applying unit labor cost for each class to the corresponding number of workers. The unit labor cost is decided with reference to the World Bank Report and interview results from F/S contractor.

2) Cost for Machine and Fuel

The ownership of any machine including vehicles required for each type of O&M work are with SPC, and the necessary costs during operation period be borne by the O&M company are only for fuel and insurance. The cost is decided with reference to the World Bank Report. The cost in the project is calculated by applying the unit cost per km of the same work in Japan.

3) Cost for Materials

The cost is verified with reference to the World Bank Report. The cost in the project is applied the unit material cost per km in Japan and cost of vehicle maintenance, average cost per vehicle in Japan is applied as well. Also, vehicle requires renewal, and the period of renewal should be 10 years.

4) Other Cost(heating, lighting, and water)

The cost for heating, lighting and water are verified based on interview with F/S contractor.

7.12 Environmental and Social Considerations

7.12.1 Obtained Documents and Reports

The following documents and reports were obtained in this Study.

(1) Related to Environmental Impact Assessment (EIA)

a) Draft Final EIA report on Bien Hoa – Vung Tau Expressway Project

b) Reference EIA Reports on previous PPP or BOT Projects

- Dau Giay – Phan Thiet Expressway Project
- Interconnecting Road of National Highway No. 91 and Long Xuyen City Bypass Project
- Cao Lanh – Vam Cong Interconnecting Road and Vam Cong Bridge Construction Project

(2) Related to Land Acquisition and Resettlement

a) F/S Report

b) Reference RAP Reports on previous PPP or BOT Projects

- Dau Giay – Phan Thiet Expressway Project
- Interconnecting Road of National Highway No. 91 and Long Xuyen City Bypass Project
- Cao Lanh – Vam Cong Interconnecting Road and Vam Cong Bridge Construction Project

7.12.2 Latest Relevant Regulations

(1) Latest Relevant Regulations

The latest major regulations related to the Project are summarized in Tables 7.12.1 and 7.12.2 respectively.

Table 7.12.1 Vietnamese Regulations related to EIA

	Regulations	Description
1	New Law on Environmental Protection.	This has taken effect in 2006 as replacement of the previous Law on Environmental Protection. Stipulated in this new law are environmental protection policies, rights and obligation of all stakeholders for the protection of the environment.
2	Law on Forest Protection and Development	Stipulating management, protection, development, and use of forest as well as rights and obligation of forest owners.
3	Biodiversity Law	Stipulating conservation and sustainable development of biodiversity.
4	Construction Law	Stipulating construction activities, rights and obligation of individuals/organizations which invest for construction or conduct construction activities.
5	Decree No. 109/2003/ND-CP	Regulating conservation of ecosystem in wetland and development.
6	Decree No. 16/2005/ND-CP	Stipulating guidance of implementing Construction law and necessity of analysis of environmental impact attributable to project
7	Decree No. 249/2005/QD	Setting The Roadmap for Application of Emission Standards to Road Motor Vehicles
8	Decree No. 23/2006/ND-CP of March 3, 2006	Regulating forest protection and development.
9	Decree No. 32/2006/ND-CP of March 30, 2006	Regulating flora and fauna which are necessary to be protected.
10	Decree No. 80/2006/ND-CP issued in July 2006	Stipulating guidance on implemention of the Law on Environmental Protection.
11	Decree No. 81/2006/ND-CP of August 9, 2006	Stipulating administrative violation in the domain of environmental protection.
12	Decree No.112/2006/ND-CP of September 2006	Stipulating amendment and supplement a number of articles in Decree No. 16/2005/ND-CP on management of investment projects on the construction of works
13	Decree No. 140/2006/ND-CP of November 22, 2006	Providing environmental protection at various stages of elaboration, evaluation, approval and implementation of development strategies, planning, plans, programs, and projects.
14	Decree No. 59/2007/N-CP	Stipulating solid waste management
15	Decree No. 21/2008/ND-CP dated February 28, 2008 on amendment and supplement of Decree 80/2006/ND-CP	Stipulating amendment and supplement a number of articles in Decree No. 80/2006/ND-CP
16	Decree No. 65/2010/ND-CP of June 11, 2010	Providing details and guidance on a number of articles on Biodiversity Law
17	Circular No. 26/2006/TT-BTNMT	Providing solid waste management
18	Circular No. 08/2006/TT-BTNMT issued on September 8th, 2006	Providing detailed contents of strategic environmental assessment (SEA), environmental impact assessment (EIA), and procedures of their appraisal and approval
19	Circular No. 05/2008/TT-BTNMT	Providing environmental protection at various stages of elaboration, evaluation, approval and implementation of development strategies, planning, plans, programs, and projects. This is in replacement of Circulars No. 08/2006/TT-BTNMT
20	Environmental Standard (QCVN)	Air Quality Standard (QCVN 05: 2009/BTNMT, QCVN 06: 2009/BTNMT) Water Quality Standard (QCVN 08: 2008/BTNMT, QCVN 08: 2009/BTNMT) Noise Standard QCVN 26: 2010/BTNMT) Vibration (QCVN 27: 2010/BTNMT)

Source: JICA Study Team

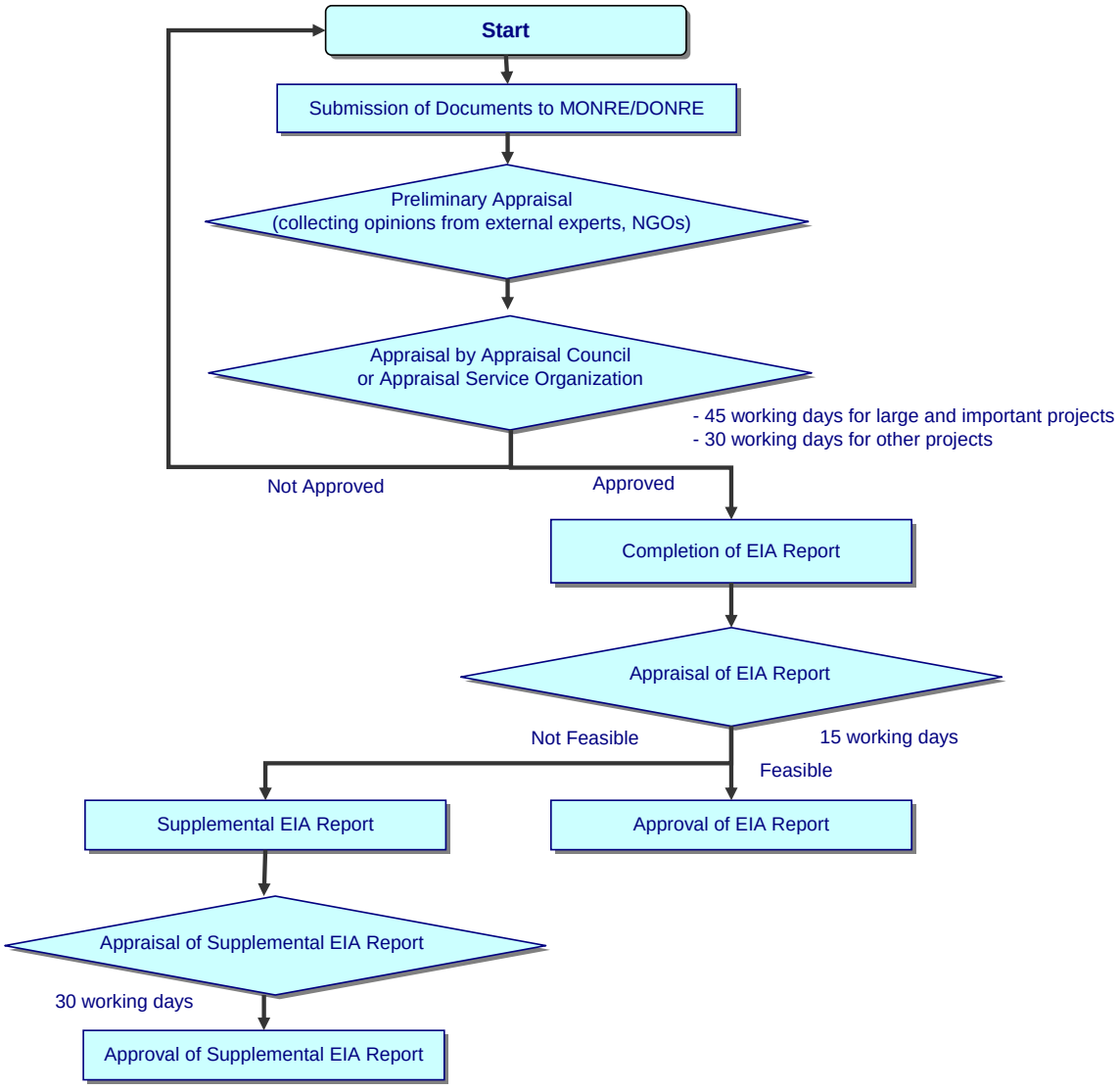
Table 7.12.2 Vietnamese Regulations related to Land Acquisition and Resettlement

	Regulations	Description
1	Law on Land	This is the upper law on regulating land use and land use right.
2	Decree No. 181/2004/ND-CP issued on 29 October, 2004	This stipulates the regulation of utilization of Law on Land.
3	Decree No. 182/2004/ND-CP issued on 29 October, 2004	This stipulates the regulation of penalty for administrative violation in the land user-rights.
4	Decree No. 188/2004/ND-CP issued on 16 November, 2004	This specifies methods for land pricing and issuance of land price framework for land categories.
5	Decree No. 197/2004/ND-CP issued in 3 December, 2004	This stipulates the land acquisition and compensation.
6	Decree No. 198/2004/ND-CP issued in 3 December, 2004	This stipulates regulation on collection of land tax.
7	Decree No. 95/2005/ND-CP issued on 24 January 2005	This stipulates regulation on property ownership and the right to use urban residential land.
8	Decree No.8/2005/ND-CP issued on 15 July 2005	This stipulates regulation on urban planning management.
9	Decree No.17/2006/VD-CP issued on 27 January 2006	This is the amendment of some provisions of some Decrees guiding implementation of the Law of Land and the Decree No.197/2004/ND-CP.
10	Decree No.69/2006/TT-BTC promulgated by Ministry of Finance on 2 August, 2006	This stipulates the compensation, support and resettlement on land acquisition.
11	Decree No.84/2007/ND-CP issued in May, 2007	This stipulates the procedure on resettlement.
12	Decision No.33/2007/QD-TTg by Prime Minister on 5 March, 2007	This stipulates the regulation for relocated ethnic minority to provide assistance on settled agriculture and settled living to be applied in 2006-2010.
13	Decree No.123/2007/ND-CP issued on 27 July, 2007	This stipulates the decision methods of land price.
14	Decree No. 44/2008/ND-CP	Amending and supplementing a number of articles of Decree No. 198/2004/ND-CP on the collection of land use levies
15	Decree No. 34/2009/QH12	Amending and supplementing Article 126 of the Housing Law and Article 121 of the Land Law
16	Decree No. 69/2009/ND-CP dated on May 13, 2009	Additionally providing for land use planning, land prices, land recovery, compensation, support and resettlement
17	Decree No. 11/2010/ND-CP dated on February 24, 2010	Prescribing the management and protection of road infrastructure facilities
18	Decree No. 120/2010/ND-CP	Amending Decree No. 198/2004/ND-CP
19	Decree No. 121/2010/ND-CP	Amending and Supplementing a number of articles in Decree No. 142/2005/ND-CP
20	Circular No. 114/2004/TT-BTC by MOF	This provides the guideline for implementation of the Decree No.188/2004/ND-CP.
21	Circular No. 06/2007/TT-BTNMT dated on July 2, 2007	Guiding the implementation of number of articles of the Decree No. 84/2007/ND-CP
22	Circular No. 14/2008/TTTL-BTC-BTNMT	Guiding Decree No. 84/2007/ND-CP
23	Circular No. 14/2009/TT-BTNMT dated on October 1, 2009	Detailing the compensation, support and resettlement, and order of any procedures for land recovery allocation and lease
24	Correction No. 181/DC-CP dated on October 23, 2009	Correcting the Decree No. 69/2009/ND-CP
25	Circular No. 57/2010/TT-BTC	Stipulating the estimation, use and finalization of implementation expense of compensation, support and resettlement when the State recovers land
26	Decision No.170/2005/QD-TTg by Prime Minister on 8 July, 2005	This stipulates the poverty line to be applied in 2006-2010.
27	Decision 44/2010/QD-TTg	Decision on the exemption from land use levy or land rent for land areas used for the construction of support facilities of national expressways

Source: JICA Study Team

(2) Approval Procedure

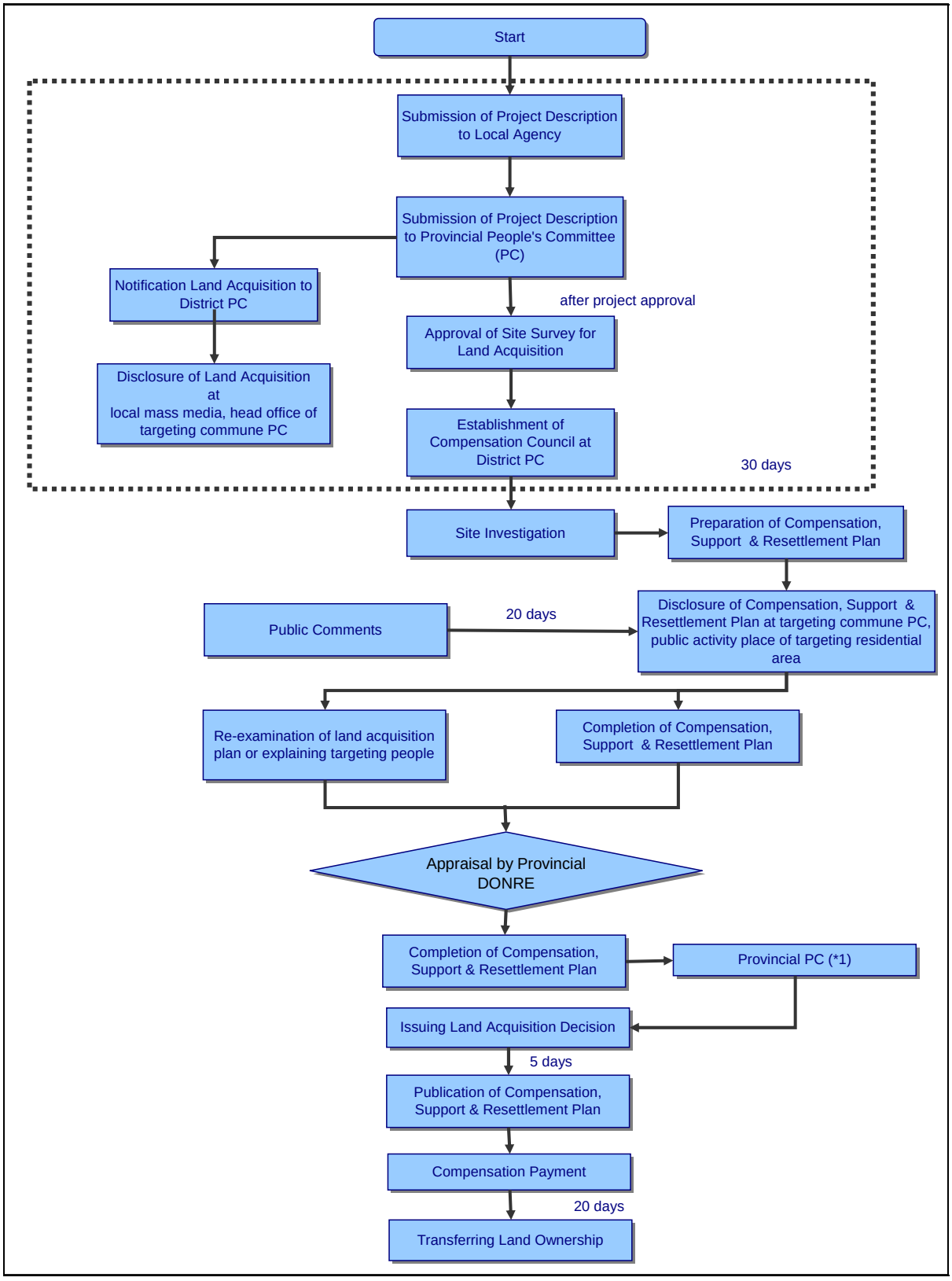
Approval procedures for EIA and land acquisition/resettlement are summarized in the Figures 7.12.1 and 7.12.2 respectively based on the national regulation related to EIA and land acquisition/resettlement.



Remark: Although there is no clear description about timetable for public consultation, this is customarily conducted when draft EIA is ready.

Source: JICA Study Team compiled based on Decree No. 80/2006/ND-CP and Circular No. 08/2006/TT-BTNMT

Figure 7.12.1 EIA Approval Procedure



Remarks*1: If a project crosses over two or more districts in a province, necessary documents shall be submitted to the provincial People's Committee (PC) for approval.
Source: JICA Study Team compiled based on Decree No. 69/2009/ND-CP

Figure 7.12.2 Land Acquisition Procedure

7.12.3 Current Environmental Condition at the Project Area

The current natural, social and environmental conditions at the Project Area investigated for EIA are summarized below.

(1) Natural Environment

The measurements of different environmental parameters such as air quality, surface water quality, groundwater quality, soil quality, noise and vibration were conducted in the course of EIA study for the Project to confirm the current conditions at different locations shown on Figure 7.12.3. The description of the current conditions are listed in Table 7.12.3.

Site	Measured Parameters	Site	Measured Parameters
1	Air quality, Noise, Vibration, Surface water quality, Sediment, Plankton	8	Air quality, Noise, Vibration, Groundwater quality, Soil quality
2	Surface water quality, Sediment, Plankton	9	Air quality, Noise, Vibration, Groundwater quality, Soil quality
3	Air quality, Noise, Vibration, Soil quality	10	Surface water quality, Sediment, Plankton
4	Surface water quality, Sediment, Plankton	11	Air quality, Noise, Vibration
5	Air quality, Noise, Vibration, Surface water quality, Sediment, Groundwater quality, Soil quality, plankton	12	Surface water quality, Sediment, Plankton
6	Air quality, Noise, Vibration, Surface water quality, Sediment, Plankton	13	Air quality, Noise, Vibration
7	Surface water quality, Sediment, Plankton	14	Air quality, Noise, Vibration, Groundwater quality, Soil quality

Source: JICA Study Team compiled based on EIA Report of the Project prepared by TEDI (April, 2011)

Figure 7.12.3 Locations of on-site measurements of environmental parameters

Table 7.12.3 Outline of Natural Environment in the Project Area

	Environmental Parameters	Condition
1	Air Quality	Measurement of air quality (TSP, PM-10, CO, NO_2, SO_2, and meteorological factors) was conducted at 9 sites for 24 hours at the Phase 1 section. The measurement result shows that the air quality condition in the Project area satisfy the national standard.
2	Surface Water Quality	Measurement of surface water quality (temperature, pH, turbidity, conductivity, TSS, DO, COD, BOD, NH4, Heavy Metals, oil, E. Coli, Coli form) was conducted at 7 sites in the Phase 1 section. Water quality in the site No. 12 (Suoi Lake), used for domestic supply, was within the national standard. However, most of rivers exceeded the level of E. coli compared with the national standards. Some of rivers exceeded the national standard on Coliform levels, DO and Fe generally. The reason for contamination might be related to high levels of human and industrial activities as well as to the poor drainage system around the area.
3	Groundwater Quality	Measurement of groundwater quality (temperature, pH, DO, hardness, COD, TSS, Cd, Pb, Zn, Mg, As, Fe, Hg, Coliform, E. Coli) was conducted at 4 sites in the Phase 1 section. Measurement result of Heavy metal and E. Coli exceeded at most of sampling sites. The potential source of contamination is the presence of contaminated surface water that pollutes the aquifer, which then causes contamination of groundwater.
4	Noise	The noise levels measured on 9 sites for 16 hours in Phase 1 section, and on 2 sites (Sites 11 and 14) exceeded the national standard. The factors that contributed to the exceedance of the national standard is the noise contribution from heavy traffic conditions and road maintenance works in the surrounding areas.
5	Vibration	Measurement of vibration was conducted on 9 sites for 16 continuous hours in Phase 1 section, and the results satisfied the national standard.
5	Protected Area	There is no protected area identified in the Project area.
6	Biodiversity	The Project area is a relatively urbanized area, and therefore does not have primal forests which contain protected species under the Vietnamese Law. There are no reported fauna and aquatic fauna that are classified as protected species under the Vietnamese Law. The most vulnerable ecosystem close to the Project area are mangroves in the Thi Vai, and its location is approximately 1.5 km from the Project area

Source: JICA Study Team compiled based on EIA Report of the Project prepared by TEDI (April, 2011)

(2) Social Environment

The Project passes through 15 communes in the 2 provinces: Dong Nai province and Ba Ria – Vung Tau province as shown in Table 7.12.4. According to the EIA report, the average family member per household is 4.2 persons in Dong Nai province and 4.3 persons in Ba Ria – Vung Tau province.

Table 7.12.4 Administrative Information of the Project Area

Province	Dong Nai		Ba Ria – Vung Tau	
District	Long Thanh		Tan Tanuh	Long Dien
Commune	Phuoc Tan	Loc An	Hac Dich	Tan Phuoc
	Tam Phuoc	Long An	Toc Tien	
	An Phuoc	Long Phuoc	TT Phu My	
	Long Duc	Phuoc Thai		
	TT Long Thanh	Tan Hiep		
		Phuoc Bihn		

Source: JICA Study Team compiled from EIA Report of the Project prepared by TEDI (April, 2011)

Table 7.12.5 Outline of Social Environment in the Project Area

	Items	Condition
1	Land Use	Most of the Project Area is covered by agricultural land which accounts for 61% of the total project area, followed by 19% of special land use (e.g., industrial area), 9% of forest land, 5% of vacant land, and 4% of residential area. This is according to statistical data from the GOV as of April 2010.
2	Economic Activities	The main economic activity in the Project Area is agriculture, and the rest are involved in small businesses or are working in industrial zones or plantations. The monthly average income in the Project area is VND 700,000 to VND 2,500,000 per person.
3	Public Infrastructures	Communes in the Project Area have basic education facilities such as kindergarten and elementary schools, and some communes have secondary and/or high schools. The percentage of population in the Project Area with access to electricity range from 81 – 99% and those households with access to public water service range from 25 – 30%.
4	Ethnic Groups	The population in the Project Area is composed of the majority ethnic groups; the Kinh accounting for 97% (this is the majority ethnic group in the entire Vietnam) and the rest are minority groups such as Hoa, Khome, Cho Ro, Stieng, Tay and Nung.
5	Religion	The main religion is Buddhism, with it members accounting for 68% of the population, followed by 23% of Christians and 9% of others. Thus, there are many temples, graves, pagodas and churches in the Project Area.
6	Cultural Properties	From 1975 to date, cultural relics from an ancient culture called Oc Eo are found in Long Dien, Chau Duc, Bung Thom and Tan Thanh in Ba Ria – Vung Tau province. Although cultural properties are not found in the Project area, the possibility remains that the Project area contains buried cultural relics.

Source: JICA Study Team, compiled based on EIA Report of the Project prepared by TEDI (April, 2011)

7.12.4 Impact Assessment on Project Implementation

Impact and mitigation measures are examined in EIA report, and their main points are summarized by using the JICA Environmental Checklist for Roads. This checklist is enclosed in Appendix-1. The outline of impact assessment is described below.

i) Physical Environment

The site measurement results showed that in majority of the locations the national standards are satisfied. However, high vehicular traffic volume at the end point area and increased human activity in the Project Area contribute to the degradation of environmental conditions in terms of noise and water quality. In general, the rapid urbanization in the Project Area is the main factor that contributes to its environmental degradation. In terms of impact due to project implementation, significant adverse impacts will not be expected during construction and operation phases based on the site measurement results, although TSP level is expected to exceed at some extent.

ii) Biological Environment

The area in and around the Project Area does not have sensitive biodiversity, such as vulnerable or endangered flora and fauna protected under Vietnamese regulation. Observed habitats in this area are considered as abundant species of the common ecosystem in Vietnam; although some of these species may potentially decrease due to increased urbanization caused by the project. However, conclusion based on preliminary assessment of the current biological environment showed that the potential impact to biological environment due to Project implementation is considerably low.

iii) Socio-Economic Environment

The project may bring positive socio-economic impact to the Project Area such as

providing job opportunities to local people and enhancing economic activities in the area. On the other hand, the project causes involuntary resettlement, loss of income source due to land acquisition and community division due to the alignment traversing thru the community settlement. According to EIA study result, 813 households will be requested for relocation, and 1,139 households will lose their agriculture land. Although there are advantages and disadvantages on the socio-economic environment due to project implementation, disadvantages will be minimized by preparing appropriate RAP and part of that plan is to provide sufficient support for livelihood rehabilitation/stabilization.

7.12.5 Gaps between Vietnamese Regulations and Requirements for PFIS

In the case of PSIF by JICA, JICA Guidelines for Environmental and Social Considerations (April 2010, herein referred to as JICA Guidelines) is applied. Thus, examination of procedural gaps on EIA and land acquisition between JICA Guidelines and Vietnamese regulations is important since the gaps sometimes become obstacles in the realization of the project. In order to manage such risks, understanding the gaps and applying the necessary actions to mutually share risks among relevant parties in the early stages of project planning, are essential in successful project implementation.

(1) EIA

Although there are many EIA relevant regulations in Vietnam, Decree No. 80/2006/ND-CP and Circular No. 08/2006/TT-BTNMT are considered as the basic regulations. Thus, these regulations are referred to in the examination of the gaps.

Findings by the Study Team show that there are no significant differences on the regulations, but current requirement in Vietnamese regulations on examination of alternatives and approach of stakeholder meeting is different from the requirement in JICA Guidelines.

Table 7.12.6 Comparison between Vietnamese Regulation and JICA Guideline

Items	Vietnamese Regulation	JICA Guidelines	Gaps
1. Procedure	• Preparation of draft EIA report based on project category (Decree No.80/2006/ND-CP • Review of draft EIA report by Appraisal committee • Approval of the appraised draft EIA report • Finalization of the appraised draft EIA report	• Screening (classifying a project into four categories based on its impact) • Examination of scope of environmental assessment • Preparation of TOR • Preparation of EIA report based on TOR	There is no significant difference.
2. Stakeholder Meeting	• One time of public consultation to People's Committee at commune level and representatives of community when draft EIA is prepared	• Holding public consultation with project affected groups and local NGOs after TOR of EIA is prepared • Holding stakeholder meeting with project affected groups and local NGOs when EIA report is prepared.	Timing and methodology to hold stakeholder meeting are different.
3. Disclosure	• Disclosure of draft EIA report before a project is approved	• Disclosure of EIA report according to the regulation of a recipient country	There is no significant difference.
4. Contents of EIA Report	• Introduction • Chapter 1 : Brief Description of the Project • Chapter 2 : Current Natural and Social Environmental Condition • Chapter 3 : Environmental Impact Assessment • Chapter 4 : Measures to Reduce Harmful Impacts, Prevent and Cope with Environmental Incidents • Chapter 5 : Commitment of Implementing Measures for Protection of the Environment • Chapter 6 : Environmental Treatment Constructions and Environmental Management and Monitoring Program • Chapter 7 : Estimates for Environmental Works • Chapter 8 : Public Consultation • Chapter 9 : Sources of Statistics, Data, and Assessment Methods • Conclusions and	• Executive Summery • Policy, Legal and Administrative Framework • Project Description • Baseline Information • Environmental Impact Assessment • Analysis of Alternatives • Environmental Management Plan • Public Consultation • Appendix	Description of examination of alternatives is different.

Items	Vietnamese Regulation	JICA Guidelines	Gaps
	Recommendations		

Source: JICA Study Team

(2) Land Acquisition and Resettlement

The findings are the similar with that for EIA, there are many regulations related to land acquisition and resettlement in Vietnam. Among these, Decree No. 197/2004/ND-CP, Decree No. 181/2004/ND-CP, Decree No. 84/2007/ND-CP and Decree No. 69/2009/ND-CP, are considered as the main regulations, which are herein referred to in the assessment of gaps. The Vietnamese regulation requests that a project proponent must report any differences between Vietnamese regulations and donor policies. In addition, Vietnamese regulations tend to have a concept similar to donor policies.

Table 7.12.7 Comparison between Vietnamese Regulation and JICA Guideline

Items	Vietnamese Regulations	JICA Guidelines	Gaps
1. Entitlement	The land users satisfy the following conditions (Article 9 of Decree No.197/2004/ND-CP, Article 44, 45 & 46 of Decree No. 84/2007/ND-CP, Article 14 of Decree No.69/2009/ND-DP) - Those who have a certificate of land use or equivalent documents - Those who are not illegal squatters, not have a certificate of land use or equivalent documents, but having documents on occupied land issued by commune level People's Committee - Owners of structures established on land to be affected by a project	People who will be requested resettlement or whose livelihood means will be affected by a project. (JICA Guidelines p30)	Entitlement of non legal-title holders is different.
2. Support for socially vulnerable people	There is no clear description about support for socially vulnerable people, but necessary support is provided by considering local situation in addition to livelihood rehabilitation. (Decree 69/2009, Art. 23)	Appropriate consideration must be given to vulnerable social groups, such as women, children, the elderly, the poor, and ethnic minorities. (JICA Guidelines p29)	There is no significant difference.
3. Assistance for restoration and improvement of living standard	Support for life and production stabilization, job-change training and job creation are provided in case of agriculture land acquisition (Decree 69/2009, Art.17).	Host countries must make efforts to enable people affected by projects and to improve their standard of living, income opportunities, and production levels or at least restore these to pre-project level. (JICA Guidelines p30)	There is no significant difference.
4. Compensation based on full replacement cost	a) Land prices for compensation calculation are land prices set for the purpose for which the land in question is being used at the time of issuance of land recovery decisions and publicized by the provincial-level People's Committees in accordance with the GOV's regulations; compensation shall not be made according to the price of land set for the new purpose to be shifted to (Article 9 of Decree No. 197) b) Compensation is basically provided by equivalent land. If land is not available or	Prior compensation, at full replacement cost, must be provided as much as possible. (JICA Guidelines p30)	At the latest regulation (Decree No. 69/2009, Art.14, 15, 16, 19, 24), compensation for structures is calculated based on the value of a newly built house or work promulgated by the provincial-level People's Committee under GOV's regulations. Thus, the gap of compensation calculation becomes small. Clarification of compensation by full replacement cost is necessary.

Items	Vietnamese Regulations	JICA Guidelines	Gaps
	PAPs refuse equivalent land allocation, compensation equal to the value of land use rights calculated based on land prices at the time of land recovery decision is provided. In the case of physical structures such as houses, compensation equivalent to the value of newly built houses and works with equivalent technical standards promulgated by the Ministry of Construction is provided. Calculation is based on the value of a newly built house or work promulgated by the provincial-level People's committee under GOV's regulation (Decree No. 69/2009, Art.14, 15 16, 19, 24).		
5. Eligibility of non-title holders	Provincial People's Committee shall consider to provide support for non-title holders (Decree 69/2009, Art.14).	People to be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported by the project proponents, etc. in timely manner. (JICA Guidelines p30)	There is no significant gap if eligibility of non-title holders is secured.
6. Public participation into planning and implementation of resettlement plan	There is no clear description about public participation into planning and implementation of resettlement plan. However, it is stipulated to ask public opinion to the prepared resettlement plan at each stage (Decree 69/2009, Section 4).	Appropriate participation by the people affected and their communities must be promoted in planning, implementation and monitoring of involuntary resettlement plans and measures against the loss of their means of livelihood. (JICA Guidelines p30)	Although approach of public participation is different, public participation is ensured.
7. Grievance redress mechanism	The following procedure is applied (Decree No. 181/2004/ND-CP, Art. 163) a) Those who are compensation targets and have complaints to the decree of land acquisition issued by the district People's Committee can appeal to the district People's Committee within 30 days of decree issued[4]. b) The district People's Committee is requested to settle complaints within the time defined by Law of Complaints and Denunciation. The solution is disclosed, and is sent by a document to a person	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA Guidelines p30)	There is no significant gap.

[4] Article 63 of Decree No. 84/2007/ND-CP defines 90 days.

Items	Vietnamese Regulations	JICA Guidelines	Gaps
	appealed. c) In case a complaint can not be solved within 45 days after appealing to the district People's Committee, it shall be handed to either provincial People's Committee or the court.		
8. Stakeholder Meeting	Prepared compensation plan is disclosed to public at a certain period, and finalized by reflecting public comments.	In preparing a RAP, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. (JICA Guidelines, p 30)	Timing and approach of stakeholder meeting is different.
9. Monitoring	Monitoring is not clearly requested.	Appropriate follow-up plans and systems, such as monitoring plans and environmental management plans, must be prepared; and costs of implementing such plans and systems, and financial methods to fund such costs, must be determined. (JICA Guidelines, p13 - 14)	Establishment of clear monitoring system is different.
10. Contents of RAP[5]	- Name and address of affected people - Area and category of acquired land - Justification of compensation calculation - Compensation amount - Resettlement - Necessary arrangement for resettlement - Resettlement implementation	- Project description - Potential impacts - Objectives - Socioeconomic studies - Legal framework - Institutional framework - Eligibility - Valuation of and compensation for losses - Resettlement measures - Site selection, site preparation, and relocation - Housing, infrastructure, and social services - Environmental protection and management - Community participation - Integration wit host populations - Grievance procedures - Organizational responsibilities - Implementation schedule - Cost and budget - Monitoring and evaluation	Significant differences are to describe; a) compensation policy b) grievance procedures c) monitoring system d) socioeconomic study

Source: JICA Study Team

(3) Actual Situation of EIA and RAP Preparation at Previous Projects

EIA and RAP reports prepared for the previous BOT or PPP projects were reviewed, and interview of relevant authorities on land acquisition and resettlement (especially province and district People's Committee) at Dong Nai and Ba Ria – Vung Tau provinces was conducted in

[5] Decree No. 69/2009 for the Vietnamese regulation and World Bank Safeguard Policy OP4.12 Annex A for JICA Guidelines are referred.

order to examine lessons-learnt that can be utilized for the Project.

The findings of the Study Team show that EIA reports were prepared according to Vietnamese regulation while RAP reports were prepared based on the donor policies. Regarding land acquisition and resettlement, following findings were obtained.

Table 7.12.8 Lessons-Learnt from Previous Projects

Items	Findings	Lessons-Learnt
Compensation payment	• Compensation was provided by official rate in most of the projects. • As for the World Bank-financed BOT project in Dong Nai and Binh Duong provinces, prevailing market price was applied for the compensation payment. • As for the governmental BOT project in Dong Nai province, official rate was applied for compensation. • As for the case of ADB-financed project[6] in located in Ho Chi Minh City and Dong Nai province, compensation was provided by replacement cost which was defined by a licensed land valuator considering both of market price and official rate. • Consultation on compensation policy between donors and project proponents is said to have taken time since both parties have their own policies/regulations.	• Consultation among donors, project proponents, relevant authorities, province and district People's Committee is necessary from the early stage of project design in order to have mutual understanding on compensation policy as well as secure the necessary budget.
Difficulties	• Confirmation of land ownership was difficult and took time. • Land user and land owner was sometimes different compared with the official document. • Displaced people requested to receive compensation by market price. • Site preparation for relocation was not enough and not in time.	• Compensation by replacement cost is necessary. • Consultation with PAPs in the preparation of RAP is indispensable in order to share the compensation policy and revise it by reflecting PAPs comments.

Source: JICA Study Team

7.12.6 Review of EIA and Feasibility Study Reports

F/S report was received on 10th April, 2011 from TEDI, and draft final EIA report was also received from TEDI on 15th April, 2011. Draft final EIA report is currently under review by BVEC, and will be submitted to MONRE when finalized.

(1) EIA Report

EIA report, which was prepared according to the Vietnamese regulation, contains the items described in Table 7.12.6. The review results of EIA report are in Table 7.12.9.

[6] This is not a BOT or PPP project but a project financed by an ADB loan.

Table 7.12.9 Review Result of EIA Report

Items	Brief Description in F/S Report	Findings/ Comments
1. Consistency with JICA Guidelines	• EIA report was prepared according to Vietnamese regulation	• Prepared format is not consistent with the required study items in JICA Guidelines as described in Table 7.12.6.
2. Impact Assessment	• Impact assessment based on the site measurements and project components.	• Impact is assessed by comparing the calculation result based on the site measurements and previous experience, which is considered an acceptable methodology. • Expected magnitude of impact due to project implementation is not established. • Impact assessment at regional level with concurrent projects or projects for implementation is necessary. • Impact assessment to the existing transportation sector is necessary. • Vulnerable species identified under the Vietnamese regulation is confirmed. Confirmation of vulnerable species designated under international treaties and IUCN red list is necessary.
3. Mitigation measures	• Mitigation measures for each environmental factor and important locations on the expressway	• Review and update of mitigation measures is necessary at the final alignment.
4. Environmental Management Plan, Environmental Monitoring Plan	• Environmental management plan and environmental monitoring plan at the construction and operation phases. • Establishment of Environmental Unit in SPC is proposed as the responsible management unit of environmental issues at construction and operation phases.	• Clarification of the structure of environmental management and monitoring is necessary at the next study stage. • Proposed monitoring structure is considered as reasonable. However, further examination of environmental management structure proposed in the Section 7.12.7 is necessary. • Monitoring form is necessary to be prepared and developed.
5. Stakeholder meetings	• Sending official documents from a project proponent to community leaders and People's Committee • EIA consultant held a small meeting with community leaders and People's Committee	• Inviting all stakeholders (not only limited to groups such as community leaders and People's Committee) is indispensable.

Source: JICA Study Team

(2) Master Plan of Compensation in F/S Report

F/S report provides brief description of the extent of land acquisition and resettlement as well as compensation policy in Chapter 13 of the F/S. This includes the items in Table 7.12.10, which is regarded as the master plan of compensation. The master plan of compensation is to be developed at the next study stage wherein it will serve as the baseline information for the RAP.

Table 7.12.10 Contents of Master Plan of Compensation

Items	Brief Description
1. Legal framework and policy	• Vietnamese regulations related to land acquisition and compensation
2. Contents of the overall ground clearance plan	• Basic concept for examination of the extent of land acquisition and estimated compensation amount
3. Scope and area of land acquisition	• Categories of affected area, location (province and commune), acquired area.
4. Number of PAPs	• Number of PAPs
5. Information source and people's expectation to the Project	• Sources of collected information and people's expectation on the Project obtained from interviews of PAPs
6. Principal issues on compensation and land acquisition	• Principal issues on land acquisition and compensation to be applied for the Project
7. Resettlement plan for households affected in housing and land	• Basic concept to compensate housing and land
8. Implementation stages, schedule of land acquisition and resettlement	• Resettlement procedure and expected schedule
9. Estimated compensation amount	• Extent of land acquisition and expected compensation amount

Source: JICA Study Team

Table 7.12.11 describes the review result of master plan of compensation.

Table 7.12.11 Review Result of Master Plan of Compensation

Items	Brief Description in F/S Report	Findings/ Comments
1. Consistency with JICA Guidelines	• As described in Table 7.12.10	• Prepared format is not consistent with the required study items in JICA Guidelines.
2. Principal issues on compensation and land acquisition	• Minimizing land acquisition and adverse effects on properties, • Giving entitlement acceptable to all affected people to improve living conditions equivalent at least to pre-project level • Compensation by paying for replacement and providing sufficient support • Holding consultations with PAPs in the course of implementation of land acquisition and restoration measures	• The proposed policy in the master plan is consistent with JICA Guidelines. • The proposed policy shall be shared with relevant authorities and PAPs as well as sustained in the entire project period • Consultation with PAPs shall be conducted before implementing land acquisition and compensation. • Grievance mechanism and monitoring system are not described, which is recommended for further examination.
3. Compensation Calculation	• Described below	• Described below
4. Consultation	• Consultation with PAPs was not held collectively but interview of limited number of PAPs was conducted in order to confirm their stand on the issues related to relocation	• Consultation with PAPs is necessary in the preparation of the RAP for the next study stage.

Source: JICA Study Team

According to interviews with TEDI, the extent of land acquisition and resettlement was estimated based on the following concepts;

a) Required area of 33.0 – 42.5 m of lane width (6 or 8 lanes), some area of embankment/cutting, 6 m of safety zone (3 m on each side), approximately 10 m of

side walk, and contingency.

b) Extent of resettlement, land and house categories were confirmed by using available data such as satellite images.

c) Prevailing market price was used for non-agricultural land, official price issued in January 2011 was used for agricultural land, housing/assets, trees/farm products, relocation of tombs, electric poles, and domestic animals. Cost for assistance was estimated based on the previous experience.

The review results of impact examination and compensation estimation are shown below;

a) The concept and methodologies for impact assessment and compensation estimation are considered appropriate.

b) Compensation estimation was based on both the official rates and prevailing market prices as shown in Table 7.12.12. The compensation amount shall be estimated based on replacement cost in order to provide livelihood to PAPs at least equivalent to pre-project level. In this report, compensation cost is estimated based on market value[7] as shown in the Table 7.12.13 in order to satisfy requirements in JICA Guidelines.

c) Necessary provisions for livelihood rehabilitation are considered as covered in the compensation cost as described in the F/S report.

d) The surveyed socio-economic conditions at the Project area and unit cost of assistance are considered as appropriate as of this moment.

[7] Since replacement cost survey was not carried out, market price obtained from interview at the site (Dong Nai and Ba Ria – Vung Tau provinces) was used for the purpose of compensation estimation in this report.

Table 7.12.12 Estimated Compensation in F/S Report (Phase-1 only)

Unit: 1000 đ

No	Item	Unit	Dong Nai			Ba Ria Vung Tau (stage 1)		
			Volume	Unit Cost	Amount	Volume	Unit Cost	Amount
I	**Land Compensation**	**m^2**	**3,122,294**		**870,120,999**	**741,823**		**174,382,895**
1	***Non-agri Land***		***273,268***		***356,771,250***	***33,024***		***42,368,000***
	Residential land	m^2	202,428	1,500	303,641,250	19,936	1,600	31,897,600
	Bussiness land	m^2	70,840	750	53,130,000	13,088	800	10,470,400
2	***Agriculture Land***		***2,849,026***		***513,349,749***	***708,799***		***132,014,895***
	Adjacent garden land	m^2	394,628	750	295,971,225	46,493	800	37,194,400
	Land of perennial plant	m^2	427,587	150	64,137,975	318,863	180	57,395,340
	Land of annual plant	m^2	162,339	140	22,727,474	137,258	160	21,961,280
	Cultivated Forest Land	m^2	1,864,473	70	130,513,075	206,185	75	15,463,875
	Land for Aquaculture	m^2	-	-	-	0	160	0
	Land for salt	m^2	-	-	-	0	160	0
	Number of household loss agriland	houldhold	830			309		
II	**House, asset, animal on land**				**140,932,130**			**27,586,400**
1	Houses							
	House level 4	m^2/unit	35,324 /631	2,000	70,648,000	2,079 /45	2,000	4,158,000
	House level 3 and above	m^2/unit	-	4,000	-	1,904 /2	4,000	7,616,000
	Number of household loss residential land	houldhold	757			56		
2	Plant and crops	m^2	2,231,271	30	66,938,130	602,096	25	15,052,400
3	Grave Moving							
	Constructed grave	Unit	81	6,000	486,000	0	6,000	0
4	Electric pole	pole						
	Low voltage		78	20,000	1,560,000	23	20,000	460,000
	High voltage		13	100,000	1,300,000	3	100,000	300,000
5	Animal							
	Shrimp	m^2	-	-	-	0	50	0
III	**Support Items**				**443,684,108**			**196,741,040**
1	Support for land lossing	m^2	984,554	300	295,366,170	502,614	360	180,941,040
2	Support for infrastruction development (Resettlement zone)	houldhold	757	150,000	113,580,000	56	150,000	8,400,000
3	Support for moving	houldhold	757	5,000	3,786,000	56	5,000	280,000
4	Support for temporary house hire	houldhold	757	6,000	4,543,200	56	6,000	336,000
5	Support for job transfer	person	1,660	3,000	4,980,473	618	3,000	1,854,000
6	Support for poverty/policy household	houldhold	317	5,000	1,587,279	73	5,000	365,000
7	Reward	houldhold	794	5,000	3,968,197	183	5,000	915,000
8	Other support (estimated)	houldhold	1,587	10,000	15,872,789	365	10,000	3,650,000
	Total I + II + III				**1,454,737,237**			**398,710,335**
IV	**Cost for land clearance compensation activity (2%)**		1,454,737,237	0.02	29,094,745		0.02	7,974,207
V	**Contingency (10%)**		1,483,831,982	0.10	148,383,198		0.10	40,668,454
	Total land clearance cost				**1,632,215,180**			**447,352,996**

Source: F/S

Table 7.12.13 Estimated Compensation Based on Replacement Cost (Phase 1 only)

Unit: 1000 đ

No	Item	Unit	Dong Nai			Ba Ria Vung Tau (stage 1)		
			Volume	Unit Cost	Amount	Volume	Unit Cost	Amount
I	**Land Compensation**	**m^2**	**3,122,294**		**943,999,320**	**741,823**		**242,758,875**
1	***Non-agri Land***		***273,268***		***356,771,250***	***33,024***		***42,368,000***
	Residential land	m^2	202,428	1,500	303,641,250	19,936	1,600	31,897,600
	Bussiness land	m^2	70,840	750	53,130,000	13,088	800	10,470,400
2	***Agriculture Land***		***2,849,026***		***587,228,070***	***708,799***		***200,390,875***
	Adjacent garden land	m^2	394,628	750	295,971,225	46,493	800	37,194,400
	Land of perennial plant	m^2	427,587	300	128,275,950	318,863	360	114,790,680
	Land of annual plant	m^2	162,339	200	32,467,820	137,258	240	32,941,920
	Cultivated Forest Land	m^2	1,864,473	70	130,513,075	206,185	75	15,463,875
	Land for Aquaculture	m^2	-	-	-	0	160	0
	Land for salt	m^2	-	-	-	0	160	0
	Number of household loss agriland	houldhold	830			309		
II	**House, asset, animal on land**				**140,932,130**			**27,586,400**
1	Houses							
	House level 4	m^2/unit	35,324 /631	2,000	70,648,000	2,079 /45	2,000	4,158,000
	House level 3 and above	m^2/unit	-	4,000	-	1,904 /2	4,000	7,616,000
	Number of household loss residential land	houldhold	757			56		
2	Plant and crops	m^2	2,231,271	30	66,938,130	602,096	25	15,052,400
3	Grave Moving							
	Constructed grave	Unit	81	6,000	486,000	0	6,000	0
4	Electric pole	pole						
	Low voltage		78	20,000	1,560,000	23	20,000	460,000
	High voltage		13	100,000	1,300,000	3	100,000	300,000
5	Animal							
	Shrimp	m^2	-	-	-	0	50	0
III	**Support Items**				**443,684,108**			**196,741,040**
1	Support for land lossing	m^2	984,554	300	295,366,170	502,614	360	180,941,040
2	Support for infrastruction development (Resettlement zone)	houldhold	757	150,000	113,580,000	56	150,000	8,400,000
3	Support for moving	houldhold	757	5,000	3,786,000	56	5,000	280,000
4	Support for temporary house hire	houldhold	757	6,000	4,543,200	56	6,000	336,000
5	Support for job transfer	person	1,660	3,000	4,980,473	618	3,000	1,854,000
6	Support for poverty/policy household	houldhold	317	5,000	1,587,279	73	5,000	365,000
7	Reward	houldhold	794	5,000	3,968,197	183	5,000	915,000
8	Other support (estimated)	houldhold	1,587	10,000	15,872,789	365	10,000	3,650,000
	Total I + II + III				**1,528,615,558**			**467,086,315**
IV	**Cost for land clearance compensation activity (2%)**		1,454,737,237	0.02	30,572,311		0.02	9,341,726
V	**Contingency (10%)**		1,483,831,982	0.10	155,918,787		0.10	47,642,804
	Total land clearance cost				**1,715,106,656**			**524,070,845**

Source: JICA Study Team

7.12.7 Issues to be Considered in the Next Study stage

The Gaps identified between regulations and the problems established in EIA and F/S reports are necessary to be resolved by a project proponent at the next study stage. This section provides hints in the search for solutions to the issues:

(1) Issues to be addressed by a Project Proponent and Recipient Country

In order for the Project to be realized, following actions at the next study stage are indispensable.

1) EIA

a) Preparation of a separate report on assessment of different options

As described in Table 7.12.9, the prepared EIA did not consider different alignment options. Thus, a project proponent needs to prepare a separate report detailing the history of evaluation of different options/alternatives undertaken to arrive at the optimal alignment. This evaluation must include the alternative of "without project".

b) Holding stakeholder meetings by inviting stakeholders

Since the prepared EIA was in accordance with the Vietnamese regulation, stakeholder meeting was held only with limited number of persons; such as community leaders and the People's Committee. A project proponent is requested to have a stakeholder meeting

with a wide range of stakeholders such as NGOs, PAPs, and relevant authorities under JICA Guidelines.

Consultation with PAPs will be held in the course of RAP preparation. Meeting with different stakeholders concerning EIA shall discuss the following objectives. Opinion or comments from attendees will be considered for incorporation in the project design.

Table 7.12.14 Draft Contents of EIA Stakeholder Meetings

Item	Description of Contents
Purpose	- Project description - Examination of alternatives - Methodology of EIA study - Expected impact and mitigation measures - Environmental management and monitoring plans
Expected Attendees	PAPs, Inhabitants along the alignment, Relevant authorities, Representatives from the academe, NGOs
Place	Meeting place at each community in Phase 1

Source: JICA Study Team

c) Assessment of environmental management and monitoring system

EIA report proposed the following actions in dealing with environmental issues;

i) Establishment of an Environmental Unit in SPC as the responsible management group that will deal with environmental issues;

ii) Conduct of monitoring by environmental consultants;

iii) Supervision of environmental monitoring by construction management consultant (this is during construction stage only, and this task will be handed over to the environmental unit at operation stage)

iv) Reporting of monitoring results from consultants to the environmental unit thru the construction management consultant

v) Reporting of monitoring results from SPC to MONRE/DONRE and BVEC

The proposed actions, likewise described in Table 7.12.9, are considered reasonable. However, another option is to propose establishment of an environmental unit in BVEC as a part of O&M section in order to manage environmental issues on several road projects in a region. The setting up of the environmental section as a part of O&M is considered a more practical approach than establishment of the environmental section in SPC, taking into consideration efficiency, work volume and staff arrangement. In addition, assessment of reporting system of environmental monitoring result to JICA is necessary as it is requested in JICA Guidelines. The group containing the environmental unit will handle reporting of environmental monitoring results to JICA. Further assessment of this setup is necessary.

2) Land acquisition and resettlement

a) Assessment of required assistance to non-title holders

Providing assistance to non-title holders is assessed by provincial People's Committee

under the current Vietnamese regulation. Consultation on such support between the project implementor, provincial and district People's Committee is essential at the early stages of project planning.

b) Assessment of compensation by replacement cost

The current Vietnamese regulation which serves as the basis for the computation of compensation defines it as based on the official rate at the time when land acquisition decision was issued. Although the official rate is decided by considering the prevailing market price, there is a possibility that official rate is lower than the market price. In order to implement compensation by replacement cost, replacement cost survey[8] is indispensable.

c) Conducting detailed surveys of PAPs

In order to satisfy JICA Guidelines in the preparation of RAP, identification of PAPs, confirmation of socio-economic condition of PAPs and examination of loss caused by a Project is necessary. For this purpose, following three kinds of surveys are necessary to be conducted.

- Census: identification of PAPs
- Inventory of losses (all PAPs): confirmation of losses due to project implementation
- Socio-economic survey (at least 20 – 25% of PAPs): confirmation of socio-economic condition to examine necessary support for livelihood rehabilitation/stabilization

e) Ensure public participation to RAP preparation and stakeholder meeting

Although the basic concept in the preparation of a compensation plan and RAP based on the current Vietnamese regulation and JICA Guidelines is essentially the same; preparation of compensation plan or RAP reflecting public comments, the approach is different for each policy. In the case of Vietnamese regulation, a compensation plan is prepared without any consultation with PAPs and finalized by reflecting public comments after sufficient disclosure to the general public. On the other hand, under JICA Guidelines, a project proponent has to prepare the RAP with the participation of and consultation with PAPs on compensation policies during the early stages. In order to prepare a practical RAP reflecting PAPs' opinions, the appropriate timing of consultation with PAPs is indispensable.

f) Assessment of monitoring procedures

The conduct of monitoring is not mandatory under the Vietnamese regulation. However, JICA Guidelines request a project proponent to establish a monitoring system and conduct internal and external monitoring. Practically, monitoring is said to be conducted regularly by the district or provincial People's Committee, and monitoring results are reported to the project proponent. In the case of a project that creates large-scale resettlement in more than 2 provinces, regular meetings with relevant parties on land acquisition/resettlement progress is said to be held. By referring to the previous practice, establishment of appropriate monitoring system is indispensable.

g) Publicity of grievance mechanism

[8] This is the survey to examine appropriate price such as construction price including material price, labor price, transportation price, etc, and/or to confirm the purchase price of new building with same specification and convenience (e.g., location and public service), in order to calculate replacement cost.

The Vietnamese regulation defines the grievance mechanism, which is regarded as well-functioned. Since the existing system is workable and considered as practical, publicity of such system to PAPs is necessary at the time of consultation with PAPs.

(3) Proposed Study Items for RAP Preparation

In order to satisfy the items described in the (1)-2) above, following two-step study of RAP is requested to be conducted by the project proponent.

a) Preparation of Resettlement Policy Framework (RPF)

According to JICA Guidelines, preparation of full-scale RAP is requested in case of a project requesting displacement of more than 200 people. This Project is expected to request resettlement of more than 200 individual, and therefore full-scale RAP is necessary to be prepared at the time of environmental review by the donor. In consideration of the procedure for land acquisition defined by the GOV, the preparation of the Resettlement Policy Framework (RPF) covering the following items is proposed as the first step in land acquisition/resettlement. This will likewise serve as the baseline for full-scale RAP preparation.

Table 7.12.15 Items to be Studied in RPF

	Items to be studied
1	Project description and necessity of resettlement
3	Preparation and approval procedure of RAP
4	Expected number of displaced individuals
5	Eligibility for compensation and support
6	Procedure for compensation by full replacement cost
7	Support of livelihood rehabilitation
8	Grievance mechanism, responsibility of relevant authorities
9	Responsibility of relevant authorities in land acquisition and resettlement
10	Practical schedule of land acquisition, compensation payment, resettlement
11	Budget arrangement
12	Monitoring system
13	Plan of public participation in the preparation of RAP

Source: JICA Study Team

b) Preparation of RAP

Based on RPF, a full-scale RAP will be prepared when the project area is delineated during the latter stages in detailed design taking into account the study items described in Table 7.12.7.

(4) Proposed Schedule for the Study Items

Table 7.12.16 shows the proposed schedule of the study items.

Table 7.12.16 Proposed Schedule of the Study Items

	Study Items	2011								2012												2013											
		5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
	<Japanese Side>																																
1	Preliminary Survey (This Study)																																
2	FF Mission																																
3	JICA Preparatory Survey																																
4	Appraisal Mission																																
5	Loan Agreement (LA)																																
	<Project Implementation>																																
1	Detailed Design																																
2	Contractor Procurement																																
3	Land Acquisition												(until March 2013)																				
4	Construction Work																								(until September 2015)								
	<EIA>																																
1	**Updating EIA**																																
1-1	Preparation of Alternative Examination Report																																
1-2	Conducting Additional Stakeholder Meetings																																
1-3	Updating EMP																																
1-4	Consented by JICA																																
	<Land Acquisition & Resettlement>																																
1	**Preparation of RPF**																																
1-1	Examination of Compensation Policy																																
1-2	Examination of Expected PAPs number																																
1-3	Examination of Grievance Mechanism																																
1-4	Examination of Monitoring System																																
1-5	Conducting Focus Group Discussion																																
1-6	Preparation and Finalization of RPF																																
1-7	Consented by JICA																																
2	**Preparation of RAP**																																
2-1	Cut-off-date (date of the decree issued)																																
2-2	Population Census																																
2-3	Inventory of Loss Survey																																
2-4	Socio-Economic Survey																																
2-5	Replacement Cost Survey																																
2-6	Updating Eligibility																																
2-7	Updating Compensation Policy																																
2-8	Calculation Compensation Amount																																
2-9	Updating Grievance Mechanism																																
2-10	Updating Monitoring System																																
2-11	Conducting Consultations																																
2-12	Preparation and Finalization of RAP																																
2-13	Consented by JICA																																

Source: JICA Study Team

7.13 Implementation Program

7.13.1 Implementation Organization

Bien Hoa-Vung Tau Expressway Development JSC (BVEC) was licensed to operate by the Department of Planning and Investment of Dong Nai Province in December 15, 2008. The business license covers many fields; i) construction, ii) irrigation, iii) hydropower, iv) civil works, v) manufacturing, vi) installment of special equipment (lighting system) in toll roads, and vii) import and export of materials/equipment. The Company has a chartered capital of VND 1,750 billion, of which IDICO holds 49%, Song Da holds 30% and BIDV holds 10%, and the rest was offered to other shareholders.

The Company's first business was investment project on widening of the existing National Highway 51 (NH51) that included installation of lighting system along NH51. On December 11, 2009, the BOT contract for construction investment project for the expansion of NH51 between the Department of Roads, MOT and BVEC was signed. The BVEC, viewed as the BOT company for expansion of the NH51, has its obligation in the maintenance of the NH51 including lighting system, and toll collection. The only work item subcontracted to an external company is the operation of highway lights. BVEC still undertook management of maintenance and toll collection businesses.

Nevertheless the role of BVEC in Bien Hoa - Vung Tau Expressway business should be different from a BOT company for the NH51. The Expressway project would require a higher standard of planning, construction and maintenance than a typical highway. Toll collection using ETC would be more technically complicated. Further expressway business requiring large-scale investment and debt financing needs a Special Purpose Company (SPC) for financial transparency. The recommendation therefore is for BVEC to participate in the Bien Hoa - Vung Tau Expressway project as an investor and not as a BOT company.

7.13.2 Implementation Program

As described in Section 7.9 "Construction Planning", and as shown in Table 7.9.4, the schedule of activities starting from land acquisition to construction works, could be completed within 4 years and a half because there are no technical difficulties in this project.

However, as a private investment project under a BOT scheme, other constraints on project implementation may involve financial arrangement of the project.

In Chapter 8, a detailed study on the financial arrangement for the BE is conducted in order to ensure smooth implementation of the project under BOT scheme.

Considering such necessary processes and procedures, a tentative implementation program is proposed and shown in Figure 9.3.1.

7.13.3 Implementation Program of Phu My – Vung Tau Section

The Study Team recommends that development of Phu My – Vung Tau section shall be implemented by governmental finance as mentioned in section 7.1.3. In consideration of governmental financial constraint, financial institution such as VGF, infrastructure fund, and guarantee fund shall be considered to introduce for new financial source.

Table 7.13.1 shows proposed implementation program for Phu My – Vung Tau section in consideration of cost reduction by seamless implementation schedule with implementation program of Bien Hoa – Phu My section.

Table 7.13.1 Proposed Implementation Program of Phu My – Vung Tau Section

No.	Year / Quarter	Period (month)	2011 I	2011 II	2011 III	2011 IV	2012 I	2012 II	2012 III	2012 IV	2013 I	2013 II	2013 III	2013 IV	2014 I	2014 II	2014 III	2014 IV	2015 I	2015 II	2015 III	2015 IV	2016 I	2016 II	2016 III	2016 IV	2017 I	2017 II	2017 III	2017 IV	2018 I	2018 II	2018 III	2018 IV
A	(PPP Scheme) Bien Hoa-Phu My-NH51 (46.8km)																																	
A100	Detailed Design																																	
A200	Procurement of Contractor																																	
A201	Negotiation																																	
A202	Contract Sign																																	
A300	Construction																																	
A400	Open to the Public																																	
B	(Japanese Yen Loan) Phu My-Vung Tau Section (31.0km)																																	
B100	Preparatory Study	6																																
B200	Loan Agreement	-																																
B300	Procurement of Consultant	6																																
B400	Detailed Design	12																																
B500	Procurement of Contractor	15																																
B600	Construction	30																																
B700	Open to the Public	-																																

Source: JICA Study Team

7.14 Economic and Financial Analysis

7.14.1 General

The review of the Economic and Financial analysis of the project in F/S report are discussed in the following sections.

7.14.2 Review of Economic and Financial Analysis in F/S

Financial analysis and estimated duration of BOT refunding are written in Chapter 18 of F/S. Specific scenarios are as follows:

- Scenario 1: Investment of VND 14,748 billion (including loan interest during construction), 'equity 10%, annual interest rate 12%, tariff rate of VND 1000/km, operation and maintenance costs 6%, VAT 10%, maintenance in accordance with road works. ' (F/S, 2011) There is no government subsidy.
'- Scenario 2: Investment of VND 5,000 billion (including loan interest during construction), equity 10%, 12% annual interest rate, tariff rate of VND 1000 /km, management and exploitation cost of 6%, VAT 10%, maintenance in accordance with road works.' (F/S, 2011) There is a government subsidy for land acquisition.
'- Scenario 3: Investment of VND 7,400 billion (including loan interest during construction), equity 10%, and annual interest rate 6.25% OCR (Ordinary Capital Resources), tariff rate of VND 1000 /km; management and exploitation cost 6%, VAT 10 %, maintenance in accordance with road works.' (F/S, 2011) There is a government subsidy for land acquisition.
'- Scenario 4: Investment of VND 8,000 billion (including loan interest during construction), equity 10%, 50% of ODA loans, 50% OCR, and annual interest rate 2.5% and 6.25%, tariff rate of VND 1000 /km; management and exploitation cost 6%, VAT 10%, maintenance in accordance with road works.' (F/S, 2011) There is a government subsidy for land acquisition.

Table 7.14.1 Result of Economic and Financial Analysis

Result	Unit	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Investment capital (loan interest during construction)	Mill dong	14,747,820	4,961,230	7,438,630	7,943,360
Net present value	Mill dong	-9,906,790	1,156,460	1,716,620	991,410
Benefit-Cost Ratio		0.42	1.19	1.16	1.09
Duration of time of refunding cost: t =	Year	60.00	28.67	23.17	20.92
FIRR	%		9.85%	5.24%	4.40%

Source: F/S

First, equity ratio on 4 scenarios is 10% in F/S. However, it should be more than 20% because the maximum debt ratio of main lender of this project is 80% based on interviews (April 2011). If loans from other lenders are given, equity ratio can be less than 20%. Yet, a possibility of participation from other lenders is low at the moment. Then, equity ratio should be more than 20%.

Second, the interest rate on ODA loan in scenario 4 is 2.5% in F/S, but it can be the interest rate based on JPY. Therefore, the interest rate (on a VND basis) should be reconsidered because revenue is obtained based on VND and it has exchange rate risk between JPY and VND.

Third, tariff VND 1,000 /km for car is required to increase based on increase of inflation rate if cost increases based on inflation rate. Policy about tariff has effects on revenues so negotiation with government is essential. The calculation of financial internal rate of return (FIRR) in F/S was

implemented based on fixed tariff. In order to make this more attractive to private investment, this tariff structure has to be revised.

Fourth, FIRR of scenario 1 could not be calculated since NPV is less than 0. Hence, only scenarios 2, 3 and 4 are reviewed. According to Table 7.14.1, FIRR of scenario 2 is 9.85% which is the highest in 3 scenarios. In scenario 2, subsidy is provided for land acquisition.An FIRR of 9.85% is considered too low for private entities to consider investment of resources to the project. Private investors normally get interested on projects with FIRR of 14.0% to 16.0%. Hence, more subsidies will be required to enhance the project viability and secure investment from the private investors.

Fifth, it is mentioned that other revenues such as advertising are not significant in F/S. Yet, given that FIRR for all scenarios is less than 10.0%, non-toll revenue should be considered to improve FIRR.

Finally, in the economic analysis, the benefit-cost ratio method is used to establish the project's economic viability. Benefit-cost ratio for scenario 1 as shown in Table 7.14.1 is less than 1.0 rendering it unfeasible. Benefit-cost ratio for scenario 2 is 1.19, the highest ratio among 4 scenarios. All BC ratios for scenarios 2 to 4 are higher than 1.0. Moreover, specific figures of EIRR (Economic Internal Rate of Return) are not mentioned in the F/S.

7.14.3 Recommendation

Equity ratio needs to be revised. Then, interest rate (on a VND basis) of ODA loan is required to be reconsidered in view of the exchange rate risk. The recommendation for the tariff rate is to base its increase on inflation rate. Finally, FIRR of scenario 2 which is the highest of 4 scenarios is not enough to attract participation from privateinvestors. The recommendation therefore is for re-adjustment and/or review of required subsidies or investment cost .

CHAPTER 8 STUDY FOR PRIVATE INVESTMENT POSSIBILITY FOR BIEN HOA – VUNG TAU EXPRESSWAY PROJECT

The main objective of this chapter is to assess whether Bien Hoa- Vung Tau expressway could be considered for private investment. The discussion includes assessment of the fundamental financial profiles and project risks involved. Included also is the derivation of implications on required government subsidies, incentives and guarantee items. There will also be simulation of various capital structures and clarifications of required contribution from JICA PSIF loan. At the end of this chapter, the summary of the potential benefits from three viewpoints; GOV, private investor and JICA, will be presented.

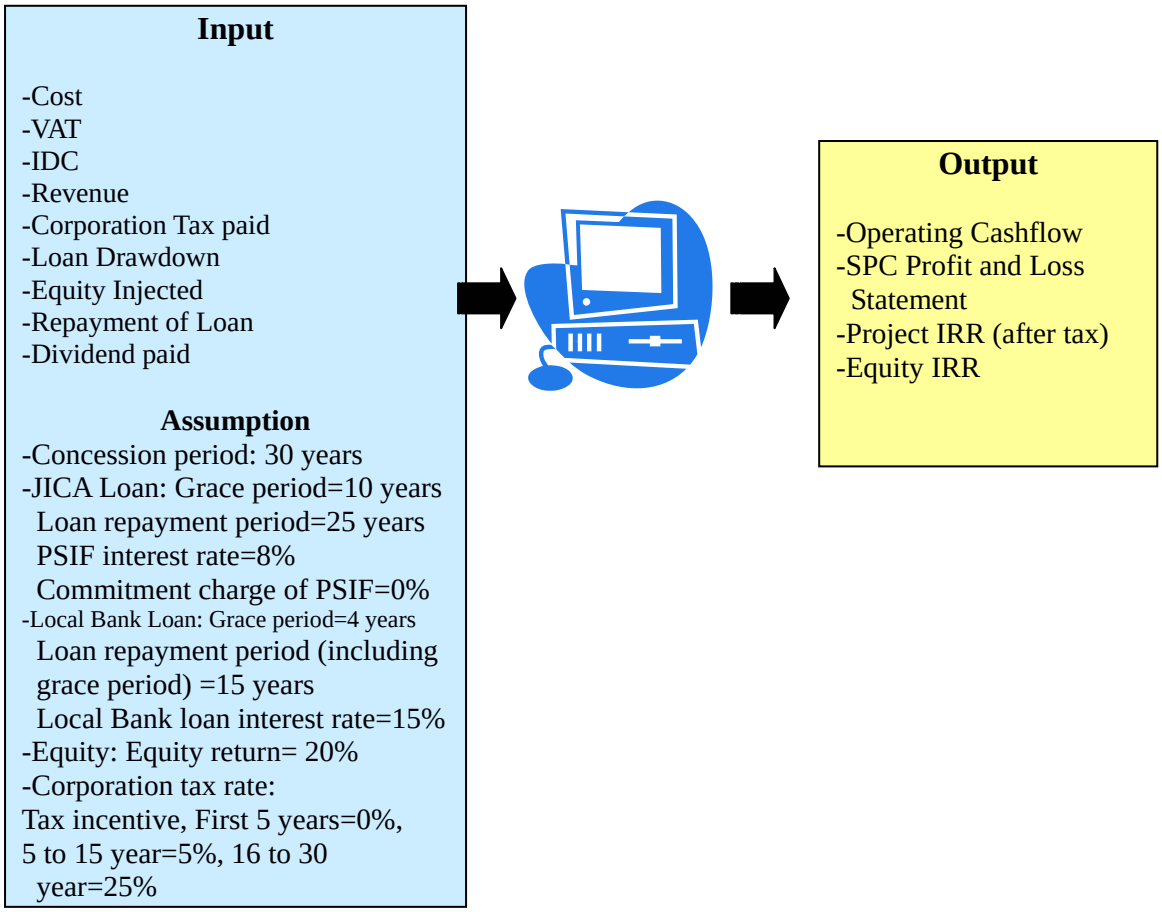
8.1 Project Financials

Presented in the previous chapter are the results of F/S review and the suggestion on the refinement of cost estimates based on a combination of bottom-up calculations and standard cost references from an engineering perspective. The discussion also included review of the demand forecast by using the network model with sample OD survey results.

In this chapter, there will be discussion of the simulation of project financials from a private investor's perspective. More specifically, identified also are the assumptions for cost efficiencies that are typically applied in private investment projects. Also, the study team made assumptions regarding future demand forecast to reflect the characteristics of Bien Hoa- Phu My corridor, which is intended to serve the logistical needs of commercial heavy trucks going in and out of Cai Mep- Chi Vai International Port.

8.1.1 Explanation of Financial Model

Input and output of financial model are explained in Figure 8.1.1. Input includes cost of Phase 1, VAT, IDC (interest during construction), revenue, corporation tax paid, loan drawdown, equity injected, repayment of loan and dividend paid. Then, assumption about concession period, loan, equity and corporation tax is as follows. Ratio of debt and equity, and interest rate of loans depend on scheme. Therefore, these will be explained in the following sections. Moreover, output was derived from input based on these assumptions. Output includes operating cashflow, SPC profit and loss statement, project IRR and equity IRR.



Source: JICA Study Team

Figure 8.1.1 Financial Model

8.1.2 Project Cost

(1) Investment Breakdown

-Cost Accumulation Scenario

Initial investment and widening investment (F/C: foreign currency, L/C: local currency) are shown in Table 8.1.1 and Table 8.1.2. This includes physical contingency and price contingency but does not include IDC and working capital. Exchange rate between JPY and VND is as follows:

1 JPY=252 VND
Source: OANDA.com, Interbank Rate (1st Quarter 2011)

Table 8.1.1 Initial Investment (F/C, L/C)

F/C (Nominal, billion VND)	2011	2012	2013	2014	2015	Total
Construction Cost	0	0	314	461	612	1,387
O&M Equipment Cost	0	0	0	19	40	59
Engineering Cost	0	0	0	0	0	0
SPC Setup Cost	7	14	21	22	22	86
Project Management Cost	0	0	0	0	0	0
Other Cost	0	0	0	0	0	0
Land Acquisition and Compensation Cost	0	0	0	0	0	0
Value Added Tax	0	0	0	0	0	0

L/C (Nominal, billion VND)	2011	2012	2013	2014	2015	Total
Construction Cost	2	2	1,975	2,336	2,742	7,057
O&M Equipment Cost	0	0	0	38	82	121
Engineering Cost	129	132	100	108	117	586
SPC Setup Cost	5	10	16	17	19	66
Project Management Cost	4	10	9	9	10	42
Other Cost	49	53	114	123	133	471
Land Acquisition and Compensation Cost	224	1,087	1,173	0	0	2,484
Value Added Tax	14	16	247	310	381	968

Source: JICA Study Team

Table 8.1.2 Widening Investment (F/C, L/C)

F/C (Nominal, billion VND)	2027	2028	2029	Total
Construction Cost	0	63	70	132
O&M Equipment Cost	0	0	0	0
Engineering Cost	0	0	0	0
SPC Setup Cost	7	7	7	22
Project Management Cost	0	0	0	0
Other Cost	0	0	0	0
Land Acquisition and Compensation Cost	0	0	0	0
Value Added Tax	0	0	0	0
L/C (Nominal, billion VND)	2027	2028	2029	Total
Construction Cost	7	1,138	1,266	2,412
O&M Equipment Cost	0	0	0	0
Engineering Cost	81	46	49	177
SPC Setup Cost	11	11	12	33
Project Management Cost	4	4	4	11
Other Cost	50	52	55	157
Land Acquisition and Compensation Cost	0	0	0	0
Value Added Tax	12	136	151	299

Source: JICA Study Team

Price escalation rate of foreign currency (F/C) was set at 1.7% (World Economic Outlook Database, 2010) per year after 2011, which was the average price escalation rate of G7 countries and EU for the last five years. Price escalation of local currency (L/C) for price contingency was set to be 7.9% (The Economist Intelligence Unit Limited, 2011) which is an estimated average price escalation rate from 2011 to 2015.

Then, price escalation rate of L/C from 2016 to 2045 is shown in Table 8.1.3. This was set based on the following calculation. Firstly, price escalation rate from 2011 to 2015 was set at 7.9%. Secondly, price escalation rate in 2035 was assumed to be 5.0% based on average inflation rate of past years (World Economic Outlook Database, 2010). The average inflation rate does not include inflation rate during hyperinflation period and the inflation rate can be considered to decrease after 2015.

Price escalation rate in 2020 was computed based on the following formula.

x = Price escalation rate from year C to year D (from year C to year D = previous period),
y = number of years from the beginning year of the previous period to year A,

Price escalation rate from year A to year B = $x \times (0.89)^{\frac{y}{5}}$

x = Price escalation rate from 2011 to 2015 = 7.9%

Price escalation rate from 2016 to 2020 = $7.9\% \times (0.89)^{\frac{5}{5}} = 7.0\%$

Price escalation rates from 2016 to 2045 are as follows based on the formula mentioned above.

Table 8.1.3 Price escalation rate (L/C, 2016-2045)

2016-2020	7.0%
2021-2025	6.3%
2026-2030	5.6%
2031-2035	5.0%
2036-2040	4.4%
2041-2045	3.9%

Source: JICA Study Team

Finally, total initial investment cost and total widening investment cost are shown in Table 8.1.4 and Table 8.1.5. This includes IDC and working capital.

Table 8.1.4 Total Initial Investment (Cost Accumulation Scenario)

(Nominal, billion VND)	2011	2012	2013	2014	2015	Total
Construction Cost	2	2	2,289	2,797	3,354	8,444
O&M Equipment Cost	0	0	0	58	122	180
Engineering Cost	129	132	100	108	117	586
SPC Setup Cost	11	24	37	39	41	152
Project Management Cost	4	10	9	9	10	42
Other Cost	49	53	114	123	133	471
Land Acquisition and Compensation Cost	224	1,087	1,173	0	0	2,484
Value Added Tax	14	16	247	310	381	968
Working capital					30	30
Interest during construction (IDC)			235	550	954	1,739
					Total	15,098

Source: JICA Study Team
*IDC is changeable by financial scheme. IDC of this table is based on a scheme below.
-Debt:Equity = 8:2, -JICA loan ratio=100%

Table 8.1.5 Total Widening Investment (Cost Accumulation Scenario)

(Nominal, billion VND)	2027	2028	2029	Total
Construction Cost	7	1,201	1,336	2,544
O&M Equipment Cost	0	0	0	0
Engineering Cost	81	46	49	177
SPC Setup Cost	18	18	19	55
Project Management Cost	4	4	4	11
Other Cost	50	52	55	157
Land Acquisition and Compensation Cost	0	0	0	0
Value Added Tax	12	136	151	299
			Total	3,243

Source: JICA Study Team

-Private Efficiency Scenario

Typically, bottom-up costing results are refined in the process of procurement with contractors. Thru various cost efficiency measures proposed and discussed, together with cost margin negotiations, the construction cost portion could be reduced by 10~20%. In this simulation exercise, the study team assumed an efficiency factor. The assumption is that the bridge on expressway at the start will have 4 lanes, with widening to 6 lanes in later stages (2027 to 2029). This is because investors would want to minimize initial equity injection amount, with a view to improve their equity return. This is called the "Private Efficiency Scenario".

Table 8.1.6 Total Initial Investment (Private Efficiency Scenario)

(Nominal, billion VND)	2011	2012	2013	2014	2015	Total
Construction Cost	2	2	1,897	2,326	2,800	7,026
O&M Equipment Cost	0	0	0	58	122	180
Engineering Cost	113	113	86	93	101	506
SPC Setup Cost	11	24	37	39	41	152
Project Management Cost	3	10	8	8	9	37
Other Cost	44	47	102	110	118	420
Land Acquisition and Compensation Cost	224	1,087	1,173	0	0	2,484
Value Added Tax	12	12	178	217	260	679
Working capital					30	30
Interest during construction (IDC)			224	491	836	1,551
					Total	13,066

Source: JICA Study Team
*IDC is changeable by financial scheme. IDC of this table is based on a scheme below.
-Debt:Equity = 8:2, -JICA loan ratio=100%

Table 8.1.7 Total Widening Investment (Private Efficiency Scenario)

(Nominal, billion VND)	2027	2028	2029	Total
Construction Cost	7	1,092	1,216	2,315
O&M Equipment Cost	0	0	0	0
Engineering Cost	69	40	42	150
SPC Setup Cost	18	18	19	55
Project Management Cost	3	3	3	10
Other Cost	44	47	50	141
Land Acquisition and Compensation Cost	0	0	0	0
Value Added Tax	9	102	114	225
			Total	2,896

Source: JICA Study Team

(2) O&M Cost Breakdown

Total O&M cost is shown in Table 8.1.8. This includes SPC operation cost and inflation adjustment. Inflation rate is based on Table 8.1.3.

Table 8.1.8 Total O&M cost

(Nominal, billion VND)

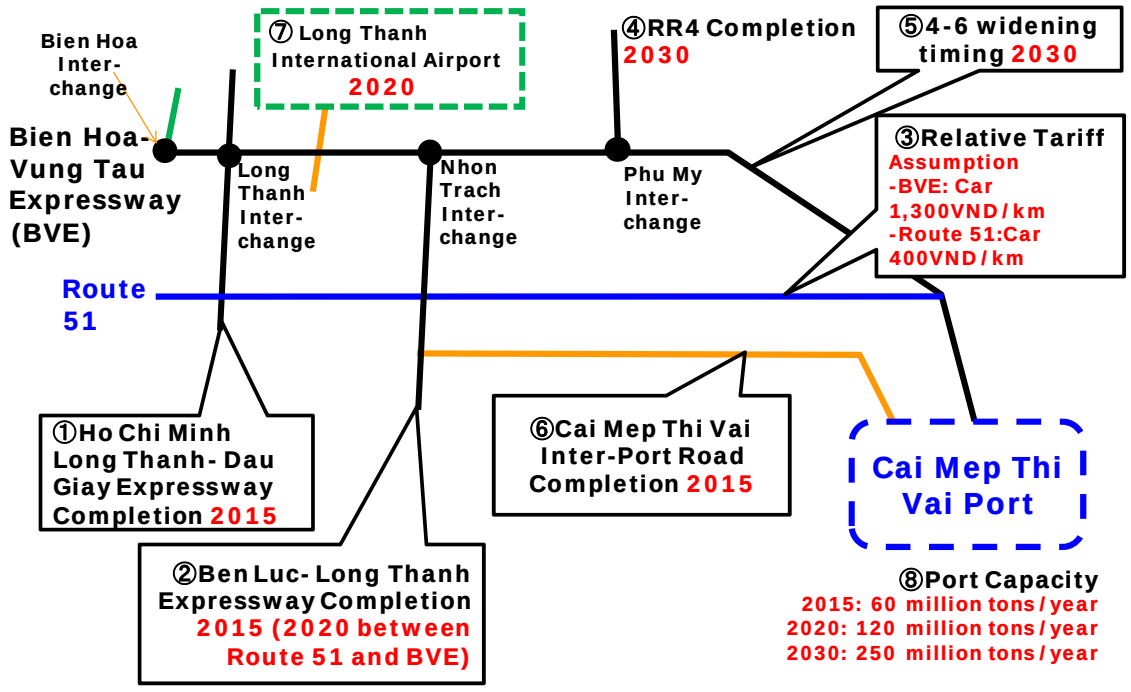
Item	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
O&M, SPC operation cost	60	64	69	74	79	84	89	95	101	107
	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
	341	188	198	209	221	232	243	255	268	281
	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
	564	306	320	334	349	362	377	391	406	422
										Total
										7,090

Source: JICA Study Team

8.1.3 Revenue Forecast Scenario

(1) Base Network Assumption

Base network assumption is shown in Figure 8.1.2. First, completion of ①Ho Chi Minh Long Thanh-Dau Giay Expressway, ②Ben Luc- Long Thanh Expressway and ⑥Cai Mep- Thi Vai Inter-Port Road was set to be in 2015 in base scenario. Second, completion of ②Ben Luc- Long Thanh Expressway between Route 51 and BVE (Bien Hoa- Vung Tau Expressway) and ⑦Long Thanh International Airport was set to be in 2020. Third, completion of ④RR4 (Ring Road 4) and ⑤ widening of BVE from 4 to 6 lanes was supposed to be in 2030. Fourth, ③tariff of BVE was set to be VND 1,300 /km in 2016 and that of Route 51 was assumed to be VND 400 /km. Finally, ⑧Port capacity of Cai Mep- Thi Vai port in 2015 was supposed to be 60 million tons/year and it was assumed to increase from 120 million to 250 million tons/year from 2020 to 2030.



Source: JICA Study Team

Figure 8.1.2 Base Network Assumption

(2) Tariff Assumption

Tariff assumption of base case is shown in Table 8.1.9. This was set to increase every 5 years. Increase of tariff is based on inflation rate mentioned in Table 8.1.3.

Table 8.1.9 Tariff Assumption

(VND/km)

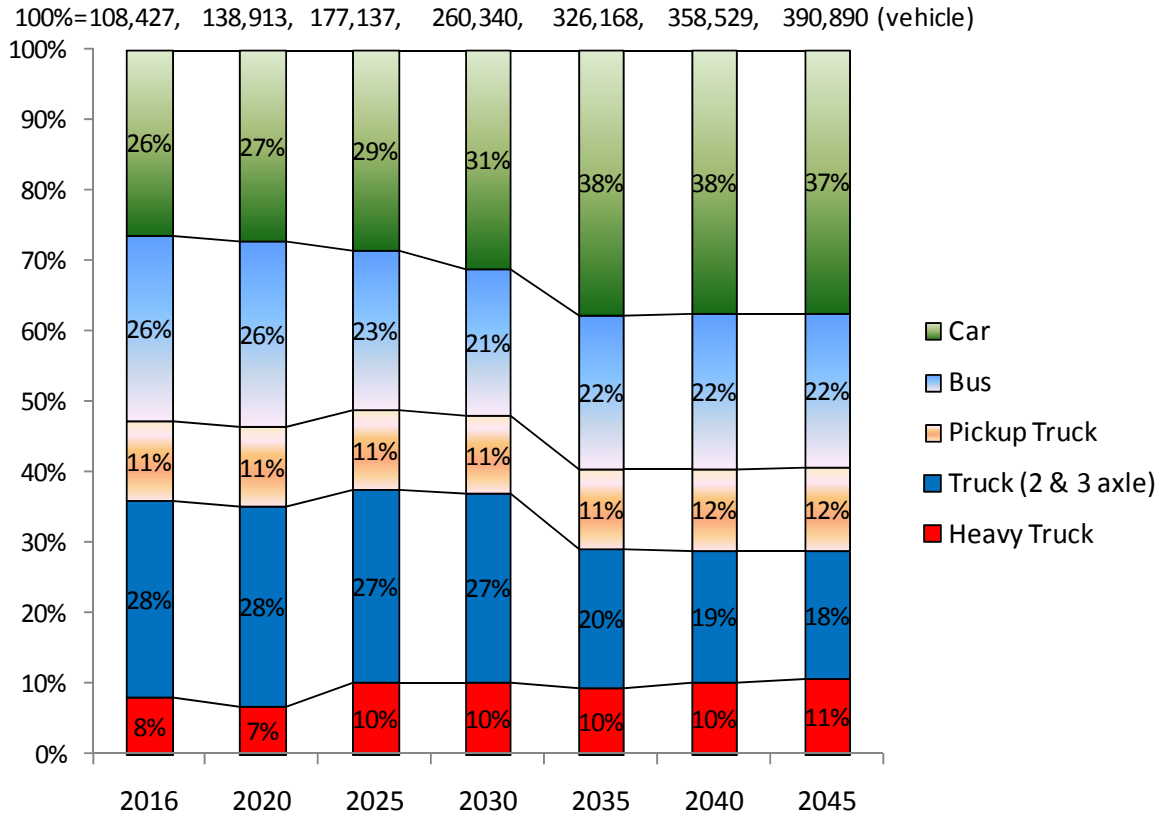
	2016	2020	2025	2030	2035	2040
Car	1,300	1,800	2,400	3,100	3,900	4,800
Mini bus	1,300	1,800	2,400	3,100	3,900	4,800
Medium bus	2,000	2,800	3,800	4,900	6,200	7,600
Heavy bus	2,900	4,000	5,400	7,000	8,900	11,000
Pickup truck	1,300	1,800	2,400	3,100	3,900	4,800
2-Axle truck	2,000	2,800	3,800	4,900	6,200	7,600
3-Axle truck	2,900	4,000	5,400	7,000	8,900	11,000
4 & more axle truck	5,400	7,500	10,100	13,200	16,800	20,800

Source: JICA Study Team

(3) Base Case Revenue Stream

Network Model Scenario

Network model scenario is an extrapolation of current OD profile. Vehicle ratio for this scenario is shown in Figure 8.1.3 based on '7.2 Traffic Demand Forecast'. As shown on Figure 8.1.3, the heavy truck ratio only fluctuates between 7% and 13% under this scenario. The study team's view is that this is due to the limitation of extrapolation method.

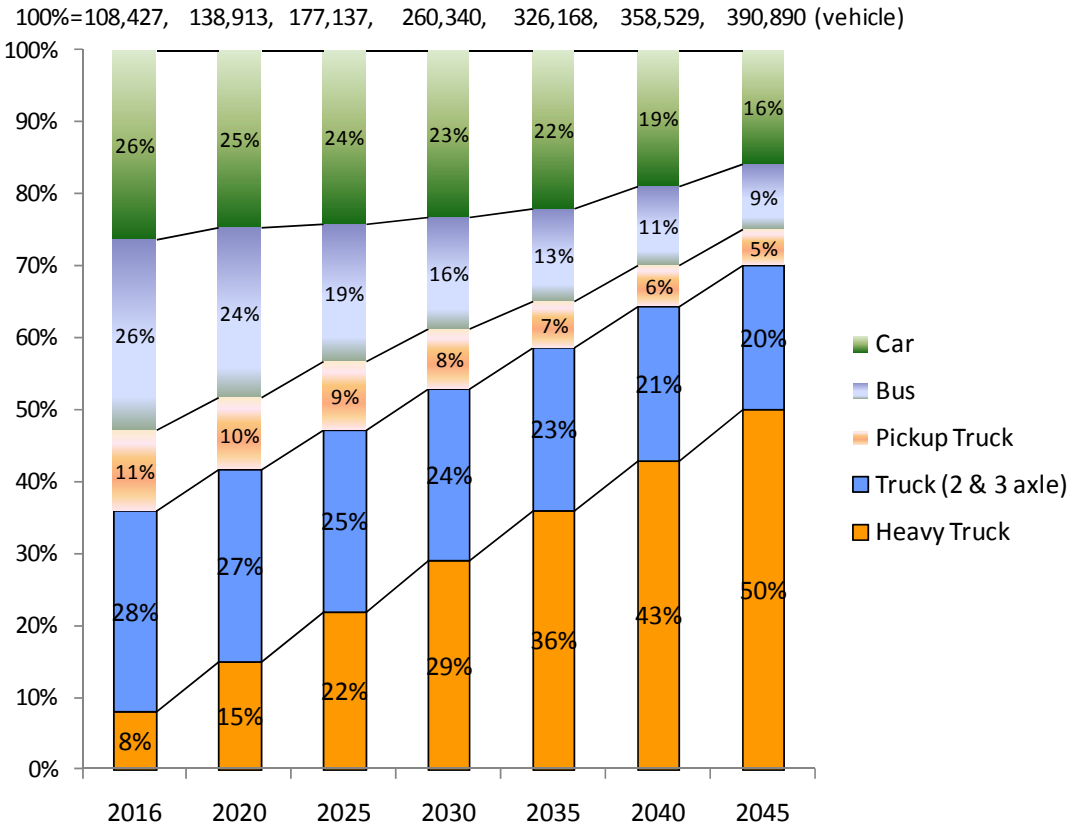


Source: JICA Study Team

Figure 8.1.3 Network Model Scenario

Industrial Expressway Scenario

This expressway corridor will undergo massive industrial zone development activities over the course of next 20 to 30 years. As an example, the capacity of Cai Mep- Chi Vai international port is planned for 250 million tons/year by 2045. This capacity is larger than the combined capacities of the ports of Yokohama and Tokyo. This type of development can be considered a future discontinuity and rather difficult to forecast if just based on a natural extrapolation of historic statistical data. Therefore, the study team refined the network model results and made additional assumptions to reflect the future characteristics of Bien Hoa- Phu My corridor. More specifically, one of the assumptions is the increase in the percentage of truck and heavy truck from 36% to 70% for selected sections of the expressway. Furthermore, heavy truck ratio is assumed to increase from 8% to 50% for selected sections. This is identified as the "Industrial Expressway Scenario". Figure 8.1.4 describes this in more detail.



Source: JICA Study Team

Figure 8.1.4 Industrial Expressway Scenario

Base case revenue stream based on industrial expressway scenario is shown in Table 8.1.10. The revenue includes non-toll revenues which is 5% of toll revenues.

Table 8.1.10 Base Case Revenue Stream

(billion VND)

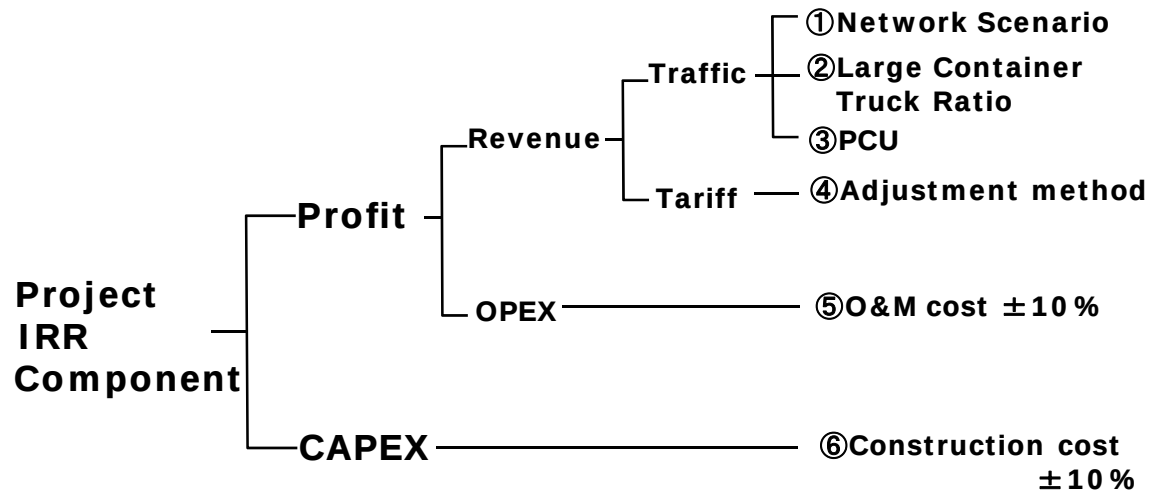
2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
625	665	704	744	784	1,268	1,450	1,631	1,813	1,995
2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
3,002	3,331	3,661	3,991	4,321	6,056	6,524	6,992	7,459	7,927
2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
10,292	10,587	10,881	11,176	11,471	14,492	14,492	15,218	15,581	15,944

Source: JICA Study Team

8.1.4 Project IRR

(1) Financial Simulation Overview

Financial simulation was implemented based on components of Figure 8.1.5. The Project IRR (Internal rate of return) components are divided into: Profit and CAPEX components. Moreover, under the Profit component are revenues and OPEX. Revenue is influenced by traffic and tariff. Additionally, traffic has 3 kinds of simulations about ①Network scenario, ②Large container truck ratio and ③PCU (passenger car unit). Tariff has ④Adjustment method simulation. These simulations are analyzed in detail below. Then, OPEX has ⑤O&M cost (±10%) simulation. Furthermore, CAPEX ⑥Construction cost simulation (±10%).



Source: JICA Study Team

Figure 8.1.5 Financial Simulation Overview

(2) Base Case Project IRR

Base Case Project IRR (after tax) is shown below. The cost is based on private efficiency scenario in '8.1.2 Project Cost'.

Project IRR of Base Case=13.3%

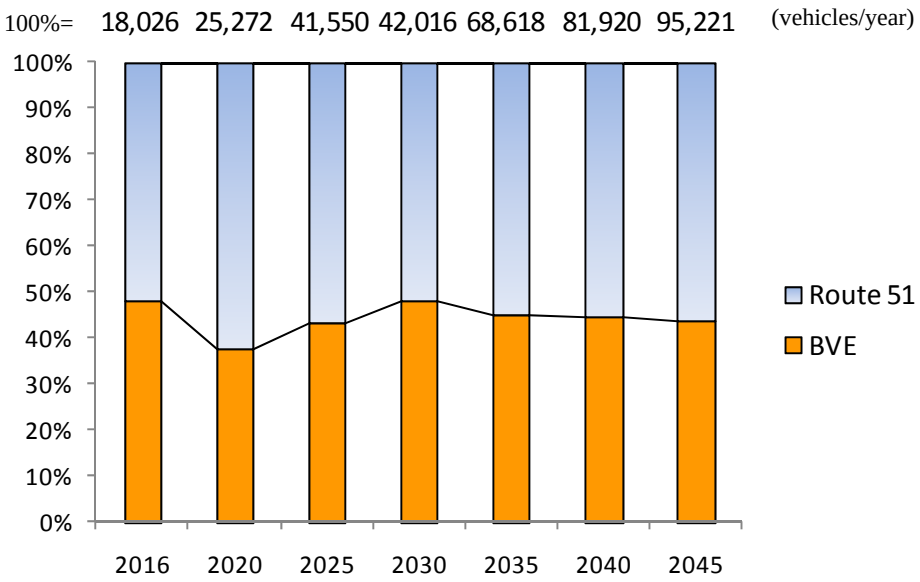
(3) Network Sensitivity Analysis

First, 5 years delay case of completion of Long Thanh International Airport and Cai Mep- Thi Vai port compared with base network scenario was analyzed in Network Sensitivity Analysis. Completion of Long Thanh International Airport is assumed to be in 2025 and in this case, full operation of Cai Mep-Thi Vai port will be in 2035.The Project IRR for this scenario of a 5 year-delay is as follows.

Project IRR for the scenario of 5 years delay = 12.5%

The impact of a 5-year delay scenario on project IRR is -0.8%. The changes on traffic demand may have affected the project IRR, but sensitivity remains relatively low.

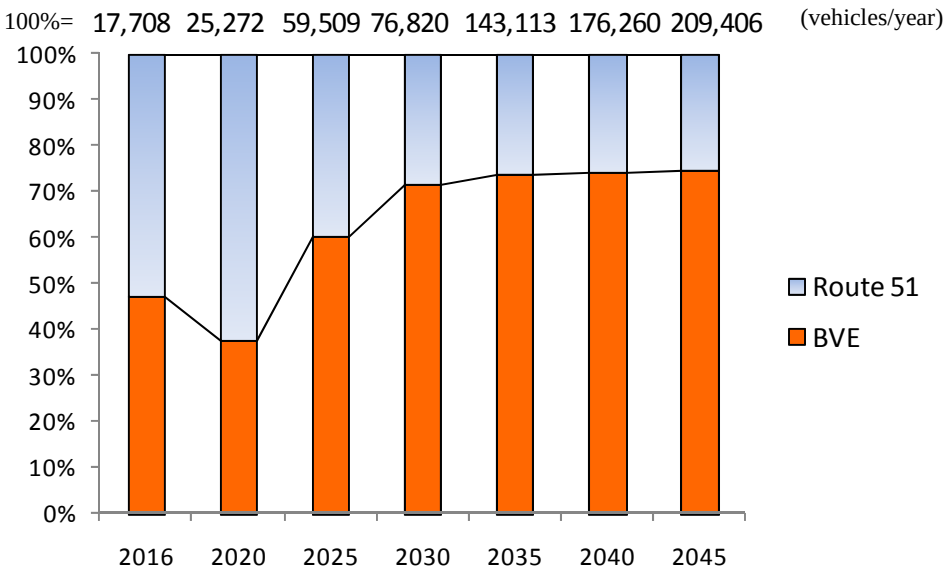
Second, Route 51 and BVE compete against each other in attracting road users. Tariff of Route 51 for car is assumed to be VND 400 /km and that of BVE was set at VND 1,300 /km in 2016. If tariff of BVE increases in the future and that of Route 51 remains stable, demand for BVE will decrease and that of Route 51 will increase. The number of heavy (4 axle) truck of BVE and Route 51 and the relative percentages of these vehicles in network model scenario and industrial expressway scenario are shown below to identify risks about relative tariff. The 100% shown in Figure 8.1.6 equals the total number of heavy trucks using BVE and Route 51.



Source: JICA Study Team

Figure 8.1.6 Heavy Truck Ratio on Network Model Scenario

Heavy truck ratio of BVE on network model scenario in assumed to fluctuate between around 40% and 50% from 2016 to 2045.



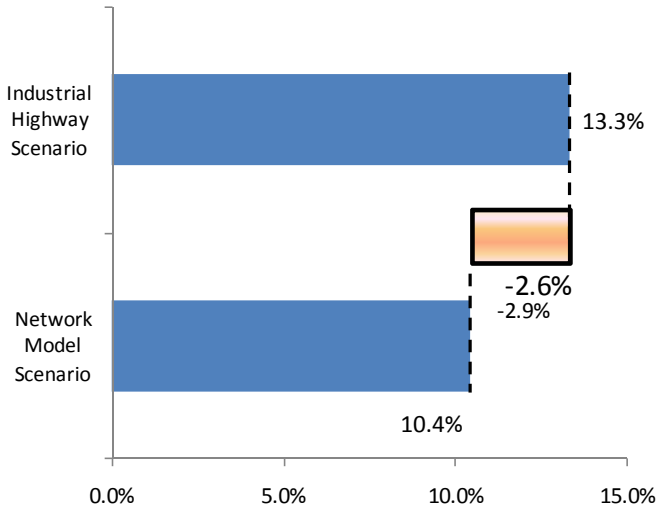
Source: JICA Study Team

Figure 8.1.7 Heavy Truck Ratio on Industrial Expressway Scenario

According to Figure 8.1.7, heavy truck ratio of BVE on industrial expressway scenario is expected to be around 50% in 2016. The share of BVE is assumed to to increase to 70% by 2045. This has a 10% to 20% difference between that of industrial expressway scenario and that of network model Scenario. If tariff of BVE increases in the future and that of Route 51 is unchanged, heavy truck ratio is assumed to be similar to that of network model scenario.

Sensitivity analysis of network model scenario was undertaken. The Project IRR for this scenario and industrial expressway scenario (base case) is shown in Figure 8.1.8. The difference between the project IRR of the two scenarios is 2.9%. If relative tariff difference between BVE and Route 51 continues, sensitivity is very high. This is the highest sensitivity in sensitivity analysis.

Project IRR of Network Model Scenario=10.4%

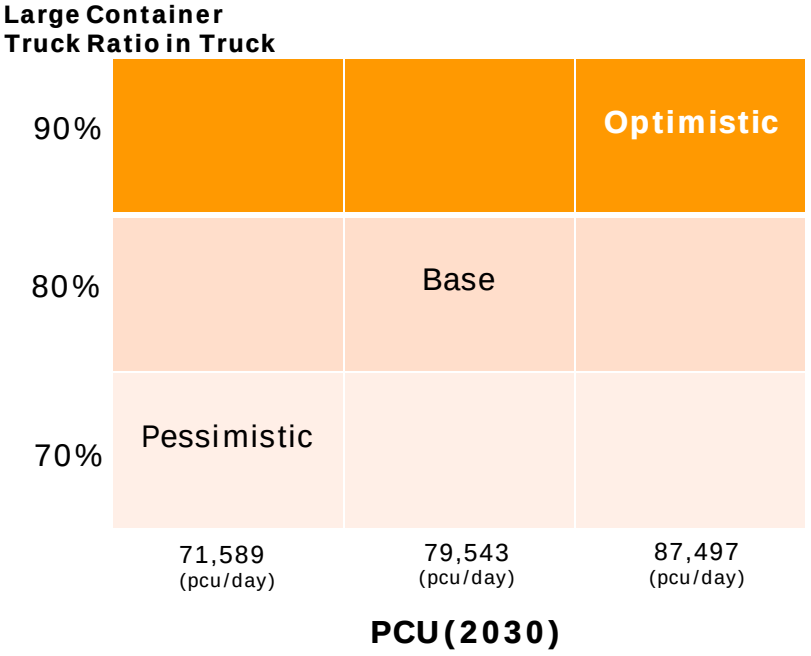


Source: JICA Study Team

Figure 8.1.8 Project IRR of both scenarios

(4) Traffic Profile Sensitivity Analysis

PCU in 2030 is around 79,500 pcu/day and large container truck ratio in truck is 80% in base case. Then, sensitivity analysis was implemented based on PCU and Large Container Truck Scenario in Figure 8.1.9. PCU in 2030 is around 87,500 pcu/day which is 1.1 times of that in each link of base case, and large container truck ratio in truck is 90% which is 10% higher than that of base case in optimistic case. On the other hand, PCU in 2030 is around 71,600 pcu/day which is 0.9 times of that in each link of base case, and large container truck ratio in Truck is 70% which is 10% lower than that of base case in pessimistic case.



Source: JICA Study Team

Figure 8.1.9 PCU and Large Container Truck Scenario

Project IRR of optimistic and pessimistic cases is shown below:

Project IRR of optimistic case about traffic profile=14.1%
Project IRR of pessimistic case about traffic profile=12.4%

The impact of optimistic case on project IRR base case is +0.8% and that of pessimistic case is -0.9%. Optimistic case has relatively a slightly large effect on project IRR compared with pessimistic case.

(5) Tariff Adjustment Sensitivity Analysis

There is possibility that the actual tariff adjustment will be delayed compared with the planned tariff adjustment. The Table 8.1.11 shows 5-year delay case of Tariff adjustment.

Table 8.1.11 Tariff Assumption (5 years delay case of Tariff adjustment)

(VND/km)

	2016	2020	2025	2030	2035	2040
Car	1,300	**1,300**	**1,800**	**2,400**	**3,100**	**3,900**
Mini bus	1,300	**1,300**	**1,800**	**2,400**	**3,100**	**3,900**
Medium bus	2,000	**2,000**	**2,800**	**3,800**	**4,900**	**6,200**
Heavy bus	2,900	**2,900**	**4,000**	**5,400**	**7,000**	**8,900**
Pickup truck	1,300	**1,300**	**1,800**	**2,400**	**3,100**	**3,900**
2-Axle truck	2,000	**2,000**	**2,800**	**3,800**	**4,900**	**6,200**
3-Axle truck	2,900	**2,900**	**4,000**	**5,400**	**7,000**	**8,900**
4 & more axle truck	5,400	**5,400**	**7,500**	**10,100**	**13,200**	**16,800**

Source: JICA Study Team

Project IRR of a 5-year delay on Tariff Adjustment = 11.6%

Since the impact of a 5-year delay case on project IRR is more than 1.5%, tariff adjustment delay results into a relatively high sensitivity. This scenario can be considered high risk for the project and government guarantee is essential in reducing the risk.

(6) OPEX Sensitivity Analysis

OPEX sensitivity analysis is implemented and 10% decrease of OPEX is optimistic case of the analysis and the 10% increase of OPEX is considered as pessimistic case. The impact of optimistic case on project IRR is exactly same as that of base case and project IRR of pessimistic case is only -0.1%. Therefore, sensitivity due to changes in OPEX is very low compared with other factors.

Project IRR of Optimistic case about OPEX=13.3%
Project IRR of Pessimistic case about OPEX=13.2%

(7) CAPEX Sensitivity Analysis

The sensitivity analysis for CAPEX which excludes land acquisition fee was carried out with the following scenarios considered: Optimistic case - 10% decrease of CAPEX and Pessimistic case - 10% increase of CAPEX. The difference between project IRR of optimistic case and that of base case is 0.4% and that of pessimistic case is 0.4%. Sensitivity of CAPEX is higher than that of OPEX but not as high as tariff adjustment sensitivity.

Project IRR of Optimistic case about CAPEX=13.7%
Project IRR of Pessimistic case about CAPEX=12.9%

8.1.5 Summary of Project Financials

Summary of Investment Breakdown is shown below.

Table 8.1.12 Summary of Investment Breakdown (billion VND)

Item	TEDI	Cost Accumulation Scenario		Private Efficiency Scenario	
Project cost	14,748 (705 million USD)	Initial Investment Cost	Widening Investment Cost	Initial Investment Cost	Widening Investment Cost
		15,098 (722 million USD)	3,243 (155 million USD)	13,066 (625 million USD)	2,896 (139 million USD)
		Total Project Cost： 18,341 (877 million USD)		Total Project Cost： 15,962 (764 million USD)	
Construction Period	2011～2015 year				
In-Service Period	2016～2045 year				
Scope of project	Phase 1 Section Only (46.5km)				
	General Section : 4 Lane width Bridge Section : 4 lane width (12.8km) 6 lane width (34.0km) *See Table 7.4.1			General Section : 4 Lane width Bridge Section : 4 lane width *See Table 7.4.2	

Source: JICA Study Team (1 USD=20,906 VND)

Table 8.1.13 shows comparison of construction cost between TEDI F/S and construction cost estimated by the Study Team. Table 8.1.14 shows detail of investment cost of Base of Cost Accumulation Scenario and Private Efficiency Scenario.

Table 8.1.13 Comparison of Construction Cost (2011 Price) (billion VND)

Items	TEDI	Base of Cost Accumulation Scenario	Balance
Construction Cost+O&M Equipment Cost	7,291	7,748	457
（Construction Cost）	(6,560)	(7,586)	(1,026)
（O&M Equipment Cost）	(730)	(161)	(-569)
Engineering Cost	514	561	47
SPC Setup Cost	-	151	151
Project Management Cost	29	30	2
Other Cost	378	391	13
Land Acquisition and Compensation Cost	2,080	2,239	159
Total	10,292	11,121	829
Remarks	*See Table 7.10.1	*See Table 7.10.6	

Note: Contents of O&M equipment cost in TEDI and this study are different
Source: JICA Study Team

Table 8.1.14 Comparison of Construction Cost (2011 Price) (billion VND)

Items	Cost Accumulation Scenario		Private Efficiency Scenario	
	Initial Investment	Widening Investment	Initial Investment	Widening Investment
Construction Cost	8,444	2,544	7,026	2,315
O&M Equipment Cost	180	0	180	0
Engineering Cost	586	177	506	150
SPC Setup Cost	152	55	152	55
Project Management Cost	42	11	37	10
Other Cost	471	157	420	141
Land Acquisition and Compensation Cost	2,484	0	2,484	0
Value Added Tax	968	299	679	225
Working Capital	30		30	
Interest During Construction(IDC)	1,739		1,551	
Total	15,098	3,243	13,066	2,896

Source: JICA Study Team

Construction period is from 2011 to 2015 and in-service period is from 2016 to 2045. Scope of the project is only Phase 1. As I mentioned above, bottom-up costing results are refined in the process of procurement with contractors. Then, 'Private Efficiency Scenario' was derived as the construction cost could be reduced compared with "Cost Accumulation Scenario" and the bridge on expressway can start from 4 lanes, with widening to 6 lanes in later stage. Additionally, Tariff Assumption of Base Case and Future Traffic Demand of Bien Hoa-Vung Tau Expressway are shown below. Future Traffic Demand mentioned in '7.3.5 Results of Updated Traffic Demand' was revised based on '8.1.3 (3) 2) Industrial Expressway Scenario'.

Table 8.1.15 Tariff Assumption of Base Case（identical to Table 8.1.9） (VND/km)

	2016	2020	2025	2030	2035	2040
Car	1,300	1,800	2,400	3,100	3,900	4,800
Mini bus	1,300	1,800	2,400	3,100	3,900	4,800
Medium bus	2,000	2,800	3,800	4,900	6,200	7,600
Heavy bus	2,900	4,000	5,400	7,000	8,900	11,000
Pickup truck	1,300	1,800	2,400	3,100	3,900	4,800
2-Axle truck	2,000	2,800	3,800	4,900	6,200	7,600
3-Axle truck	2,900	4,000	5,400	7,000	8,900	11,000
4 & more axle	5,400	7,500	10,100	13,200	16,800	20,800

Source: JICA Study Team

Table 8.1.16 Major Condition of Traffic Demand Forecast

Items	Major Transport Facilities	Condition
Network	Long Thanh International Airport	Phase 1：2020 Phase 2：2030 Phase 3：after 2030
	Cai Mep – Thi Vai Port (26 Berth)	Full Operation :2030
	Bien Hoa – Vung Tau Railway	2020
Induced Traffic Volume	Long Thanh International Airport	Car 2020：6,852 vehicle 2025：8,454 vehicle 2030：10,431 vehicle 2035：42,618 vehicle Heavy Bus 2020：406 vehicle 2025：501 vehicle 2030：619 vehicle 2035：2,528 vehicle *See Table 7.3.18
	Cai Mep – Thi Vai Port	Container Truck 2020：4,100 vehicle 2030：11,600 vehicle Cargo Truck 2020：4,800 vehicle 2030：9,400 vehicle *See Table 7.3.16
	Bien Hoa – Vung Tau Railway	10% of total trip number

Source: JICA Study Team

Table 8.1.17 Future Traffic Demand of Bien Hoa-Vung Tau Expressway (Industrial Expressway Scenario: 2015-2035, vehicles/day)

2016 Traffic (Vehicles/day, Both directions)

Section	Car	Mini Bus	Medi. Bus	Heavy Bus	Pickup	2- Axle	3-Axle	4 and More	Total
Bien Hoa City -	4,270	1,704	765	721	1,783	1,273	2,810	1,169	14,495
LT Dau Giay Exp	4,407	1,913	845	889	1,841	1,448	3,182	1,260	15,784
LT Dau Giay-LT Airport	5,407	2,714	1,133	1,076	2,176	1,683	3,838	1,513	19,542
LT Airport-Ben Luc Exp	3,559	2,184	938	880	1,576	1,202	2,769	1,037	14,144
Ben Luc Exp-RR4	3,721	2,332	996	948	1,637	1,242	2,804	1,140	14,821
	3,721	2,332	996	948	1,637	1,242	2,804	1,140	14,821
RR4-Port	3,721	2,332	996	948	1,637	1,242	2,804	1,140	14,821

2020 Traffic (Vehicles/day, Both directions)

Section	Car	Mini Bus	Medi. Bus	Heavy Bus	Pickup	2- Axle	3-Axle	4 and More	Total
Bien Hoa City -	4,621	2,371	1,018	1,062	1,899	1,497	3,183	2,415	18,066
LT Dau Giay Exp	4,687	2,405	1,032	1,077	1,926	1,519	3,228	2,449	18,323
LT Dau Giay-LT Airport	5,874	3,014	1,294	1,350	2,414	1,903	4,045	3,069	22,964
LT Airport-Ben Luc Exp	4,439	2,278	978	1,020	1,825	1,438	3,057	2,320	17,354
Ben Luc Exp-RR4	5,100	2,617	1,123	1,172	2,096	1,767	3,742	3,117	20,735
	5,100	2,617	1,123	1,172	2,096	1,767	3,742	3,117	20,735
RR4-Port	5,100	2,617	1,123	1,172	2,096	1,767	3,742	3,117	20,735

2025 Traffic (Vehicles/day, Both directions)

Section	Car	Mini Bus	Medi. Bus	Heavy Bus	Pickup	2- Axle	3-Axle	4 and More	Total
Bien Hoa City -	5,747	2,389	1,082	1,068	2,257	1,696	3,533	4,086	21,859
LT Dau Giay Exp	5,026	2,089	946	934	1,973	1,483	3,090	3,573	19,114
LT Dau Giay-LT Airport	6,143	2,553	1,157	1,142	2,412	1,813	3,777	4,367	23,365
LT Airport-Ben Luc Exp	6,699	2,784	1,262	1,245	2,630	1,977	4,118	4,762	25,478
Ben Luc Exp-RR4	7,031	2,922	1,324	1,307	2,760	2,395	4,956	6,411	29,107
	7,031	2,922	1,324	1,307	2,760	2,395	4,956	6,411	29,107
RR4-Port	7,031	2,922	1,324	1,307	2,760	2,395	4,956	6,411	29,107

2030 Traffic (Vehicles/day, Both directions)

Section	Car	Mini Bus	Medi. Bus	Heavy Bus	Pickup	2- Axle	3-Axle	4 and More	Total
Bien Hoa City -	7,833	2,862	1,154	1,275	2,800	2,131	4,335	7,078	29,467
LT Dau Giay Exp	8,786	3,210	1,294	1,430	3,140	2,390	4,862	7,938	33,050
LT Dau Giay-LT Airport	12,597	4,602	1,855	2,050	4,502	3,426	6,972	11,382	47,387
LT Airport-Ben Luc Exp	10,350	3,781	1,524	1,684	3,699	2,815	5,728	9,351	38,932
Ben Luc Exp-RR4	9,470	3,459	1,395	1,541	3,384	3,248	6,551	11,876	40,924
	9,470	3,459	1,395	1,541	3,384	3,248	6,551	11,876	40,924
RR4-Port	6,862	2,507	1,011	1,117	2,453	2,354	4,747	8,606	29,656

2035 Traffic (Vehicles/day, Both directions)

Section	Car	Mini Bus	Medi. Bus	Heavy Bus	Pickup	2- Axle	3-Axle	4 and More	Total
Bien Hoa City -	10,638	3,312	1,311	1,590	3,178	2,648	5,239	11,595	39,510
LT Dau Giay Exp	10,313	3,211	1,270	1,542	3,080	2,567	5,079	11,240	38,302
LT Dau Giay-LT Airport	16,185	5,038	1,994	2,419	4,834	4,028	7,971	17,640	60,109
LT Airport-Ben Luc Exp	10,845	3,376	1,336	1,621	3,239	2,699	5,341	11,820	40,277
Ben Luc Exp-RR4	11,831	3,683	1,458	1,769	3,534	4,116	8,071	19,396	53,858
	11,831	3,683	1,458	1,769	3,534	4,116	8,071	19,396	53,858
RR4-Port	8,843	2,753	1,089	1,322	2,641	3,077	6,033	14,497	40,255

Source: JICA Study Team

Furthermore, results of financial analysis are as shown in Table 8.1.18.

Table 8.1.18 Project IRR, Equity IRR

Project IRR (after tax)	13.3%	Base Case
Equity IRR	16.6%	Base Case
Equity IRR	20.4%	Land Subsidy Case

Source: JICA Study Team

Table 8.1.19 Cash Flow Waterfall (Base Case)

Item	2011	2016	2021	2026	2031	2036	2041	2045	Total
1. Revenue									0
Toll revenue allocated to private sector		656	1,331	3,152	6,359	10,807	15,217	16,741	204,833
2. Capital costs	▲ 409	0	0	0	0	0	0	0	▲ 15,962
3. O&M, SPC operation cost		60	84	341	232	564	362	422	7,090
4. VAT	0	54	112	264	546	927	1,313	1,445	17,601
5. Corporation tax paid		0	0	91	1,224	2,282	3,477	3,667	38,905
6. Loan drawdown	0								13,349
7. Equity injected	409								2,613
8. Debt service		836	808	946	1,240	1,274	1,324	5,278	38,026
9. Dividend paid		0	327	1,510	3,117	5,760	8,740	5,929	104,294
Net cashflow for Project IRR (before tax)	▲ 409	542	1,135	2,547	5,582	9,316	13,542	14,874	165,731
Net cashflow for Project IRR (after tax)	▲ 409	542	1,135	2,456	4,357	7,034	10,064	11,207	126,827
Net cashflow for Equity IRR (after tax)	▲ 409	▲ 294	327	1,510	3,117	5,760	8,740	5,929	100,599
Cumulative net cash flow (Equity IRR)	▲ 409	▲ 2,907	▲ 3,368	688	11,764	33,043	67,397	100,599	733,046
Debt Service Cover Ratio (DSCR)		0.65	1.41	2.60	3.51	5.52	7.60	2.12	

Financial indicators	
Project IRR (before tax)	14.3%
Project IRR (after tax)	13.3%
Equity IRR (after tax)	16.6%
Average DSCR	3.13
Minimum DSCR	**0.65**

Source: JICA Study Team

Cost of Base Case is based on 'Private Efficiency Scenario' in Table. 8.1.12. According to Cashflow of Base Case (see appendix-2), the first year when dividends are paid will be 2021 (the sixth year of in-service period). The year when investment (equity) is repaid and cumulative net cash flow turns to the black will be 2026 (the eleventh year of in-service period). Capital structure of Base Case is the scenario which is Debt:Equity=80:20, JICA PSIF Loan 100%. Details about capital structure will be mentioned in '8.3.3 Draft of Capital Structure Options'.

8.2 Progress of BOT/PPP Legal and Regulatory Framework

8.2.1 Decree 24

On 5 April 2011, the GOV issued Decree 24/2011/ND-CP (Decree 24) amending a number of articles including Decree 108/2009/ND-CP (Decree 108) dated 27 November 2009 on investment on the basis of BOT (Build-Operate-Transfer) contracts, BTO (Build-Transfer-Operate) contracts and BT (Build-Transfer) contracts.

Discussed below are the changes created thru Decree 24 on Decree 108:

1. Decree 24 increases the types of projects in Decree 108 that are "encouraged" for investment in BOT, BTO and BT forms by specifying the development of infrastructure facilities in the following additional sectors:

    - medical health
    - education and training
    - occupational training
    - culture
    - sports
    - offices of State bodies

2. Decree 24 also amends Article 8 of Decree 108 in that the use of State funds to cover the costs for project proposals is no longer permitted. Proposals for projects are no longer to be funded by the State budget but the costs of formulating and evaluating feasibility reports of projects, including costs relevant to the preparation of "other projects", are still to be funded by State funds.
3. Articles 11 and 12 of Decree 108 have been amended by Decree 24 to better manage the preparation and review of both project proposals and feasibility reports.

    Project proposals under Article 11 must now comply with relevant construction law requirements for a "pre-feasibility report" in addition to including the items agreed for a feasibility report under the revised Article 12.

    The project proposal requirements have now been incorporated into the feasibility report requirements.

    The content requirements for a feasibility report are not different from what were previously required for a project proposal, except that a few specific proposal requirements have now been removed (from nine requirements down to only five requirements).
4. Another important change introduced by Decree 24 is the amendment of Article 12.5 of Decree 108 regarding authority of both the Prime Minister and other Government bodies to approve feasibility reports and proposals.

    Because of the harmonized criteria for evaluating proposals and feasibility reports as mentioned in item 3 above, only feasibility reports are now reviewed and approved.

    The Prime Minister only approves feasibility reports for projects of national importance as decided by the National Assembly. This is not a change from prior provisions in Decree 108. The change is that under the new provision, the Prime Minister is no longer required to approve feasibility reports for projects which:

    a. need to use 200 or more hectares of land; or
    b. are in Group A and have a total investment capital of VND 1,500 billion or more.

This means that approval responsibility for all Groups A, B, C projects now resides with the relevant State bodies as set out in Decree 108. However, if a Government guarantees or state funds are required to assist with implementation of the project, a report must be submitted to the Prime Minister for his consideration and decision prior to approval of any feasibility report.

Decree 24 will take effect on 20 May 2011. In conclusion, Decree 24 amending a number of articles of Decree 108 does not affect implementation of the Bien Hoa-Vung Tau Expressway Project. The use of the state budget is planned to secure Right-of-Way, in that manner the feasibility report shall be submitted to the Prime Minister as scheduled.

8.2.2 Expressway Toll Rate

Toll rates in Vietnam are consistent across the country. There is no variation allowed above the level approved. The Ministry of Transport (MOT) submits its request to the Ministry of Finance (MOF) for toll rate approvals and must justify any changes. There is no regulatory authority, other than the MOF, involved in the approvals. To date no automatic annual adjustment on toll rates has been applied; the MOT must make a separate application to the MOF every time it seeks an adjustment. For the traditional tollways, where the government is involved, the funds collected are deposited to the central government's consolidated revenue fund, and then apportioned to specific activities, not necessarily related to the toll road and not necessarily related to its maintenance. In the case of a BOT, however, the BOT Company is allowed to collect the toll fees and then use the revenues to operate and maintain the said tollway. In the past there has been a significant amount of "leakage" in the collection of toll fees through the existing system of collection. To counter this, the GOV has recently approved private sector participation in toll collection. This move is expected to improve the level of collection.

The authority to levy tolls, Circular No. 90/2004 of September 7, 2004 is the guiding legal document which sets the regime of road toll collection, payment, management and use. The new Circular amending Circular No.90/2004 has been under way. As a regulator, the MOF would keep its authority to determine toll rates. The MOF has to take into account the users' capacity to pay based on social consideration. The MOF simultaneously has to continue encouraging private sector investment in expressway business by considering possible minimum revenue guarantee or toll fee adjustment based on cost recovery concept. The new Circular must include these important issues .

8.3 Development of BOT/PPP Scheme

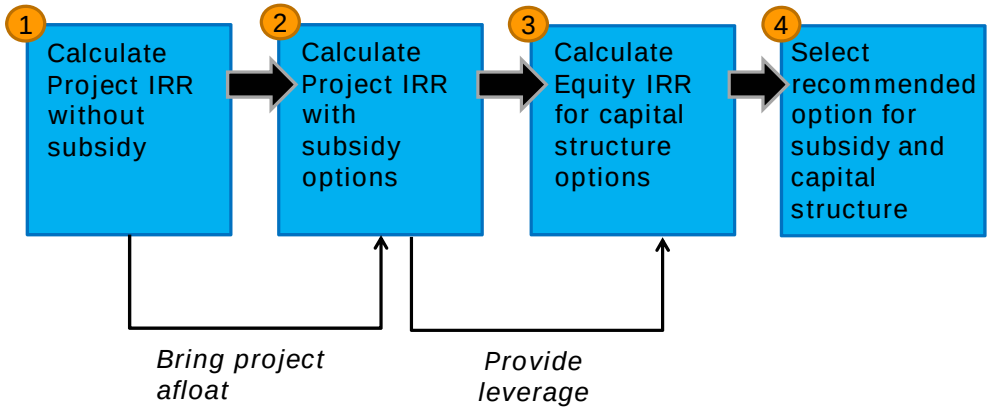
Using the financial models described in previous sections, options for BOT financial scheme are analyzed and evaluated according to the following steps.

STEP 1: Project IRR is calculated to see whether the subsidy is necessary. The calculated result of Project IRR for the Base Case scenario is 13.3% without subsidy this is lower than the target Project IRR of around 14% to 16%[9]

STEP 2: Based on the STEP 1 result, subsidy options are set to bring the project afloat, then Project IRR with different subsidy options are calculated to see the impact of each subsidy option.

STEP 3: Different Capital structure options are set for calculation of Equity IRR. Merits and Demerits are discussed for each capital structure option.

STEP 4: Equity IRR is calculated for each capital structure with subsidy option. Based on the calculated result, recommended option for subsidy and capital structure is selected.



Source: JICA Study Team

Figure 8.3.1 Steps for BOT Financial Scheme Design

8.3.1 Application of Private Sector Investment Finance (PSIF)

Application of long-term soft loan provided by JICA Private Sector Investment Finance (JICA-PSIF) is assumed for financing the project. The following terms and conditions are used for the application of PSIF loan:

(1) Base interest rate: 2.0% per year at fixed rate
(2) Risk spread including foreign exchange risk premium: 6.0%[10], therefore the applied interest rate is 8.0% per year
(3) Loan period: 30 years with a 10-year grace period plus 20-year repayment period
(4) Full repayment at the end of concession period

[9] 14-16% of Project IRR is required for expressway projects in ASEAN 5 countries (Thailand, Malaysia, Indonesia, Vietnam and Philippine). 16% of Project IRR is required for a project with moderate risk and 14% of Project IRR is required for a project with low risk.

[10] The rate is set between average annual depreciation rate of VND against Japanese Yen for the period of 1992 to 2011(6.5%) and the current on-lending premium of the World Bank in Vietnam (7.0%).

8.3.2 Draft of Government Subsidy Options

Since the Project IRR calculated for the Base Case is at marginal level, the base project profitability should be improved by injecting government financial support/subsidy. The following three options are set up:

(1) Land Cost Subsidy

Land acquisition and compensation cost of about USD 119 million is required for the project. First option is for the SPC to request this land cost subsidy from the GOV. The subsidy would actually be allocated to the provincial governments which will conduct the land acquisition and compensation.

(2) Ancillary facilities

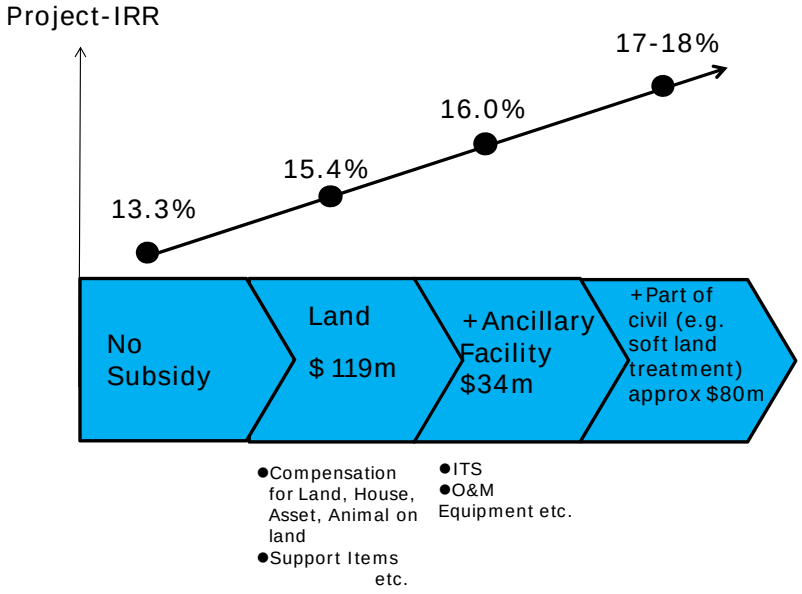
Second option is, ancillary facilities such as ITS and O&M equipments (USD 34 million) to be considered as subsidy from GOV,

(3) Part of Construction Cost

The third option is to consider part of civil work (about USD 80 million) as subsidy from the GOV.

(4) Project IRR Scenario by Subsidy Options

The Base Case Project IRR is 13.3%. With the Land Cost Subsidy (First Option), the calculated Project IRR is 15.4%, an increase of 2.1% from the Base Case. In addition to the Land Cost Subsidy, the Ancillary Facilities (Second Option) is added to the subsidy to make the Project IRR to 16.0%. The total subsidy amount in this case is USD 153 million, which is about 21% of the total project cost. The third option, a portion of Civil Works is added to the subsidy, which could raise the Project IRR to 17% - 18% level. However, the total subsidy amount would add up to USD 233 million, which would go beyond 30% of the total project cost.



Source: JICA Study Team

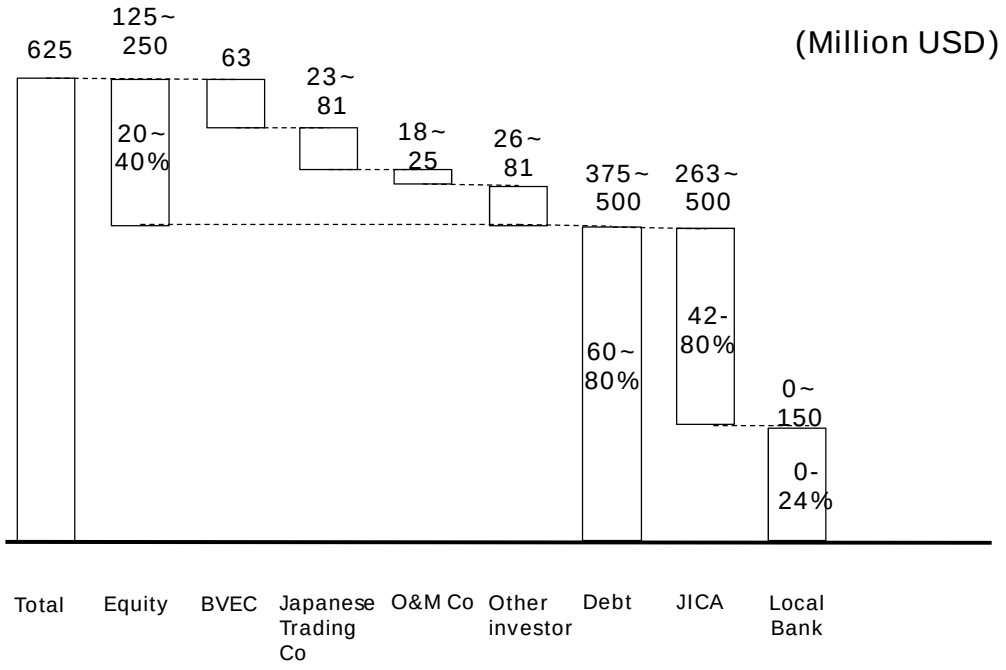
Figure 8.3.2 Project IRR Scenario for Subsidy Options

8.3.3 Draft of Capital Structure Options

(1) Capital Structure Options

For easier understanding of capital composition, hypothetical capital structure is assumed for the SPC to be established for the project implementation as illustrated in Figure 8.3.3. Total means total initial investment which is initial cost of Phase 1 (Bien Hoa- Phu My- NH51). Construction period is from 2011 to 2015.

Out of the total initial investment of USD 625 million (13,066 billion VND which was shown in Table 8.1.6, 1 USD=20,906 VND), 20% to 40 % is assumed as equity and 60% to 80% debt. The BVEC will hold about 10% of the total project cost as its equity, and will assume the rest of equity held among Japanese trading company, International O&M operator, and other investors. Debt is assumed to be provided by JICA-PSIF loan and local banks.
Total initial investment is different from figures of Phase 1 in Table 7.10.7 because they are annual disbursement in 2011 price. Total initial investment is in nominal price and it is composed of total project cost structure of Phase 1 in Table 7.10.3. Total project cost which includes widening is 764 million USD (15,962 billion VND) and widening cost is 139 million USD (2,896 billion VND) which was shown in Table 8.1.7.



Source: JICA Study Team

Figure 8.3.3 Capital Structure (Hypothesis)

With varying degrees of debt and equity structure and different levels of coverage of JICA-PSIF loan, 6 different capital structure options are set up for assessment as illustrated in the following Table 8.3.1. Three different debt and equity structures are shown combined with either of the two types of coverage of JICA-PSIF loan. Description of each option is as follows:

(i) Case 1: JICA-Driven Scenario

Case 1 has debt equity ratio of 80:20 with JICA-PSIF Loan of 100% for the debt portion. Majority of the equity would be held by BVEC with minority shareholding possibly by Japanese investor. Based on this capital structure, Weighted Average Cost of Capital (WACC) is calculated at 10.4% with the

assumption that the target equity return is 20% and the interest rates of JICA-PSIF Loan and the local bank loan are 8.0% and 15.0% respectively.

(ii) Case 2: JICA + Japanese Investor Scenario

Case 2 has debt-equity ratio of 70:30 with JICA-PSIF Loan of 100% for the debt portion. BVEC would hold largest, but not majority shareholding with a multiple number of Japanese investors holding the balance of the equity. Based on this capital structure, Weighted Average Cost of Capital (WACC) is calculated at 11.6% with the same assumptions as described above.

(iii) Case 3: Japan Majority Scenario

Case 3 has debt equity ratio of 60:40 with JICA-PSIF Loan of 100% for the debt portion. In this case, Japanese investors combined would hold majority shareholding of the SPC with BVEC holding minority share. Based on this capital structure, Weighted Average Cost of Capital (WACC) is calculated at 12.8% with the same assumptions as described above.

(iv) Cases 4, 5 and 6: Addition of Local Bank as Lender (Case 7 is for reference)

Cases 4, 5 and 6 are the variations of Cases 1, 2 and 3 with 70% (JICA PSIF Loan) and 30% (Local Bank) borrowing composition. The WACC of Cases 4, 5 and 6 are 12.1%, 13.1% and 14.1% respectively as the equity portion increases.

Table 8.3.1 Capital Structure Options

	Lender = JICA 100%	Lender=JICA 70%+Local Bank 30%
Debt: Equity 80:20	**Case 1: JICA Driven Scenario:** Merit: Speed Demerit: Jap. MOF & JICA Internal Assessment WACC=10.4%	**Case 4: JICA Driven + Local Scenario:** Merit: Speed Demerit: Slower to close finance WACC=12.1%
Debt: Equity 70:30	**Case 2: JICA + Japanese Investor Scenario:** Merit: Clear Japan Scenario Demerit: Slow to form investor WACC=11.6%	**Case 5: JICA + Japanese + Local Scenario:** Merit: Balanced Japan Scenario Demerit: Slow to form investor/finance WACC=13.1%
Debt: Equity 60:40	**Case 3: Japan Majority Scenario:** Merit: Stability of Capital/Finance Demerit: Slow to form investor and Inconsistent with BVEC preference WACC=12.8%	**Case 6: Japan Majority + Local Scenario:** Merit: Stability of Capital Demerit: Slow, Complicated and Inconsistent with BVEC preference WACC=14.1%
	Lender = Local Bank 100%	
Debt: Equity 70:30	**Case 7: Local Scenario:** Merit: None Demerit: High cost, Short tenure, Small availability WACC=16.5%	

Source: JICA Study Team

(2) Merits/Demerits

Merits and demerits of each case are as follows:

Case 1

Merit of Case 1 is clearly its speed of implementation as JICA, as promoter of the project, would drive the formulation of the project. On the other hand, demerit is, due to its thin portion of equity, it may need to hurdle internal assessment of JICA as well as Ministry of Finance of Japan.

Case 2
Merit of Case 2 is that it presents clear Japan scenario as its equity would be held by a multiple number of Japanese investors and 100% debt coverage by JICA-PSIF loan. On the other hand, the demerit is, since the number of Japanese investors increase, formation of investor consortium may take longer than Case 1.

Case 3
Merit of Case 3 is that since majority share would be held by creditworthy Japanese investors, the project would have a stable capital structure and easiness for debt financing. On the other hand, demerit is its slow creation of investor consortium and inconsistency with BVEC's preference of holding majority share.

Cases 4, 5 and 6
Merits of Case 4, 5 and 6 are balanced financing with addition of local bank loan, whereas demerits are slowness and complexity associated with local bank finance.

8.3.4 Selection of Capital Structure Option and Subsidy Option

Equity IRRs are calculated for each case with three subsidy options, namely i) No subsidy; ii) Land Cost Subsidy; and iii) Land + Ancillary Subsidy.

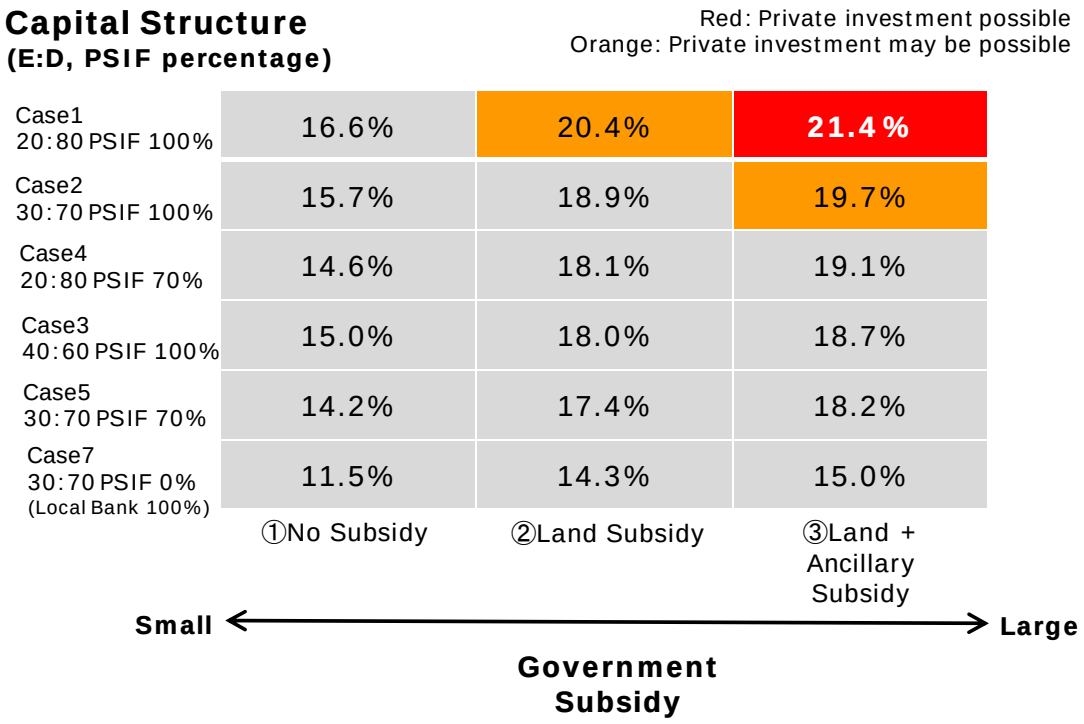
As illustrated in the below Figure, government subsidy option is placed horizontally and capital structure Cases are placed vertically to create 18 options.

The result is that Case 1 capital structure (E/D = 20:80, PSIF 100%) with Land + Ancillary Subsidy option would attain Equity IRR of 21.4%, which is acceptable to private investors[11].

Private investment may be possible for the following cases:

- Case 1 (E/D=20:80, PSIF 100%) + Land Subsidy only: Equity IRR of 20.4%
- Case 2 (E/D=30:70, PSIF 100%) + Land Subsidy + Ancillary Facility Subsidy: Equity IRR 19.7%

[11] Financial analysis is conducted on VND basis, therefore the target private sector Equity IRR is set as follows: Target Equity IRR on the hard currency basis (12% to 15%) + Foreign Exchange Premium of VND/JPY (6%) + Green Field Project Risk Premium (3%) = 21% to 24% ≒ 20%.



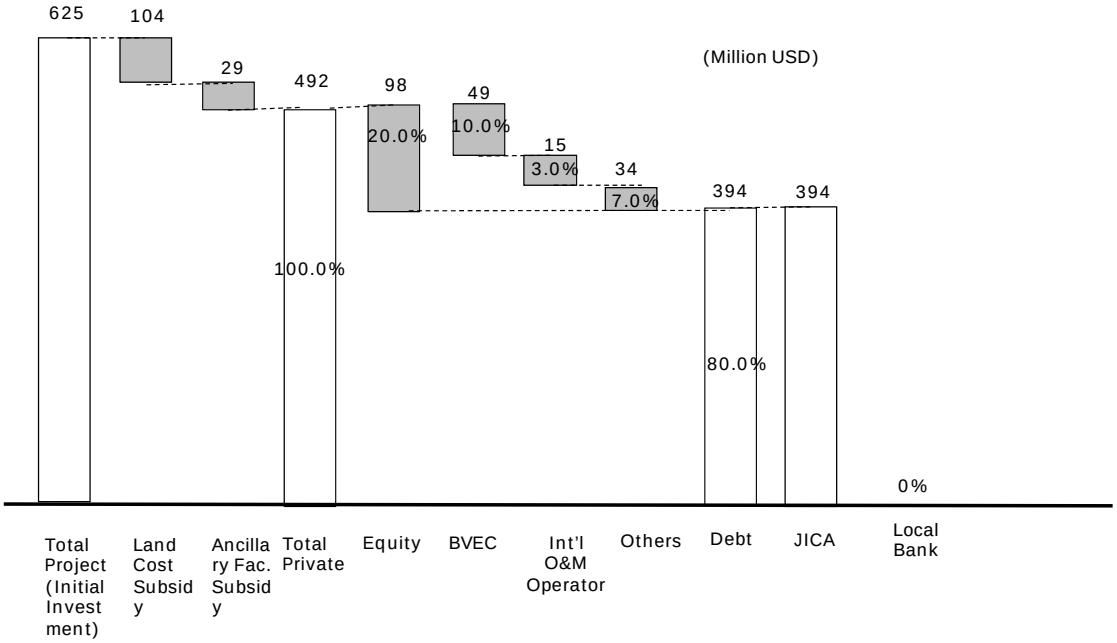
Source: JICA Study Team

Figure 8.3.4 Selection of Option for Capital Structure and Subsidy

Our recommendation for capital structure and subsidy option is Case 1 (E/D=20:80, PSIF 100%) capital structure with Land + Ancillary Subsidy Option, which has sufficient profitability and speed in project formation. Value for money of this capital structure is calculated as Net Present Value (NPV) of net cash flow[12] received by the GOV. The result is positive NPV of VND 1,751 billion (around 84 million USD), which means that government tax revenues (Corporate income tax and VAT) associated with this project could easily recover the up-front subsidy payments of Land Cost Subsidy and Ancillary Facility Subsidy by the GOV.

Recommended capital structure is shown in the following Figure.

[12] Cash out flow is subsidy from the government and cash in flows are corporate income tax revenue from the SPC and VAT revenues associated with the project. 12% discount rate is used for the NPV calculation.



Source: JICA Study Team

Figure 8.3.5 Recommended Capital Structure

8.3.5 Effects of JICA-PSIF Loan

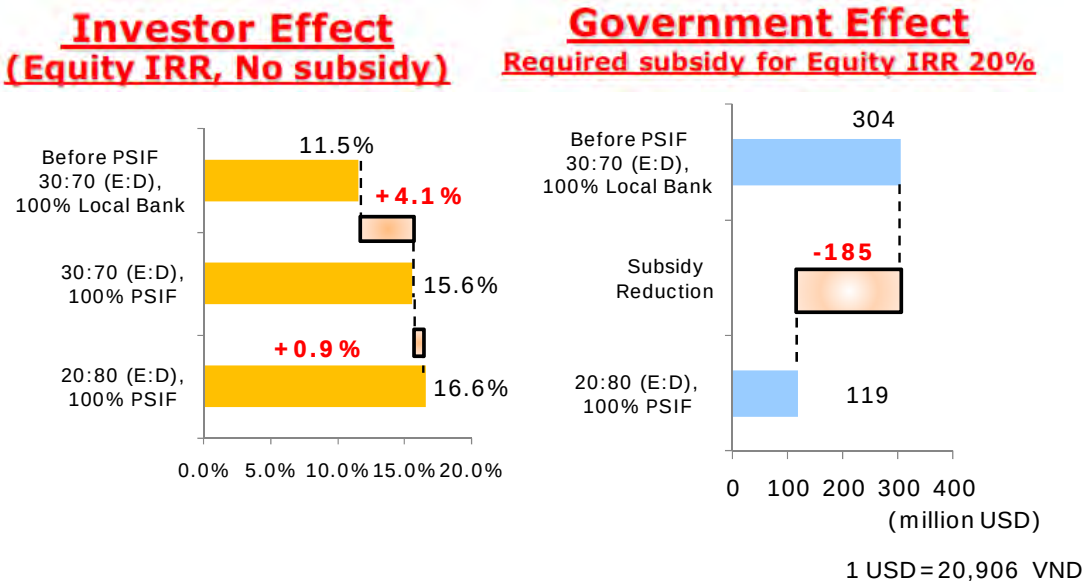
Effects of JICA-PSIF Loan are calculated for both Investor Effect and for Government Effect as illustrated in the following figure.

(1) Investor Effect

Investor effect is calculated based on the level of Equity IRR without subsidy attained with and without JICA-PSIF loan. Without JICA-PSIF loan and local bank loan of 100%, Equity IRR would be 11.5% (D/E=70:30), whereas WITH JICA PSIF loan of 100%, Equity IRR could become 15.6% with an increase of 4.1%. If debt and equity structure is further leveraged to 80:20, Equity IRR could further increase to 16.6%. This considerable improvement of investor's profitability is the investor effect of JICA-PSIF loan.

(2) Government Effect

Government effect is calculated based on the amount of subsidy required by the Government to attain the Equity IRR level of 20% with and without JICA-PSIF loan. Without JICA-PSIF loan and local bank loan of 100%, the amount of subsidy required would become USD 304 million, which is about a half of total project cost, whereas WITH JICA-PSIF the amount of subsidy would decrease drastically down to USD 119 million. This subsidy reduction of USD 185 million is the Government Effect of JICA-PSIF loan.



Source: JICA Study Team

Figure 8.3.6 Effects of JICA-PSIF Loan

8.3.6 Draft of Project Entity Options

(1) Shareholding Structure

There are several options for shareholding structure of the SPC. The BVEC prefers in principle to have majority shareholding of the SPC to control the corporate governance and decision making. According to the new company law of Vietnam majority interest for normal resolution is 65%, but could be modified to 51% in the articles of incorporation. Required shareholding for special resolution is 75%, so the veto power for special resolution could be attained by shareholding of 25%.

Based on the recommended capital structure, BVEC would hold majority shareholding of 51% with international O&M operator and other investors holding the rest of shareholding of the SPC.

(2) SPC Roles

Defining SPC role is critical in determining the form of SPC. One of the important elements is whether SPC would have role of O&M service provider in-house or not. Options regarding the SPC role are a) In-House O&M Service Option which has In-House O&M service provision function of some 250 staff and; b) Management and Monitoring SPC Option which would limit the SPC role only to management and monitoring of services contracted out from the SPC on the performance-based service contract. For the latter option, major SPC functions are as follows:

(i) SPC General Administration
(ii) Management and Monitoring of O&M services
(iii) Financial Management of SPC especially with regards to the project finance
(iv) Environmental Monitoring for different stages (Before construction, During construction and During Operation as specified in “Social and Environmental Consideration” of this report)

(3) Contracting Structure

The SPC would be incorporated upon the issuance of investment certificate by the Department of Planning and Investment to relevant provinces with BOT contract entered into between the SPC and Ministry of Transport. For the SPC, there would be shareholders agreement among the investors for equity injection and obligations of sponsors with loan agreements with JICA-PSIF and local banks. If services are outsourced, there would be an EPC contract with a contractor for construction and O&M

service contract with an O&M service provider who can be a subsidiary of BVEC and the investors. The SPC can procure technical and management expertise from an international O&M operator based on a fee-based advisory service contract.

(4) Development Rights

Development Rights to be given to the concessionaire is the usual practice in Vietnam and BVEC is also planning to incorporate it as an important and supporting project element. However, mixture of cash flows of different risk profiles, namely expressway business and property development businesses would be considered by lender as difficult elements to control and manage within one SPC. This view is shared by JICA-PSIF. Therefore, the property development is treated separately outside the SPC for the entity option assessment. It is assumed that potential profit from the property development would increase the amount of equity and /or the amount of financial support such as sponsor loan/LC commitment from the specific investors involved in such property developments.

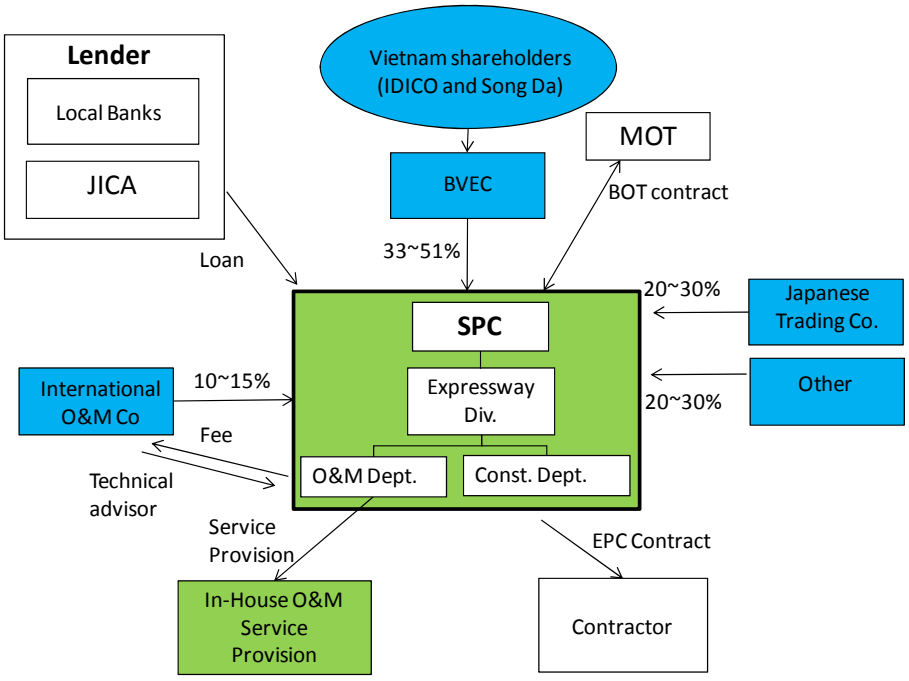
(5) Entity Options and Merits/Demerits

Based on the above discussions the following entity options as shown in the following figures are set up for assessment:

(i) In-House O&M Service Option

The SPC would have actual O&M department inside the SPC which would provide O&M service for the expressway with assistance from the international O&M operator who would be at the same time one of the investors for the project.

The merit of this option is assurance and control of a robust O&M service provision from the beginning and resultant accumulation of O&M expertise inside the organization. On the other hand, demerit is large fixed cost required for retaining more than 250 O&M staffs which the lenders would usually consider large project risk retained inside the SPC for financing the project, hence more difficult for financial closing.



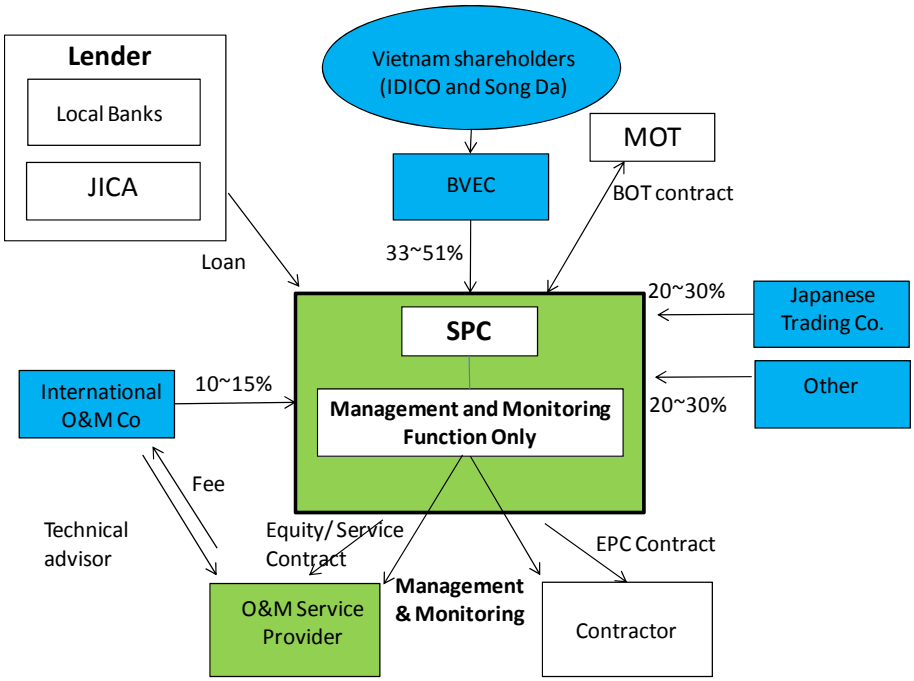
Source: JICA Study Team

Figure 8.3.7 In-House O&M Service Option

(ii) Management and Monitoring SPC Option

The SPC would have only management and monitoring functions for the services which are contracted out from the SPC on performance-based service contracts with assistance from the international O&M operator who would be at the same time one of the investors for the project.

Merit of this option is the small risk retained inside the SPC for the provision of necessary services for O&M operation, hence the lender would consider the project easier for financial closing. On the other hand, demerit is indirect control of the O&M services and a less robust O&M team as the expertise required for managing and monitoring outsourced service provision is by limited number of staff inside the SPC.



Source: JICA Study Team

Figure 8.3.8 Management and Monitoring SPC Option

(6) Preliminary Selection of Option

Based on the above discussion and assessment, the Management and Monitoring SPC Option is the recommended organization structure for the implementation of the BV Expressway Project.

8.4 Risk Analysis and Risk Management Plan

For private investors and lenders, assessment/allocation/management of project risks will be critical in making final decisions for project participation. In this section, there will be detailed description of risk management for the Bien Hoa-Vung Tau Expressway Project, included are the four categories of risks explained in Chapter 4.1.

8.4.1 Risk Assessment by Risk Type

The assessment of the project risks is based on interviews (private investor, government agency, lawyer and BVEC), combined with team brainstorming sessions involving engineering/environmental/finance experts. Figure 8.4.1 provides an overview of the assessment.

(1) Project design/construction/O&M risks

Land acquisition risk: <u>High Risk</u>
In Vietnam, the ownership of land belongs to the government. Land usage rights are provided and land cost will be on the purchase of usage rights and other resettlement related costs. From a cost point of view, there is possibility that this project may receive subsidy from the GOV. In this case the risk of cost exceeding the budget will not be a concern for the private sector. However, based on most recent estimates, there are approximately 800 households requiring resettlement. Negotiation for compensation and resettlement will be under the responsibility of the local People's Committee. The implementation of negotiation with 800 households should require a significant effort. In fact, similar land acquisition delays were observed in other toll road projects in Vietnam. There is no denying the high risk nature of potential delays to the project from this point of view.

Environment/ Social risk: <u>Medium Risk</u>
In case of Vietnam, EIA and RAP will be reviewed by MONRE. In addition, JICA's overseas private loan will have its guidelines to fulfill. The same guidelines as ODA loan will apply in the case of PSIF loan. Resettlement of 800 household falls into category "A" from an environmental/social point of view. Therefore, developing the RAP will likely require significant time and effort. Even with a dedicated study to develop this plan, the risk of delays from this process remains at medium level.

Technical risk: <u>Low Risk</u>
In case of B-V expressway, the technical difficulty/complexity levels are low. Currently, there are some proposed changes to the alignment, which require approval from the Ministry of Transport. From this point of view, there is potentially heightened risk due to approval delays.

Project completion risk: <u>Low Risk</u>
In case of B-V expressway, once the construction starts, the construction management of the project is expected to encounter minimum difficulty in implementation.

O&M risk: <u>Low Risk</u>
While the O&M organization for B-V expressway is not yet fully defined, BVEC has indicated willingness to establish a 100% subsidiary for O&M services. This organization will be set up independent from VEC. Therefore, it can consider building alliances with overseas O&M service providers such as NEXCO Central. This approach is reasonable and the foreseen risks are low.

(2) Project finance risks

Sponsor Risk: Medium Risk
B-V project needs sponsors that have 1) abundant financial capacity that can back up the working capital requirements, 2) know-how of expressway project management in terms of O&M, construction management and financial coordination, 3) long-term commitment interests in stable and long-term operating returns. Not many sponsors can fulfill the above requirements. In addition, the financial analysis revealed that the project IRR is not attractive without government subsidy. Given this uncertainty, it may not be easy to find a reliable and committed sponsor. Therefore, the risk is medium.

Financing risk: Medium Risk
With the current level of project IRR, lenders will be concerned about debt service coverage. Project scheme design on government subsidy and guarantee will be quite important. In addition, security package will need to be optimized to ensure sufficient project loans can be secured. Given current uncertainty, securing loan from lenders cannot be taken for granted. Therefore, the risk is medium.

(3) Market Risk

Traffic demand risk: High Risk
This expressway connects the heart of future industrial zone in South Vietnam. This includes connection links to Cai Mep-Thi Vai International Port and Long Thanh International Airport. The traffic demand also includes additional traffic generated from new industrial parks developed along the road. Based on the demand forecast exercise, two scenarios have been developed. 1) "Network model" scenario, which is an extrapolation of current Origin-Destination table (based on OD surveys). 2) "Industrial road" scenario, which assumes that a large portion of this expressway will be used by heavy trucks to deliver goods between port and industrial parks as well as city center. The base case scenario for project IRR calculation assumes "industrial road" scenario. Under the "network model" scenario, this project did not reach feasible levels even with the support given by government subsidy. In other words, from an investor's perspective, it really boils down on whether the investor is convinced with the "industrial road" scenario or not. This obviously requires further due diligence. However, even with further facts and evidence, the uncertain nature of demand forecast remains. The assessment therefore of the risk due to traffic demand is high.

Tariff risk: Medium Risk
In B-V project, BOT contract is the primary basis in fixing and agreeing on tariff scenarios. However, tariff adjustment regulation based on the BOT contract alone is rather weak. This is because the tariff adjustment will require approval every time adjustments are made. The operating cash flow is highly sensitive to the tariff levels. If tariff levels are not adjusted and only cost factors increase, this could eventually lead to SPC's financial difficulties. The assessment, therefore, of the level of risk posed by tariff adjustment is medium.

Network Risk: High Risk
Under Network risk, there are two risks that require attention.

1. Relative tariff with Route 51: Route 51 is currently undergoing an extensive road expansion. From an alignment point of view, this route will compete directly with the proposed B-V expressway. Road users will consider the "time savings" benefit and will make trade-off decisions based on "relative tariff" of BV Expressway with Route 51. The risk lies on whether Route 51 tariff will adjust at the same pace with B-V Expressway. If not, the scenario for demand

will be significantly affected. Based on the sensitivity analysis, project IRR will reduce significantly if increased number of truck drivers choose Route 51. This is a high risk category since it is not within scope of the SPC BOT contract.

2. Changes or additions to the other network scenario: For B-V expressway, there are many network schemes that may potentially affect its traffic demand. The following road network and urban plans by the GOV are just some examples that might affect the traffic demand on B-V Expressway. These include, North-South Expressway, Ben Luc-Long Thanh Expressway, HCMC ring road No.4 which may extend to Phu My intersection, general road connecting Cai Mep-Thi Vai International Port and Ben Luc-Long Thanh Expressway, Cai Mep-This Vai Port and other surrounding facilities, and Long Thanh Airport. Given the sheer number of variables, this is also a high risk category. Based on the sensitivity analysis of a 5-year delay on port and airport development, the results showed considerable reduction on project IRR.

(4) Project External Risks

FX Risk: Medium Risk
VND has depreciated against yen with increased trend of depreciation recently. While SBV and government is taking measures to stabilize the currency, from an investor's perspective, the FX risk is of valid concern. This is especially true for the capital structure option that is largely reliant on yen-based debt. Investors will most likely prefer to share this risk with the government.

Interest Rate: Low Risk
Although the local interest rates have moved up over the previous years from 13% to 15%, the outlook of long-term local market interest rate is expected to move within a reasonable range. At present, SBV has increased interest rates to avoid high inflation. In any case, based on the capital structure of this project, interest rate fluctuations will have limited direct impact on project financials.

Currency Conversion: Medium Risk
Recently, foreign currency reserve levels have dropped considerably. In response, SBV has put restrictions on currency conversion. Companies now are allowed to convert just 30% of revenues into foreign currency. This has raised concerns amongst the investor community. While it is believed that this is a tentative situation, this risk needs to be monitored carefully.

Regulatory Risk: Medium Risk
Interview with several government agencies, including MOT, MPI and MOF confirmed the tentative nature of the PPP pilot law. Also, the exact application of BOT law for this project will still need further confirmation. Many of these decisions lie with PM approval in Vietnam. Recently, Decree 24 was released to supplement BOT Law 108. It describes clearer role of the authorized body as the window for contract negotiation. It is intended to increase the responsibility and authority of ministries and reduce the burden on the office of PM. While this is an improvement, further changes to the regulations are expected.

Political risk/Force majeure: Low Risk
With the recent deterioration of financial situation in Vietnam (low foreign currency reserves, high level of public debt, repeated FX devaluations, high reliance on dollars by the banking system), some rating agencies have downgraded Vietnam's country risk rating. However, in terms of political risk and force majeure, there are no notable risks to alert at this point. However, the overall stability of the financial situation of this country requires careful monitoring, especially over the course of next 1-2years.

Medium risk
Potentially high risk

	Name	Assessment (for investor)/Comments
Project design , construction and O&M risks	Land acquisition risk	813 household require resettlement. Negotiation by local people committee may take more time than 3years.
	Environment/Social risk	Approval of resettlement plan may take more time than expected.
	Technical risk	No critical technical difficulties found
	Project Completion risk	No critical difficulties found
	O&M risk	Solid commitment to set up O&M organization arrangement
Project finance risks	Sponsor risk	Current Project IRR may not attract good sponsor (need sufficient subsidy and guarantee commitment from gov't)
	Financing risk	Limited local lending capacity
Market risks	Traffic demand risk	Volatility regarding speed and degree of industrial development scenario along expressway
	Tariff risk	Potential loss from delayed tariff adjustment
	Network risk	Relative tariff and driver behavior regarding selection between B-V expressway and route 51
Project external risks	FX rate risk	Recent volatility. VND based revenue and hard currency debt service structure.
	Interest rate risk	Recent volatility. However, low structural exposure.
	Currency conversion	Recent restrictions to 30% conversion.
	Regulatory risk	Many additional changes to BOT law expected. Unstable.
	Political risk/Force majeure	Stable government. Not much severe natural disaster expected.

Source: JICA Study Team

Figure 8.4.1 Project Risk Assessment Overview

8.4.2 Risk Allocation Plan by Risk Type

The best way to allocate risks between government and private have been carefully deliberated on. The key is to understand the reason for each risk type and figure out which party is in a better position to control the risk. Figure 8.4.2 summarizes the allocation result and the reasons for allocation. Basically, this allocation sets the basis for constructive risk management. This should be used in the discussion between government and private investor.

First, it provides guidance on the mutual actions that needs to be taken by each party, which has to be described in the BOT contract. As an example, network risk was allocated to government because private investor has no control over the network. The GOV has to agree on actions regarding Route51 tariff in relation to the expressway tariff. This expressway was designed primarily to serve industrial logistical needs. Proposed actions include monitoring by GOV of the truck driver's road selection and reviewing/refining of relative tariff structures to provide incentives to truck drivers to use the expressway. This delineation of responsibilities for the required actions should be clearly written in the BOT contract.

Second, risk allocation provides guidance on government guarantee discussions. SPC will need to be protected from losses caused by risks allocated under government's responsibility. For example, land acquisition is clearly allocated under government responsibility. SPC has to be compensated for losses due to land acquisition delays.

Details of management actions and guarantee methods are described in 8.4.3.

	Name	Allocation		Allocation Reason/Comments
		Gov't	Private	
Project design, construction and O&M risks	Land acquisition risk	○		Land acquisition will be implemented by local people committee. Private has no control in this area.
	Environment/Social risk	○		This is largely government approval category. Private investor cannot control the schedule .
	Technical risk		○	Private will select and pay for engineering design
	Project Completion risk		○	Private will select and pay EPC contractor
	O&M risk		○	Private will select in-house or outsource model for O&M
Project finance risks	Sponsor risk	○	○	Government will need to prepare the right environment, while current investor will select additional investor
	Financing risk		○	Private investor will need to prepare and negotiate optimal security package for lender and ensure SPC has liquidity
Market risks	Traffic demand risk	○	○	Government and private both has roles to enhance demand
	Tariff risk	○		Government controls tariff. Private cannot control tariff.
	Network risk	○		Government is in a better position to control network
Project external risks	FX rate risk	○	○	Neither can control this. Sharing is sensible.
	Interest rate risk		○	Private is in a better position to control this in terms of lender negotiation
	Currency conversion	○		Government policy matter and out of private control
	Regulatory risk	○		Government policy matter and out of private control
	Political risk/Force majeure	○	○	Neither can control this. Sharing is sensible.

Source: JICA Study Team

Figure 8.4.2 Project Risk Allocation Overview

8.4.3 Risk Management Action and Insurance/Guarantee Method for Med-High Risk Item

After assessment and allocation of risks, the following describes the actions to manage risks and the methods to guarantee against potential losses from medium-high risk items.

For this particular case, the private investor's point of view is taken. Therefore, all actions are written in the form of what the private investor needed to do. Althoug, this includes risks allocated to the government, the private investor still needs to take action to ensure that the government commits to fulfilling their part of the responsibility to ensure project success. Also, all guarantee methods are described to protect SPC from undue losses.

(1) Project design/construction/O&M risks

Land acquisition risk: High Risk, Allocated to GOV

- **Risk Management Action:** In terms of acquisition cost, negotiate so that government pays for all costs for compensation and resettlement. This is consistent with conclusion from project IRR calculation. In terms of schedule, discuss detailed schedule with the authorized body. Ideally, this schedule should be discussed and agreed with the local People's Committee that will carry out implementation. Include the schedule in the BOT contract as part of government's responsibility. In addition, set milestones and monitor progress closely.
- **Risk Guarantee Method:** After establishment of SPC, with paid-in capital and permanent staff, any delay will now translate to additional cost to the SPC. BOT contract should specify how to calculate losses from land acquisition delay and clarify government's method for loss compensation.

Environment/ Social risk: Medium Risk, Allocated to GOV

- **Risk Management Action:** There is a high likelihood of formation of a study team dedicated to the development of environment/socio-related action plans essential in fulfilling both the GOV and JICA requirements. Investors should hold periodic discussions with this team to closely monitor the action plan and the likely timing of its approval. The different groups must pay special attention to the difference of guidelines between GOV and JICA in areas such as PAP communication procedure and method of resettlement compensation calculation.
- **Risk Guarantee Method:** BOT contract should demonstrate the calculation of losses from environment/socio-related approval delays and clarify government's method for loss compensation.

Technical risk: Low Risk, Allocated to private sector

- **Risk Management Action:** Set robust requirements for Pre-qualification (PQ) of Detailed Design (DD) contractor and ensure selection of experienced DD contractor. Potentially include 3rd party review process.
- **Risk Guarantee Method:** Secure design liability guarantee from DD contractor.

Project completion risk: Low Risk, Allocated to private sector

- **Risk Management Action:** Set robust requirements for PQ of EPC contractor and ensure selection of experienced EPC contractor.
- **Risk Guarantee Method:** Secure EPC performance guarantee from EPC contractor.

O&M risk: Low Risk, Allocated to private sector

- **Risk Management Action:** Set specific Key Performance Indicator (KPI) for O&M. The key is to ensure operational availability of the road and to minimize toll collection leakage. The required road availability should at par with international standards for availability if road is maintained accordingly. Toll collection must be counterchecked via multiple methods such as to install vehicle counting system and also to check against pay slips. These KPIs should be included in the O&M contract.
- **Risk Guarantee Method:** Agree to performance-base payment with O&M contractor and deduction of payment for missed KPI target.

(2) Project finance risks

Sponsor Risk: Medium Risk, Shared

- **Risk Management Action:** Secure enough time to conduct discussion with GOV the issues concerning subsidy, incentives and guarantee contents. Obtain from the GOV, agreement on those issues. This agreement will serve as means to provide assurance to other co-investor candidates. Clarify each shareholder's responsibilities in contract, including board positions and capital contribution terms.
- **Risk Guarantee Method:** Create a fund that pools contribution from different sponsors to ensure sufficient capital for project completion and SPC working capital. Also, limit ownership changes for the initial operations period, as a means to stabilize sponsor policy.

Financing risk: Medium Risk, Shared

- **Risk Management Action:** Obtain lender's MOU at the time of in-principle agreement from government on subsidy, incentives and guarantee contents. Also, start upfront discussions on

lender's security package and ensure that there are no critical bottlenecks before SPC capital injection.

- **Risk Guarantee Method:** Secure separate funding arrangements (e.g. in the form of subordinated debt, with recourse to sponsor) in preparation for SPC working capital shortage.

(3) Market Risk

Traffic demand risk: High Risk, Shared

- **Risk Management Action:** Conduct a thorough demand survey of industry expressway scenario. This should include overseas statistics of similar "industry expressway" profile in terms of ratio of trucks on the road. It should also investigate factories' need for on-time delivery and how that will influence logistic company behavior for selection of expressway over Route51.
- **Risk Guarantee Method:** Obtain minimum revenue guarantee from the government. This sets a minimum and maximum revenue limits as a function of the forecasted revenue range. If actual revenue is below the minimum revenue limit, then, the government will compensate for the revenue gap. On the other hand, if actual revenue is above maximum revenue limit, then, SPC pays the government for the revenue surplus (see below Figure 8.4.3). BOT contract should include calculation method of revenue gaps and surpluses. This should also specify method of government compensation as well as SPC payment.

Tariff risk: Medium Risk, Allocated to gov't

- **Risk Management Action:** Re-confirm responsible authority for tariff adjustment responsibility. Specify formula for and schedule of adjustment in the BOT contract.
- **Risk Guarantee Method:** Obtain tariff adjustment guarantee from the government. This should also set an agreed tariff adjustment schedule. If adjustments are delayed (or lower), then, the government shall compensate for revenue loss (see below Figure 8.4.4). BOT contract should include calculation method of SPC's revenue loss when tariff adjustments are not made according to agreed schedule. The contract should also specify method of government compensation to be adopted.

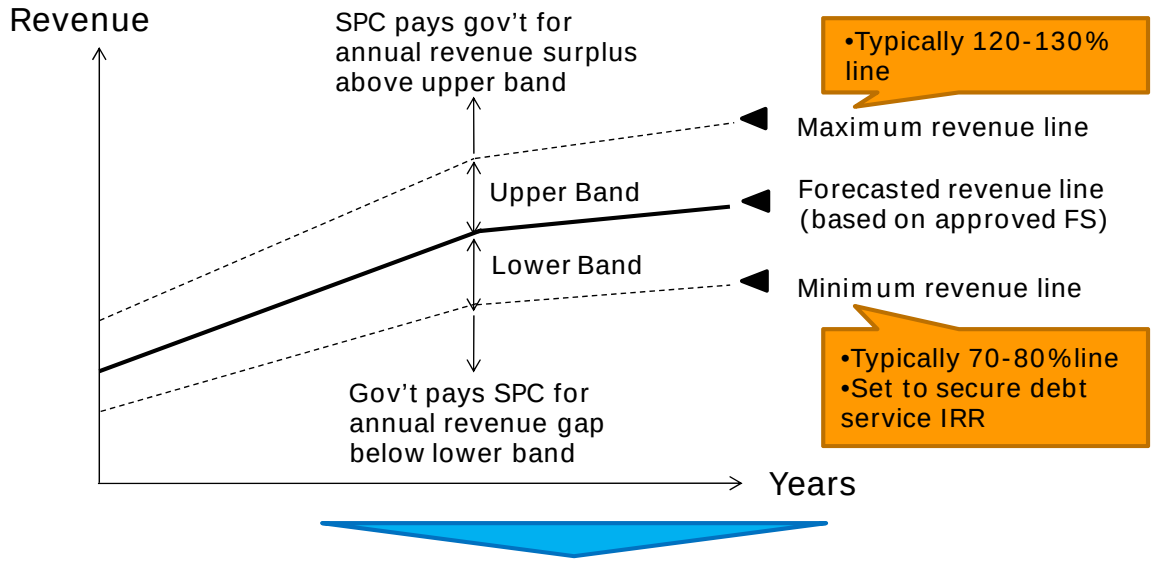
Network Risk: High Risk, Allocated to GOV
There are two risks to be managed.

1. Relative tariff with Route 51:

- **Risk Management Action:** Re-confirm tariff adjustment responsibility for Route 51. Then, clarify the objective of tariff adjustment as means to "ensuring industrial expressway scenario". Therefore, the relative tariff needs to be adjusted to provide incentive to heavy truck vehicle users to choose expressway over Route 51. Describe this in BOT contract, together with the assumed scenario of Route 51 tariff adjustment.
- **Risk Guarantee Method:** Obtain minimum revenue guarantee from government.

2. Changes or additions to the other network scenario:

- **Risk Management Action:** Specify the assumed network scenario in terms of capacity and opening date of operation (e.g. Ben Luc-Long Thanh Expressway) on the BOT contract. Secure government commitment on the fulfillment of the transport network according to an assumed implementation schedule.
- **Risk Guarantee Method:** Obtain minimum revenue guarantee from the government.

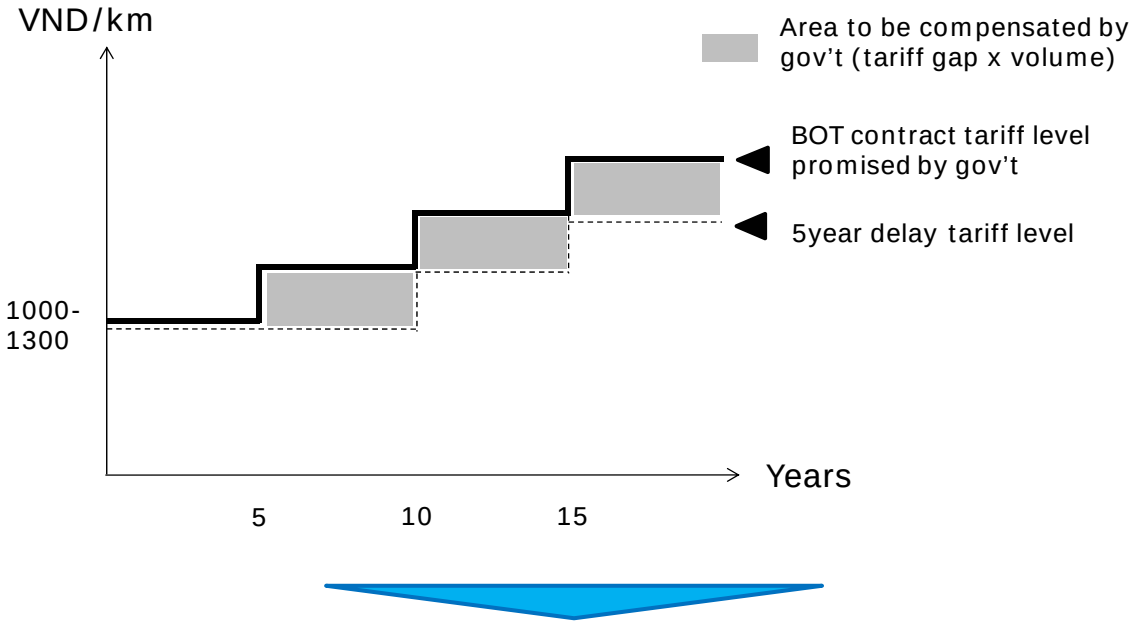


Gov't objective:
- Create a mechanism to attract private investment into a sector, which is perceived to be non-attractive
- Avoid excessive profit gains to private sector

Investor objective:
- Receive protection from revenue volatility caused by external forces
- Ensure SPC enough operating cash flow for debt service

Source: JICA Study Team

Figure 8.4.3 Minimum Revenue Guarantee



Gov't objective:
- Provide comfort to investor and attract private investment

Investor objective:
- Allocate uncontrollable risk to gov't, who is in a better position to control tariff risk than private

Source: JICA Study Team

Figure 8.4.4 Tariff Adjustment Guarantee

(4) Project External Risks

FX Risk: Medium Risk, Shared

- **Risk Management Action:** The risk due to VND rate depreciation against Yen is difficult to reduce. Investors have to carefully review the past statistics and embed sufficient FX risk premium into the financial calculation. In the calculation, a 6% FX risk premium is assumed. In totality, increasing local debt portion will reduce FX risk for investors, but this needs to be weighed against direct increase in cost of debt.
- **Risk Guarantee Method:** Integration of FX fluctuation factor into the tariff adjustment formula could partially hedge the risk. Investors with export revenue portfolio may be able to consider a natural hedging structure.

Interest Rate: Low Risk, Allocated to private sector

- **Risk Management Action:** Secure fixed interest rate debt structure.
- **Risk Guarantee Method:** Not necessary under current capital structure.

Currency Conversion: Medium Risk, Allocated to GOV

- **Risk Management Action:** Involve SBV and MOF into the BOT contract discussions early on. Secure in-principle agreement for currency conversion mechanism in terms of amount limits and applied rates. Specify in the BOT contract conditions agreeable to parties involved.
- **Risk Guarantee Method:** Secure a breach of contract guarantee, for which the government will provide compensation for loss in the event government does not fulfill their promise.

Regulatory Risk: Medium Risk, Allocated to GOV

- **Risk Management Action:** Include a specific clause in the BOT contract exempting SPC from negative regulatory changes but benefiting from positive regulatory changes.
- **Risk Guarantee Method:** Secure a breach of contract guarantee.

Political risk/Force majeure: Low Risk, Shared

- **Risk Management Action:** This risk is difficult to mitigate.
- **Risk Guarantee Method:** Secure a government guarantee that ensures buy-out of the project in case of occurrence of a natural force majeure which cannot be remedied within an agreed remedial period. Also, IFI/ECA insurance packages are available

The above risk management actions and guarantee methods have been written as guide to potential investors looking for an investment opportunity. Figure 8.4.5 provides an overview that will facilitate understanding.

	Name	Management Action (for investor)	Insurance/Guarantee Method (for investor)
Project design, construction and O&M risks	Land acquisition risk	Gov't land subsidy. Specify gov't responsibility in contract.	Compensation for delay loss
	Environment/Social risk	Specify approval schedule.	Compensation for delay loss
	Technical risk	Selection of reliable design/eng. contractor	Design liability guarantee
	Project Completion risk	Selection of reliable EPC contractor	EPC performance guarantee
	O&M risk	Selection of reliable O&M player	Performance-based payment
Project finance risks	Sponsor risk	Secure sufficient preparatory discussion for subsidy/guarantee	Sponsor pool fund. Limit ownership changes for initial several years
	Financing risk	Prepare solid security package for lender	Separate working capital funding arrangement
Market risks	Traffic demand risk	Thorough demand survey	Minimum revenue guarantee
	Tariff risk	Specify tariff formula in contract	Tariff adjustment guarantee
	Network risk	Specify network scenario on contract	Minimum revenue guarantee
Project external risks	FX rate risk		Indexation to tariff adj. , export revenue portfolio
	Interest rate risk	Secure fixed interest rate debt structure	
	Currency conversion	Specify conversion conditions and agree with SBV, MOF	Breach of contract guarantee
	Regulatory risk	Specify taxation/reg. regime	Breach of contract guarantee
	Political risk/Force majeure		Buy-out. IFI/ECA insurance package

Source: JICA Study Team

Figure 8.4.5 Overview of risk management action and insurance/guarantee methods

8.5 Security Package for Lender

8.5.1 Overview of Security Package

Security package is considered part of a set of various arrangements geared towards protection of lender's loan. This is envisioned to enhance the SPC's financial viability by allocating and sharing project risks appropriately among project stakeholders and setting lender's security interests over the SPC's asset or other items. "Security package for lender" is defined in this report as a set of arrangements described below both in Layer 1 and Layer 2. The details of the proposed arrangements are written in the following sections.

Layer 1: the SPC's viability arrangements (Section 8.5.2)

This includes various government guarantees, incentives, subsidies, sponsor guarantees and robust bankable major projection agreements (including arrangements with respect to EPC, O&M, cash collections and currency conversion and project insurance). The objective is to generate positive operating cashflow for the SPC, which in return will be the fundamental security for lender's debt service. Typically, the basic contents of all forms of government support [i.e., items stated in the Government Guarantee and Undertaking (GGU), the BOT Agreement (BOTA) and the Investment Certificate (IC)] for the project should be discussed and agreed upon before the establishment of the SPC (which occurs upon the issuance of the IC).

In general, the elements described for Layer 1, which are stipulated in major project contracts, are discussed and agreed upon during the period between the establishment of the SPC and financing as these documents form part of the lender's due diligence.

The loan agreement and any political risk insurance provided to the lenders (such insurance can be obtained by the SPC or the sponsors but is less common) is part of the financing package itself and would be the last element of layer 1 to be put in place.

Sponsor support can occur in a number of forms such as shareholder loan or capital contribution obligations. These supports might form part of an agreement between multiple sponsors and would be put in place early on (before the establishment of the SPC), but any capital contribution support agreement or completion guarantee required by the lenders would be part of the financing package.

Note that these steps were seen conducted in various sequences and there is some flexibility – though settling the agreed government support before expending significant capital is usually the best policy.

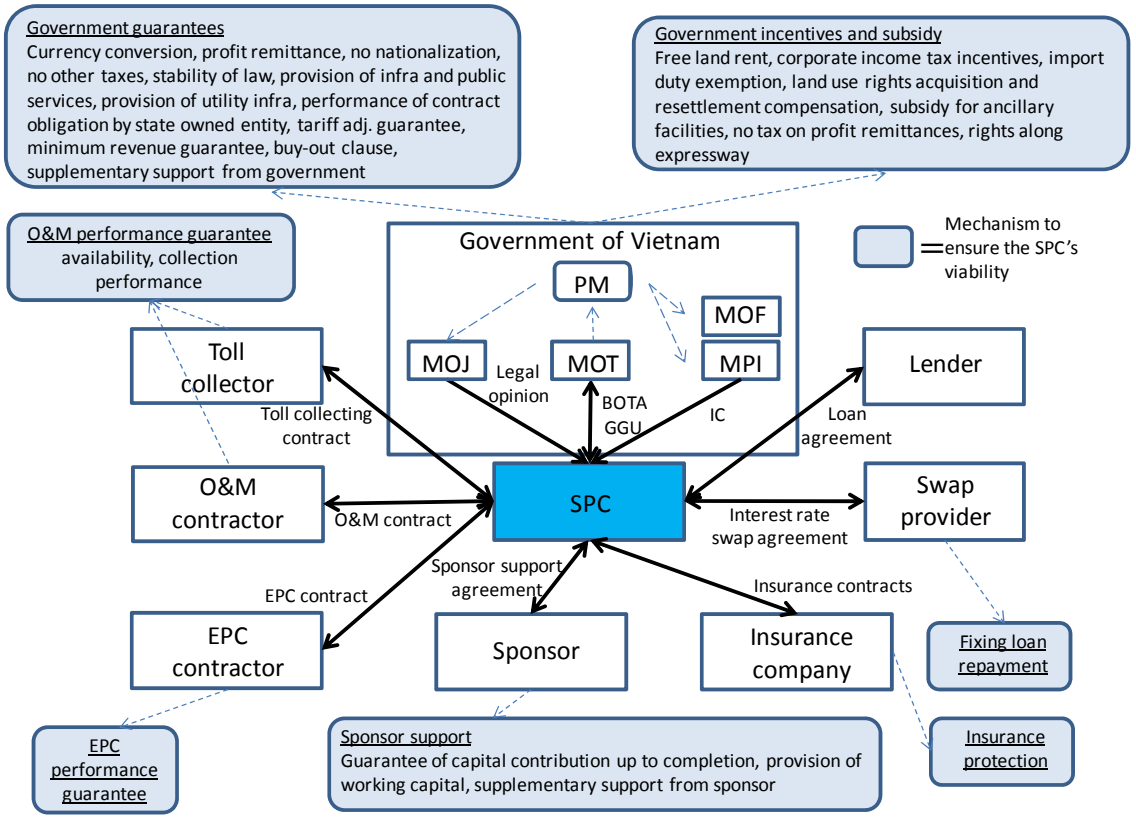
Layer 2: lender's asset control arrangements (Section 8.5.3)

In the unfortunate event of the SPC's poor performance/default, the lender should be in a position to control the assets of the SPC. This includes mortgage of the shares in the SPC, security over all material contract agreements, securities over on-shore and off-shore accounts and mortgage over fixed assets. Lender's asset control arrangements would not only be on mortgage and security, but also include approval from SBV, some arrangements in the loan agreement (e.g. cash waterfall, accounting structure, financial covenants). Typically, arrangements for Layer 2 will be put in place as part of the financing package – with the exception of the account and currency conversion arrangements which will be put in place earlier on, together with the main project contracts.

8.5.2 Layer 1: Arrangements for the SPC's Viability

(1) Overview of Layer 1

Overview of the arrangements in Layer 1 is shown below.



Source: JICA Study Team

Figure 8.5.1 Overview of the Arrangements in Layer 1

(2) Details of each arrangements *

Type	Contract	Description	Issues/Notes
Government guarantees			
• Currency conversion	GGU	The SPC's right to make currency conversion from VND-based toll revenue to USD.	Due to scarcity of foreign reserves, GOV has imposed an upper limit of 30% conversion of revenue on any government guarantee. The GOV has been firm on this policy in recent project negotiations. Government would like to ensure the convertibility of foreign currency in the market and not to provide guarantee.
• Profit remittance	GGU or BOTA**	The SPC's right to remit profits overseas.	
• No nationalization	GGU or BOTA	Assets of the SPC will not be nationalized. Full	

Type	Contract	Description	Issues/Notes
		compensation will be paid if such case occurs.	
• No other taxes	GGU or BOTA	The SPC will not be affected by negative tax changes and has the right to receive benefits from positive changes.	GOV may not give positive benefits but open to negotiation.
• Stability of law	GGU or BOTA	The SPC has the right to enjoy favorable changes in law and receive compensation when there are unfavorable changes in law. Specific mechanism on compensation to be stated in GGU or BOTA.	
• Provision of infrastructure and public services	GGU or BOTA	Authorized body shall provide feeder roads and other public facilities critical to traffic demand, according to mutually agreed schedule. The SPC receives compensation from government if authorized body fails to provide agreed infrastructure. Specific mechanism on compensation to be stated in GGU or BOTA.	GOV may resist responsibility for feeder roads built by private sector. Causes of delay or failure of the provision of the infrastructure may need to be specified.
• Provision of utility infrastructures	GGU or BOTA	Basic utility infrastructures have to be provided to or available at the project site such as electricity and water.	
• Performance of contract obligation by state-owned entity	GGU or BOTA	The SPC may have the right to receive benefits from state-owned entity actions stated in the contract. The SPC receives compensation from government if government and/or state owned entity fails to comply with such contractual obligations. Specific mechanism on compensation to be stated in GGU or BOTA.	This performance clause is typical for state enterprises selling raw materials or purchasing products and services. It has not yet expanded to state-owned sponsor obligations. In any case, it is now government policy to reduce exposure under these types of guarantee.
• Tariff adjustment guarantee	GGU or BOTA	Authorized body shall adjust tariff according to mutually agreed adjustment mechanism. Mechanisms of reflecting changes of inflation rate and foreign currency exchange rate should be incorporated. The SPC receives compensation on loss portion if authorized body fails to comply.	Upfront discussion necessary. Explanation of project importance to be emphasized.

Type	Contract	Description	Issues/Notes
• Minimum revenue guarantee	GGU or BOTA	Government guarantees a minimum level of traffic demand converted into revenue. This applies for the initial 10years of operation when the traffic could be volatile and well below forecast. Minimum level is set to allow the SPC to stay afloat, without additional capital injection. In addition, upper limit of the SPC's revenue would be set and the SPC would pay government for the amount beyond the limit.	Upfront discussion necessary. Explanation of project importance to be emphasized.
• Buy-out clause	GGU or BOTA	Government guarantee to buy-out the project, in the event of breach of contract by the government (e.g. no tariff adjustment) and natural force majeure event which is not remedied within an agreed remedial period. Method of buy-out to be specified in GGU or BOTA.	Similar clause has been successfully negotiated in other Vietnam infrastructure projects.
• Supplementary support from government		Supplementary support to other risk mitigation mechanisms could be required such as foreign exchange rate change.	Discussion with government required.
Government Incentives and Subsidy			
• Free land rent	IC	The SPC is exempt from the land use fee or land rent with respect to the land on which the toll road is built. This is automatic if the project is a BOT project as stated in the Decree 108/2009*** and has to be negotiated in other cases.	
• Corporate income tax incentives	IC and GGU or BOTA	Exemption from corporate income tax for a period of four years commencing from the first year in which the SPC starts to generate taxable income. A 50% reduction of tax rate for the subsequent nine years. Tax losses to be carried over for a period of up to five years. Permitted to	Considered for preferential investment sectors and granted on a case-to-case basis. Note that there has not been much recent relevant experience on this.

Type	Contract	Description	Issues/Notes
		accelerate depreciation of fixed assets up to twice the rate of depreciation as stipulated by law.	
• Import duty exemption	IC and GGU or BOTA	Exemption from import duties for goods and services imported for the construction, O&M (subject to some conditions).	
• Initial land use rights acquisition and resettlement compensation	IC and GGU or BOTA	Authorized body will be responsible for all costs related to initial land rights acquisition and resettlement compensation costs. Authorized body will ensure that regional people's committee will execute on schedule and within guidelines set by the sponsor/lender.	
• Subsidy for ancillary facilities	GGU or BOTA	Authorized body will provide ancillary facilities in relation to the toll road project. This includes service areas (SA), parking areas (PA), interchange and surrounding facilities, toll booths and information systems.	Straigthforward discussion required. Emphasize project importance.
• No tax on profit remittances	IC and GGU or BOTA	Supplementing the right to remit.	
• Rights along expressway	GGU or BOTA	Advertising business rights and other development rights along the expressway are provided to the SPC or sponsor as an incentive. Specific conditions to be specified in GGU or BOTA.	
Sponsor support			
• Guarantee of capital contribution up to completion	Sponsor support agreement	Sponsor guarantees to provide required capital up to completion. This type of contribution might be provided by subordinated loan.	
• Provision of working capital	Sponsor support agreement	Senior lenders would provide a common working capital facility as well, if required. However, when senior lenders are not able to provide this as part of the senior debt package, the sponsors might provide the working capital	

Type	Contract	Description	Issues/Notes
		with subordination to the senior debt.	
• Supplementary support from sponsor		Supplementary support to other risk mitigation mechanisms could be required such as inflation and foreign exchange rate change and currency convertibility.	Discussion with sponsor required.
Fixing loan repayment			
• Interest swap	Interest rate swap agreement	In order to avoid risk of interest rate fluctuation, the SPC will enter into interest rate swap agreement with swap provider.	
Insurance protection			
• Insurances	Insurance contracts	Protection from several risks, including additional cost or damage caused by natural force majeure event, should be provided by insurances, such as construction insurance, property damage insurance, third-party liability insurances, etc.	
Contractor obligation			
• EPC performance obligation	EPC contract, completion bond	The EPC contract has to include bankable provisions dealing with a number of issues such as completion risk, bonds, retentions and liquidated damages regimes.	
• O&M performance obligation	O&M contract	O&M contractor fee will be paid based on tightly-defined key performance indicators on toll road availability.	
• Toll collection obligation	Toll collecting contract	Toll collecting fee will be coupled with toll collection leakage.	Cash collection performance is difficult to control. Mechanism for cashflow transparency will be required.

* Statements here represent the approach generally taken as modified by current circumstances. In reality, each project will be approached and documented differently.

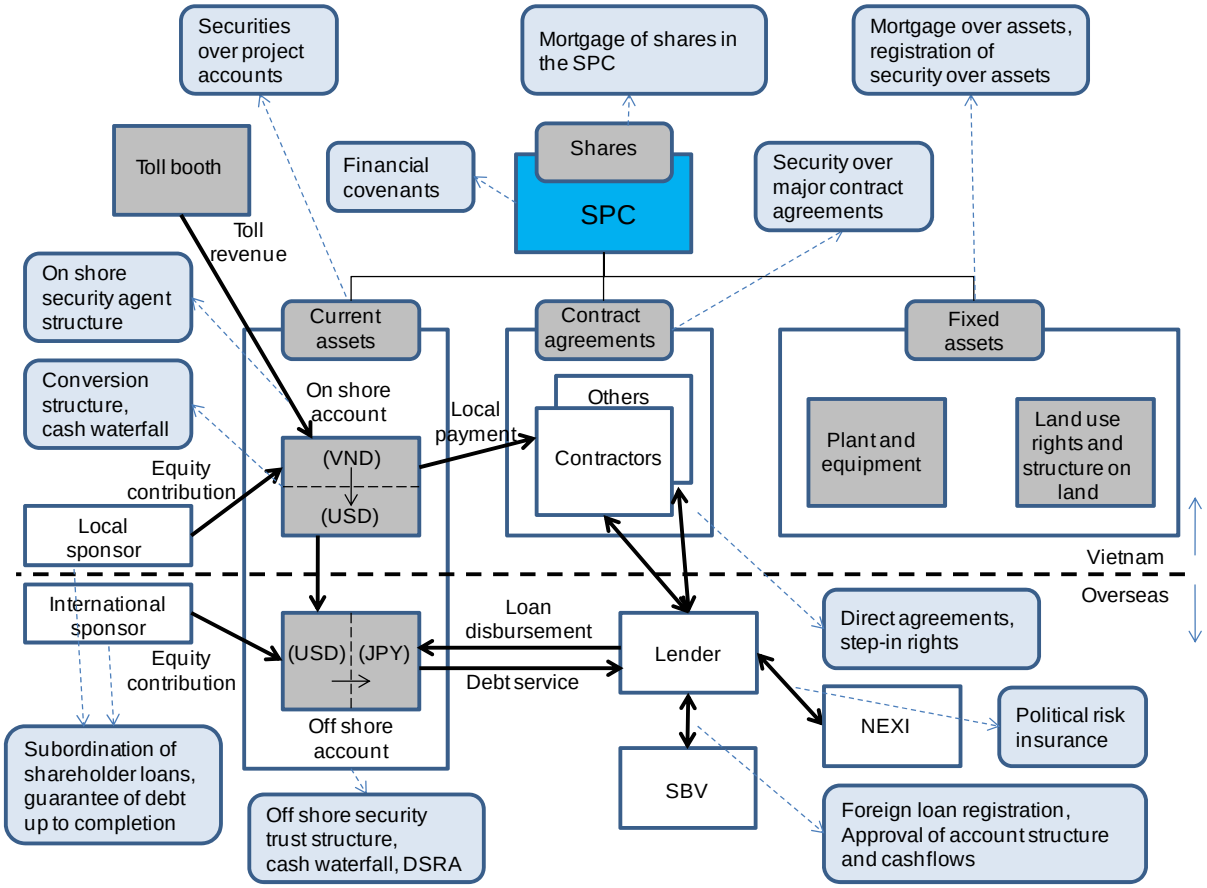
** Where the project has a BOTA, most provisions will be contained in the BOTA and the GGU will be a shorter document covering headline issues such as government guarantees of state entities involved in the project and currency availability and conversion. Where there is no BOTA, all issues normally located in the BOTA have to be relocated to a longer GGU.

*** Article 38 of the Decree 108/2009/ND-CP "Decree on Investment in the Form of Build-Operate-Transfer, Build-Transfer-Operate or Build-Transfer Project"

8.5.3 Layer 2: Arrangements for Lender's Asset Control

(1) Overview of Layer 2

Overview of the arrangements in Layer 2 is shown below.



Source: JICA Study Team

Figure 8.5.2 Overview of the Arrangements in Layer 2

(2) Details of each arrangements *

Type	Contract	Description	Issues/Notes
Cash control mechanism			
• Foreign loan registration	State Bank of Vietnam(SBV) registration	Foreign loans of more than 12 months must be registered with SBV. This will be required for the remittance of the proceeds of security enforcement out of the country.	
• Approval of account structure and cashflows	BOTA or GGU and SBV approval	The SPC will request to receive foreign currency receipts (of loans, equity, insurance proceeds etc.) into an off-shore account. The SPC will also want to be able to pay foreign currency outgoings (including dividends, debt service	This will require a detailed step-by-step plan to be agreed as part of the BOTA or the GGU as currently, SBV regulation will not support these

Type	Contract	Description	Issues/Notes
		and payments to foreign contractors) from this account. It will request ability to remit revenue generated on-shore into the off-shore account (after allowing for local payments). Local VND and foreign currency accounts will also be required. Any local payments in VND will be managed from the VND account. This includes VND debt service payments to local banks and/or dividend payments to local sponsors, upon instruction from overseas offshore account waterfall account manager.	arrangements without an agreed exemption. SBV may want foreign currency receipts (of loans, equity, insurance proceeds etc.) into an on-shore account in the aspect of keeping foreign currency reserves in Vietnam. In relation to the relevant laws such as Ordinance on Foreign Exchange Control, the SPC is required to obtain approvals from SBV.
• Conversion structure	Conversion bank agreement	Mechanisms and conditions for currency conversion of VND to USD within onshore account should be agreed upon.	The effect of PM's instruction to guarantee conversion limitation of only 30% of the revenue should be monitored closely.
• Onshore security agent structure	Agent agreement with local bank	A designated security agent will hold the security in onshore assets on behalf of the lenders. Lender syndication should ideally include local bank that will also play this agent role. If not, it is still possible to convince a local bank to play the role, if they are given some incentives (such as that the local accounts are to be opened with them). Some foreign banks which have their branch office in Vietnam are playing this role on existing projects.	Unlike trust structure, this agent structure cannot cope with changes in lender syndicate, and requires changes to the documents and registrations every time such changes occur.
• Offshore security trust structure	Agreement with offshore security trustee	A designated offshore security trustee will hold the security in offshore assets on behalf of the lenders. Ideally, security trustee should be designated from one of the overseas lender syndicates. If not, it is still possible to convince a foreign bank to play the role, if they are given some incentives.	Should discuss with potential lenders how they plan to manage this.
• Cash waterfall	Loan agreement	The loan agreement will include provisions of cash waterfall. This will detail prioritized order of cash allocation among the project accounts and what may be withdrawn from those accounts.	
• Debt service	Loan	The SPC will establish an offshore	

Type	Contract	Description	Issues/Notes
reserve account	agreement	debt service reserve account (DSRA), which must be funded before lower ranking payments (such as profits remittance) from cash waterfall.	
• Financial Covenants	Loan agreement	Loan agreement will include financial covenants such as keeping a certain number of Debt Service Coverage Ratio (DSCR) or Debt/Equity Ratio. If the SPC cannot keep these covenants, lenders can stop dividend distribution to the sponsors or announce the event of default in accordance with the provisions of the loan agreement.	
• Subordination of shareholder loans	Shareholder loan agreement	To the extent shareholder loans to the SPC compete with the senior debt, these would have to be subordinated.	
• Guarantee of debt up to completion	Loan agreement or separate Completion Guarantee Agreement	The Sponsor guarantees the debt until financial completion (generating stable operational cashflow satisfying financial covenants) occurs.	
Mortgage and Security			
• Registration of security over assets	National Registry of Security Interests	Security over assets in Vietnam should be registered with the National Registry of Security Interests, to ensure priority.	
• Mortgage of shares in the SPC	Mortgage agreement between lender and each shareholder	Lender's right to retain ownership of shares in the SPC in the event of an SPC default.	In Vietnam, approval by government on shift in ownership must be obtained on enforcement in addition to corporate approvals from the SPC and waivers from the sponsors. It is not possible to achieve these approvals up front and so, upon enforcement, hurdles remain. This may especially be the case if sponsor is state-owned or if there are some disputes with the government (e.g. no adjustment to tariff).

Type	Contract	Description	Issues/Notes
• Mortgage over plant and equipment	Mortgage agreement with the SPC	Lender's right to retain ownership of plant and equipment (e.g. O&M equipment for toll road) in the event of an SPC default.	The relevant equipment in this case may be limited and difficult to transfer.
• Mortgage of land use rights and structures on land	Mortgage agreement with the SPC	Lender's right to retain control of land use rights and structures on land during the course of concession period, in the event of an SPC default.	The law prohibits the grant of mortgages over land to foreigners. There have, in the past, been exceptions granted for projects of national importance. However, recently, government has shown reluctance. In the context of toll road, the focus should be to ensure that land use rights are not transferred to other entities (negative protection). This will allow continued inflow to the operational cashflow, which is the most important to protect since these assets cannot be liquidated.
• Security over major contract agreements	Mortgage Agreement	Lender's right to retain security over contract. In the toll road project, Toll Collection Contract is also important in the aspect of maintaining cashflow.	
• Direct Agreements with all major project counterparts	Direct Agreement	Each mortgage of a project contract (including the GGU and the BOTA) should be accompanied by a direct agreement, including assurance not to change or terminate contract without lender's consent.	
Step-in rights	Mortgage Agreements and Direct Agreements	Lender's right to step-in and control the SPC management, in the event of non-performance or default.	In reality, most lenders prefer not to step-in because they don't want to be held responsible. Also, since the authorities will only recognize the legal representatives of the SPC, step-in rights may not be effective. Nevertheless, there is no downside in including this provision in the

Type	Contract	Description	Issues/Notes
			contract. It is important to note, however, that control and continuity of operational cashflow from toll booth is the most important factor and not necessarily management of the SPC entity itself.
Political risk			
• Political risk insurance	NEXI insurance package (if required by overseas lenders)	NEXI provides Overseas Untied Loan Insurance which will guarantee the payment of debt, in the case of the SPC's poor performance/default caused by political changes that negatively affect the basic operations of the SPC. Such political changes include breach of contractual obligation risk, change in law/permission risk, remittance and conversion of foreign currency risk, expropriation/nationalization risk and political force majeure (war, civil war, terrorism, strike, etc.)	

* Statements here represent the approach generally taken as modified by current circumstances. In reality, the approach and documentation for each project will be somewhat different.

8.6 Summary of Private Investment Possibility

In this last section of Chapter 8, summarized are the key messages in terms of benefits from three viewpoints (GOV, Private Investor, JICA) , overall private investment possibility, key remaining issues and suggested next steps.

8.6.1 Summary of Benefits from Three Viewpoints

Viewpoint 1: GOV

For the GOV, the key is to solve the acceleration of basic infrastructure development under current budgetary constraints. This project can provide the following benefits:

1) Reduction of financial burden: Approximately $500 Million of investment and loan will come from overseas. This will clearly reduce the GOV's financial burden. Various forms of subsidy, incentives and guarantees from the GOV are viewed as catalyst arrangements necessary to attract private investment and loan.

2) Additional "value-for-money" generated from JICA-PSIF: The PSIF is expected to have a remarkable positive effect on the government's value-for-money. Given its lower cost of debt (we assumed 8% after FX risk premium, compared to 15% local bank rate), government subsidy requirement has been reduced by more than 50% compared to standard project finance structure.

3) Development of "industrial expressway": It is important to re-emphasize that this expressway connects the heart of future industrial engine of Vietnam. The planned capacity of Cai Mep-Thi Vai International Port, together with plans for industrial park development along the expressway corridor, confirms the huge logistical traffic potential of heavy commercial trucks in the future. In addition, the new Long Thanh International Airport will surely need convenient road access. There is no doubt that fast and reliable "industrial expressway" will be needed. This BOT scheme, combined with JICA-PSIF loan, can provide an accelerated solution for developing this important expressway.

4) Potential model case for successful JV between SOE and private in toll road: As Vietnam embarks on a journey of massive expressway development, JV structure between SOE and private sector could be an accelerated path. This is because development rights for much of high potential traffic zones have already been given to SOEs. A successful JV model can pave the way to attract further private financing to the toll road sector.

Viewpoint 2: Private Investor

For private investors, the key is whether the project has the right risk-return profile. This project can provide the following benefits:

1) Opportunity for stable, long-term cash flow: This project opportunity is meant for investors that have confidence in the "industrial expressway" scenario. For those that are convinced of the project, the question does not lie on the realization of the industrial expressway project but on "how soon" it will become a reality. Once it reaches that state, toll revenues is foreseen to remain be stable and plenty.

2) Local SOE partner to facilitate government communication and arrangements: This BOT scheme will make or break depending on communication and arrangements with GOV. For overseas investors, it is not easy to negotiate all the conditions on subsidy, incentives and guarantee required for this project. In this project, BVEC can play the role of facilitator for such government interactions in a way that is constructive and win-win for both parties.

3) Leveraged capital structure effect from PSIF: The proposed capital structure is 20% equity portion and PSIF loan provided for all of the 80% debt portion. This provides quite an attractive leverage for the private investor. In addition, the 10-year grace period should buy enough time for SPC cash flow to increase and stabilize before larger debt service requirement kicks in.

4) Potential development rights along industrial expressway corridor: For investors interested in property developments along the expressway corridor, this project could open up doors for privileged access. While the SPC will not be directly involve in property development business, investors could discuss separate but packaged development rights with the facilitation of BVEC or its parent IDICO.

Viewpoint 3: JICA

For JICA, the key is to generate a model case of PSIF and showcase its unique function to contribute to a broader Japan-Vietnam economic collaboration. This project can provide the following benefits:

1) Important component of Japan-Vietnam economic collaboration: JICA is supporting the development of Cai Mep-Thi Vai International Port. As explained in Chapter 2.2.4, there are already numerous on-going investments by Japanese companies planned along the expressway corridor. JICA is also supporting the development of Ho Chi Minh-Long Thanh-Dau Giay Expressway, Long Thanh International Airport and Cai Mep-Thi Vai inter-port road. This project connects all of these developments and will inevitably be an important component of the overall Japan-Vietnam economic collaboration.

2) Model case of JICA dual function in action: In this type of BOT/PPP scheme projects, the role of JICA changes over time. At the initial stages, JICA functions as the "project promoter". This function is required because most public infrastructure projects (with the exception of simple structures such as energy IPP) are not ready for private investor's consideration. Once private investor and government reaches a state of self-sustaining dialogues, at this point JICA functions as the "lender" to private party and conducts lender assessments and due diligence. This project could be a model case for this dual function in action.

3) Opportunity to set PSIF standards on two-layer security package: As explained in Chapter 8.5, this project requires arrangements for lender's security package in two layers. Layer 1 is determined by private investor's negotiation with the government. However, JICA can influence the outcome to ensure SPC is viable for debt service. Layer 2 is mainly JICA-led arrangements with investor, contractors and banks. This kicks in after in-principle agreement for Layer 1. This process of two-layer security package arrangements can set PSIF standards for future similar projects.

4) Opportunity to set up PSIF account management operations: Bank account management to control project cash flow will be a key component in project finance operations. This is especially true for toll road projects where the single most important project value comes from toll cash flow. This project provides all the key ingredients of this operation such as leakage management, on-shore and off-shore account transactions, currency conversion management and waterfall management. Therefore, this project will have synergies with other PSIF projects currently in the pipeline. Needless to say, the selection between managing in-house versus outsourcing would be an important element in operations design.

8.6.2 Summary of Private Investment Possibility

In summary, the conclusion is that private investment is possible for Bien Hoa-Vung Tau Expressway project. However, this requires the government to play their role in terms of subsidy, incentives and guarantee. Also, JICA-PSIF loan is an inevitable part of the project scheme. Without it, private

investment will not be possible. Described above are the sufficiency of benefits from all three viewpoints. In other words, this project provides a great potential for a win-win-win situation. Revisited herein are the key reasons behind the conclusion.

Equity IRR target: A 20% equity return is defined as a minimum return profile required for private investor. This is not high, especially given current market interest rates in VND (approx.15%).

Project IRR: In the base case (industry expressway scenario), project IRR was 13.0%. This return profile is not good enough as a standalone (no government subsidy) project.

Project IRR with government subsidy: Defined are several levels of government subsidy. Subsidy for land and ancillary facilities raised the project IRR to 15.7%, which may reach target equity IRR with sufficient leverage.

Capital Structure Leverage: The study team conducted analysis of various capital structure options for project with government subsidy. The results showed that an equity IRR of 20.8% under the scenario of 20% equity and all PSIF for 80% debt portion can be achieved.

Therefore, the conclusion is that a combination of government subsidy (land plus ancillary) and highly leveraged PSIF capital structure could potentially attract private investment.

However, robust risk management and guarantee methods will need to be considered together as part of a comprehensive two layer security package for lenders.

8.6.3 Key Remaining Issues

There are various remaining issues overall, including environmental/social aspects. Here are the descriptions of the remaining issues related to private investment.

-**Substantiate the "industrial expressway" scenario:** In this study, presented are the assumptions made by the study team on the industrial expressway scenario. This should be substantiated with facts and analysis. For example, there is a need to confirm the truck driver's likely behavior on the use of expressway over Route 51. In other words, the study team needed to confirm the value of time savings. Also included are the surveys of other similar country cases of industrial expressway and the confirmation of the high heavy truck ratio used in the assumptions.

-**Establish two-way dialogue with local people committee on land acquisition schedule:** Included in this study is the assessment of land acquisition as one of the high risk factors. It is important to establish solid communication channel with the local People's Committee that will carry out the implementation. There could be bottlenecks that private sector could help solve. For example, delay due to government budget approval process can be solved by some form of bridge financing mechanism.

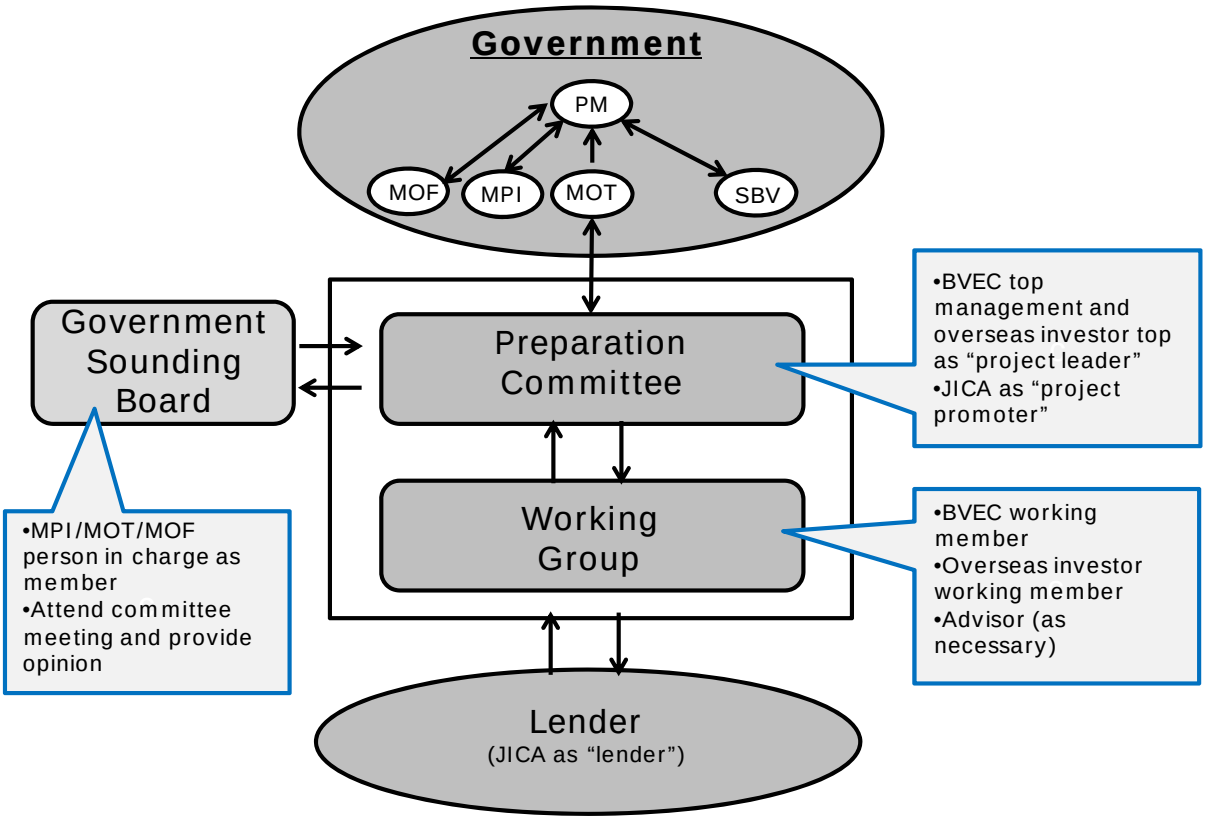
-**Bring potential private investor into the discussion table:** Driving force for implementation has to originate from the private investor. It is important to transform this study result into an investor reference material and likewise look for investors willing to engage in such projects.

8.6.4 Suggested Next Steps

The study team's perspective is that the next important step is the development of a working group that will serve as the nucleus of project implementation. Ideally, the working group members should consist of staff that will be involved in moving SPC activities forward. Therefore, members from BVEC together with members from potential private investor should be the key members. This is a desirable setup for JICA to continue its function as the "project promoter", at least until the private

investor is fully engaged in the working group. This working group should develop the term sheet (business contents) for BOT/GGU contract.

The working group could report to a preparation committee made up of senior members of BVEC and private investor. The preparation committee should provide draft guidance to the working group and also channel this to the government sounding board for verification. Figure 8.6.1 describes this mechanism for the succeeding steps, including image of working group, preparation committee and government sounding board.

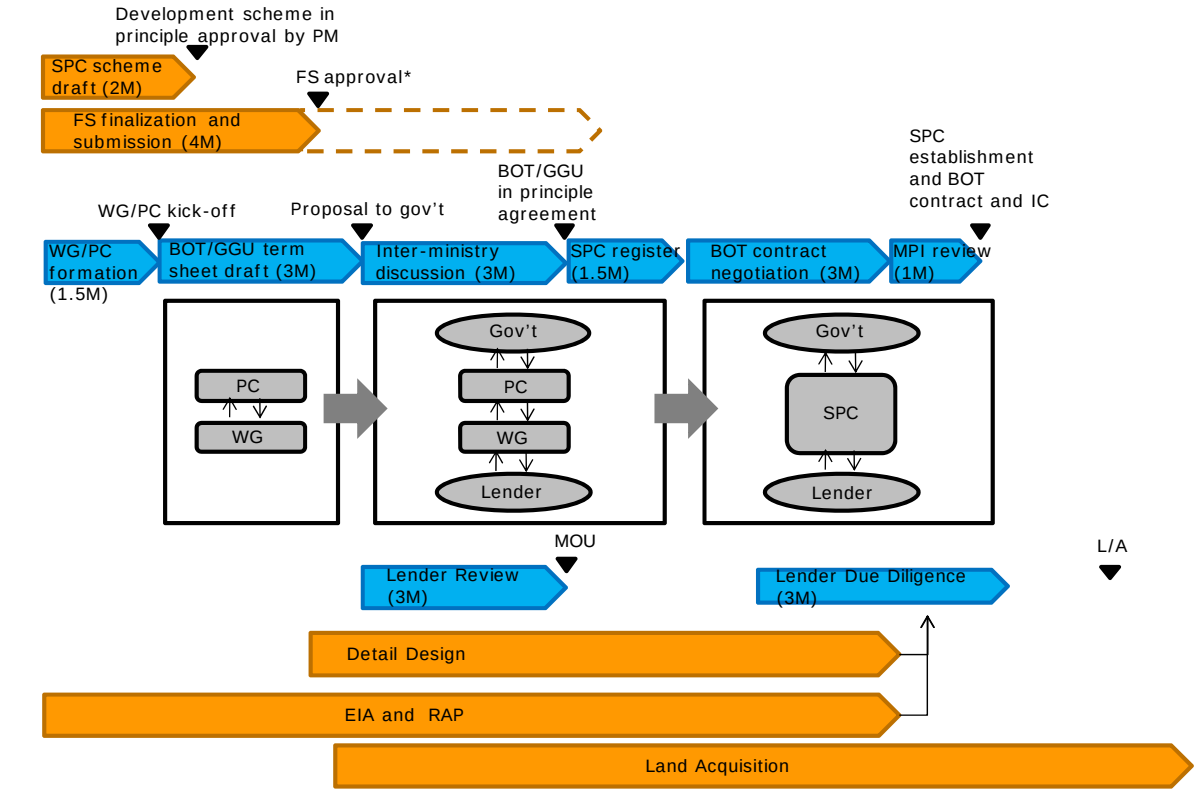


Source: JICA Study Team

Figure 8.6.1 Mechanism for next steps

Once the term sheet is ready, then, the preparation committee should officially start a dialogue with the authorized body (MOT), with the aim to reach in-principle agreement after inter-ministerial coordination. At this point, JICA will now shift its function as the lender and move on with the review of the agreed term sheet from a lender's perspective. JICA could issue MOU if the contents of term sheet (basically, Layer 1 of security package) is sufficient.

Thereafter, the project will move into the official registration of SPC establishment, signing of BOT contract and issuance of Investment Certificate. In parallel, JICA will continue with negotiation for Layer 2 of security package and conduct due diligence. After this process is complete, L/A could be signed. Figure 8.6.2 describes this process in the form of an implementation roadmap.



*includes required subsidy amount and guarantee items

Source: JICA Study Team

Figure 8.6.2 Implementation Roadmap

CHAPTER 9 SUMMARY AND CONCLUSION

9.1 Summary (1), Review of Engineering Aspects

The Feasibility Study(F/S), by TEDI, submitted in March 2011 was reviewed. First, the contents of the final report were reviewed and several recommendations proposed for the Detailed Design (DD) stage:

Table 9.1.1 Summary of Engineering Review

No.	Field	Review Results
1	Traffic Demand	- Number of lanes of Bien Hoa – Vung Tau Expressway is planned at 4 lanes in 2025, traffic demand on the section of the Ben Luc – Long Thanh Expressway to Ring Road No.4 and to Port Access may exceed the 4-lane capacity. - By 2030, the Expressway is expanded to 6 lanes and will be able to handle the traffic demand within the 6-lane capacity. - The maximum traffic demand is observed at the section of Long Thanh – Dau Giay Expressway to Long Thanh Airport with forecast traffic demand of 78,400 pcu/day and 37,400 vehicles/day in 2030. - By 2035, traffic volume on the section of Ben Luc Expressway to RR4 and Port access may again exceed the 6-lane capacity due to high demand of heavy vehicles to/from the Cai Mep – Thi Vai Port. - Further and more detailed study will be necessary at this point for judging investment by investor such as O/D survey at entrance/exit of industrial parks and supplemental traffic survey for various development scenario.
2	Highway Design	- Section between Phu My IC and NH51 IC should be expressway not national highway taking account traffic safety. - Horizontal alignment is acceptable. - Additional interchange for connecting crossing roads shall be considered. - Vertical alignment is acceptable. - Cross-section elements of bridge section should satisfy the TCVN4054-2005 requirement. - For Long Thanh IC, weaving distance should be studied further. - Phu My IC should reconsider the stage construction plan taking into account future development of RR$, Tram Bong – Phu My section.
3	Bridge Design	- Locations of thruway bridges are mostly acceptable. - Only the railway crossing at KM 0+721 can be studied further. - Locations of rampway bridges and flyover bridges are acceptable. - Typical cross section of bridges should be 4-lane road taking account of the potential reduction of initial investment cost. - Bridge types, superstructure, substructure, foundation, are mostly acceptable.
4	Retaining wall	- At NH51 IC, the sight distance should be further studied for the retaining wall section. If necessary, alternative structure should be studied.
5	Construction Planning	- Contract packaging was updated considering the scale of the contract of which enable to procure local contractor. VND 2,000 Billion was set as standard maximum scale of a contract. - Addition to the civil works, i) Building works, ii) ITS works, and iii) O&M equipment packages are newly proposed. - Construction period is reduced to 36 months from 48 months in the F/S.
6	Construction Cost	- Construction cost is updated with newer unit rate. - New cost items for private investment were included. - Construction cost increased 8% from the F/S. O&M cost was updated.

No.	Field	Review Results
7	O&M Plan	- Scope of O&M works was re-defined. - Preliminary ITS systems are proposed. - O&M Office and personnel are proposed. - Present O&M Manual for HCMC-Trung Luong is reviewed. - Level of Service (LOS) is proposed for BE. - Cost of O&M, initial and operation, was estimated.
8	Environmental and Social consideration	- Latest relevant regulations for environmental and social consideration were confirmed. - EIA approval procedure and Land Acquisition procedure were confirmed. - Land acquisition cost in the F/S was updated. - For application of PSIF, the JICA environmental guidelines shall be applied, and therefore, necessary items and level of clarification required are confirmed. - Further environmental procedure for clearance of JICA requirements were confirmed with tentative work plan.
9	Implementation Program	- See section 9.3.
10	Economic and Financial Analysis	- Four (4) scenarios in the F/S were reviewed. - BOT/PPP scheme studied are carried out further in this Study.

Source: JICA Study Team

9.2 Summary (2), Evaluation of Private Investment Environment

Results of private investment possibility was summarized in three(3) view points: i) Vietnam Government, ii) Private Investor and iii) JICA.

Study on private investment possibility is summarized as follows:

The conclusion is that private investment is possible for Bien Hoa-Vung Tau Expressway project. However, this requires the government to play their role in terms of subsidy, incentives and guarantee. Also, JICA-PSIF loan is an inevitable part of the project scheme. Without it, private investment will not be possible. The discussions presented in the previous sections showed that there are enough benefits from all three viewpoints. In other words, this project provides a great potential for a win-win-win story. In the succeeding discussions, the key reasons behind the conclusion are re-examined.

Equity IRR target: An equity return of 20% has been set as the minimum return profile required for private investor. This is not high, especially given the current market interest rates in VND (approx.15%).

Project IRR: In the base case (industry expressway scenario), project IRR was 13.3%. This return profile is not high enough for a standalone (no government subsidy) project.

Project IRR with government subsidy: Several levels of government subsidy have been clearly defined. The subsidy for land and ancillary facilities raised the project IRR to 16.0%, which may reach target equity IRR with sufficient leverage.

Capital Structure Leverage: The analysis of various capital structure options for project with government subsidy showed the possibility of achieving an equity IRR of 21.4% under the scenario of 20% equity and all PSIF for the 80% debt portion.

Therefore, the conclusion is that a combination of government subsidy (land plus ancillary)

and highly leveraged PSIF capital structure could potentially attract private investment.

However, robust risk management and guarantee methods are essential components of a comprehensive two layer security package for lenders.

9.3 Tentative Project Implementation Program

Taking into account the necessary preparation and arrangement needed to setup an SPC, the following tentative implementation programme is developed. As mentioned in section 7.13.3, Phu My – Vung Tau section shall be implemented by governmental finance, and seamless implementation schedule with Bien Hoa – Vung Tau section is proposed. However, if Japanese yen loan can be applied to Phu My – Vung Tau section, implementation schedule to develop whole ITS and O&M facilities on Bien Hoa – Vung Tau Expressway can be proposed as shown in Table 9.3.2.

Table 9.3.1 Tentative Implementation Program

Tentative Implementaion Program (L/A: September 2012)

No.	Year / Quarter	Period (month)	2011 I	2011 II	2011 III	2011 IV	2012 I	2012 II	2012 III	2012 IV	2013 I	2013 II	2013 III	2013 IV	2014 I	2014 II	2014 III	2014 IV	2015 I	2015 II	2015 III	2015 IV	2016 I	2016 II	2016 III	2016 IV	2017 I	2017 II	2017 III	2017 IV
			Preparation Phase								Construction Phase (36 months)												Operation Phase							
A	**Investment Preparation Package**																													
A100	**BVEC**																													
A101	FS Approval by PM				■																									
A102	Land Acquisition				■	■	■	■	■	■	■	■	■	■																
A103	Setup WG/PC	1.5			■	■																								
A104	Draft BOT/GGU	3			■	■	■																							
A105	Inter-ministry Discussion	3				■	■	■																						
A106	SPC Registration	1					■																							
A107	Negotiation of BOT Contract	3					■	■	■																					
A108	MPI Review	2							■	■																				
A109	SPC Establishment	1							■																					
A110	BOT Contract	1							■																					
A111	Investment Certificate	1							■																					
A200	**JICA-PSIF**																													
A201	Preliminary Survey (This Study)		■	■																										
A202	FF Mission	1			■																									
A203	JICA Preparatry Study	4			■	■	■																							
A204	Appraisal Mission	1					■																							
A205	Letter of Intent (LOI)	1						■																						
A206	Review of Detailed Design	3						■	■																					
A207	L/A Sign	1								■																				
B	**SPC Package**																													
B100	SPC Registration	1					■																							
B101	SPC Establishment	1						■																						
B102	BOT Contract	1						■																						
B103	Investment Certificate	1						■																						
B104	Organization Set up	5					■	■	■																					
C	**EPC Package**																													
C101	Detailed Design				■	■	■																							
C102	Procurement of Contractor						■	■	■																					
C1021	Negotiation								■	■																				
C1022	Contract Sign									■																				
C103	Construction										■	■	■	■	■	■	■	■	■	■	■	■								
C104	Open to the Public																						■							
D	**O&M Package**																													
D101	Preparation of O&M Company																■													
D102	Establish O&M Company																			■										
D103	O&M Training																				■	■								
E	**JICA-Environmental Package**																													
E100	**EIA**																													
E101	Preparation of EIA Report				■	■																								
E102	Approval of EIA by MONRE					■																								
E200	**RAP (Framework)**																													
E201	Preparation of RAP Report				■	■																								
E202	RAP Report Consented by JICA					■																								
E300	**RAP (Detail)**																													
E301	Preparation of RAP Report					■	■	■																						
E302	RAP Report Consented by JICA							■																						

Source: JICA Study Team

Table 9.3.2 Tentative Implementation Program of Phu My – Vung Tau Section

No.	Year	Period (month)	2011				2012				2013				2014				2015				2016				2017				2018			
	Quarter		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
A	(PPP Scheme) Bien Hoa-Phu My-NH51 (46.8km)																																	
A100	Detailed Design																																	
A200	Procurement of Contractor																																	
A201	Negotiation																																	
A202	Contract Sign																																	
A300	Construction																																	
A400	Open to the Public																																	
B	(Japanese Yen Loan) Phu My-Vung Tau Section (31.0km)																																	
B100	Preparatory Study	6																																
B200	Loan Agreement	-																																
B300	Procurement of Consultant	6																																
B400	Detailed Design	21																																
B410	ITS/O&M Works	12																																
B411	Bien Hoa-Phu My-NH51 (46.8km)	6																																
B412	Phu My-Vung Tau Section (31.0km)	6																																
B420	Civil Works	12																																
B500	Procurement of Contractor	18																																
B510	ITS/O&M (KM0-KM68+600)	15																																
B520	Civil Works	15																																
B600	Construction	45																																
B610	ITS/O&M Works	45																																
B611	Bien Hoa-Phu My-NH51 (46.8km)	15																																
B612	Phu My-Vung Tau Section (31.0km)	18																																
B620	Civil Works	30																																
B700	Open to the Public	-																																

Source: JICA Study Team

9.4 Proposed Action Plan for Next Stage

9.4.1 Key Remaining Issues for Calling Private Investment

There are various remaining issues overall, including environmental/social aspects. Described below are the remaining issues related to private investment.

Substantiate the "industrial expressway" scenario: In this study, several assumptions made on the industrial expressway scenario requires substantiation with facts and analysis. As an example, there should be confirmation of the truck driver's likely behavior on selecting expressway over Route 51 to confirm the value of time savings. Also, other means to verify the assumptions is to conduct survey on other similar country cases of industrial expressway and confirm the high heavy truck ratio.

Establish two-way dialogue with local People's Committee on land acquisition schedule: The assessment of the study team showed that land acquisition is one of the high risk factors. It is important to establish a reliable communication channel with the local People's Committee that will carry out the implementation. There could be bottlenecks that private sector could assistance in searching for a solution. For example, delay due to government budget approval process can be solved by some form of bridge financing mechanism.

Bring potential private investor into the discussion table: The initiative that will move the project forward for implementation has to come from the private investor. It is important to convert this study result into an investor communication material and to look for investors willing to engage in the project.

9.4.2 Proposed Action Plan for Next Step

As described in Section 8.6.4, a working group (WG) under preparation committee (PC) is one of the procedures essential in moving the project forward efficiently.

A WG should be established and a draft work plan prepared for the next step with reference to

this report. Moreover, if Japanese yen loan can be applied to Phu My – Vung Tau section, preparatory survey for Phu My – Vung Tau section shall be conducted to realize seamless implementation schedule with Bien Hoa – Phu My section.

APPENDIX

Appendix-1 Environmental Check List

Environmental Checklist: 7. Roads (1)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) N (d) N	(a) EIA report is under preparation in official process. (b) Not yet. (c) ditto (d) No.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) Stakeholder meetings were held according to the Vietnamese regulation, and therefore targets were only limited persons. Additional stakeholder meetings inviting a wide range of stakeholders are necessary to be held. (b) Obtained comments will be reflected in order to finalize the FS study as well as EIA study.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Alternatives were examined in the selection of the optimum alignment, but it was not described in EIA report since the Vietnamese regulation did not request it. Preparation of a separete report to explain the process of alternative examination is necessary.
2 Pollution Control	(1) Air Quality	(a) Is there a possibility that air pollutants emitted from the project related sources, such as vehicles traffic will affect ambient air quality? Does ambient air quality comply with the country's air quality standards? Are any mitigating measures taken? (b) Where industrial areas already exist near the route, is there a possibility that the project will make air pollution worse?	(a) Y (b) Y	(a) Expected level of TSP during construction phase and operation phase will exceeds the national standard despite of limited area. As for chemical components, they will be within the national standard. Mitigation measures such as sprinlking water, preparing a material cover, limiting a transportation area of construction vehicle, obedience with the regulation (Decree No. 249/2005/QD; Setting The Roadmap for Application of Emission Standards to Road Motor Vehicles) are proposed in EIA report, which will be developed at the next study stage. (b) Although indistrial area locates along the project alignment, air quality is estimated as under the national standard except for TSP. Thus, it is considered that project implementation will not attribute degradation of air quality worse.
	(2) Water Quality	(a) Is there a possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? (b) Is there a possibility that surface runoff from roads will contaminate water sources, such as groundwater? (c) Do effluents from various facilities, such as parking areas/service areas comply with the country's effluent standards and ambient water quality standards? Is there a possibility that the effluents will cause areas not to comply with the country's ambient water quality standards?	(a) Y (b) Y (c) Y	(a) There is a possibility of water quality degradation at the downstream water area. Mitigation measurs such as limiting construction area, arrangement of appropriate construction organization, arrangement of ditchs to prevent overflow and checking/maintenance of ditches in the construction phase are proposed in EIA report. (b) There is a possibility of surface runoff from roads will contaminate water sources. EIA report proposes to keep road and bridge condition clean and to arrange water collection system. These measures will be further examined at the next study stage. (c) It is estimated in EIA report that effluent during operation phase is regarded as negligible level. The effluents from facilities will be treated adequately such as management of pH and concentration in waste water to comply with the effluent standard in Vietnam.

Environmental Checklist: 7. Roads (2)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(3) Wastes	(a) Are wastes generated from the project facilities, such as parking areas/service areas, properly treated and disposed of in accordance with the country's regulations?	(a) Y	(a) Waste will be generated during construction phase and operation phase, which will be treated according to the Vietnamse regulation (Circular No. 26/2006/TT-BTNMT) during operation of construction phases. In EIA report, it is proposed that wastes will be collected and disposed to the designated area by contracted collectors. Regarding hazardous wastes, it will be kept in the limited area with appropriate treatment and monitoring, and will be handled by licenced companies.
	(4) Noise and Vibration	(a) Do noise and vibrations from the vehicle and train traffic comply with the country's standards?	(a) Y	(a) Assessment result in EIA shows that noise level until 50m from the noise source during construction phase still exceeds the national standard. Such level might be minimized at certain degree by appling for the mitigation measures proposed in EIA. During operation phase, noise level is expected under the national standard.Limiting costruction time in a day, using low noise constructoin equipment, proper maintenance of construction equipments, and installation of temporal noise wall during construction are proposed as mitigation measures in the construction phase at EIA report. Regarding the operation phase, planting trees and installing generator in a separete area with soundproof condition is proposed. Such measures will be examined further at the next study stage. As for vibration during constuction and operation phases, it is expected to be under the national standard.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) There is no protected area in and around the project area.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate protection measures taken to prevent impacts, such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock? (e) Is there a possibility that installation of roads will cause impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystems due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered? (f) In cases the project site is located at undeveloped areas, is there a possibility that the new development will result in extensive loss of natural environments?	(a) N (b) N (c) N (d) Y (e) Y (f) N	(a) There is no ecologically valuable habitats. (b) There is no endangered species by the national laws, but further confirmation is necessary on the endangered species designated by international treaties. (c) Since the project area does not have primal forest or ecologically valuable habitats, significant ecological imapct is not anticipated. (d) Mitigation measures on ecosystem such as education to workers and obedience to the regulation related to forest and biodiversity protection is proposed in EIA, and further examination is necessary. (e) Mitigation measures to prevent destruction of forest is proposed in EIA, which will be developed at the next study stage. (f) The project locates in the relatively urban area, and therefore extensive loss of natural environments will not be expected.
	(3) Hydrology	(a) Is there a possibility that alteration of topographic features and installation of structures, such as tunnels will adversely affect surface water and groundwater flows?	(a) Y	(a) Alternation of topographic features and installation of structures by project implementation might attribute for adversely affect surface water and groundwater flows, but such impact will be minimized by surveying before construction and introducing appropriate techniques.

Environmental Checklist: 7. Roads (3)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(4) Topography and Geology	(a) Is there any soft ground on the route that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (b) Is there a possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(a) N (b) Y (c) Y	(a) Existence of a soft ground is not reported along the Project alignment. (b) There is a possibility that cutting and filling cause slope failures or landslides. Preparation of necessay protection by stone, removal of organic soil and appling soil stabilization such as replacement of soft soil and ashlars and concrete. (c) There is a possibility of soil ranoff from cut/fill area, waste soil disposal site and borrow site. EIA report proposed to prepare appropriate construction plan, prepare cover, prepare necessary fence for soil storage, preparation of temporary embankment, regular check in a day etc, further
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) Y (b) N (c) N (d) Y (e) Y (f) Y (g) Y (h) N (i) N (j) N	(a) Involuntary resettlement will be caused by project implementationm, and efforts to minimize resettlement impact are made to examine appropriate compensation and support. (b) Although consultation with PAPs on resettlement issues is not held in this study stage, it will be held at the next study stage. (c) Master plan of compensation including basic concept of land acquisition/resettlement/compensation is preapred in this study stage. Resettlement plan will be prepared at the next study stage. (d) Compensaiton wil be paid prior to the resettlement. (e) Basic concept of land acquisition/resettlement/compensaiton is prepaed as the master plan of compensation. (f) The Vietnamse regulations stipulate to provide necessary support for socially vulnerable people by considering regional situation. (g) Agreement will be obtained with the affected people prior to resettlement. (h) Organizational framework is not yet established, which will be examined in the couse of preparation of RAP at the next study stage. (i) Monitoring system will be developed in the couse of RAP preparation at the next study stage. (j) The grievance redress mechanism is defined by the Vietnamese regulatio
	(2) Living and Livelihood	(a) Where roads are newly installed, is there a possibility that the project will affect the existing means of transportation and the associated workers? Is there a possibility that the project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Are adequate measures considered for preventing these impacts? (b) Is there any possibility that the project will adversely affect the living conditions of the inhabitants other than the target population? Are adequate measures considered to reduce the impacts, if necessary? (c) Is there any possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (d) Is there any possibility that the project will adversely affect road traffic in the surrounding areas (e.g., increase of traffic congestion and traffic accidents)? (e) Is there any possibility that roads will impede the movement of inhabitants? (f) Is there any possibility that structures associated with roads (such as bridges) will cause a sun shading and radio interference?	(a) Y (b) N (c) Y (d) N (e) Y (f) N	(a) The possibility that the project affects the existing transportaion means and associated workers will be low. The project implementaiton will cause adverse impact to land use and income source. Necessary compensation and support will be studied at RAP to be prepared in the next study stage. (b) Except for people living and working in the project area, the possibility of adverse impact to inhabitants other than the target population is low. (c) There is a possibility that imigration of workers associated with the project will cause diseases. However, such risk will be minimized by providing necessary education to them. (d) Project implementation will contribute for improvement of regional traffic condition. (e) Due to road construction, inconvenience for inhabitants on movement will be caused. However, it will be improved by arrangement of necessary corridors. (f) Necessary area of safety zone will be arranged. Thus, a risk related to shading and radio interference will be low.

Environmental Checklist: 7. Roads （4）

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
4 Social Environment	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) Y	(a) There is a possibility of buried properties at the time of Oc Eco culture area in the Project area. Necessary actions and procedure to protect these properties are examined.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) Y	(a) Due to embankment and cutting, local landscape will be changed. Alignment design not to bringe significant change will be examined in the next study stage.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources to be respected?	(a) - (b) Y	(a) It is not sure whether ethnic minority groups live in the project area. Once their habitation is confirmed, necessary measures shall be considered. (b) If ethnic minority groups would be affected due to project implementation, all of their rights shall be respected.
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures being taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) N (b) N (c) N (d) N	(a) The project proponent does not violate the national laws for the project implementaion. (b) Necessary satety measures will be considered and shared with workers to protect their working condition. (c) Necessary safety measures will be prepared and shared with workers to protect their health condition. (d) Necessary trainings will be provided to securty guards not to violate indivisuals and local residents.
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) Y (c) Y	(a) Adequate measurss are proposed in EIA as described in "2. Pollution Control", which will be developed in the next study stage. (b) Adequate measures are proposed in EIA as described in "3. Natural Environment", which will be developed in the next study stage. (c) Adequate measures will be planned and provided to reduce the negative impacts of social environment during construction phase such as necessary traffic arrangment to reduce traffic jam and temporary pedestrian paths, etc. Regarding negative impact caused by land acquisition and resettlement, adequate measures will be examined in the couse of preparation of RAP.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) (c) Y (d) Y	(a) Monitoring program is proposed in EIA, which is necessary to be further examined at the next study stage. (b) Monitoring of physical environment is proposed to be conducted regulary during construction and operation phase. Regarding monitoring of land acquisition/resettlement, it will be proposed in the couse of RAP preparation. (c) Monitoring structure and necessary budget are proposed in EIA, which is necessary to be further examined at the next study stage. (d) Monitoring report system and monitoring frequency are proposed in EIA report. Examination of monitoring format is necessary.

Environmental Checklist: 7. Roads (5)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Forestry Projects checklist should also be checked (e.g., projects including large areas of deforestation). (b) Where necessary, pertinent items described in the Power Transmission and Distribution Lines checklist should also be checked (e.g., projects including installation of power transmission lines and/or electric distribution facilities).	(a) N (b) N	(a) The Project does not have relevance to forest or forestry since the Project locates in the relatively urban area where any primal nature is not observed. (b) The project will not include components of power transmissin and distribution lines.
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed, if necessary (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N	(a) There is a possibility of temporal increase of Greenhouse Gass (GHG) emission during construction phase. Regarding operation phase, level of air pollutants caused by the project is estimated within the national standard though accumulation of GHG connected to other development projects in the region is necessary to be examined.

1) Regarding the term "Country's Standards" mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made.
In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).
2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

Appendix-2 Cash Flow of Bien Hoa – Vung Tau Expressway Project (Base Case)

Cashflow Projections of Bien Hoa-Vung Tau Expressway (Base Case)

Funding during construction (Nominal terms, Billion VD)

Item	2011	2012	2013	2014	2015			Total
1. Land acquisition	224	1,087	1,173	0	0			2,484
2. Construction work	2	2	1,897	2,326	2,800			7,026
3. O&M, Engineering, SPC Operation, Project management and Other Costs	171	193	233	308	390			1,295
4. VAT	12	12	178	217	260			679
5. Working capital					30			30
								0
								0
6. Financing cost (commitment charge)			0	0	0			0
7. Interest during construction (IDC)			224	491	836			1,551
Total	409	1,295	3,704	3,341	4,317			13,066
Sources								
Equity	409	1,295	909					2,613
Loan			2,795	3,341	4,317			10,453
Total	409	1,295	3,704	3,341	4,317			13,066
Debt:equity ratio						Ratio	Ratio	
Equity		2,613	20.0%		JICA	8.0%	100.0%	10,453
Debt		10,453	80.0%		BIDV	15.0%	0.0%	0

Revenue Share

Government	0.0%
Private sector	100.0%

Item	2027	2028	2029	Total
1. Land acquisition	0	0	0	0
2. Construction work	7	1,092	1,216	2,315
3. O&M, Engineering, SPC Operation, Pr	134	108	114	356
4. VAT	9	102	114	225
5. Working capital				0
				0
				0
6. Financing cost (commitment charge)	0	0	0	0
7. Interest during construction (IDC)	0	0	0	0
Total	150	1,302	1,444	2,896
Sources				
Equity				0
Loan	150	1,302	1,444	2,896
Total	150	1,302	1,444	2,896
Debt:equity ratio				
Equity	0	0.0%		
Debt	2,896	100.0%		

Profit & Loss account (Billion VD)

Item	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	Total
1. Revenue																																				
Toll revenue allocated to private sector						656	698	740	781	823	1,331	1,522	1,713	1,904	2,095	3,152	3,498	3,844	4,191	4,537	6,359	6,850	7,341	7,832	8,323	10,807	11,116	11,426	11,735	12,044	15,217	15,217	15,979	16,360	16,741	204,833
2. O&M, SPC operation cost						60	64	69	74	79	84	89	95	101	107	341	188	198	209	221	232	243	255	268	281	564	306	320	334	349	362	377	391	406	422	7,090
3. Depreciation						246	246	246	246	246	232	232	232	232	232	232	308	308	308	308	308	308	308	308	308	308	308	308	308	308	308	308	308	308	308	8,481
Hard cost (initial work)						232	232	232	232	232	232	232	232	232	232	232	232	232	232	232	232	232	232	232	232	232	232	232	232	232	232	232	232	232	232	6,956
Hard cost (expanded work)																	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	1,452
Soft cost (initial work)						15	15	15	15	15																										73
Soft cost (expanded work)																																				0
4. Interest payment						836	831	826	820	814	808	801	793	785	776	766	999	1,077	1,073	940	922	902	881	858	833	806	777	746	712	676	636	594	548	498	1,342	24,677
Initial work (JICA)			224	491	836	836	831	826	820	814	808	801	793	785	776	766	755	744	732	719	704	689	672	654	635	614	592	567	541	512	481	448	412	374	856	22,109
Initial work (BIDV)			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																			0
Expanded work (JICA)																	244	333	341	221	217	213	208	203	198	192	186	179	172	164	155	146	136	125	487	4,118
Expanded work (BIDV)																	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					0
5. Profit before tax						▲ 487	▲ 444	▲ 402	▲ 359	▲ 317	208	400	593	787	980	1,813	2,003	2,261	2,601	3,068	4,897	5,397	5,897	6,398	6,900	9,128	9,724	10,051	10,380	10,711	13,910	13,938	14,732	15,147	14,668	164,586
6. Cumulated profit before tax						▲ 487	▲ 931	▲ 1,333	▲ 1,693	▲ 2,009	▲ 1,802	▲ 1,401	▲ 808	▲ 21	960	2,772	4,775	7,037	9,638	12,706	17,603	23,000	28,897	35,295	42,195	51,323	61,048	71,099	81,479	92,191	106,100	120,039	134,770	149,917	164,586	1,206,944
7. Corporate tax to be paid						0	0	0	0	0	0	0	0	15	49	91	100	113	260	307	1,224	1,349	1,474	1,600	1,725	2,282	2,431	2,513	2,595	2,678	3,477	3,485	3,683	3,787	3,667	38,905
8. Net profit of the year			0	0	0	▲ 487	▲ 444	▲ 402	▲ 359	▲ 317	208	400	593	772	931	1,722	1,903	2,148	2,341	2,761	3,673	4,047	4,423	4,799	5,175	6,846	7,293	7,538	7,785	8,034	10,432	10,454	11,049	11,360	11,001	125,681
9. Cumulated net profit of the year						▲ 487	▲ 931	▲ 1,333	▲ 1,693	▲ 2,009	▲ 1,802	▲ 1,401	▲ 808	▲ 36	895	2,617	4,520	6,669	9,009	11,771	15,444	19,491	23,914	28,712	33,888	40,734	48,027	55,566	63,351	71,385	81,817	92,271	103,319	114,680	125,681	943,261
10. Dividends to be paid						0	0	0	0	0	208	400	593	772	931	1,722	1,903	2,148	2,341	2,761	3,673	4,047	4,423	4,799	5,175	6,846	7,293	7,538	7,785	8,034	10,432	10,454	11,049	11,360	11,001	127,690
11. Retained profits																																				0
12. Cumulated retained profits			▲ 224	▲ 715	▲ 1,551	▲ 2,038	▲ 2,482	▲ 2,884	▲ 3,243	▲ 3,560	▲ 3,352	▲ 2,952	▲ 2,358	▲ 1,587	▲ 655	1,067	2,969	5,118	7,459	10,220	13,893	17,941	22,363	27,162	32,337	39,183	46,476	54,015	61,800	69,834	80,266	90,720	101,769	113,129	124,130	894,250

Cashflow Waterfall (Billion VD)

Item	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	Total
1. Revenue																																				0
Toll revenue allocated to private sector						656	698	740	781	823	1,331	1,522	1,713	1,904	2,095	3,152	3,498	3,844	4,191	4,537	6,359	6,850	7,341	7,832	8,323	10,807	11,116	11,426	11,735	12,044	15,217	15,217	15,979	16,360	16,741	204,833
2. Capital costs	▲ 409	▲ 1,295	▲ 3,704	▲ 3,341	▲ 4,317	0	0	0	0	0	0	0	0	0	0	0	▲ 150	▲ 1,302	▲ 1,444	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	▲ 15,962
Initial work	▲ 409	▲ 1,295	▲ 3,704	▲ 3,341	▲ 4,317																															▲ 13,066
Expanded work																	▲ 150	▲ 1,302	▲ 1,444																	▲ 2,896
3. O&M, SPC operation cost						60	64	69	74	79	84	89	95	101	107	341	188	198	209	221	232	243	255	268	281	564	306	320	334	349	362	377	391	406	422	7,090
4. VAT	0	0	0	0	0	54	57	61	65	68	112	129	145	162	178	264	298	328	358	388	546	588	631	673	716	927	958	984	1,011	1,038	1,313	1,313	1,379	1,412	1,445	17,601
5. Corporation tax paid						0	0	0	0	0	0	0	0	15	49	91	100	113	260	307	1,224	1,349	1,474	1,600	1,725	2,282	2,431	2,513	2,595	2,678	3,477	3,485	3,683	3,787	3,667	38,905
Operating cashflow before financing	▲ 409	▲ 1,295	▲ 3,704	▲ 3,341	▲ 4,317	542	576	610	643	676	1,135	1,304	1,473	1,626	1,761	2,456	2,762	1,903	1,920	3,622	4,357	4,670	4,981	5,291	5,601	7,034	7,421	7,608	7,795	7,980	10,064	10,043	10,526	10,755	11,207	125,276
6. Loan drawdown	0	0	2,795	3,341	4,317												150	1,302	1,444																	13,349
Initial work	0	0	2,795	3,341	4,317																															10,453
Expanded work																	150	1,302	1,444																	2,896
7. Equity injected	409	1,295	909	0	0												0	0																		2,613
Initial work	409	1,295	909	0	0																															2,613
Expanded work																																				0
Cash available for debt service	0	0	0	0	0	542	576	610	643	676	1,135	1,304	1,473	1,626	1,761	2,456	2,912	3,205	3,364	3,622	4,357	4,670	4,981	5,291	5,601	7,034	7,421	7,608	7,795	7,980	10,064	10,043	10,526	10,755	11,207	141,238
8. Debt service						836	831	826	820	814	808	801	936	939	942	946	1,233	1,330	1,346	1,235	1,240	1,246	1,252	1,259	1,266	1,274	1,283	1,292	1,302	1,313	1,324	1,337	1,350	1,365	5,278	38,026
Initial work (principal) JICA						0	0	0	0	0	0	0	143	154	167	180	195	210	227	245	265	286	309	333	360	389	420	454	490	529	571	617	666	720	2,523	10,453
Initial work (principal) BIDV						0	0	0	0	0	0	0	0	0	0	0	0																			0
Initial work (interest)						836	831	826	820	814	808	801	793	785	776	766	755	744	732	719	704	689	672	654	635	614	592	567	541	512	481	448	412	374	856	20,559
Expanded work (principal) JICA																	40	43	46	50	54	58	63	68	73	79	86	92	100	108	116	126	136	147	1,412	2,896
Expanded work (principal) BIDV																	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					0
Expanded work (interest)																	244	333	341	221	217	213	208	203	198	192	186	179	172	164	155	146	136	125	487	4,118
Cash available for distribution						▲ 294	▲ 255	▲ 216	▲ 177	▲ 138	327	503	537	687	818	1,510	1,679	1,876	2,018	2,387	3,117	3,423	3,728	4,032	4,334	5,760	6,138	6,316	6,493	6,667	8,740	8,706	9,176	9,391	5,929	103,212
9. Dividend paid						0	0	0	0	0	327	503	537	687	818	1,510	1,679	1,876	2,018	2,387	3,117	3,423	3,728	4,032	4,334	5,760	6,138	6,316	6,493	6,667	8,740	8,706	9,176	9,391	5,929	104,294
Net cashflow for Project IRR (before tax)	▲ 409	▲ 1,295	▲ 3,481	▲ 2,850	▲ 3,480	542	576	610	643	676	1,135	1,304	1,473	1,641	1,810	2,547	2,862	2,017	2,180	3,928	5,582	6,019	6,455	6,891	7,326	9,316	9,852	10,121	10,390	10,657	13,542	13,528	14,209	14,542	14,874	165,731
Net cashflow for Project IRR (after tax)	▲ 409	▲ 1,295	▲ 3,481	▲ 2,850	▲ 3,480	542	576	610	643	676	1,135	1,304	1,473	1,626	1,761	2,456	2,762	1,903	1,920	3,622	4,357	4,670	4,981	5,291	5,601	7,034	7,421	7,608	7,795	7,980	10,064	10,043	10,526	10,755	11,207	126,827
Net cashflow for Equity IRR (after tax)	▲ 409	▲ 1,295	▲ 909	0	0	▲ 294	▲ 255	▲ 216	▲ 177	▲ 138	327	503	537	687	818	1,510	1,679	1,876	2,018	2,387	3,117	3,423	3,728	4,032	4,334	5,760	6,138	6,316	6,493	6,667	8,740	8,706	9,176	9,391	5,929	100,599
Cumulative net cash flow (Equity IRR)	▲ 409	▲ 1,704	▲ 2,613	▲ 2,613	▲ 2,613	▲ 2,907	▲ 3,163	▲ 3,379	▲ 3,557	▲ 3,695	▲ 3,368	▲ 2,864	▲ 2,327	▲ 1,640	▲ 822	688	2,367	4,243	6,261	8,647	11,764	15,188	18,916	22,948	27,283	33,043	39,181	45,497	51,990	58,657	67,397	76,104	85,280	94,670	100,599	733,046
Debt Service Cover Ratio (DSCR)						0.65	0.69	0.74	0.78	0.83	1.41	1.63	1.57	1.73	1.87	2.60	2.36	2.41	2.50	2.93	3.51	3.75	3.98	4.20	4.42	5.52	5.79	5.89	5.99	6.08	7.60	7.51	7.80	7.88	2.12	

Financial indicators

Project IRR (before tax)	14.3%
Project IRR (after tax)	13.3%
Equity IRR (after tax)	16.6%
Average DSCR	3.13
Minimum DSCR	**0.65**