Bien Hoa - Vung Tau Expressway Company
Viet Nam

The Preparatory Survey On Bien Hoa – Vung Tau Expressway Project In Viet Nam

Final Report

April 2013

Japan International Cooperation Agency (JICA)

Japan Expressway International Company Limited
Central Nippon Expressway Company Limited
Sojitz Corporation
Nippon Koei Co., Ltd.
KRI International Corp

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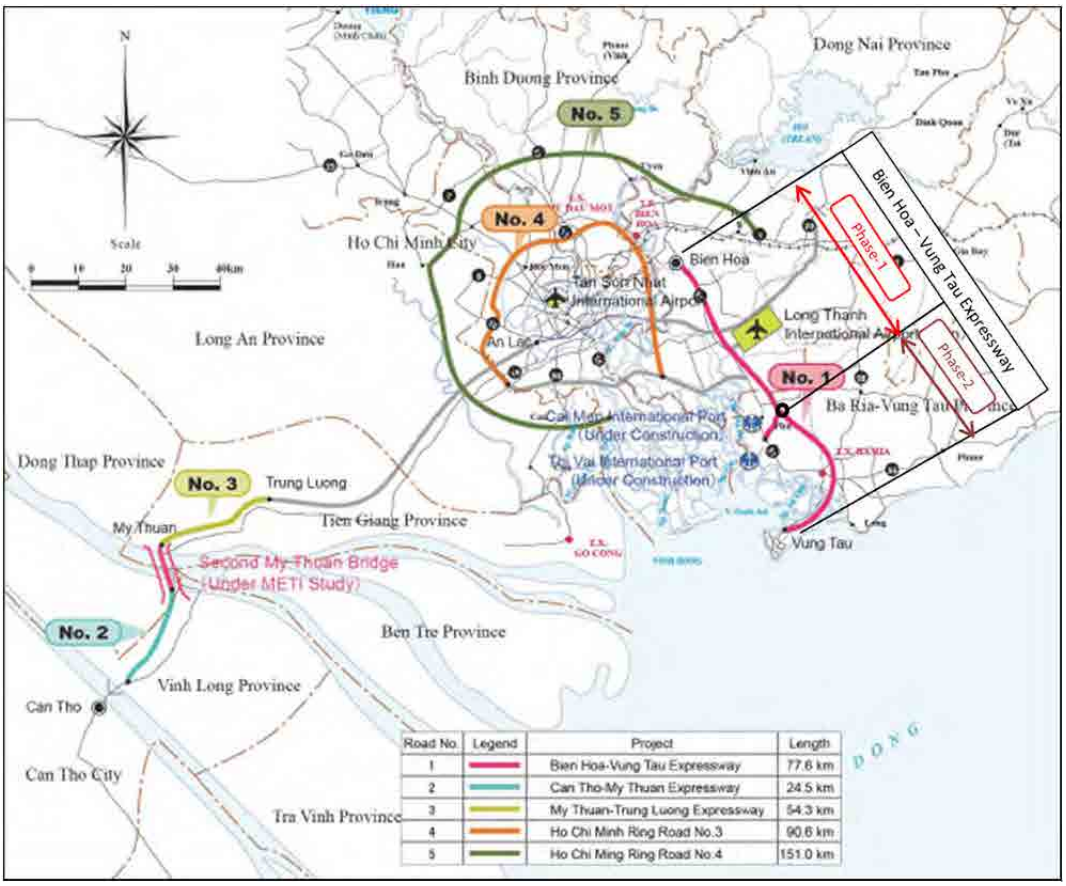


Study Location Map

EXECUTIVE SUMMARY

INTRODUCTION

The Bien Hoa-Vung Tau Expressway Project is located in the southern part of Vietnam and composed of two sections, one from Bien Hoa IC to Phu My IC and NH51 intersection (Phase1) and Phu My IC to Vung Tau IC (phase 2).

Phase 1 Section, which is judged to be feasible as a private investment project, is the subject of project viability in this Study. For Phase 2 Section considered not an appropriate commercial project that can beckon private investments, it is basically regarded as a public works project using government funds including ODA.

The objects of the Study are to organize tasks necessary to promote the expressway project using the private finance scheme; conduct (1) formulation of the project implementation plan, (2) survey and review on project viability and profitability improvement, (3) implementation of basic design with improvement of project profitability taken into consideration, and (4) survey on environmental and social considerations; and formulate the optimal overall implementation plan and propose a private participation scheme for submission to the stakeholders in Japan and Vietnam, thereby promoting consensus building of all the stakeholders.

With respect to proposal of a private participation scheme, a project that uses a project scheme, in which the entire project including construction and operation of all necessary infrastructures is implemented by a private project while mobilizing investments and loans from public organizations, and capitalizes on ODA funds including JICA Private Sector Investment Finance(hereinafter JICA PSIF) .

(from Chapter 1 Introduction and Chapter 2 Background and Necessity of the Project)

STUDY AND PROPOSAL ON IMPLEMENTATION PLAN

Hurdle rate for Japanese Investors of the Project

The reason why Project IRR is more convenient in the negotiation is that the cash flow base for Project IRR is much simple without any influence of debt structure while that for Equity IRR is calculated after the debt service, including interest payment and repayment of the debt. Therefore we use Project IRR for hurdle rate setting because it is more practical for daily business occasions both for investors and the government.

The reasons for the hurdle rate of Project IRR = 20% or more are mentioned as below;

(1) Interest rate for Vietnamese government bond (10 years): approximately 10% (as of December 2012)

(2) Risk premium for green field expressway project: approximately 5%

(3) Country risk(S&P: BB-, Moody's:B2) and forex(VND/JPY[1]) risk: approximately 5%

By adding (1)-(3), the hurdle rate is calculated to approximately 20%[2] or more.

(from Chapter 3 Study and Proposal on Implementation Plan)

The result of financial analysis for Base case

The Project IRR is 9.2% (Phase 1 only) from the financial cashflow model under the base case assumptions. Considering that Hurdle rate for Japanese Investors of the Project is approximately 20%, the Project IRR for the project is too low to implement by Japanese private sector investors.

Assumptions for Base Case are shown as below;

(1)operation start:

2017:BOT for Phase 1(Bien Hoa-Phu My-NH51)

2020:Public works for Phase 2(Phu My-Vung Tau)

(2)toll collection period：concession for 30 years after operation start

(3)road network scenario: reffered from Master plan(Decision No. 1745/QD-BGTVT)

(4)toll rate on BHVT Expressway：1, 000VND/km(2012price),to be increased by 30% every 5 years

(5)toll rate on NH51: 20,000VND (2012price)

(6)conversion rate:JPY 1 = 263 VND 1 円=268VND(reffered from SBV web site as of June end in 2012)

(7)land acquisition: Land acquisition(2,638 bil VND) is responsible for GoV

(8)Inflation in Vietnam:

Table-1 Inflations assumptions

Period	Inflation(%)	Period	Inflation(%)
2012 – 2013	10.0%	2025	5.5%
2014	9.0%	2026	5.0%
2015 – 2020	8.0%	2027	4.5%
2021	7.5%	2028	4.0%
2022	7.0%	2029	3.5%
2023	6.5%	2030-2046	3.0%
2024	6.0%		

(from Chapter 3 Study and Proposal on Implementation Plan)

[1] From 1992 to 2011, it is 6.2% for the average annual devaluation of VND against JPY. Therefore, 5% of forex risk is somehow favorable for Vietnam.

[2] In November 2011, we had an informal interview with BITEXCO, the national investor for Phan Thiet – Dau Giay expressway with loan from World Bank. According to BITEXCO, the target IRR was 15%(they did not mention either Project IRR / Equity IRR), which corresponds to our hurdle rate 20% - forex risk 5%.

Proposed government support measures

To improve the profitability, **Project IRR 9.2%**, of the project, these measures are requested as below;

1)Category1 : supports relating to Phase 2

(a) Acceleration of Phase 2 construction and transfer its profit to BOT project

(b) Postpone Phase 1 until 2020

(c) Excluding BOT and transfer to public construction of the sub-section of Nhon Trach – Phu My(+ access road to NH51)

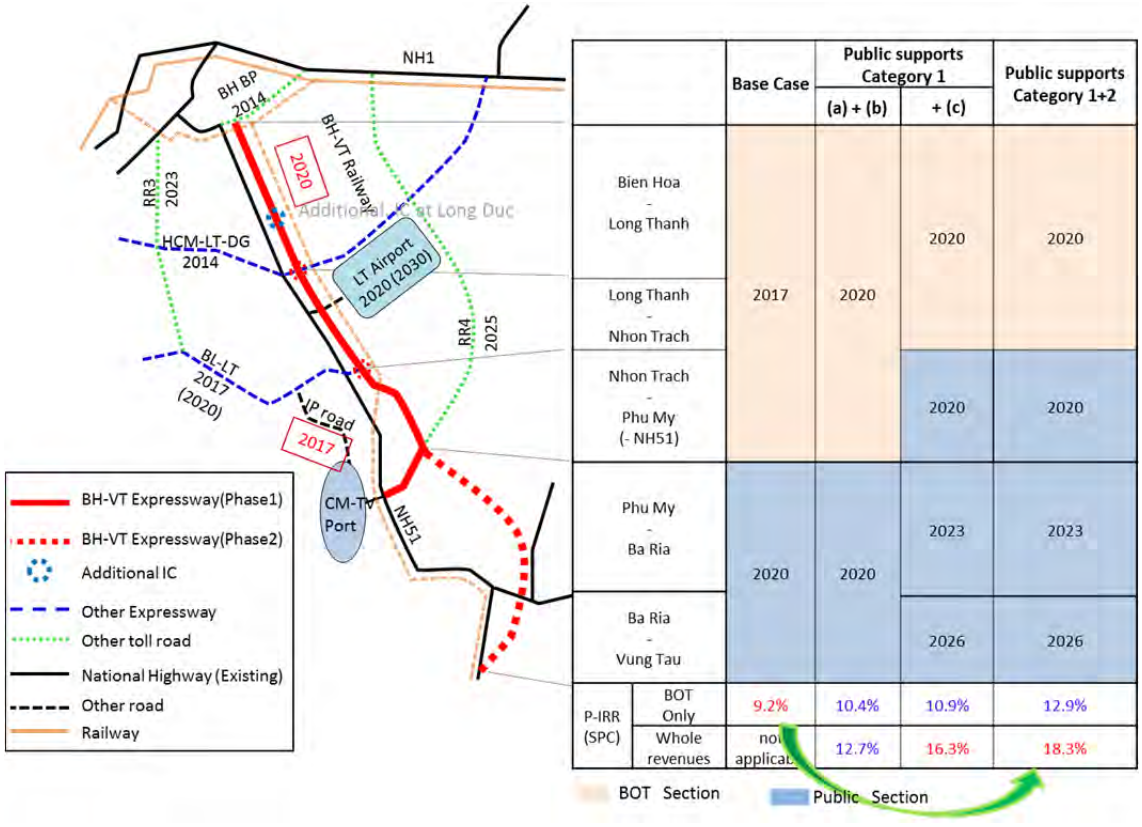
2)Category2 : various other supports

(a) Postpone BH-VT railway project until 2030

(b) Upgrading of access road to NH51 to expressway standard

(c) Public construction of overpass bridges in BOT section

From these government supportive measures above, we confirmed **the Project IRR improvement to 18.3%,** which achieves the hurdle rate of approximately 20%.



		Base Case	Public supports Category 1		Public supports Category 1+2
			(a) + (b)	+ (c)	
Bien Hoa - Long Thanh		2017	2020	2020	2020
Long Thanh - Nhon Trach					
Nhon Trach - Phu My (- NH51)				2020	2020
Phu My - Ba Ria		2020	2020	2023	2023
Ba Ria - Vung Tau				2026	2026
P-IRR (SPC)	BOT Only	9.2%	10.4%	10.9%	12.9%
	Whole revenues	not applicable	12.7%	16.3%	18.3%

BOT Section Public Section

Figure-1 Comparison of sub-sections by Project IRR

(from Chapter 3 Study and Proposal on Implementation Plan)

Sensitivity analysis

The sensitivity analysis is conducted for the change in forecasted parameters in the proposed case as follows.

Table-2 Result of sensitivity analysis in comparison of forecasted parameters

Proposed Case		18.3%	
Changing parameter	range	Project IRR	decrease/increase
traffic volume	-30%	14.4%	-3.9%
	+30%	21.4%	3.1%
inflation	x 1.5 times	14.9%	-3.4%
	x 0.5 times	21.1%	2.8%
toll increase	once every 7 years	15.8%	-2.5%
	once every 10 years	13.9%	-4.4%
CAPEX	+20%	17.2%	-1.1%
	-10%	18.9%	0.6%
OPEX	+20%	17.8%	-0.5%
	-10%	18.5%	0.2%

(from Chapter 3 Study and Proposal on Implementation Plan)

Traffic Demand Forecast

Estimated results of future traffic volume of BH-VT Expressway and NH51 from 2018 to 2030 are given as follows.

Table-3 Traffic volume of BH-VT Expressway and NH51 (PCU/day)

Section	2012 (Actual)	2018	2020	2025	2030
■Bien Hoa - Vung Tau Expressway					
Bien Hoa - Long Thanh	-	32,268	27,839	34,971	69,784
Long Thanh - LT Airport	-	34,830	31,185	50,876	75,764
LT Airport - Nhon Trach	-	34,830	21,359	40,870	57,607
Nhon Trach - Phu My	-	21,473	32,611	65,579	80,367
Phu My - Ba Ria	-	21,473	9,703	20,171	25,030
Ba Ria - Vung Tau	-	-	22,908	33,072	46,030
■NH51					
Bien Hoa - Long Thanh	65,028	51,867	51,160	64,529	66,437
Long Thanh - LT Airport	-	43,896	41,901	46,535	51,196
LT Airport - Nhon Trach	41,365	47,298	48,438	48,633	54,164
Nhon Trach - Phu My	42,336	56,185	54,382	61,957	76,645
Phu My - Ba Ria	23,907	39,254	25,588	35,409	34,914

Section	2012 (Actual)	2018	2020	2025	2030
Ba Ria - Vung Tau	26,176	27,097	14,731	24,370	27,969
■Bien Hoa - Vung Tau Expressway & NH51					
Bien Hoa - Long Thanh	65,028	84,135	78,999	99,500	136,221
Long Thanh - LT Airport	-	78,726	73,086	97,411	126,960
LT Airport - Nhon Trach	41,365	82,128	69,797	89,503	111,771
Nhon Trach - Phu My	42,336	77,658	86,993	127,536	157,012
Phu My - Ba Ria	23,907	39,254	48,496	68,481	80,944
Ba Ria - Vung Tau	26,176	27,097	31,473	48,411	62,951

(from Chapter 4.Implementation of survey and review for improvement of project viability and profitability)

Assumptions for toll rate

Tolls for expressways including BH-VT expressway are assumed to follow the toll rate of HCMC-Trung Luong expressway, with a 30% increase every five years, Toll rates set for 2017 are shown in Table 4.

Table-4 Toll rate (2017)

Toll Rate Regime		Motorcycle	Car	Bus	Truck
Current Toll System (Open System)	VND	0	10,000	22,000	40,000
Toll Index		0	1.00	2.20	4.00
Expressway	VND/km	-	1,300	2,860	5,200
NH51	VND/km	0	286	629	1,143
BH Bypass and RR3 & RR4 Sevice Road	VND/km	0	143	314	571

(from Chapter 4.Implementation of survey and review for improvement of project viability and profitability)

Proposed design changes for cost reduction

In consequence, some proposed design changes adopted in the review of BVEC F/S after discussion with Vietnamese authorities are shown as below;

1) Reduction of bridge length
2) Application of Prefabricated Vertical Drain Method for Planned sand drain section

(from Chapter 5 Basic Design for Higher Viability)

Project Cost

From the profitability criteria in the financial analysis, the table below shows the summary of proposed Project scheme by JICA study team.

Table-5 BOT and public section in the proposed project cost

	Whole	BOT Section (Bien Hoa – Nhon Trach)	Public section (Nhon Trach – Vung Tau)
Project costs with inflation	30,633 bil VND	6,907 bil VND (excl. land acquisition)	23,726 bil VND (incl. land acquisition)
without inflation, price of 2012	17,928 bil VND	4,460 bil VND (excl. land acquisition)	13,468 bil VND (incl. land acquisition)
Land acquisition (without inflation, price of 2012)	2,638 bil VND (whole section)		

(from Chapter 3 Study and Proposal on Implementation Plan)

Establishment Cost of SPC

Under the BOT/PPP Scheme, Investor's due diligence cost, SPC advisory cost (legal, financial) are estimated at approximately VND 137.5billion as table below. This cost is required for only phase 1 section where is assumed as the BOT/PPP scheme.

Table-6 SPC Establishment Cost

	Item	Cost (million VND)
i)	Legal fees for BOT and Loan/collateral agreements.	55,000
ii)	Financial Advisory fees for Project Implementation Plan, cashflow projection and negotiation with banks	27,500
iii)	Office rent	8,250
iv)	Personnel expenses	13,750
v)	Corporate registration fee	8,250
vi)	General consultation fees in relation to the Project	8,250
vii)	Inauguration and promotion fees	11,000
viii)	Other expenses	5,500
	Total	137,500

(from Chapter 5 Basic Design for Higher Viability)

CONCLUSION AND RECOMMENDATIONS

The result of cash flow projection, based on the assumptions in the previous phase 1 section, the Project IRR for Bien Hoa - Phu My section only (Phase 1) is 9.2%, which is same as the latest F/S study by TEDI. The expected profitability measure by Project IRR does not justify the BOT

implementation of the Project, however it can be somehow possible if there is sufficient support from the government of Vietnam. In this context, it is worth continuing this F/S study to pursue the detailed the Project structure, which are mutually agreeable between private sector investors and the government of Vietnam.

Proposed project structure

Based on the proposed project structure, **the Project IRR is 18.3%.** Assumptions for proposed project are shown as below;

(1)operation start:

2020: BOT (Bien Hoa- Nhon Trach), Public work (Nhon Trach-Phu My-NH51)

2023: Public work (Phu My-Ba Ria)

2026: Public work (Ba Ria-Vung Tau)

(2)toll collection period：concession for 30 years after operation start

(3)road network scenario: reffered from Master plan(Decision No. 1745/QD-BGTVT)

(4)toll rate on BHVT Expressway : 1，0000VND/km(2012price),to be increased by 30% every 5 years

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(6)conversion rate:JPY 1 = 263 VND 1 円=268VND(reffered from SBV web site as of June end in 2012)

(7)land acquisition: Land acquisition(2,638 bil VND) is responsible for GoV

(8)Inflation in Vietnam:

Table-7 Inflations assumptions

Period	Inflation(%)	Period	Inflation(%)
2012 – 2013	10.0%	2025	5.5%
2014	9.0%	2026	5.0%
2015 – 2020	8.0%	2027	4.5%
2021	7.5%	2028	4.0%
2022	7.0%	2029	3.5%
2023	6.5%	2030-2046	3.0%
2024	6.0%		

(9)Government supports

1)Category1：supports relating to Phase 2

(a) Acceleration of Phase 2 construction and transfer its profit to BOT project

(b) Postpone Phase 1 until 2020

(c) Excluding BOT and transfer to public construction of the sub-section of Nhon Trach – Phu My(+ access road to NH51)

2)Category2 : various other supports

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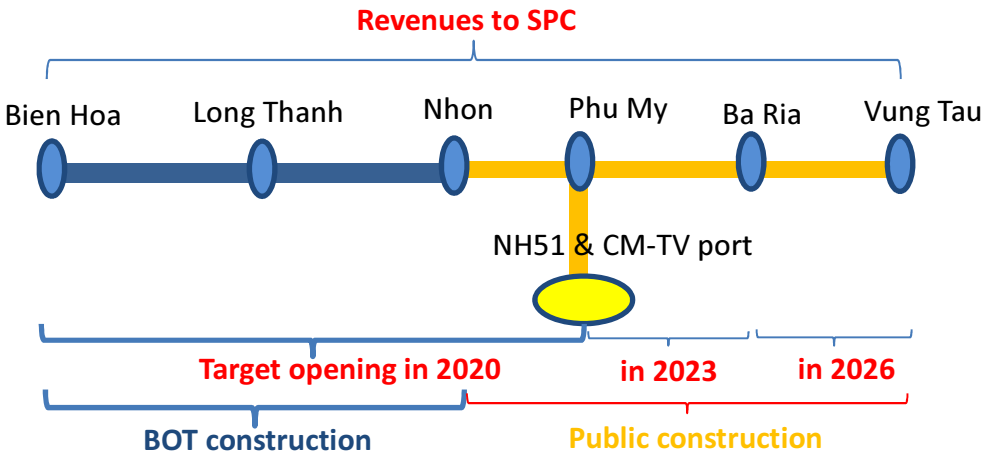

Figure-2 Illustration of BOT and public section in BH-VT expressway

Table-8 BOT and public section in the proposed project scheme

–	**BOT section** (Bien Hoa – Nhon Trach)	**Public section** (Nhon Trach – Vung Tau)
Length	29.4km	36.6km +7.7km (upgrade)
Operation start year	in 2020	in 2020, 2023, 2026 (3 phases)
Project costs with inflation	6,907 bil VND (excl. land acquisition)	23,726 bil VND (incl. land acquisition)
without inflation, price of 2012	4,460 bil VND (excl. land acquisition)	13,468bil VND (incl. land acquisition)
Land acquisition (without inflation, price of 2012)	2,638 bil VND (whole section)	
Net Present Value of profit (=toll revenue – O&M costs) (as of 2012, discount rate of 20%)	1,174 bil VND (53% of whole section)	1,052 bil VND (47% of whole section)

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
ADF	Asian Development Fund
BEDC	BIDV Expressway Development Company
BHVT	Bien Hoa – Vung Tau
BIDV	Bank for Investment and Development Company
BOT	Build Operate Transfer
BT	Build Transfer
BTO	Build Transfer Own
BVEC	Bien Hoa - Vung Tau Expressway Company
CCTV	Closed-Circuit Television
CPC	Commune People's Committee
DCC	District Compensation and Site Clearance Committee
D/D	Detail Design
D/E	Debt and Equity
DMS	Detailed Measurement Survey
DONRE	Department of Natural Resource and Environment
DPC	District People's Committee
DRVN	Directorate for Roads of Vietnam
DSCR	Debt Service Coverage Ratio
DSRC	Dedicated Short Range Communication
EA	Environmental Assessment
ECA	Export credit agency
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EMP	Environment Management Plan
ENPV	Economic Net Present Value
EPC	Engineering, Procurement and Construction
ETC	Electric Toll Collection
F/C	Foreign Currency
FDI	Foreign Direct Investment
FIRR	Financial Internal Rate of Return
F/S	Feasibility Study
GDP	Gross Domestic Product
GGU	Government Guarantee and Undertaking

GRDP	Gross Regional Domestic Product
HCMC	Ho Chi Minh City
HCM-LT-DG	Ho Chi Minh-Long Thanh- Dau Giay
IC	Interchange
IDA	International Development Association
IDICO	Vietnam Urban and Industrial Zone Development Investment Corporation
IEE	Initial Environmental Examination
IOL	Inventory of Loss
IRP	Income Restoration Program
IRR	Internal Rate of Return
ITS	Intelligent Transport Systems
JBIC	Japan Bank for International Cooperation
JCT	Junction
JICA	Japan International Cooperation Agency
JV	Joint Venture
L/A	Loan Agreement
L/C	Local Currency
LURC	Land Use Right Certificate
MOC	Ministry of Construction
MOF	Ministry of Finance
MONRE	Ministry of Natural Resource and Environment
MOSTE	Ministry of Science, Technology and Environment
MOT	Ministry of Transport
MOU	Memorandum of Understanding
MPI	Ministry of Planning and Investment
NEXI	Nippon Export and Investment Insurance
NH51	National Highway 51
OBU	On Board Unit
OCR	Ordinary Capital Resource
OD	Origin and Destination
ODA	Official Development Assistance
O&M	Operation and Maintenance
PCMs	Public Consultation Meeting
PCU	Passenger Car Unit
PMU	Project Management Unit
PPC	Provincial People's Committee
PPP	Public and Private Partnership

Project IRR	Project Internal Rate of Return
PSIF	Private Sector Investment Finance
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
SA	Service Area
SBV	State Bank of Vietnam
SCF	Standaed Conversion Factor
SKEZ	Southern Key Economic Zone
SPC	Special Purpose Company
STRADA	System for Traffic Demand Analysis
TEDI	Transport Engineering Design Inc
TOR	Terms of Reference
USD	United States Dollar
VAT	Value Added Tax
VEC	Vietnam Expressway Company
VGF	Viability Gap Fund
VITRANSS	The Comprehensive Study on the Sustainable Development of Transport System in Vietnam
VND	Vietnamese Dong
WB	World Bank
WG	Working Group

1. Introduction

1.1. Background and Objectives of the Study

1.1.1. 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 72.9% of all freight transport and 91.7% 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 (hereinafter GOV) gives priority to transport infrastructure development as the most important subject in "the 9th social economic development 5-year plan (2011-2015)". 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 (hereinafter 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.

The southern part of Vietnam, the subject area of the Project, is a booming area of the country where the country's economic center Ho Chi Minh City and its suburban industrial parks are located, but the infrastructure development sufficient to support such rapid progress is still behind.

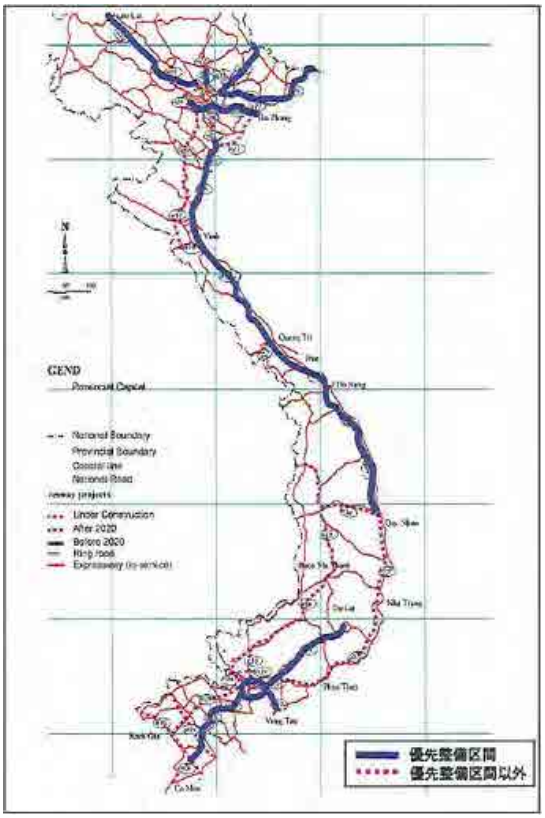


Figure 1.1.1-1 Expressway Master Plan (Decision 1734)

GOV is reinforcing their effort to construct more expressways, with the high priority put on construction of the north-south expressway that runs through the country. Planned to be 3,236 km in total length, this north-south expressway will connect Hanoi and Can Tho along National highway No. 1, and the section connecting major cities such as Hanoi, Ho Chi Minh and Da Nang is particularly regarded highly important.

In accordance with the present status and development policy for the transport infrastructure development mentioned above, Japan International Cooperation Agency (hereinafter JICA) conducted “The Comprehensive Study on the Sustainable Development of Transport System in

Vietnam (hereinafter 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.

Table 1.1.1-1 Discription of The Comprehensive Study on the Sustainable Development of Transport System in Vietnam (VITRANSS 2)

Item	Details
Objectives	Based on requests from Vietnam, formulating and proposing the following in the shipping and transportation field: (i) a long-term (through 2030) development strategy in the shipping and transportation field, (ii) a medium-term (through 2020) master plan, and (iii) a short-term (through 2015) investment plan. Through doing so, making clear the means by which Vietnam can proceed with development of a shipping and transportation network with a balance between optimal use of existing facilities and new construction, under conditions of limited resources. Also, as part of these efforts preparing a master plan and preliminary feasibility studies for priority sectors on the North–South Expressway project and formulating a basic plan (outline study) for the North-South High-Speed Railway project, both of which were requested in an October 2006 Japan-Vietnam Joint Statement.
Subjects of Study	1. Reviewing and collecting information on existing plans, laws, regulations, etc. concerning the transportation sector as a whole 2. Socioeconomic survey and transportation (passenger, freight) demand forecasting 3. Based on item 2 above, formulating long-, medium-, and short-term shipping and transportation development plans 4. Formulating a master plan for the North–South Expressway network consistent with items 2 and 3 above 5. Formulating an outline study of plans for the North–South High-Speed Railway consistent with items 2 and 3 above
Outputs	Planning ・ Formulating a sustainable shipping and transportation development strategy (target year: 2030) ・ Formulating a shipping and transportation master plan (target year: 2020) ・ Formulating priority investment programs (target years: 2011 – 2015) ・ Outline study of plans for the North–South Expressway project ・ Formulating a master plan for the North–South Expressway network

	(including preparation of preliminary feasibility studies for priority sectors)
Details in the Expressway Field	The following activities will be conducted in formulating a master plan for the North–South Expressway network: 1) Formulating plans for expressways and facilities 2) Formulating investment plans and organizational plans toward completion of the expressway network 3) Confirmation and classification of Vietnamese legal systems related to environmental and social considerations and methods of implementing a strategic environmental assessment (hereinafter SEA) 4) Studying sustainable toll systems, maintenance methods, and the possibility of private-sector participation 5) Choosing priority projects 6) Implementing studies at the preliminary feasibility study level 7) Conducting a survey of environmental and social considerations
Outline of Study Findings	1. Demand forecasts: Transportation and shipping demand in Vietnam will increase massively through 2030. Passengers and cargo tonnage per kilometer are projected to rise by 700 – 800% in comparison with 2008. This will bring about an excess of passengers and road use exceeding capacity in many areas, with the regular railways in the Hanoi and Ho Chi Minh City areas unable to accommodate demand and insufficient capacity at airports in Hanoi, Da Nang, and Ho Chi Minh City as well. Similarly, for freight transportation as well demand is rising rapidly for rail transport and transport on inland waterways, with many ports exceeding capacity, particularly in the Mekong Delta and elsewhere. 2. Proposal of plans Development of a multimodal transportation and shipping network at the national and international level is proposed, including effective linkage of local transportation and shipping networks with regional- and national-level transportation and shipping systems. Under VITRANSS 2, a comprehensive long-term general development strategy is being proposed for the transportation and shipping field through the target year of 2030, a comprehensive medium-term general plan is being formulated for transportation and shipping through the target year of 2020, and short-term investment plans, a general plan for the North-South Expressway network, and an initial plan for the North-South High-Speed Railway are being formulated for the years 2011 – 2015, among other activities. However, fulfillment of these objectives will involve considerable costs. According to JICA estimates,

	Vietnam's multimodal transportation and shipping development program through 2030 consists of a total of 396 projects requiring USD 166,753,000,000 (estimated at 2008 values). Specifically, the VITRANSS 2 proposal calls for implementing 210 projects from now through 2020 (including 131 transportation and shipping projects approved by the government), for a total investment amount of USD 49,071,000,000. When the two segments of the North-South High-Speed Railway to be completed by 2020 (Ho Chi Minh City - Nha Trang, Hanoi – Vinh) are included, the total investment amount rises to USD 70 billion. While these projects are included in the Vietnamese government's long-term transportation development goals, to increase their feasibility there is a need for numerous additional analyses of their economic potential and of public finances. JICA is researching 44 expressway projects expected to open to traffic in 2020. Among these, the projects that would have the greatest economic impacts are the Bien Hoa – Vung Tau, Cau Gie – Ninh Binh, Vinh – Ha Tinh, Ho Chi Minh City – Moc Bai, Long Thanh – Ben Luc, Ho Chi Minh City – Dau Giay, Ninh Binh – Thanh Hoa, Ho Chi Minh City – Trung Luong, Lang – Hoa Lac, Hanoi Ring Road No. 4, and Ho Chi Minh City Ring Road No. 3 routes. In addition, north-south transport and transport in the Mekong Delta can be facilitated and chaotic transportation conditions avoided by advancing expressway development together with the development of inland waterways. This is recommended as a way of making a significant contribution to Vietnam's future economic development.

Source : JICA VITRANSS2

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 Official Development Aid (hereinafter ODA) of Japanese government, World Bank(hereinafter WB), Asian Development Bank(hereinafter 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 hereinafter BOT) and public-private-partnership (hereinafter 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.
On the other hand, requests have been made from GOV and project implementing organizations for provision of support to survey on the Bien Hoa - Vung Tau Expressway (hereinafter BHVT Expressway). In particular, there is a high industrial intensification along the BHVT Expressway, with many industrial parks located in the area. This expressway will also form an expressway network together with an expressway linking Ho Chi Minh - Long Thanh - Dau Giay Expressway, which is currently under construction, and the Ho Chi Minh Ring Road No. 3 and 4 and is therefore expected to play the most important role in boosting up the national economic growth. Considering this, this project has a high necessity.
The Feasibility Study on Private Investment in Highway Projects in Southern Vietnam (hereinafter the Preliminary Survey) conducted in June 2011 given those circumstances also identified this project as one of high priorities for investment.

Table 1.1.1-2 Discription of the study on measuring the possibility of private investment in expressway projects in Southern Vietnam (the Preliminary Survey)

Item	Details
Objectives	This study will verify whether it would be possible to promote development of Vietnam's expressway network entirely through private-sector financing, what kind of PPP options are available if full private-sector financing were difficult, and project feasibility through the PPP method, to examine the possibility of private-sector investment in expressway development based on the conclusions and recommendations of VITRANSS2 In consideration of the facts that the Vietnamese government has made a strong request for aid, that freight and passenger volume have increased rapidly in recently years on main roads centered on Ho Chi Minh City, and that greater private-sector investment could be expected in Ho Chi Minh City due to its role as the economic center of Vietnam, this study will be implemented with a focus on five expressway projects in southern Vietnam, centered on Ho Chi Minh City.
Subjects of Study	1. Collecting basic information on private-sector investment in expressway projects in Vietnam 2. Study and recommendations concerning risks and security packages when implementing expressway projects in Vietnam through private-sector initiative or the PPP method. 3. Studying the feasibility of individual expressway projects through private-sector initiative or the PPP method (subject projects: Bien Hoa – Vung Tau expressway project, Can Tho – My Thuan expressway project, My

	Thuan - Trung Luong expressway project, Ho Chi Minh City Ring Road No. 3 route, Ho Chi Minh City Ring Road No. 4 route). 4. Conducting studies to supplement the feasibility studies 5. Sorting out the issues related to implementing project schemes through private-sector initiative or the PPP method.
Outline of Study Findings	The study has concluded that use of private-sector investment would be sufficiently feasible for the BHVT expressway project. However, the government would need to commit to conditions such as aid, incentives, and guarantees. Also, a JICA PSIF loan is an essential condition, and it is thought that without the leverage effects of such a loan use of private-sector investment would be difficult.

Source: The Preliminary Survey

1.1.2. Objectives of the Survey

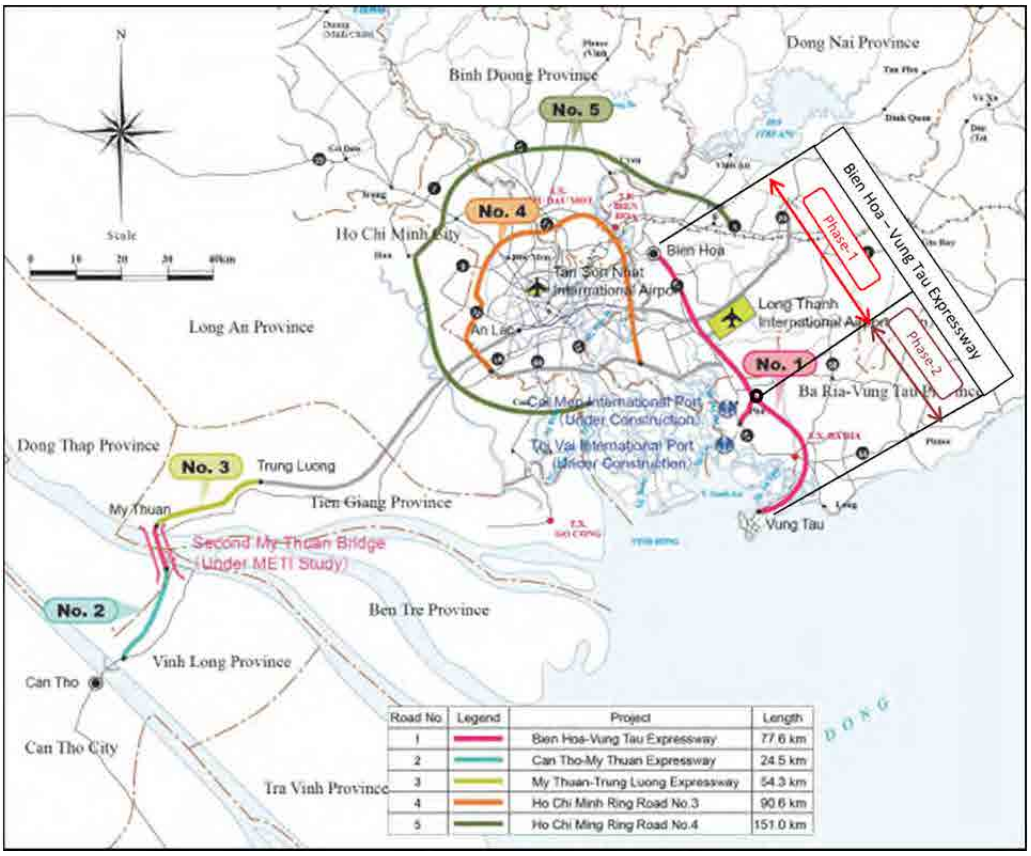
The objects of the Study are to organize tasks necessary to promote the expressway project using the private finance scheme; conduct (1) formulation of the project implementation plan, (2) survey and review on project viability and profitability improvement, (3) implementation of basic design with improvement of project profitability taken into consideration, and (4) survey on environmental and social considerations; and formulate the optimal overall implementation plan and propose a private participation scheme for submission to the stakeholders in Japan and Vietnam, thereby promoting consensus building of all the stakeholders.

With respect to proposal of a private participation scheme, a project that uses a project scheme, in which the entire project including construction and operation of all necessary infrastructures is implemented by a private project while mobilizing investments and loans from public organizations, and capitalizes on ODA funds including JICA Private Sector Investment Finance(hereinafter JICA PSIF) .

1.2. Study Area and Scope of the Study

1.2.1. Study Area

The subject area is the southern part of Vietnam, as shown in the layout map below.



Source: JICA Pre-F/S

Figure 1.2.1-1 Study Area of the Study

1.2.2. Scope of the Study

1.2.2.1. Subjected Project on the Study

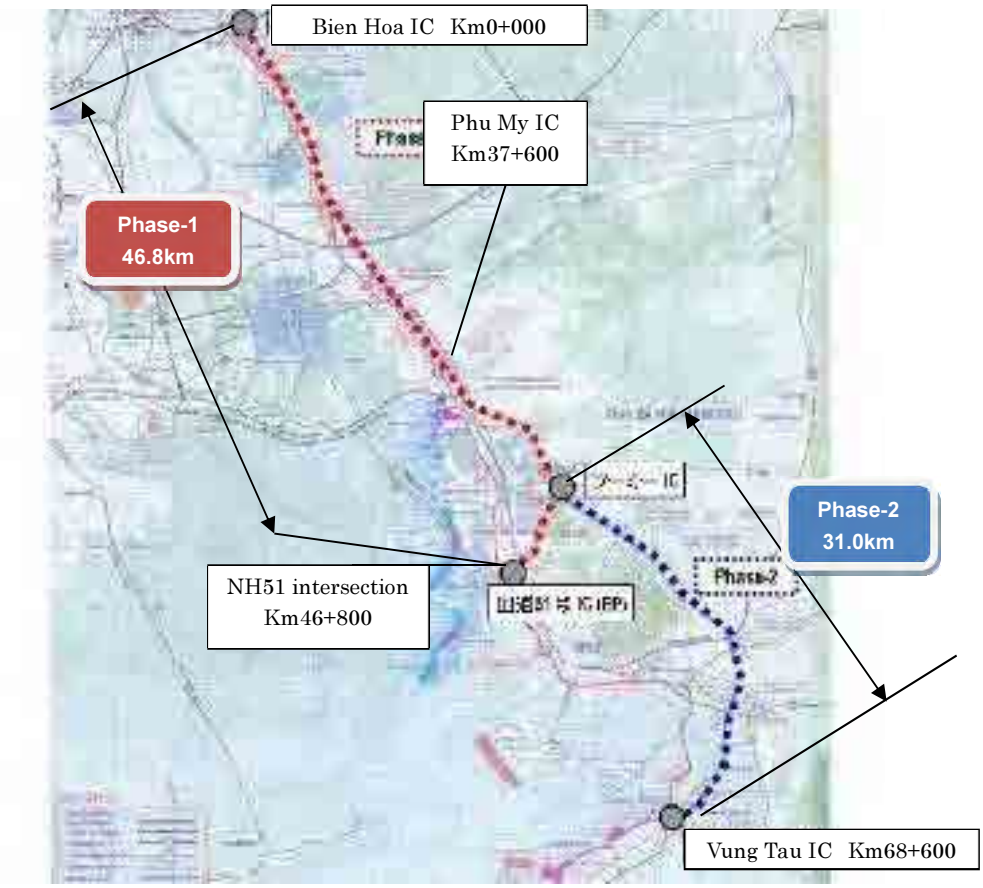
The subject expressway project, BHVT Expressway, is composed of two sections, one from Bien Hoa IC to Phu My IC and National Highway 51 (hereinafter NH 51) intersection (Phase 1) and Phu My IC to Vung Tau IC (Phase 2).

With respect to setting of those sections, it was judged that Phase 2 Section, which is found to main serve sightseeing transportation by the Preliminary Survey, will make no profitable business that justifies private investments. Thus, Phase 1 Section is chosen as the subject of feasibility study for private investment based on the consultation with the Vietnamese supervising agency, MOT and the implementing organization Bien Hoa - Vung Tau Expressway Development Corporation (hereinafter BVEC) as this section will serve an artery linking Ho Chi Minh City, its suburban industrial parks and the Cai Mep - Thi Vai International Terminals. Therefore, Phase 1 Section (Bien Hoa IC - Phu My IC and NH 51 intersection), which is judged to be feasible as a private investment project, is the subject of project viability in this Study.

For Phase 2 Section considered not an appropriate commercial project that can beckon private investments (from Phu My IC to Vung Tau IC), it is basically regarded as a public works project using governmental funds including ODA.

1.2.2.2. Description of the Project

The outline of Phase 1 and Phase 2 is shown below.



Source: BVEC F/S

Figure 1.2.2-1 Route Map of Bien Hoa-Vung Tau Expressway

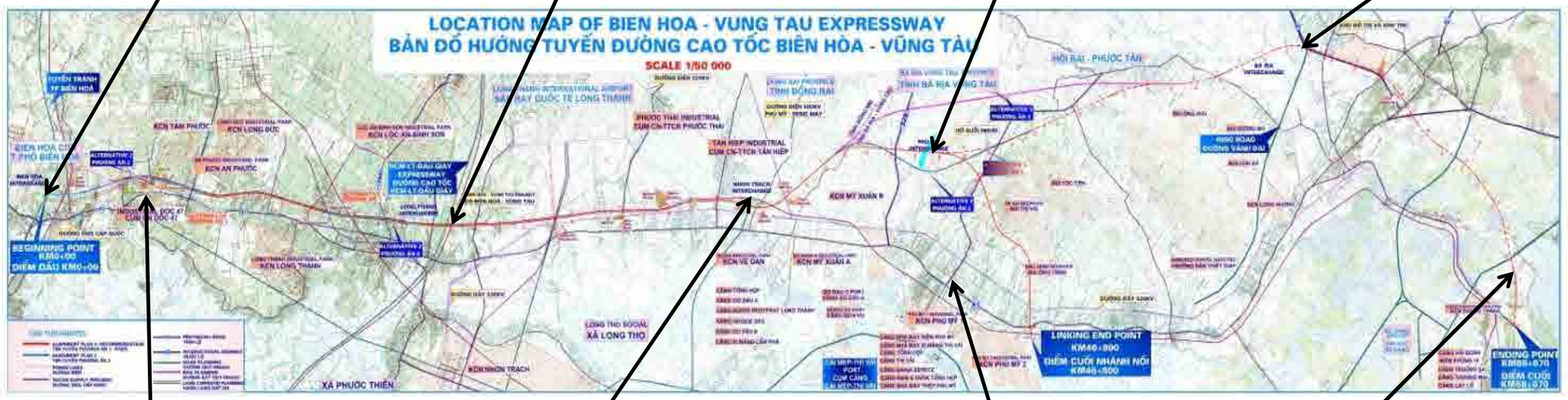
Figure 1.2.2-2 Route map and pictures of Bien Hoa-Vung Tau Expressway

No.1 Bien Hoa IC (Km0+00)

No.3 Long Thanh IC (Km17+900)

No.5 Phu My IC (Km37+800)

No.7 Ba Ria IC (Km53+800)



No.2 NH51 (Bien Hoa)

No.4 Nhon Trach IC (Km29+600)

No.6 NH51(Phu My)

No,8 Vung Tau (Km64+800)

Soource: JICA Study Team

Table 1.2.2-1 Description of the BHVT Expressway Project

Route	Bien Hoa-Vung Tau Expressway			
Project section	Phase1		Phase2	
	Bien Hoa IC to Phu My IC	Phu My IC to NH51 intersection	Phu My IC to Vung Tau IC	Vung Tau IC to NH51C intersection
Implementer	BVEC		MOT/PMU (expected in case it is implemented as ODA project)*	
Project method (current)	BOT		Not yet determined (public works project)*	
Road standard	Expressway Class A	National Highway Class II	Expressway Class A	Urban Road
Design speed	120km/h	100km/h	120km/h	80km/h
Length	37.6km	9.2km	28.4km	2.6
No. of lanes	4 (when opened)	4 (when opened)	4	4
	6 to 8 (when fully completed)	6 (when fully completed)		

Source：BVEC F/S

Table 1.2.2-2 Tentative schedule of the implementation Project

No.	Year	2012	2013	2014	2015	2016	2017	2018	2019	2020
A	Phase 1 Section (Bien Hoa-Phu My) Project will be conducted as a private project									
A100	Formulation of the Project implementation SPC Establishment									
A200	Land Acquisition									
A300	Detailed Design									
A400	Procurement of contractors									
A500	Construction									
A600	Open to the Public									
B	Phase 2 Section (Phu My- Vung Tau) Project will be conducted as a public works									
B100	Confirmation of the methods of preparatory study for implementation of Phase 2									
B200	Preparatory Study for using ODA loans									
B300	Loan Agreement (ODA)									
B400	Detailed Design									
B500	Land Acquisition									
B600	Procurement of contractors									
B700	Construction									
B800	Open to the Public									

Source：JICA Study Team

1.2.2.3. Contents of the Study

The contents of the Study described in the Terms of Reference are shown below:

Table 1.2.2-3 Contents of the Study

Contents of the Study
1. Preparation
2. Reconfirmation of the necessity and background of the Project
3. Formulation of Project implementation
(1) Confirmation of the purpose of the Project
(2) Review of the scope of the Project
(3) Review of the scheme of the Project
(4) Economic and financial analysis
(5) Review of risks and security packages related to implementation of the Project
(6) Options of government support
(7) Project Implementation system and planning
(8) Scheduling of the Project Implementation
4. Survey and review on project viability and profitability improvement
(1) Demand Forecasting for the Project
(2) Transportation Planning
(3) Study for Promotion of Utilization
5. Basic Design for higher viability
(1) Basic Design
(2) Construction Plan
(3) Operation and maintenance plan
(4) Calculation of the preliminary project cost
6. Project viability of Phase 2 Section (from Phu My to Vung Tau)
(1) Sort-out of policies about the entire project of Bien Hoa – Vung Tau Expressway
(2) Confirmation of the methods of survey and review necessary for implementation of Phase 2 Section
7. Survey on Environmental and Social Considerations

Source：JICA Study Team

This is a Preliminary Survey for realization of the construction of the Expressway as a viable project using a business scheme that justifies private investments.

(1) Formulation of a feasible business implementation plan

For this Study, the basic purpose is to implement the construction of Phase 1 Section as a project scheme that utilizes Japanese and Vietnamese private funds. In this respect, a project implementation plan is expected, which realizes consensus building of the related stakeholders by analyzing as quantitatively as possible the risks that were qualitatively identified by the previous year's Preliminary Survey, identifying hidden risks as much as possible, reducing the risks by taking every possible measure, and implementing appropriate allocation of work among private and public participants, risk reduction particularly with the help of governmental support, and appropriate risk allocation.
It is also necessary to establish a project scheme that clearly justifies participation of Japanese investors and create profits for relevant Vietnamese organizations, which hold the original right of project, by working together with the Japanese participants through the said project scheme. Considering those circumstances, in order to review a project scheme that guarantees mutual profits for the government (MOT) and private businesses, a project implementation system that reflects the allocation of work among the public and private participants and the appropriate fund-raising plan will be established while maintaining consistency with Vietnam's legal system and existing contracts. In addition, methods to cope with major risks will be studied, and feasible government support measures will be proposed.

1) Maintenance of consistency with the Vietnamese legal system and existing contracts

It is necessary to provide support that is based on the laws of Vietnam in order to promote an infrastructure project in which private businesses participate.
Vietnam has two laws related to this Project, or BOT Law and Pilot PPP Law.
A viable project scheme utilizing private funds while maintaining consistency with those laws will be proposed.

2) Allocation of work among public and private participants

The allocation of work among public and private participants is shown in the following:

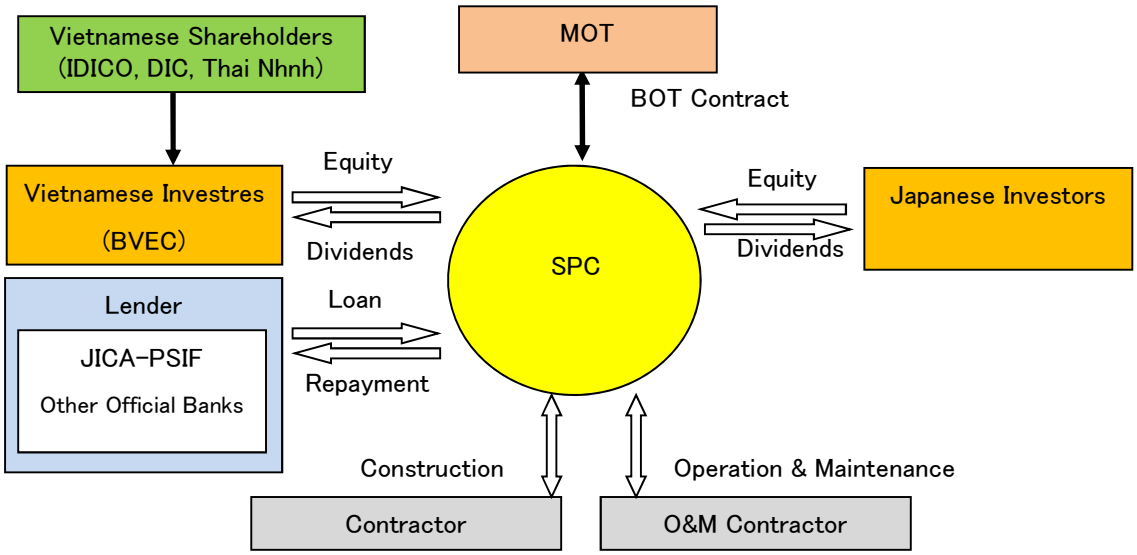
Table 1.2.2-4 Allocation of work among the public and private (proposed)

Public roles（MOT）	Private roles (SPC including BVEC)
• Granting of the project right • Acquisition of land • Support of negotiation with relevant governmental agencies • Preservation of the right to collect tolls • Role as the supervising administration of business implementers (SPC) (including approval of toll revision) • Permission of exchange of project profits in foreign currency and relocation of the profits out of the country	• Procedures necessary for implementation of BHVT Expressway Project • Efficient project promotion for design, construction, operation and maintenance • Provision of quality service to expressway users through project implementation

Source：JICA Study Team

3) Proposal of project implementation system

The proposed project implementation system is shown below:



Source：JICA Study Team

Figure 1.2.2-3 Proposed project implementation system

Special Purpose Company (hereinafter SPC) is the very organization that implements the Project; it should serve as a united body of Japanese and Vietnamese private investors including BVEC and carry out the Project under a BOT contract with MOT. It will also procure funds from public financing institutions including JICA and Japanese and Vietnamese private banking facilities. SPC will conduct general management, covering survey, design, procurement, construction, construction management, maintenance, property management and operation that is necessary to cover all services of BHVT Expressway including construction, operation and maintenance. After the expiration of the contract, SPC will be disbanded as per the BOT Law and transfer all its properties to MOT.

4) Financing

It is hoped that financing to be conducted by the financial analysis of the private part (SPC) will be essentially project financing by means of syndicated loans with private banks. But considering the present severe financial condition triggered by Europe's credit crisis and particularly European private banks' reluctance to grant loans, we should practically have no choice but to procure the amount equivalent to 80% of the project fund by PSIF loans by JICA.

5) Proposal of major methods to cope with risks

There are various risks expected to occur with respect to implementation of the Project. For qualitatively and quantitatively analyzed, examined and identified risks, it is necessary to discuss and determine how to share what risks among the funding stakeholders, or MOT, SPC, and sponsors and how to control them. It is then important to incorporate the results of such discussion into various pacts, agreements and contracts and come up with a security package that is acceptable to financiers. Although the Study does not include preparation of documents, it will check the items and contents to be included in those documents.

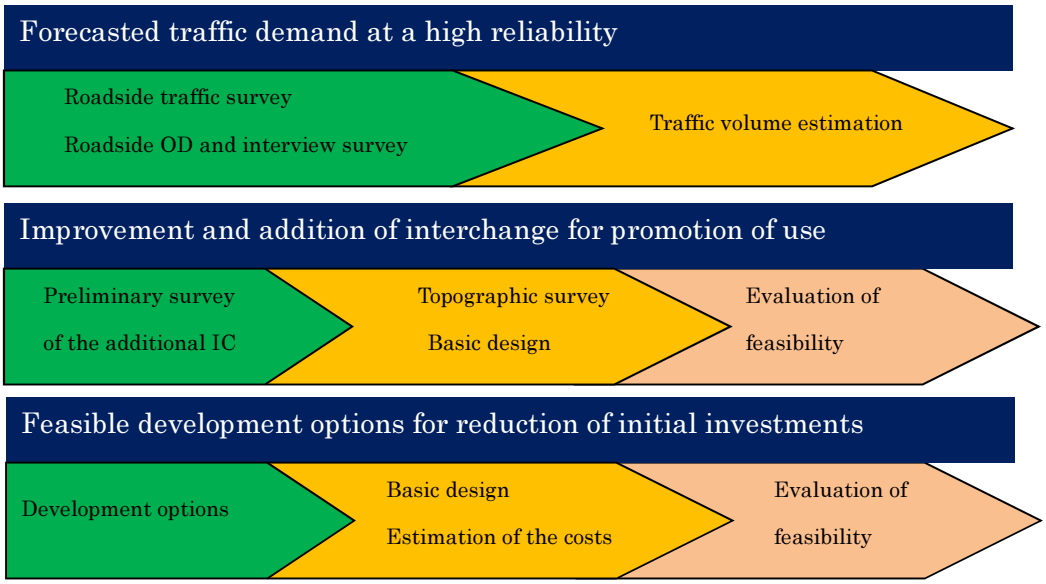
6) Review of feasible government support measures

If risk analysis reveals risk factors that cannot be taken by the private sector, government support to provide risk avoidance will be requested. In this respect, government support options that can be available as per the new BOT Law and pilot PPP Law will be clarified. It is also necessary to evaluate the benefit of each support option, such as which option will make how much contribution to the betterment of the cash flow, in conjunction with financial analysis.

Based on that evaluation, optimal government support plans will be selected from the viewpoint of the level of contribution to project profitability and the degree of the government's financial burden.

(2) Implementation of survey and review for improvement of project viability and profitability

Estimation of traffic demand is one of pivotal factors for judgment on investment or loan when it comes to formulation of the appropriate project implementation plan and consensus building of private investors, financial institutions and other stakeholders about project participation. The Study will forecast traffic demand at a high reliability in order to conduct quantitative evaluation of economic efficiency of the Project necessary for judgment on investment or financing. In addition, since it is necessary to meet the demand of the stakeholders for further improvement or project profitability, feasible development options will be studied, including promotion of use by improvement or addition of interchanges or reduction of initial investments.

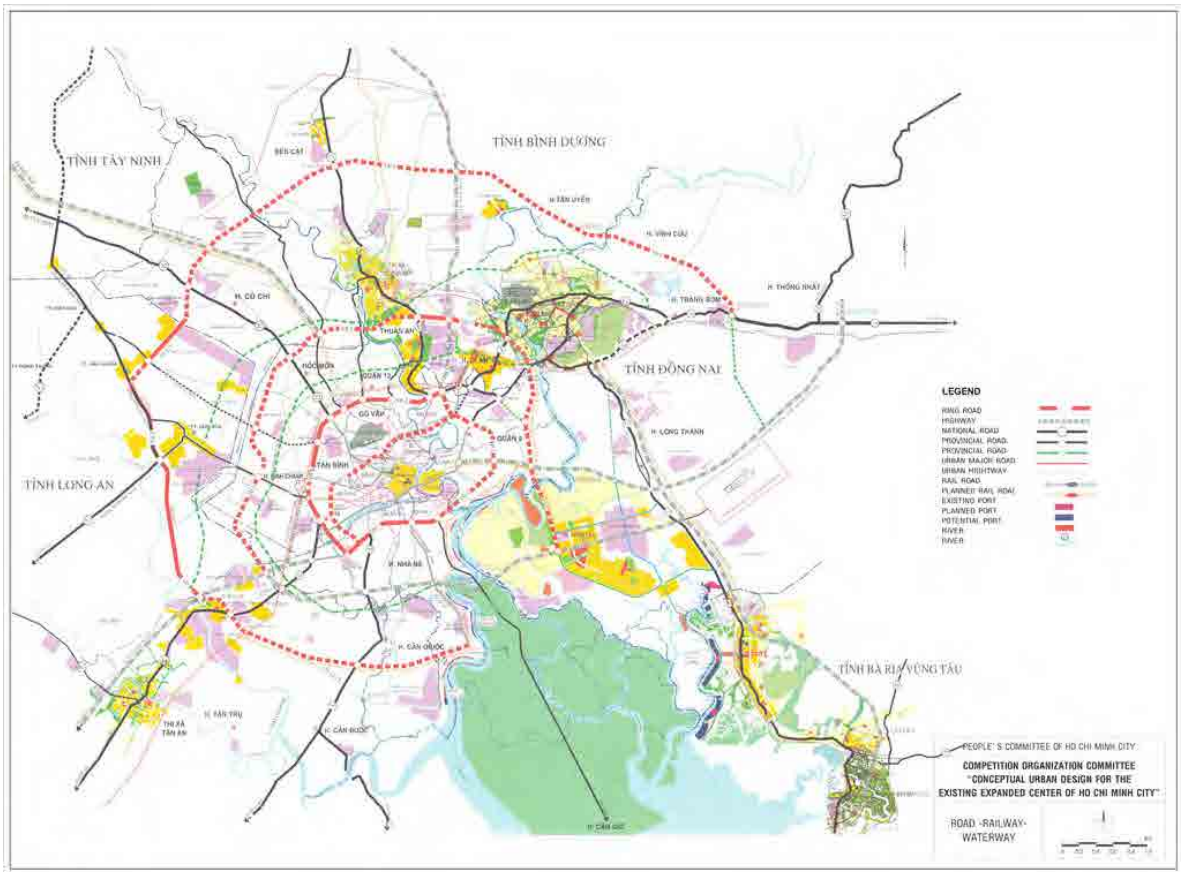


Source：JICA Study Team

Figure 1.2.2-4 Work flow for survey and review of project viability and profitability improvement

1) Implementation of highly reliable traffic demand forecasting

In forecasting of traffic demands that greatly affect the project profitability, a complementary traffic survey will be conducted including a detailed interview survey with people working in industrial parks located along the route and with port and harbor operators, and then accurate forecasting from the viewpoint of the private investors will be conducted. To be specific, new traffic demands from large-scale projects including the Long Thanh International Airport and Cai Mep - Thi Vai International Terminals and many industrial parks both existing and being planned along the route will be anticipated. On the other hand, many factors that will have a major impact on traffic demand forecasting such as the expressway network and the plans to build roads that may become competitors of the Project road will be examined for reflection in traffic demand forecasting.



Source : HCMC People's Committee

Figure 1.2.2-5 Transport planning of Hochi Minh City Area

2) Review of promotion of use by improvement or addition of interchanges to be constructed

The existing road plans will be scrutinized, and addition or improvement of interchanges (hereinafter IC) and junctions (hereinafter JCT) to be constructed in the Project will be proposed to enhance profitability by use promotion and to improve operation and maintenance.

Table 1.2.2-5 Proposal on addition and improvement of interchanges and junctions, etc.

Number	Proposal
1	**Construction of additional interchange between Bien Hoa IC and Long Thanh JCT** Around the area between Bien Hoa IC and Long Thanh IC, there are industrial parks and many villages. The interval of interchange is as long as 17.8 km. It is expected that adding a new IC would increase traffic demand.
2	**Raising the road grade of Phu My IC - NH51 intersection (connecting to Cai Mep - Thi Vai Ports)** This section has been developed as an ordinary national toll-free highway (design speed: 100km/h). In Phase 1, an intersection will be added to provide access to side roads. The plan also shows that a guardrail will be placed along the paved road and motorcycles will then be permitted to drive on the shoulder of the road. This section will therefore be upgraded to the superior class of toll expressway (120 km/h),

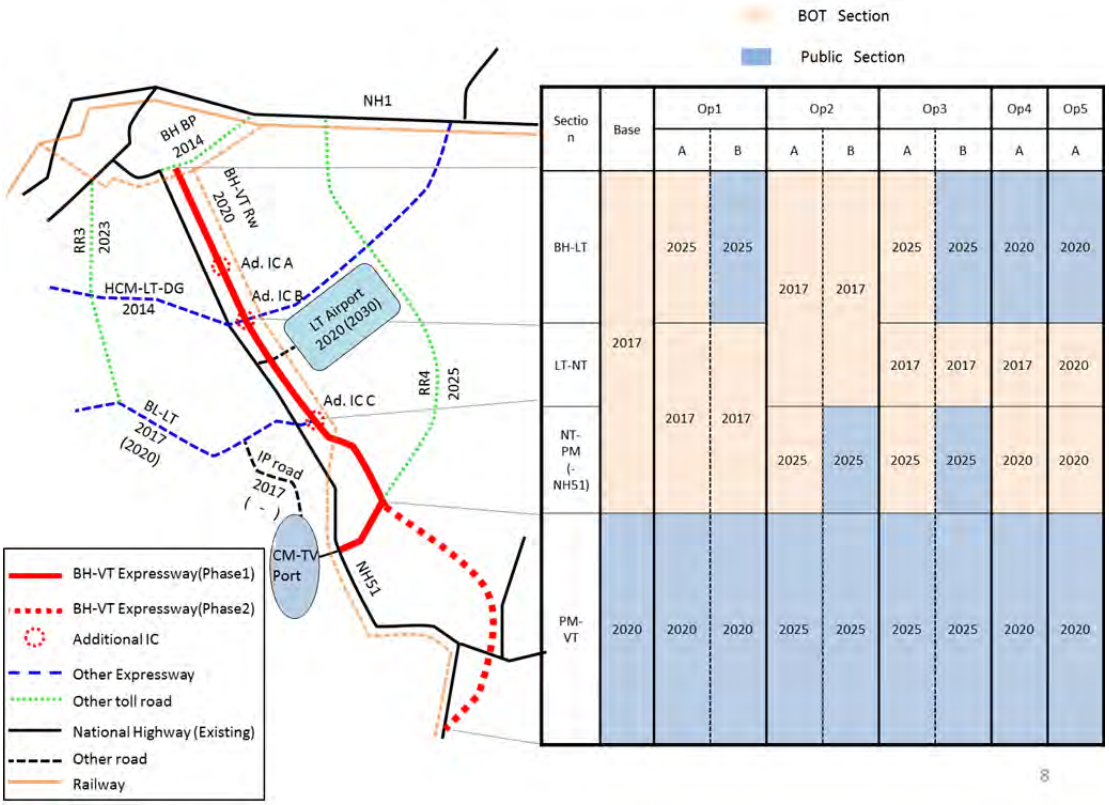
Number	Proposal
	equivalent to the section between Bien Hoa IC and Phy My IC, to increase the running speed and traffic safety. With this upgrade, there will be some changes in the type of Phy My IC (JCT) (connection method): the route for the Nhon Trach JCT - NH51 intersection will be the main line and the route for the Baria IC - NH51 intersection will be a ramp way. In consideration of the connection between this JCT and HCMC Ring Road No. 4, a future change to the four-way system is necessary.
3	**Construction of temporary Nhon Trach IC** Nhon Trach JCT, which connects BHVT Expressway to Ben Luc - Long Thanh Expressway, will be constructed in Phase 2 under the Ben Luc - Long Thanh Expressway Project. Because this junction cannot be ready by the time the BHVT Expressway is completed, a temporary IC connecting to ordinary roads will be constructed to improve traffic demand and traffic control and maintenance.

Source: JICA Study Team

3) Proposal of development options

Feasible development options (including section separation or the number of lanes to build) shown in the following table will be evaluated and compared with the existing basic development plan so as to verify the Basic Approaches.

Development options (base)	Phase1(BOT) Bien Hoa-Phu My-Nh51 intersection, 4lanes, open to the public in 2017 Phase2(Public works) Phu My-Vung Tau, 4lanes, open to the public in 2020



Source: JICA Study Team

Figure 1.2.2-6 Development options

(3) Implementation of basic design with improvement of project profitability taken into consideration

Since it will be necessary to verify the measures to promote use of the expressway and to reduce investment cost proposed in 1.2.2.3(2), basic design with those proposals fully considered will be implemented, efficient construction programs and operation and maintenance programs that match the sustainable road characteristics will be developed, and the preliminary project cost necessary for economic and financial analysis will be calculated.

1) Implementation of basic design based on the use promotion measures and profitability improvement plans

The basic design will be based on the plans to improve profitability, such as the use promotion measures to be proposed in 1.2.2.3(2) and re-evaluation of the originally planned number of lanes, which was studied in the Preliminary Survey as a measure to reduce the initial investment. The design will also ensure efficient accommodation of future demands and changes such as expansion of the road width or connection to other road routes.

2) Development of efficient construction plan

According to the Preliminary Survey, the feasibility study report does not contain detailed descriptions on construction planning. Since it will be a private initiative, reduction in the period of construction and acceleration of opening to the traffic will help improve project profitability. On the contrary, construction work behind schedule will mean deteriorating profitability. Therefore, work delay risks will be identified, and preventive measures be proposed.

3) Development of operation and maintenance plans that match the sustainable road characteristics

The Study will analyze the available information including past surveys, determine specific operation and maintenance services that are considered to be absolutely essential, efficient and suited to the road characteristics in terms of operation and maintenance of the Expressway with high-speed traveling and safety taken into consideration, and clarify the contents of those services and their level based on the assumption of phased development. The Study will also include reviews on considerations in the stage of design and construction and incorporate them into the outline design of the Study as required.

4) Calculation of the rough project cost

Construction cost as per the outline design created based on the use promotion measures and profitability improvement plans will be revised. The rough cost will also be calculated for

project cost items assuming the use of BOT/PPP project approach, and the calculated cost will be input to economic and financial analysis.

(4) Support of review on project viability of Phase 2 Section as a public works project

The Study puts top priority on promotion of project viability of Phase 1 Section using the private investment scheme. For Phase 2 Section of which project realization with private investment is considered difficult and which is to be promoted as a public works project by GOV using ODA funds including yen loans, survey items that will be necessary in the future, such as technical survey, will be clarified so as to provide support to the relevant Japanese and Vietnamese organizations.

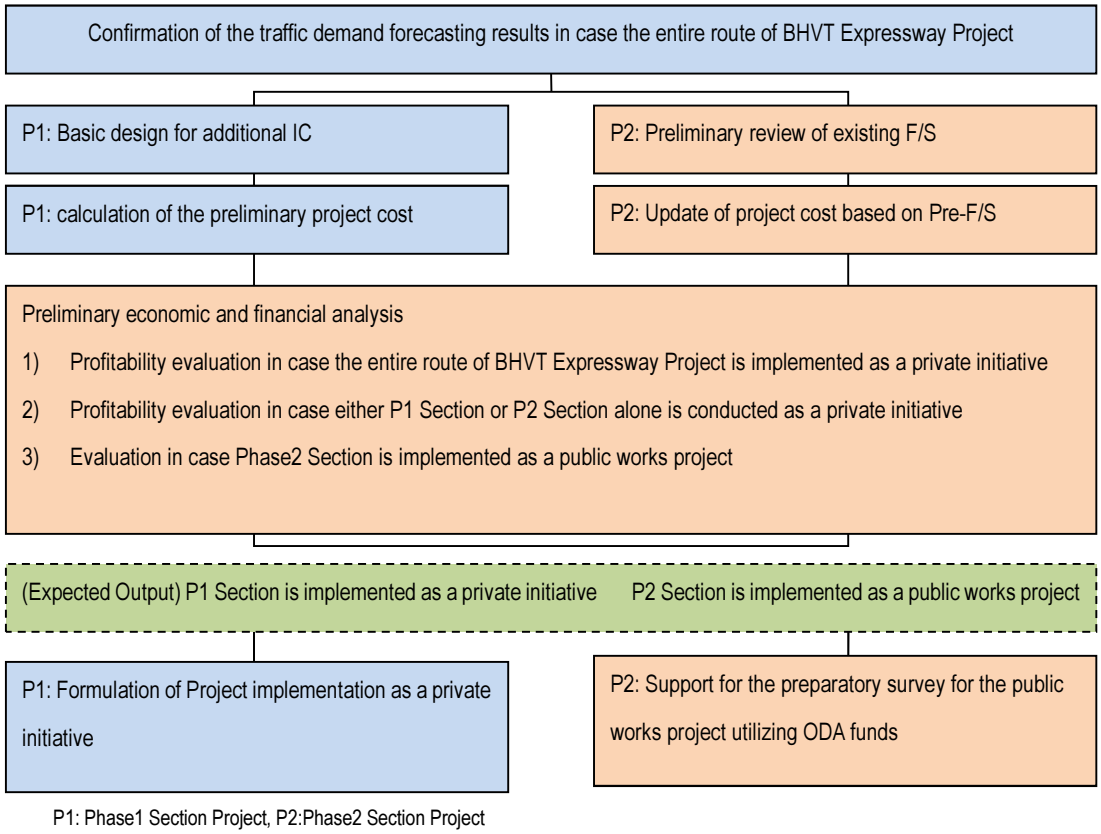
In this respect, the work under this policy will involve, for Phase 2 Section, collection and sort-out of existing literature, preliminary review of past FS reports, update of rough project cost at the pre-FS level, and confirmation of the traffic demand forecasting results.

Based on those results, the following review will be conducted to evaluate the project methods for Phase 1 Section and Phase 2 Section, and the range that suggests viability as a private investment project will be quantitatively determined using Internal Rate of Return (hereinafter IRR):

1) Profitability evaluation in case the entire route of BHVT Expressway Project is implemented as a private initiative.
2) Profitability evaluation in case either Phase 1 Section or Phase 2 Section alone is conducted as a private initiative.
3) Evaluation in case Phase 2 Section is implemented as a yen loan project

For evaluation of i) and ii) above, the outcome should be more than the equity IRR set for this Study. For iii), the target should be 12% in Economic Internal Rate of Return(hereinafter EIRR).

It is necessary to clarify the method of survey and review for implementation of Phase 2 Section. The prerequisite here is that Phase 2 Section be implemented as a yen loan project. Based on this assumption, the contents of the preparatory survey will be confirmed and sorted out in order to complement the information shortage related to the existing fiasibility study or Environment Impact Assessment(hereinafter EIA) reports and review alternative plans from the viewpoint of the project validity in terms of technical and financial aspects and the environmental and social considerations.



Source: JICA Study Team

Figure 1.2.2-7 Flow of review on project method for each phase

(5) Implementation of environmental and social considerations for realization of project viability

As the Project is the route that will contribute to the economic growth of Vietnam, it is of high necessity and therefore smooth implementation is essential. But if there is a difference between the requirements of the donor in terms of environmental and social considerations and the institutional system and procedures of the lender, it can be a critical factor for realization of a project. Given this, it is indispensable to ensure appropriate environmental and social considerations.

The risk analysis conducted in the Preliminary Survey concluded that land acquisition is a high risk factor as is technical risk, sponsor risk, exchange risk and other project-related risks because of the expected difficulty in conducting procedures for land acquisition or expected increase in acquisition cost. The results of the review in the Preliminary Survey of the EIA Report for Phase 1 Section prepared at the time of FS pointed out several items not covered in the past as well as suggested the necessity of a system for environmental management and

monitoring such as environmental monitoring during construction and after completion or livelihood monitoring related to land acquisition.

The Study intends to clarify differences between JICA's Guideline for Environmental and Social Considerations (April 2010) (hereinafter JICA's Guideline) and Vietnam's procedures or institutional systems for environmental and social considerations, to identify critical points related to environmental and social considerations for realization of the Project such as JICA's responsibilities for environmental and social considerations and their procedures or the requirements to be fulfilled by Vietnam, and to provide support to solutions appropriate in terms of JICA's Guideline for Environmental and Social Consideration, thereby promoting implementation of appropriate environmental and social considerations.

1) Confirmation of differences between JICA's Guideline and Vietnam's relevant laws and regulations

Considering differences between JICA's Guideline and Vietnam's EIA and resident resettlement laws as shown in Table 1.2.2-6, it is necessary that not only the implementing organizations but also the relevant organizations such as local or provincial administrative sections in charge of land acquisition provide support to preparation of EIA and resident resettlement plans (hereinafter RAP) that satisfy both requirements.

Table 1.2.2-6 Major differences between JICA's Guideline and Vietnam's relevant laws

Item	Major differences
EIA	When to hold stakeholder consultation and how to do it; review of alternative plans
Land acquisition and resident resettlement	Eligibility requirement, payment of compensation by reacquisition price, support to illegal occupants, negotiation with residents, monitoring

Source: JICA Study Team

2) Proposal on land acquisition and a system for implementation of environmental and social monitoring

Since the Project is planned to be implemented and maintained by an SPC, it is necessary to set up a division dedicated to environmental considerations including risk reduction of land acquisition and environmental/social monitoring in planning, construction and in-service stages. Since road development projects have been conducted in Vietnam with the Japanese government, the WB and ADB as donors, the Study will propose a feasible implementation system that fits the conditions of Vietnam based on the roles of relevant organizations as per the relevant laws and regulations and the analyses of systems for implementation of environmental and social considerations in similar projects.

1.3. Organization of the Study Team

The survey organizational chart is shown in the following.

Source:JICA Study Team

Figure 1.3-1 Organization of the Survey

Table 1.3-1 List of the Study Team

Name	Position	Company
Mr. TSUJI Takehiko	Team Leader/ Survey Management	JEXWAY
Mr. MIYAKE Hiromichi	Deputy Team Leader/ Specialist (Expressway Development Planning)	NEXCO
Mr. TSUBOI Shinji	Deputy Team Leader/ Design Engineer (Expressway)	NK
Mr. ISHIMOTO IchiZuru	Specialist (Project Coordination for Stakeholders)	NK
Mr. IWASAKI Masayoshi	Specialist (Project Scheme)	KRI
Mr. KIKUCHI Kenichi	Specialist (Economic and Financial Analysis)	KRI
Mr. SHIRATO Arata	Specialist (Funding Plan)	JEXWAY
Mr. YAGI Toshiharu	Specialist (Risk Analysis and Security Package 1)	SOJITZ
Mr. HIRATA Kenji	Specialist (Risk Analysis and Security Package 2)	JEXWAY
Mr. MORI Nobuhiro	Specialist (Government Support)	KRI
Mr. TANIGUCHI Yasushi	Specialist (Demand Forecasting)	NEXCO
Mr. Okamura Goro	Specialist (Regional Development Plan/ Investment Environment)	SOJITZ
Mr. EMA Tomohiro	Specialist (Transportation Planning/ Promotion of Utilization	NEXCO
Mr. HORIKIRI Kan	Specialist (Traffic Survey)	NK
Mr. MAGARIO Akira	Design Engineer (Interchange)	NK
Mr. CHUJO Takashi	Design Engineer (Bridge and Road Structure)	NK
Mr. NOZUE Yasuhiro	Design Engineer (Geotechnical)	NK
Mr. IMADA Shimpei	Engineer (Construction Plan/ Cost Estimation)	NK
Mr. MARUO Katsumi	Expert (Expressway Operation and Maintenance)	NEXCO
Mr. SATO Shinsuke	Expert(Environment Considerations)	NK
Ms. OTA Tomoko	Expert (Social Consideration)	NK

JEXWAY: Japan Expressway International Company Limited , NEXCO: Central Nippon Expressway Company Limited, SOJITZ: Sojitz corporation, NK: Nippon Koei Co.,Ltd, KRI: KRI International Corp.

Source:JICA Study Team

1.4. Schedule of the Study

The progress chart of the Study is shown in Table 1.4-1

Table 1.4-1 Schedule of the Study

Contents of the Survey	2012										2013		
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
1. Preparation													
2. Reconfirmation of the necessity and background of the Project													
3. Formulation of Project implementation plan													
(1) Confirmation of the purpose of the Project													
(2) Review of the scope of the Project													
(3) Review of the project scheme													
(4) Economic and financial analysis													
(5) Review of risks and securitiy packages related to implementation of the Project													
(6) Review of government support													
(7) Project implementation system and planning													
(8) Project planninng schedule													
4. Survey and review on project viability and profitability improvement													
(1) Demand forecasting for the Project													
(2) Transportation planning													
(3) Promotion for the utilization													
5. Basic design for higher viability													
(1) Basic design													
(2) Construction plan													
(3) Operation and maintenance plan													
(4) Caluculation of the preliminary project cost													
6. Project viability of Phase 2 Section (from Phu My to Vung Tau)													
(1) Sort-out of policies about the entire project of Bien Hoa - Vung Tau Expressway													
(2) Confirmation of the methods of survey and review necessary for implementation of Phase 2 Section													
7. Survey on Environmental and Social Considerations													
8. Compiling report													
9. Explaneatory and Discussion													
(1) Inception report													
(2) Interim report													
(3) Draft final report													
Activities of Applicant Companies as a investor													
1. Discussion with Relevant Agencies in VN/JP													
2. Consultation with stakeholders													
Subjects of discussion with GOV and BVEC													
(1) Basic approach, methods, schedule and organization for the Survey	○												
(2) Basic approach for formulation of Project implementation	○												
(3) Policy of development for BHVT Expressway	○												
(4) Detailed contents of survey and review	○												
(5) Results of survey and review on project implementation								○					
(6) Results of basic design								○					
(7) Results of survey on Environmental and Social Considerations								○					
(8) Policy of development for Phase 1 Section								○					
(9) Policy of development for Phase 2 Section								○					
(10) Draft proposed Project implementation plan								○					
(11) Proposed Project implementation plan												○	
(12) Finalization of the Survey												○	

Source: JICA Study Team

2. Background and Necessity of the Project

2.1. Current status of the Socio-Economic Condition in Vietnam

(1) Overview of Socio-Economic Conditions in Vietnam

In 2011, the Vietnamese economy faced high inflation as a result of gradual price increases since the second half of 2010. In order to curb inflation and stabilize the macro economy following an increase of the trade deficit and further inflation caused by active domestic demand, the State Bank of Vietnam devaluated the dong by 9.3% against the US dollar and introduced financial control policies on February 11, 2011.

However, despite the introduction of various policies, domestic prices continued to rise due to the increase in the prices of electricity and gasoline in March, and thereafter, the inflation rate reached 23% YoY in August. The price fluctuation reached its peak in and after September owing to the government's financial control policies; however, the annual inflation rate ended with 18% in 2011.

On the other hand, the financial control policies gave rise to an increase in the domestic loan rate, which reached about 24% of the dong lending interest rate at its peak period. While the cash flows of Vietnamese companies worsened rapidly, Japanese companies which had already entered Vietnam had to strengthen credit control of Vietnamese companies.

In response to the price escalation, the revision of the minimum wage, which had been expected to take effect in January 2012, was moved forward to October 2011, thus making Japanese companies struggle with labor management related to the wage revision.

Nevertheless, even under such circumstances, foreign exports showed favorable growth. In 2011, the country marked a record high of over 98 billion dollars in foreign exports, as well as a decrease in trade deficit to 9.5 billion dollars, the level below 10 billion dollars.

Table 2.1-1 General matters of Vietnam

Item	Contents
Country name	• Social Republic of Viet Nam
Location	• Located in the east of the Indochina Peninsula, 1,650km north-south elongated as S-shaped • Southeastern Asia, bordering the Gulf of Thailand, Gulf of Tonkin, and South China Sea, as well as China, Laos, and Cambodia
Area	• 331,689 sq km
Population	• 86,930,000 people（2010,GSO)
Major cities	• Hanoi（6,449,000 people） • Ho Chi Minh City（7,123,000people）, December 31, 2009.
Ethnic groups	• Kinh(Viet):90%, Chinese3%, other 53 ethnic minorities

Item	Contents
Languages	• Vietnamese (official), other minorities
Religions	• Buddhist（80%）,Catholic(10%),Hoa Hao, Cao Dai
Education	• Literacy: age 15 and over can read and write 90%（male 94%,female 87%） • School life : 5-4-3 education system, 5-year term of compulsory education

Source: JICA Study Team

(2) Basic economic indicators

Table 2.1-2 Basic economic indicators in Vietnam

Item	2009	2010	2011
GDP			
Real GDP（%）	5.3	6.8	5.9
Nominal GDP （million VND）	1,658,389,000	1,980,914,000	2,535,008,000
Nominal GDP （million USD）	97,180	106,427	n.a.
Nominal GDP per capita (USD)	1,068	1,174	1,374
Consumer Price Index			
Inflation rate (consumer prices)（%）	6.9	9.2	18.6
（Remarks）	the year before=100	the year before=100	The year before=100
Consumer Price Index	191.8	209.5	248.6
（Remarks）	2005=100	2005=100	2005=100
Unemployment rate（%）	4.6	4.3	3.6
Energy and Industrial Production Index			
Industrial Production Index	108.5	115.3	106.8
（Remarks）	1994=100	1994=100	1994=100
Growth rate of Industrial Production Index（Year-on-year）（%）	-4.7	6.3	-7.4
International Balance of Payments			
Current Balance (International Balance of Payment basis)（million USD）	-6,100	-4,300	-600
Balance of trade (International Balance of Payment basis)（million USD）	-12,853	-12,610	-9,844
Reserves of foreign currency (million USD)	16,447	12,467	n.a.
（Remarks）	Except for the Gold	Except for the Gold	
External Debt (million USD)	38,700	45,400	50,300

Item	2009	2010	2011
Exchange rates（Average, USD rate）	17,065.1000	18,612.9000	n.a.
Exchange rates（Year-end, USD rate）	17,941.0000	18,932.0000	n.a.
Growth rate of money supply（%）	26.2	29.7	n.a.
Exports (million USD)	57,096	72,191	96,906
Exports to Japan (million USD)	6,335	7,727	10,781
Imports (million USD)	69,949	84,801	106,750
Imports from Japan (million USD)	6,836	9,016	10,400
Direct Investment Acceptance(million USD)	22,626	19,764	14,696
（Remarks）	including the new extension	including the new extension	Including the new extension

Source:

Real GDP, NominalGDP, Inflation rate, Unemployment rate, Industrial Production Index,: General Statistics Office of Vietnam

GDP per capita, Consumer Price Index: IMF"World Economic Outlook Database"

International Balance of payments, External debt: World Bank "A World Bank Economic Update for the East Asia and Pacific Region"

Reserves of foreign currency, Exchange rate: IMF "IF/S" CD-ROM

Direct investment acceptance: Agency of Foreign Investment（FIA）

Growth rate of money supply: IMF "International Financial Statistics Yearbook"

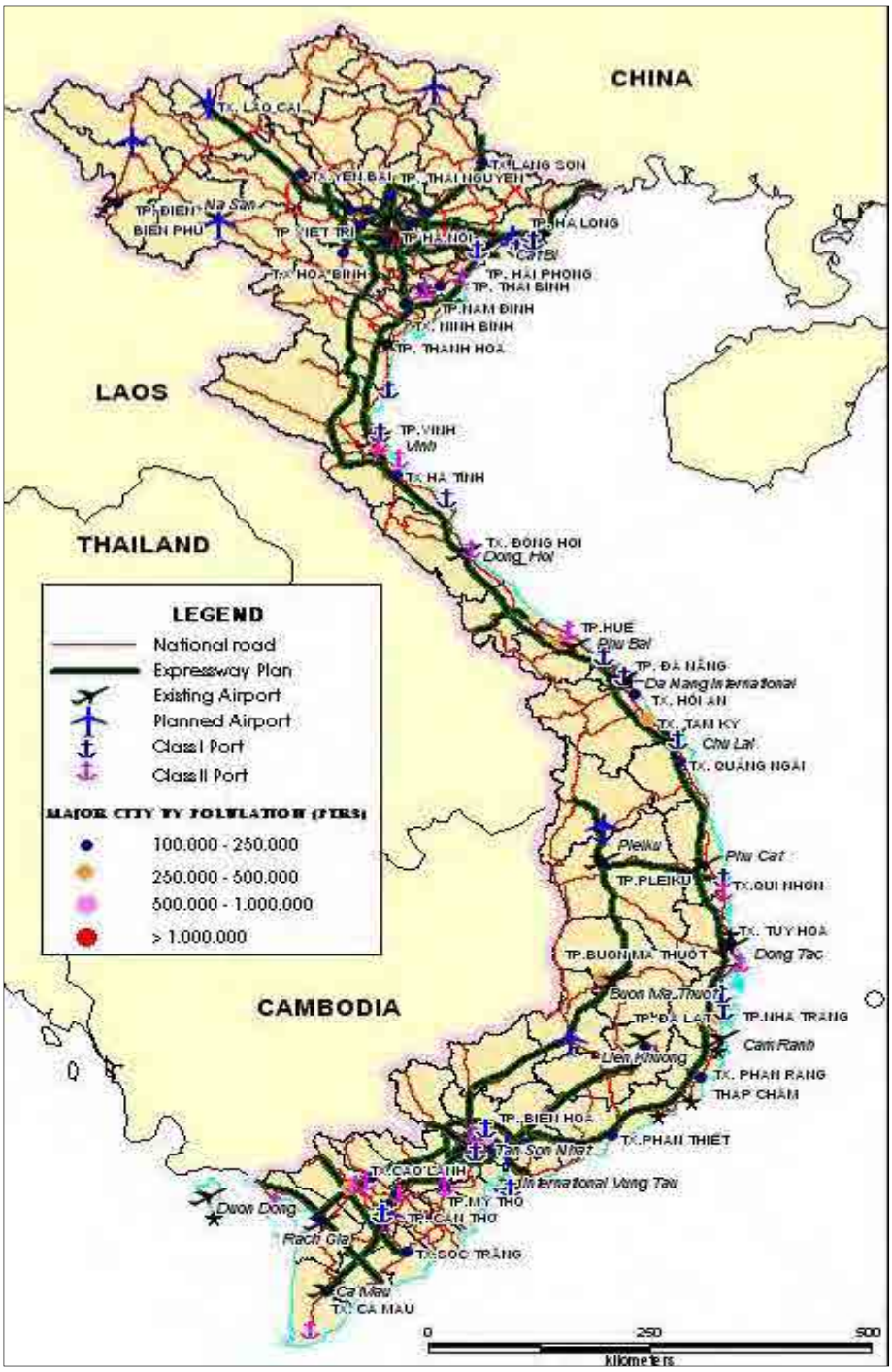
Exports and Imports: Directorate General of Customs

*Growth rate of money supply: IMF "International Financial Statistics Yearbook 2011","Broad Money"

2.2. Current Status of Expressway Development in Vietnam

(1) Status of legislation on expressway development

The expressway development plan was issued as Prime Minister Decision No.1734/QD-TTg dated 1st December 2008, and is shown in Figure 2.2-1.



Source: MOT Master Plan (No.7056/TTr-BGTVT dated 5 November 2007)

Figure 2.2-1 Expressway Development Plan (Decision No.1734)

Table 2.2-1 List of expressway projects (MOT)

No.		Section	MOT Master Plan (2007)		MOT Development Plan (2012)	
			Length (km)	No. of Lanes	Length(km)	No.of Lanes
North–South Expressway	1	Eastern (Phap Van–Can Tho)	1,941	4-6	1,941	4-6
	2-1	Western(Phu Tho–Pho Chau)	457	4-6	457	4-6
	2-2	Western(Ngoc Hoi-Rach Gia)	864	4-6	864	4-6
Northern Expressways	3	Lang Son–Bac Giang–Bac Ninh	130	4-6	130	4-6
	4	Hanoi–Hai Phong	105	4-6	105	6
	5	Hanoi–Viet Tri-Lao Cai	264	4-6	264	4-6
	6	Ha Noi-Ha Long-Mon Cai	294	4-6	294	4-6
	7	Hanoi–Thai Nguyen-Bac Kan	90	4-6	90	4-6
	8	Ha Noi–Hoa Lac-Hoa Binh	56	4-6	56	4-6
	9	Ninh Binh–Hai Phong–Quang Ninh	160	4	160	4
Central Expressways	10	Hong Linh–Huong Son	34	4	34	4
	11	Cam Lo–Lao Bao	70	4	70	6
	12	Quy Nhon–Pleiku	160	4	160	4
Southern Expressways	13	Bien Hoa–Vung Tau	76	6	76	6
	14	Dau Giay–Da Lat	209	4	209	4
	15	HCMC–Thu Dau Mot–Chon Thanh	69	6-8	69	6-8
	16	HCMC–Moc Bai	55	4-6	55	4-6
	17	Chau Doc–Can Tho–Soc Trang	200	4	200	4
	18	Ha Tien–Rach Gia–Bac Lieu	225	4	255	4
	19	Can Tho–Ca Mau	150	4	150	4
Ring Road System in Hanoi	20	Ring road No 3	56	4-6	56	4-6
	21	Ring road No 4	125	6-8	125	6-8
Ring Road System in HCMC	39	Ring road No 3	83	6-8	90	6-8
	40	Ring road No.4	-	-	198	6-8
Total			5,873		6,108	

Source: MOT Master Plan (No.7056/TTr-BGTVT dated 5 November 2007) and MOT Document (The 6th Seminar on Expressway in Japan dated 29 October 2012)

(2) Capital Requirement for Expressway

The following table shows a comparison between the MOT investment plan included in the Expressway Seminar in August 2011 and that of October 2012.

Table 2.2-2 Comparison of Investment Plan

Description	Issue	Till 2020		After 2020	
		Target construction length（km）	Necessary Funds(10 billion USD)	Target construction length（km）	Necessary Funds(10 billion USD)
5th Expressway Seminar	2011/8	1,870	19	4,000	21.5
6th Expressway Seminar	2012/10	3,000	26	3,108	24
Changes		+1,130	+7	-892	+2.5

Source: 5th Expressway Seminar, August 2011 and 6th Expressway Seminar, October 2012

As of 2012, the target construction length by 2020 has increased by approximately 1,130 compared to the previous year's plan. It is intended that MOT develops its medium-term development targets ahead of schedule. On the other hand, in terms of funds, there has been an expected increase of 70 billion USD, including the fact that it is ahead of schedule.
In addition, total length of expressways in the 2012 investment plan is 6,108km which has increased from 5,873km in the Master Plan because of additions such as Ring Road No.4 in HCMC (198km) has been added.

(3) Land-use planning for expressway construction

According to information from MOT in 6th Expressway Seminar 2012, the total amount of land planned for expressway construction is 42,000ha. The land acquired for constructing expressways is more than 3,000 ha and there are 39,000ha of additional l.

(4) Current Status of Expressway Projects

1) Priority Expressway Projects

The following table shows the High priority expressway projects for investment MOT has been assumed. (14 projects 1,293km)

Table 2.2-3 Priority Projects for Investment

No	Section	Length(km)
1	Ring Road No.3 Ha Noi	56
2	Ha Noi-Hai Phong	105
3	Ha Noi-Thai Nguyen	62
4	Ha Noi-Lao Cai	264
5	Lang-Hoa Lac-Hoa Binh	56
6	Cau Gie-Ninh Binh	50
7	Ninh Binh-Thanh Hoa	115
8	Da Namg-Quang Ngai	131
9	Dau Giay-Long Thanh-HCMC	55
10	Long Thanh-Ben Luc	55
11	Dau Giay-Phan Thiet	98
12	Trung Luong-My Thuan-Can Tho	92
13	Bien Hoa-Vung Tau	76
14	Ring Road No.3 HCMC	83
	Total	1,298

Source: 6th Expressway Seminar, October 2012

2) Current Status of Expressway Projects

Table 2.2-4 Current Status of Expressway Projects

No	Expressway /Project	Length (km)	Lanes	Total investment (billion VND)	Construction period	Progress	Status
Eastern North-South Expressway							
1	Phap Van-Cau Gie Expressway Project	28	6	4,743	2012-2019	Project being formed	Stage 1: Upgrading 4-lane expressway Stage 2: Expanding 6-lane expressway MOT and NEXCO-Central are currently completing the proposal to submit to the Prime Minister for approval
2	Cau Gie-Ninh Binh Expressway Project	50	4-6	8,974	2006-2012	Open to traffic	Completed and opened on 30 June 2012 Managed by VEC Distance-based toll charge system
3	Ninh Binh-Thanh Hoa Expressway Project	121	6	27,000	-	Project being formed	Feasibility study report being performed Calling for investment in PPPscheme Managed by MOT/PMU1
4	Thanh Hoa-Ha Tinh Expressway Project	96	6	22,185	-	Project being formed	Feasibility study report being performed Calling for investment in PPPscheme Managed by MOT/PMU6
5	Da Nang-Quang Ngai Expressway Project	131	4 (Stage 1)	28,518 (1,600 mil.USD)	2011-2014	Implementation process	Detailed Design being carried out Managed by VEC Co-financed by IDA, IBRD,and JICA loans

No	Expressway /Project	Length (km)	Lanes	Total investment (billion VND)	Construction period	Progress	Status
6	Quang Ngai-Qui Nhon Expresway Project	108	4-6	26,654		Project being formed	
7	Dau Giay-Phan Thiet Expressway Project	98	4-6	17,230	2012-2016	Project being formed	Calling for investment in PPP pilot scheme supported by WB First investor is BITEXCO
8	HCMC-Long Thanh-Dau Giay Expressway Project	55	4-6	15,000	2009-2013	Under construction	Managed by VEC Co-financed by JICA＋ADB loans Implementation process is slow due to landacquisition
9	Ben Luc-Long Thanh Expressway Project	58	4	32,100	2012-2017	Implementation process	Detailed Design completed ADB assists are hiring consultants to adjust F/S and T/D to avoid increasing total investment cost, resulting in slow implementation process Managed by VEC Co-financed by ADB,and JICA loans
10	HCMC-Trung Luong Expressway Project	39.8	4-8	9,884	2004-2011	Open to traffic	Completed and opened on 3 February 2010 Managed by PMU My Thuan(Cuu Long CIPM) Distance-based toll charge system
11	Trung Luong-My Thuan Expressway	54.3	4	20,000	-	Project being formed	Project was planned initially in BOT scheme invested by BEDC, but BEDC pulled out

No	Expressway /Project	Length (km)	Lanes	Total investment (billion VND)	Construction period	Progress	Status
	Project						Managed by CuuLongCIPM Feasibility study report being performed by JICA in PPP scheme
12	My Thuan-Can Tho Expressway Project	24.5	6-8	15,000	-	Project being formed	
Northern Expressways							
13	Hanoi-Lang Son Expressway Project	140	4-6	22,120	-	Project being formed	Expected ADB,and JICA loans Feasibility study report being reviewed by ADB Managed by VEC
14	Hanoi-Hai Phong Expressway Project	105	6	24,566	2008-2011	Under construction	Impementation by VIDIFI（VDB）with BOT contract Implementation process is 20 months show due to land acquisition.
15	Noi Bai-Lao Cai Expressway Project	245	4-6	21,233	2009-2013	Under construction	Managed by VEC ADB loans, government budget Process is slow due to land acquisition and contractor's low capacity
16	Hanoi-Thai Nguyen Expressway Project	61	2-4	8,104	2009-2013	Under construction	Upgrating NH3 Hanoi-Soc Son: 4 lanes

No	Expressway /Project	Length (km)	Lanes	Total investment (billion VND)	Construction period	Progress	Status
							Soc Son-Thai Nguyen:2 lanes Managed by PMU2-MOT JICA's ODA Fund, Government Fund Process is slow due to land acquisition and contractor's low capacity
17	Lan-Hoa Lac Expressway Project	29.2	6	7,527	2005-2010	Open to traffic	Completed and open to traffic on 29 September 2010 Central budget, local budget Construction by VINACONEX with BT contract Free toll
18	Hoa Lac-Hoa Binh Expressway Project	30	6	6,000	2011-2016	Project being formed	In progress investment by Geleximco BT contract
19	Bac Ninh-Ha Long Expressway Project	147	4	20,557	2015-2020	Project being formed	Study investment by GITEC (China) BOT contract
20	Ha Long-Mong Cai Expressway Project	130	4	19,000	2015-	Project being formed	Feasibility study report being performed Expected ADB Managed by VEC（PMU TL）
Southern Expressways							
21	Dau Giay-Da Lat Expressway Project	230	4	19,590	2012-2017	Project being formed	Dau Giay-Lien Kuong Section: Calling for investment in PPP scheme

No	Expressway /Project	Length (km)	Lanes	Total investment (billion VND)	Construction period	Progress	Status
							Managed by MOT（PMU1） South Korea's Incheon Urban DevelopmentCorporation (IUDC) made a memorandum of understanding (MOU) with MOT for investment of approx. 1 billion USD and plans to build and operate under the BOT scheme
22	Bien Hoa-Vung Tau Expressway Project	76	4-6	16,033	2013-2020	Project being formed	Planned to apply BOT scheme for Phase 1 Section. Investor is BVEC Phase2 Section uses government funds via JICA's ODA loans.
Ring roads for Hanoi							
23	Hanoi Ring Road No.3	56	4-6	17,990	2004-2018	Under construction/ Project being formed	Mai Dich-Phap Van Section: JICA's ODA loans and State budget Completed and opened in 2011 Thanh Tri Bridge-Southern RR3 Section: JICA's ODA Completed and opened in 2010 Managed by MOT（PMUTL） Mai Dich-Noi Bai Section (20km):

No	Expressway /Project	Length (km)	Lanes	Total investment (billion VND)	Construction period	Progress	Status
							Project being assigned to VEC for research Requested to use Chinese ODA Tu Hiep-Noi Bai Section(21km): Not formed yet
24	Hanoi Ring Road No.4	136	6-8	72,000	2011-2020	Project being formed	Project being formed in BT and BOT scheme Managed by MOT
Ring roads for HCMC							
25	HCMC Ring Road No.3	90	6-8	43,000	2011-2020	construction/ Project being formed	57 km section under construction Managed by Cuu Long CIPM

Source: JICA Study Team based on information from MOT

3) Implementation of and Difficulties in Expressway Projects

Consideration of the current conditions of expressway projects underway or in the planning stages results in the following findings.

A. Matters common to both expressway projects underway and those in the planning stages

Since each project is being implemented by multiple organizations (VEC, CLCIPM, and BOT), project coordination and project management by the MOT, the agency with jurisdiction over the projects, is complicated.

In addition, risks are involved in the mutual relations among organizations in formation of network functions. These include project delays.

B. Projects in the planning stages

Raising funds for projects is proving difficult due to the limitations of Vietnam's national government budget. While private-sector funding such as PPPs is being used on a trial basis, in light of the outlook for project profitability it is difficult to get private-sector businesses to participate. Also, development of related legal systems and organizational structures to improve the situation is moving slowly.

Vietnam is experiencing marked inflation, so that amounts of investment also are in a significant increasing trend. As such, the investment environment for these projects is a tough one, from both the public- and private-sector sides.

C. Projects underway

Delays in land acquisition due to national government budget shortfalls have a significant impact on project progress. The MOT is forced to respond urgently to this situation.

In some cases the progress of construction is delayed due to insufficient capabilities on the part of the construction contractors awarded contracts.

Individual main projects are outlined below.

(a) Phap Van-Cau Gie Expressway

28km of length, operated as NH1 By-pass since 2002 with a scope of 4 lanes.

In order to ensure an integrated standard for expressways from Phap Van to Ninh Binh after the completion of Cau Gie-Ninh Binh Expressway, MOT has initially assigned it to Vietnam Expressway Compnay (hereinafter VEC) to propose an upgradingproject for the Phap Van-Cau Gie section to fulfill the above.

Scope of Investment: divided into two stages with a total investment of 386.5 million USD, as follows:

Stage 1: Pre-Expressway with 4 lanes, with improved pavement, no land acquisition (except for the Toll Gates), total investment of 74 million USD.

Stage 2: Complete with 6 lanes, total investment of 312.5 million USD.
MOT has applied to the government to allow NEXCO-Central apply the BOT model for Stage 1. The investor will call for 30% of the total investment, while the rest will be a loan from JICA-PSIF.

(b) Da Nang-Quang Ngai Expressway

The length of this route is 131.49km with 4 lanes. Its total investment funds are 29,203 billion VND co-financed by WB+JICA+VEC. The proposed funds from JICA are about 673.6 million USD accounting for 48% of the total investment cost, and a credit agreement was signed to borrow 15.912 billion JPY (199 million USD) from JICA. The WB funded the amount of 43.7% (613.5 million USD) , and the last proposition from VEC is counterpart funds of 3.988 billion VND (116.6 million USD, accounting for 8.3%).
The progress of this project: VEC is preparing to submit the bidding documents. The opening is supposed to be launched in Quarter Ⅲ, of 2012. On 17 July 2012, MOT had local governments (Da Nang City, Quang Nam Province and Quang Ngai Province) handle the land clearance component.

(c) Ho Chi Minh-Long Thanh-Dau Giay Expressway

The length of this route is 55km with 4 lanes (6-8 lanes at the completed stage). Its total investment funds are 932.4 million USD including Component 1 (Section An Fhu-Ring Road 2, 4km in length), and Component 2 from Km 4+514-Km54+983
Co-financed by JICA, ADB and VEC
JICA: 2 agreements were signed with total funds of 41,677 billion JPY for Component 1 and the section from KM4-Km23+900 (interchange NH51), and Intelligent Transport Systems (hereinafter ITS) for the whole project.
Ordinary Captital Resource (hereinafter OCR) Loan from ADB with total funds of 410.2 million USD
VEC fund: 5.7 million USD
The progress of the project:
Component 1: The bidding process for civil works packages are implemented by VEC for the An Phu-VD2 section.
Component 2: All six packages have been constructed and the planned progress is acceptable.
For land clearance: This work has basically been finished, but 1 household and an 11KV electric line remain on site.

(d) Ben Luc-Long Thanh Expressway

The length of this route is 57.8km with 8 lanes.

The total length of bridges is 25.71km.
Implementer: VEC
Total investment (the road length is 31.14km) : 1,067 millioon USD from ODA, co-financed by JICA (50.04%) and ADB (49.96%)
Project progress: Regarding to its technical detailed design, the total investment fund increases is around 32% more than the approved one. MOT is reviewing solutions for this issue.
Bidding process: Bidding documents were submitted to ADB and JICA by VEC.

(e) New National Highway No.3- Hanoi-Thai Nguyen Expressway

The length of this road is 61km with 2-4 lanes.
Total investment is 8,104 billion VND, including current JICA fund of 28.955 billion JPY.
Project progress: Four packages are under construction with 6-9 months of delay behind the schedule due to obstacles in land clearance and the capacity of the contractors. Due to price escalation, its total investment fund has now increasesed.

(f) Noi Bai-Lao Cai Expressway

The length of this route is 245km with 4-6 lanes.
Total investment fund of this project is 1,249 million USD, including Asian Development Fund(ADF) (ADB) of 200 million USD, OCR (ADB) of 896 million USD, and a counterpart fund (VEC) of 153 million USD.
The project launched on 1 July, 2009 and is scheduled to be completed in 2013. The contractors have now carried out their civil works.
The amount of construction work and its disbursement are still delayed because of obstacles in land clearance. On the other hand, for sections without land clearance problems, the contractors have not mobilized enough equipment, or manpower to ensure their construction.
VEC is currently concerned with adjusting the total investment for land clearance components due to price escalation and other problems related to land acquisition policy.
ADB approved the arrangement of an un-located budget from the loan to use for land clearance, resettlement, and an income restoration program.

(g) Trung Luong-My Thuan Expressway

The length of this project is 54.3km with 4 lanes.
Total investment fund is 1,338 million USD
At the Mid-term report meeting, JICA recommended six financial methods with terms and Finamcial Internal Rate of Return (hereinafter FIRR) from 7.3% to 16.5%. MOT requested the Consultant to revise the total investment cost, estimated traffic volume, tickets, and to

perform further study on the other investment plans stated in the final report, and the decision to use ODA in order to report to the Prime Minister.

(h) Thanh Hoa-Ninh Binh-Bai Vot Expressway

The total investment cost for 219 km is 4,574 million USD, including the Ninh Binh-Thanh Hoa(121km-2,193 million USD) and Thanh Hoa-Bai Vot section(98km;2,341 million USD). WB and JICA consultant have now carried out the study from Quarter IV of 2011.

(i) Dau Giay-Phan Thiet Expressway

This project is 98.7km in length with a total investment of 1,730 million USD (1,538 million USD for the first stage and 192 million USD for the second). In the first stage, the embankment is designed with 6 lanes, while the road pavement has 4 lanes, and there are other main structures such as main bridges with complex structures and tunnels. For the second stage, the project shall be upgraded with 6 lanes.
An independent consultant (SYSTRA MVA Singapore) has been selected by WB and was mobilized from March 2012 in order to appraise the its technical design, and total investment cost and to estimate the revenue of the project or create a strategy for selling tickets in the long term. Currently, the consultant is reviewing its F/S to investigate the starting and ending points and the traffic volume.
A financial consultant (Crisit infrastructure risks and solutions Ltd) has been selected by WB and was mobilized from September 2011. The consultant made up a Financial Relationship Management (hereinafter FRM), including methods to analyze, monitor and manage tentative debt related to the responsibilities of the Vietnamese government as well as to use this FRM for other PPP projects in the future.

4) Administrative organization for the Expressway

The organizational structure for the expressway sector in Vietnam is shown below.

a) Central Government

The structure of the central government after the July 2002 reorganization of the Vietnamese government is shown below.

Table 2.2-5 Structure of Central Government in Vietnam

No	Ministry
1	Ministry of National Defense
2	Ministry of Public Security
3	Ministry of Foreign Affairs
4	Ministry of Justice

No	Ministry
5	Ministry of Finance
6	Ministry of Transport
7	Ministry of Construction
8	Ministry of Education and Training
9	Ministry of Agriculture and Rural Development
10	Ministry of Industry and Trade
11	Ministry of Planning and Investment
12	Ministry of Health
13	Ministry oF/Science and Technology
14	Ministry of Natural Resources and Environment
15	Ministry of Information and Communication
16	Ministry of Home Affairs
17	Government Inspectorate
18	State Bank of Vietnam
19	Committee for Ethnic Minorities
20	Government office
21	Ministry of Labor, War Invalids and Social Affairs
22	Ministry of Culture, Sports and Tourism

Source: Government of Vietnam HPP

b) Ministry of Transport（MOT）

MOT is one of the minisitries of the Vietnamese government and is responsibile for planning, managing and maintaining national transport infrastructure such as roads, railways, inland waterways, and maritime and aviation routes. Also, MOT's authorities include the Directorate for Road of Vietnam (hereinafter DRVN), Vietnam National Maritime Bureau (VINAMARINE), Civil Aviation Administration of Vietnam (CAAV), Vietnam Railways Administration (VNRA), Vietnam Inland Waterway Administration (VIWA), Vietnam Register Administration (VR), and the Transport Construction Quality Control and Management Bureau (TCQM).

c) Ministry of Planning and Investment (hereinafter MPI)

The MPI is an agency of the Vietnamese government. It is responsible for the planning and investment fields, including formulating strategies and plans for national socio-economic development plans under the jurisdiction of the central government, economic management mechanisms and policies, domestic and international investment, and management of ODA funds.

d) Ministry of Finance (hereinafter MOF)

The MOF is an agency of the Vietnamese government. It is responsible for management of planning and execution related to national public finances, including formulating the national budget, taxation, systems of public charges (including road tolls), national public funds, and national investment.

5) Organizational structure for management of expressways

Currently, some expressway projects are open in Vietnam, such as Ho Chi Minh City-Trung Luong Expressway (toll road), Lang-Hoa Lac Expressway (free) and Cau Gie-Ninh Binh Expressway (toll road). In addition, an expressway with a total length of 525,9km is in progress and the target for opening is still 2015.

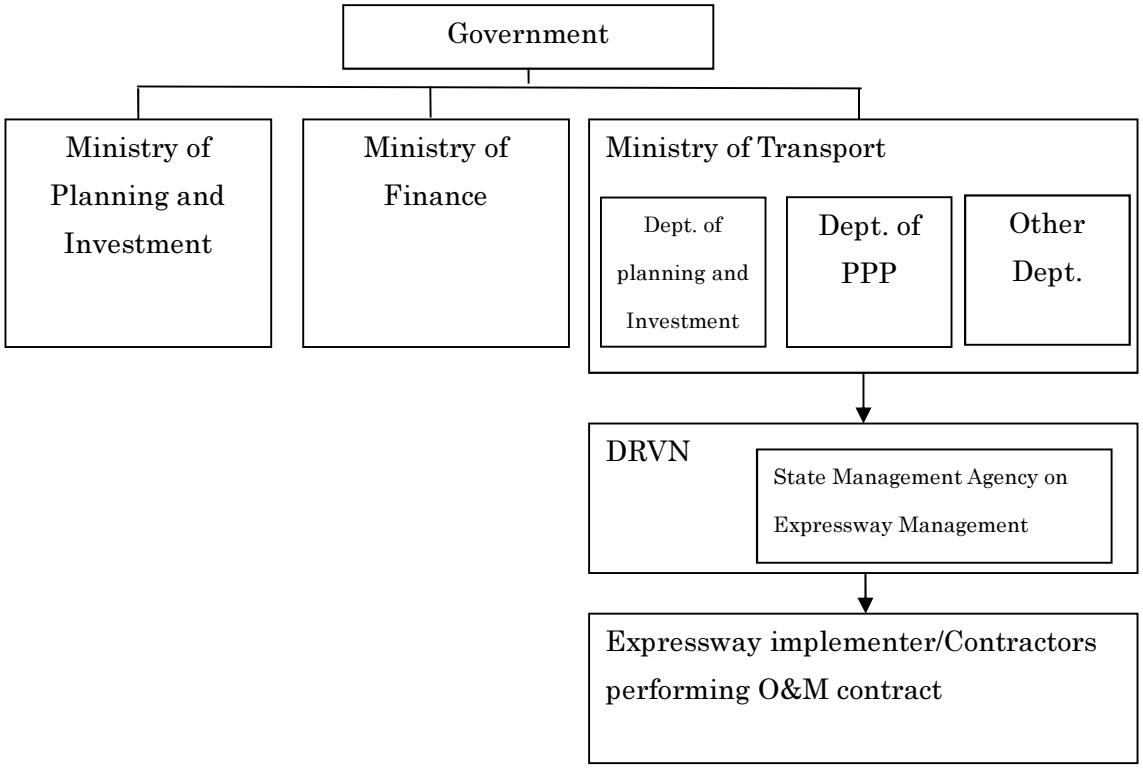
Some issues related to the management of expressways are shown below.

MOT is a regulatory agency for expressways under the relevant laws and regulations and DRVN (Expressway Management Office) is directly responsible for the organization as instructed by MOT.

The Expressway Management Office (EMO) was established as an organization in MOT under Decision No.633/QD-BGTVT, dated 1 April 2011.

At the beginning, EMO was to be reorganized to the Directorate for Expressway in the future. However it was incorporated into DRVN by Decision No.892/QD-BGTVT dated 24 April 2012.

On the other hand, Decision No.1815/QD-BGTVT, dated 3 August 2012, newly established the management of the Department of Private and Public Partnerships (Department of PPP). This organization has duty authority on transportation infrastructure projects according to the scheme of PPP, BOT, Build Transfer (hereinafter BT), and Build Transfer Own (hereinafter BTO), and is responsible for advising the Minister of Transportation regarding the management of PPP projects.



Source: JICA Study Team

Figure 2.1-2 Expressway administration, management, maintenance and operation structure in Vietnam

Advisory organizations to the Minister of Transport regarding investment, construction, management, and development of expressways are the Department of Planning and Investment, the Department of Science and Technology, the Department of Transport Infrastructure, the Department of PPP, and the Department of Quality Control.
Other relevant organizations include the VEC, Vietnam Development Bank (hereinafter VDB), and the Bank for Investment and Development Company (hereinafter BIDV) as private companies based on the BOT contract, which carried out the construction, operation, and management of the expressway project.

- For regulations and cooperation for the expressway operators
  MOT has issued tentative operation and maintenance standards for each expressway which is open to public, in which the terms of standards related to the liability of expressway operators such as general rules, traffic management, operation, and maintenance are described.
  And at the same time, Provincial People's Committee is responsible for traffic police, traffic safety audits, health, and safety throughout the expressway as the relevant local organization.

2.3. Current Status and Future Prospects of Project-related Legislation in Vietnam

2.3.1. Legislation related to the PPP regulation

The existing legislation for PPP/BOT investment in Vietnam is defined by the following regulations.

GOV has enacted Decree No.108/2009/ND-CP, dated 7 November 2009, on " Investment on the Basis of BOT, BTO, and Build-Transfer(hereinafter BT) Contracts"

This Decree was issued to encourage the participation of the private sector in the projects for the construction and operation of new infrastructure or upgrading, expanding, and rehabilitating existing infrastructure such as roads, bridges, tunnels, railways, airports, clean water supply systems,water drainage systems and other infrastructure facilities.

A state agency competent to sign and perform a project contract, such as MOT is a party to the project contract and has the rights, obligations and responsibilities as agreed with the investor in the project contract.

Decision No.71/2010/QD-TTg on Public-Private Partnership Investment Piloting (hereinafter referred to PPP Regulation) was issued on 9 November 2010.

The main objectives of this PPP Regulation are that it improves the profitability of the project and that financial support is properly provided by the government.

This decision is based on the definition that investment by the private sector is 70%, 30% of which needs to be supported by major investors, other portions of which are to be financed by supporters other than the guarantee by the government. Governmental financial support is limited to 30% of the total investment fund.

According to the Ministry of Planning and Investment (hereinafter MPI), the introduction of the PPP scheme in accordance with international standards is expected to facilitate the raising of private capital including foreign investment and to improve existing legislation focused on making the BOT scheme more effective.

However, there are challenging matters to overcome in introducing the PPP scheme. The profitability of the proposed projects is not sufficient for investors.

In particular, the rules on capital recovery through toll roads, which is a traffic sector project, are stipulated in the toll collection mechanism rules in Circular No.90/2004/TT-BTC established by the Ministry of Finance (hereinafter MOF); however, the fee standard remains low because it has not been updated for a long time. This prolongs the period of capital recovery of the project.

The Pilot PPP Regulation is not adequate for actual application of the PPP scheme, and it contains a number of problems because many parts are not clear in the implementation phase. The relevant organization always has to receive the confirmation of the superior organization. The Regulation defines neither how government funds are used and spent and how providers are selected, nor the combination of financial support (ODA, foreign private investment, government budget, etc.). The authorities concerned and local organizations are not actually controlled because there have arisen many issues regarding how to bear costs incurred for the agreed PPP pilot scheme. Although the PPP scheme has great potential for Vietnam, the Pilot PPP Regulation alone is not enough to control it. There is a need to develop an environment in which private investments are promoted and improve the related law systems to simplify the procedures between authorities.

Table 2.3.1-1 The comparison of Pilot PPP Regulation and BOT Regulation

	Prime Minister Decision No. 71 QD-TTg on Public-Private Partnership Investment Piloting (2010)	Government Ordinance No. 108 New BOT law (2009)	Notes
Project Form	Infrastructure development project implemented through public-private partnership (PPP) method	Investment project based on BOT, BTO, and BT contractual forms	Definition of public-private partnership not clear
Government Support (Maximum)	No more than 30% of amount of investment (Article 9), with government support included in the amount of investment (Article 2)	For urgent and priority projects, government support of up to 49% of amount of investment, and this amount is not included in the amount of investment (Article 6)	Effectively the share of public funding is decreasing
Details of Government Support (Public Funding)	National budget, ODA, government bonds, credit provided through government guarantees, credit provided through development investment by national government, development investment capital from state-owned enterprises, etc.	National budget, credit provided through government guarantees, credit provided through development investment by national government, development investment capital from state-owned enterprises, etc.	ODA and government bonds are included under “etc.” in the BOT law.
Uses of Government Support	Reserve facilities, compensation, land expropriation, clearance, relocation expenses	Same as at left	
Capital Subscription/ Loan Ratio	Capital subscription up to 30% of private-sector investment. No government guarantees for loan	Capital-subscription ratio not less than 15% for projects with amounts of investment of up to	Since the share of public funding has decreased under the

	Prime Minister Decision No. 71 QD-TTg on Public-Private Partnership Investment Piloting (2010)	Government Ordinance No. 108 New BOT law (2009)	Notes
	portion.	VND 1.5 trillion. Not less than 15% of amount up to VND 1.5 trillion for projects with amounts of investment of more than VND 1.5 trillion. Not less than 10% of amounts in excess of this amount.	PPP law, there is a need for considerable stable funding covered by private-sector investors using their own funds.
Fields of Investment	Roads, railways, urban transportation, airports, water supply, electricity supply, hospitals, waste processing (Article 4) Underlined fields indicate new subjects for PPP projects.	Roads, railways, airports, water supply, electricity supply, etc.	It is not possible to determine which law applies to fields included in the subjects of both laws.
Project Portfolio, Feasibility Study Report	Project list decided by Prime Minster after screening and approval by the MPI (Article 14). Feasibility study report submitted to Prime Minister, decisions made on government support and guarantees, and final decision made by MPI and MOF (Article 18). Cost of feasibility study eligible for government support (Article 6) => Cost of preparing feasibility studies paid later by chosen investors.	Basically, the regulators have responsibility for the project list. The Prime Minister approves feasibility study reports for projects involving amounts of investment of more than VND 1.5 trillion, those involving expropriation of 200 hectares or more in land, and those requiring government guarantees (Article 12). Feasibility study paid for by private-sector investors (Article 8).	
Land Expropriation		Compensation, land expropriation, and relocation expenses paid for by private-sector investors, except for urgent projects as defined in Article 6 (Article 30).	

	Prime Minister Decision No. 71 QD-TTg on Public-Private Partnership Investment Piloting (2010)	Government Ordinance No. 108 New BOT law (2009)	Notes
Charges	Application made to regulators for revision of charges based on costs, profit, users, and national policies (Article 37)	Same as at left (Article 33) Government guarantees for charges (Article 34)	Setting and revision of charges both effectively prescribed by MOF regulations
Incentives	Mitigation, reduction, and exemption from corporate taxes, import duties, and land use charges (Article 41)	Same as at left (Article 38)	
Competitive Bidding and Selection Criteria for Selection of Investors	Competitive bidding (no explicit noncompetitive terms) Selection criteria not described in particular.	While competitive bidding is used in principle, noncompetitive measures are used in some cases. Selection criteria (e.g., capabilities, experience) prescribed by lower-level laws and regulations.	For investor-proposed projects, even the investor that proposed the project formally faces conditions identical to those of other investors.
Related Institutions etc.	MPI, MOF, Ministry of Justice (MOJ), State Bank of Vietnam (SBV), etc. Authorization of MPI strengthened. Inter-sectoral Task Force formed.	MPI, MOF, MOJ, local-level people's commissariats, etc. Inter-branch working group formed.	While under the BOT law the inter-branch working group basically handles operations after project selection, under the PPP law the ITF is expected to take part beginning at a stage prior to public announcement. => It is difficult to coordinate interests among agencies in a large-scale project.

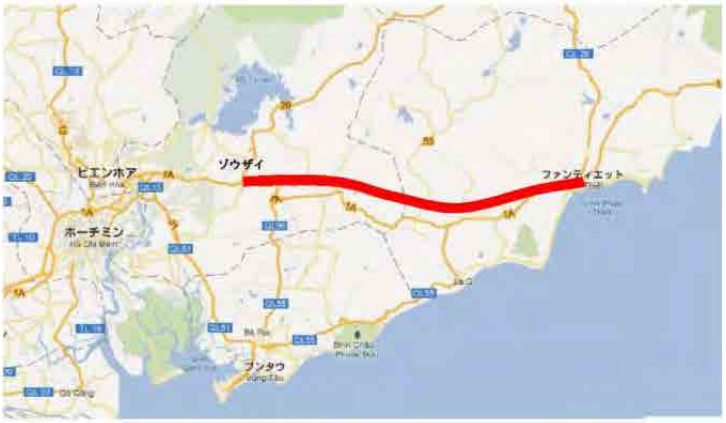
Source : Survey team

(1) Public-Private Partnership (PPP) Expressway projects in Vietnam

In the listed projects under PPP scheme, Dau Giay-Phan Thiet Expressway is the only "PPP" project under taken by the private company and approved by Prime Minister supported by WB.

The outline of this project is as follows:

Table 2.3.1-2 Outline of Dau Giay-Phan Thiet Expressway Project

Name of Project	Dau Giay-Phan Thiet Expressway
Outline	The Project is important section in Southern Vietnam connecting Phan Thiet city and Dau Giay where it extends to National Highway No.1 A . Total length is about 101km with 4 lanes in the 1st phase and 6 lanes in the 2nd phase at road grade A. Design speed is 100km/h- 120km/h There are 9 interchanges, 15 bridges traversing rivers, 19 flyovers and 12 over-bridges. ITS including ETC and traffic management system and service area are to be installed. 
Total Cost	23,223 billion VND
Executing Organization	Decision 1495/BGTVT dated July, 2011, original investors were changed as follows: The first investor: BITEXCO (Binh Minh Import-Export Co.) The second investor: one selected through international competitive bidding
Implementing Scheme	As this is the first PPP project in Vietnam financed by WB, the final implementing scheme will be decided after the international consultant selected by WB reviewed it.
Funding	Investment from local and foreign investors. Loan from national budget and WB.
Construction Schedule	4 years of construction period after starting in 2012

Source: Mayer Brown Publications, 10 August 2010,"Vietnam's First Trial PPP Project"

On 21 February, 2012, with the support of consultants from WB, MOT completed a draft mechanism for pilot management and implementation of the Dau Giay-Phan Thiet Expressway Project under PPP and sent it to the relevant agencies (Ministry of Planning and Investment, Ministry of Finance, WB, the first investor of BITEXCO, and members of the interdisciplinary working group) for comment.
At this point, the mechanism has been completed and is still waiting for government approval before implementing the next step.

Basically, the project implementation mechanism is described as follows:
Principles and application mechanism:

1. The first investor is the limited liability company – BITEXCO group (because this unit has activity studied FS for the project from the first time).
2. The second investors were selected through international bidding in accordance with the mechanism and the sponsor's instructions. The second investor and the first investor form a business to conduct the project.
3. The equity of each investor in the project shall not be less than 20% of the total construction cost. The proportion of owner's equity participation between investors will be agreed upon based on the resources of each investor during the process of implementation.
4. Compensation for land acquisition, resettlement, relocation of social-welfare facilities, and the cost of mine clearance are made by the State budget in accordance with the provisions of Vietnamese law and donor requirements.
5. The government will bail out for the first investor to borrow from the WB's IBRD and this is one of the main incentives for investment projects. IBRD loans are counted as the investor's participation in the project.

Capital for the project is as follows:

1. Capital mobilized by the private sector includes:
   a) Corporate equity contributed by investors.
   b) The WB's IBRD loans guaranteed by the government for the first investor.
   c) Other capital arranged by project coorporation and the investors themselves.
2. Capital mobilized by the government includes:
   a) Viability Gap Fund (hereinafter VGF) for the project: to be determined through the international bidding process conducted by MOT and approved by the Prime Minister

in accordance with the mechanism. VGF for this project will be arranged through the WB International Development Association (hereinafter IDA) loans.

b) State budget will be used to pay for the land acquisition, compensation, support and resettlement, demining, relocation of facilities and infrastructure construction costs (if any) to implement the project.

c) Funds from international donors comply with the relevant agreements between the donors and the Government of Vietnam.

2.3.2. Collection of tolls on toll roads

Existing regulations related to collection of tolls on toll roads in Vietnam are as outlined below.

(1) Ordinance on Charges and Fees No. 38/2001/PL-UBTVQH10 of August 28, 2001

(2) Decree No. 57/2002/ND-CP of June 3, 2002 stipulating details in the implementation of the Ordinance on Charges and Fees

(3) Decree No. 24/2006/ND-CP of the Government on amendment and supplement to some articles of Decree No. 57/2002/ND-CP of the Government dated 03/06/2002 providing in detail the implementation of the Ordinance of Fees and Charges

(4) Circular No. 109/2002/TT-BTC of December 6, 2002 guiding the regime of collection, remittance, management and use of road tolls

(5) Circular No. 90/2004/TT-BTC of September 7, 2004 guiding the regime of collection, remittance, management and use of road tolls (replaces Circular No. 109/2002/TT-BTC)

The above detailed rules on implementing collection of road tolls (Circular No. 90/2004/TT-BTC) constitute an official notice from the MOF concerning the system of collection, remittance, management, and use of road tolls. Key points of the system of collection of tolls on existing toll roads prescribed by these detailed rules are listed below:

(1) Tolls on roads for which investment was provided from the government budget shall be standardized at all toll booths as prescribed in the toll table attached to the detailed implementation rules.

(2) The face value of passes issued for passenger vehicles (with seating capacity of 12 persons or fewer) shall be VND 10,000 per passage.

(3) The distance between two neighboring toll booths shall be no less than 70 kilometers.

(4) Tolls for roads and other facilities funded using private-sector funds such as BOT facilities shall not exceed double the tolls on roads for which investment was provided from the government budget.

(5) Firms handling collection of road tolls may deduct and retain a part of such tolls based on the prescribed percentage (%) prior to delivering collected tolls to the national budget.

(6) Firms collecting road tolls may deduct 20% of tolls collected. Of this 20%, 5% shall be remitted to the Directorate for Roads of Vietnam (DRVN) as funding for investment in modernization of toll-collection technologies and the remaining 15% shall be used for toll-collection work.

A recent development is the approval by the Prime Minister of Vietnam at the end of November 2012 of a policy for increasing tolls, proposed by the MOT. According to this policy, by 2016 the amount of tolls will increase by 3.5 times from the toll levels prescribed in Circular No. 90/2004/TT-BTC from the MOF. The toll for passenger vehicles with seating capacities of 12 persons or fewer will rise from the current level of VND 10,000 per passage to VND 35,000 per passage, and the toll for trucks with capacities of 18 tons or more will rise from VND 80,000 per passage to VND 280,000 per passage. The MOT plans to increase tolls first on the widened segment of National Highway No. 1 (between Hanoi and Can Tho) and on the Ho Chi Minh Highway (in the Thai Guyen segment).

The toll collection system on the HCMC-Trung Luong Expressway in service in southern Vietnam employs a closed method in which entry and exit at special expressway interchanges are controlled and tolls are charged by distance travelled. MOF Report No. 77/BC-BTC dated 28 July, 2009 prescribes tolls on the HCMC-Trung Luong Expressway, setting a level of VND 1,000 per kilometer for passenger vehicles with seating capacities of 12 persons or fewer. Tolls for other vehicle types are set based on the percentage differences in tolls by vehicle type prescribed in Circular No. 90/2004/TT-BTC. In addition, during the period they collect tolls on these roads the operators are permitted to revise tolls by increasing them by 30% every five years.

2.4. Status of the subject area of the Project

(1) Current status of the social infrastructure in the southern region

1) Roads

The major routes in Ho Chi Minh include NH1, connecting to Hanoi, and NH22, leading to Cambodia. NH1 was the only route connecting to the Don Nai Province (two lanes on each side).

Construction of the main highway in the east-west direction, including the tunnel crossing the Saigon River, was undertaken in order to mitigate traffic congestion and then completed in 2011 under a yen loan project (the Saigon east-west highway construction project, which started in 2000). This road is a 22 km-long urban expressway that runs across the city, and each end of the road connects to NH1 in the southwest and northeast of Ho Chi Minh. This

expressway is expected to help reduce the number of vehicles flowing into the metropolitan area, and as a result, relieve traffic congestion.
Moreover, a 55 km-long expressway connecting the east-west highway to Dau Giay through NH51 (Long Thanh City) is also under construction as a yen loan project, and is expected to open in 2014. This expressway will make it possible for drivers to travel between Ho Chi Minh and Long Thanh in about one hour. It is also expected that the commutation area will expand dramatically because of the connection with Ring Road No. 2.
NH22 is a two-lane pavement road, which is about 60 km long or one hour's drive from the suburbs of Ho Chi Minh to the Cambodian border. The section from the city to the suburbs, which is currently under expansion, is another hour's drive. In addition, NH50 connects Ho Chi Minh to the end of Long An Province, while NH51 connects Bien Hoa to Vung Tau.

2) Public Transport

In response to the survey results showing that 75% of the means of transportation in Ho Chi Minh are motorcycles, the Ho Chi Minh People's Committee intends to reduce the volume of motorcycles by 25% from the current level by 2010 and lower the percentage to 50% by 2020. It also aims to further mitigate the city's traffic congestion and air pollution through the construction of the east-west highway and subway.
Ho Chi Minh City is proceeding with the construction of Subway Line No.1, which began in 2010, with the support of ODA from Japan. This subway line, which is expected to open in 2014 or 2015, is an urban railway connecting the Ho Chi Minh metropolitan area (Ben Thanh) to the northeast part of the city (Suoi Tien) (19.7 km of total distance, which includes 2.6 km of underground lines) (subway and elevated railroad). It has also been reported that there is an initiative on the construction of Subway Line No. 2 to No. 7, which has attracted the attention of China, Germany, France, Russia, and Australia as well as Japan, according to the Ho Chi Minh subway development plan.

3) Railways

Railways in southern Vietnam include the North-South Vietnam Railway, which runs vertically through the country. The entirety of this 1,726 km single railway operates about ten daily trains linking Ho Chi Minh and Hanoi at a time of about 30 hours. Although the locomotives, passenger cars, and freight cars are shabby and the performance of railway stations is poor, this railway service is convenient for transporting heavy and high-volume goods because of the low cost.

4) Ports

Saigon Port, which consists of 24 harbors along the Saigon River, handles a large amount of cargo and containers. However, because it is a river port, it is only accessible to ships weighing up to 30,000 tons. As the port is a 10-minute drive from Ho Chi Minh City, it faces challenges with traffic jams, requiring the implementation of traffic controls for large vehicles. In order to respond to the increase in volume of cargo handled at the harbors following the economic expansion, development of Cai Mep - Thi Vai International Ports began along the Thi Vai River in Baria - Vung Tau Province, with investment by public and private participants, to serve as an international gateway. Of the 26 berths in all the projects, two private ports have already been opened.

5) Airports

Tan Son Nhat International Airport, which is located about 7 km from the downtown area of Ho Chi Minh, has two 3,000 m-long runways. In response to the rising demand for international flights, a new terminal was built beside the airport land with ODA from Japan and opened in September 2007. The new, four-story terminal has a floor area of 100,000 m^2 and is capable of handling 8,000,000 to 10,000,000 passengers. Although the existing terminal is currently used for domestic flights, Tan Son Nhat International Airport is expected to be filled to capacity within a few years. Thus, the New Long Thanh International Airport is planned to be built about 25 km east of Ho Chi Minh City.

6) Telecommunication

There are no serious power shortages in Ho Chi Minh and the surrounding area because electricity is supplied through the gas-fired power station in Vung Tau. Although ADSL has been developed, communications sometimes fail at heavy traffic hours because of the small line capacity.

7) Southern Industrial zone

The south of Vietnam is home to many industrial parks, export processing zones, and hi-tech parks in which many Japanese companies have made great investments. Around 60% of the total investments in the southern area are concentrated in Ho Chi Minh City, Don Nai Province, and Binh Duong Province. Characteristically, a number of industrial parks are built along NH1 around Ho Chi Minh and the border of Binh Duong Province and along NH13, which runs through the country from south to north.

(a) Dong Nai Province

i) Area and population of Dong Nai Province

Area: 5,903.940km2 (1.76% natural area of the whole country)

Population: 2,483,211 people（2009）
Population density: 386.511 people per square kilometers（2009）
Divided into sex: Male 1,232,182 people Female 1,251,029 people（2009）
Birth rate of the province in 2008 is: 15.24%

ii) Economic structure growth and transformation of the province

A high economic growth rate is maintained, economic structure transformation is performed properly and is improving the socio-economic infrastructural structure gradually and promoting the processes of industrialization and modernization.
The Gross Domestic Product (hereinafter GDP) increased to 13.2% per year on average. Therein, industry and construction increased to 14.5% per year, service increased to 15% per year, agriculture, forestry, and seafood increased to 4.5% per year. Although the resolution goals (14 – 14.5% per year) were not met for the above GDP increase rate, it was still higher than the increase of 12.8% per year during the period of 2001 to 2005, 1.5 times higher than the growth rate of the Southern key economic area, and 1.9 times higher than the general growth rate nationwide.
GDP per capita (upon actual price until 2010 up to 29.6 million Vietnam dong (equal to US$ 1,629)) increased 2.1 times higher than that of 2005 and beyond the resolution goal (29,4 million Vietnam dong).
conomic structure continued to transform in a positive way, in the right orientation and meeting specified goals. The GDP structure in the sector was transformed along with the direction of gradual increase in industry density - construction from 57% in 2005 to 57.2% in 2010, and service from 28% to 34.1%, with agriculture, forestry and seafood dropping from 14.9% to 8.7% in 2010. Economic structure in the economic sector was transformed along with the direction of gradual reduction in the contributive density of the state economic sector in GDP (from 24.7% in 2005 to 19% in 2010) and an increase in that in the GDP of the private economic sector (from 75.2% to 81%), in which there was a strong increase in foreign-invested economic sector (from 39.2% to 43%).
In parallel with the process of transformation of the economic structure, the labor structure saw strong transformation along with direction of reducing labor density in agriculture from 45.5% in 2005 to 30% in 2010. Non-agricultural labor increased from 54.5% in 2005 to 70% in 2010.

iii) Industry

Industrial production developed well along with the direction of modernization, and there were strong increases in production capacity. The production value of the whole sector increased to 18.1% per year on average, of which foreign-invested enterprises made up

83.8%. The internal structure of the industry underwent transformation in a positive direction, with the group of key industrial sectors accounting for over 70% of the production value of the whole sector, and achieved a growth rate was of 20% year. At the same time, it developed some high-tech industrial sectors (production of high quality electronic spare parts, some automobile parts, medical scanners, cosmetics etc).
The construction area achieved rather positive results. Construction output value increased to 20% per year on average, and the operational capacity of the sector showed progress both in the construction and manufacturing force of building materials, meeting the development requirements of the economy.
The planning and development of industrial parks was promoted and proved to be efficient. Eleven industrial parks were developed in the past five years, and at present, there are 30 industrial parks with an area of 9.573ha. Out of these, about 61% of the land area is leased (higher than the 47% nationwide and the 56% of the Southern key economic area).
The industrial parks play a very important role in the development of the industrial sectors as a motivational force for the process of urbanization, and they serve to facilitate remarkable contributions into local socio-economic development.

iv) Trade and service

The trading area developed rapidly. There were many supermarkets being built and commissioned, and the retail market was well utilized, meeting people's consumption demands. The total value of retail sales of goods and services increased to 26.9% per year on average. Special attention is paid to trade promotion, which contributed to supporting enterprises in discovering and expanding their markets. Total export turnover in 2010 acquired more than 7 billion USD (accounting for about 10% of total export turnover nationwide), increasing to 17.2% per year on average (higher than 16.6% than 5 years ago). The structure of export articles was mostly focused on industrial goods with a density of over 87%. Import turnover increased to 12.2%/year on average.
Service activity developed rather rapidly in some areas in scale, professions, and market thanks to the participation of the economic sectors. Added value increased to 15% per year on average (higher than the GDP growth rate in the region), contributing to employing more than 191 thousand employees working in service sectors until 2010, which makes up 30.9% of the total employees working in society. Some high quality services were developed, as were services for the industrial parks, and the quality of public transportation services were improved. A powerful information communications system was developed. Telephone subscription density per 100 people was increased up to 103 subscribers by 2010 (4.3 times greater than in 2005) and internet subscription density to 30 subscribers (7.7 times greater than in 2005).

v) Agriculture

The production value increased to 5.6% per year on average (higher than 5 years ago). The agricultural land use coefficient increased from 1.27 times in 2005 to 1.37 times in 2010. Average production value per 1 ha farming land in 2010 was 49.8 million VND, more than 2.4 times what it was in 2005

vi) Investment environment

The investment environment has improved considerably, so there were rather positive results in attracting foreign and domestic investment. Total foreign direct investment attracted over a 5 year period reached more than 11 billion USD, accounting for over 60% of the total Foreign Direct Investment (hereinafter FDI) from 1991 until now.
High results were achieved in the mobilization of resources for development investment. Total development investment for a five year period reached more than 121 thousand billion VND, making up 45% of the annual GDP (beyond the resolution goal). There were also positive transformations in investment structure, in which domestic investment made up 48% of the total investment, mostly from inhabitants, the private sector, and credit capital. Apart from investment of budget, which despite its small density (7.4%) is a key source of capital for investment in infrastructural structures and social infrastructures, especially in infrastructure for agriculture, rural areas, medical fields, education projects, key works, important fields, etc., creating a basic motivational force for the process of socio-economic development of the province.
The total budget revenues for the five year period reached 61 thousand billion VND, increasing 12.5% per year on average. The rate of budget revenue on annual GDP is 23%. Total budget expenditure for five years reached 24 thousand billion VND, increasing 9.1% per year on average, of which development investment made up more than 32%.

b) Ba Ria-Vung Tau Province

Baria - Vung Tau Province, with a population of about one million people, is located in the southeast of Ho Chi Minh City. This area is well known in Vietnam as a tourist region, developed by France during the colonial period about 100 years ago, and the marine industry, including fisheries, was developed long ago. The current major industries of the province include tourism, fishery, oil fields, steel, and electricity. In particular, the energy industry for oil and gas development has achieved the greatest level of development in Vietnam, and electricity and steel production is first place countrywide. Moreover, harbor development has been emphasized in recent years. Thanks to the development of the new

Cai Mep - Thi Vai International Ports, direct ships to North America began operation, enabling transportation without using intermediate port, such as Singapore, Hong Kong, and Taiwan. The existing harbor functions of Ho Chi Minh will be transferred into this port in the future. Centering on harbor development, the Province is promoting a shift from an agricultural population to an industrial population, in the aim of becoming an area where modern industry is integrally developed with harbors for physical distribution.

The oil development sector is controlled directly by the central government. With regard to the heavy and chemical industry sector, investments have been made in over 10 projects by corporations, including China Steel (Taiwan) and Posco (South Korea); however, there are a few projects in the supporting industries that have received investment.

With regard to industry parks that have been developed in the Province, 14 parks are presently open and half of the total foreign investment in the Province covers the costs of corporate entry to these industrial parks.

On the other hand, the Province regards the development of supporting industries as an important issue and focuses on supporting the development of technical workers in order to shift the business from agriculture to industry. The monthly wage for plant workers in this province is about 2 million dong (about 8,000 yen) to 3 million dong (about 12,000 yen), which is nearly half the level of Ho Chi Minh City, the area with the highest labor cost.

2.5. Current Status of Foreign Companies

Foreign companies, especially South Korean and Chinese companies, are participating in business- related expressway development in ways such as consulting service for survey and design, as contractors for civil works, and construction management in the construction stage.

In term of investment plans, Noi Bai-Ha Long Expressway Project is listed and the Economic and Technical Cooperation International Guanxi (GITEC) from China is conducting a feasibilitiy study.

Also, for the Dau Giay-Lien Khuong Expressway Project, South Korea's Incheon Urban Development Corporation (hereinafter IUDC) made a memorandum of understanding (hereinafter MOU) with MOT for investment of approx-imately. 1 billion USD and plans to build and operate under the BOT scheme.

2.6. Necessity of the Project

The studied area is located in the Southern Key Economic Zone (hereinafter SKEZ) including the provinces of Dong Nai, Binh Duong, Ba Ria-Vung Tau, Tai Ninh, Binh Phuoc, and Long An, as well as HCMC.

This region has achieved the highest economic growth rate in the country and contributes the most to the national economy. It is a hub for gathering and transport by road and aviation, it plays

role of an international gateway, and it attracts foreign investment. The infrastructure, especially transportation infrastructure, plays an important role in ensuring the development of the region, and it is the main driving force thereof.

Currently, there are many transport infrastructure improvement projects in progress as improvement projets for major national highways in this region, including the National Highway 1A development project, National Highway 51 widening project, National Highway 22 (HCMC-Moc Bai section) development project and many others.

However, in the country and this economic zone, there are still transport infrastructure situations that would support the increasing demand of social growth but that have not been satisfied yet.

According to the transportation sector development strategies (2020-2030) approved by the Prime Minisier (Decision No.35/2009/QD-TTg dated 3 March 2009), transportation infrastructure in the SKEZ will be developed for regional transportation improvement.

Some examples are the Ho Chi Minh-Long Thanh-Dau Giay Expressway Projects (under construction), the Ben Luc-Long Thanh Expressway Project (in detailed design), and the Bien Hoa-Vung Tau Railway Project (in the plan) in progress.

The BHVT Expressway project has been planned since 1996. MOT announced the approval of this project in Decision No.1949/QD-BGTVT, dated 2 July 2010, after the approval of the Prime Minister (official later No.298/KTN dated 24 January 1996).

Then, MOT has selected BVEC as an investor for the BHVT expressway project in order to meet the demands of the transportation infrastructure and ensure the regional socio-economic development plan.

The BHVT Expressway plays a very important role. This route will be the main factor in speeding up the economic development, and it plays an important role for the region and the country as well. This route is going to be constructed to bear the NH51 traffic burden and enhance the transport capacity from HCMC to ports and vice-versa. The construction of this expressway is a premise for developing industry Zones (IZs), the urban zones of the region and helping to complete the transport infrastructure, which is considered one of the most important factors in building up the international airport-Long Thanh as well as other transport hubs. As the eastern hub of HCMC, Long Thanh Airport is designated to share transport pressure with the Tan Son Nhat Airport, and accordingly, the urban transport of HCMC will also be improved. Not only will transportation activities benefit, but if done early, the BHVT Expressway will facilitate the development of the urban satellites of HCMC such as Long Thanh, Nhon Trach, Phu My, and so on.

At the same time, the importance of this expressway is deeply related to the Cai Mep - Thi Vai International Ports Project. In recent years the Cai Mep - Thi Vai deep-water port area's role as a hub port has attracted attention in light of the limitations on cargo handling capacity at the Saigon and Cat Lai port areas. It is attracting particularly strong attention from the sea transport and

trucking industries. Companies located in industrial parks in surrounding areas such as Ba Ria-Vung Tau, Dong Nai, and Binh Duong provinces, and those located in industrial parks in Ho Chi Minh City, expect to use the Cai Mep - Thi Vai deep-water port area as a main logistics facility, and as such this expressway is expected to be used for access from the industrial park to the deep-water port area. The deep-water port area is seen as a promising candidate for a future hub port with a sphere of influence extending as far as Cambodia, new industrial parks are planned in the SKEZ, an important economic zone in southern Vietnam, and use of the Bien Hoa-Vung Tau Expressway can be expected to increase more and more, including increases arising as a result of synergy effects with the Cai Mep - Thi Vai Port.

2.7. Economic Growth Forecasts, Projections, etc. for the Project Target Region

1) Current conditions

The average annual growth rate in the SKEZ where this project is located is 12%, and this zone accounts for 60% of Vietnam's industrial production, 70% of its export income, and 40% of its GNP.

The SKEZ is an important region as a target for investment in Vietnam, and 54% of the total amount of FDI in the nation over the past 20 years has been invested in this SKEZ region. Although FDI in Vietnam fell in 2009 to one-third the level of the previous year as a result of the global economic crisis, FDI in the SKEZ remained strong.

A look at current conditions shows that economic growth in Vietnam as a whole slowed in 2012 due to continued tight monetary policies intended to restrain the high inflation of the previous year, although these policies were successful at keeping inflation down. As a result, economic conditions in Ho Chi Minh City, the leading district in the southern region, clearly slowed from 2011, but it has been announced that the rate of growth in gross domestic product (GDP) in 2012 is projected to be a little over 9% in the region (The rate is 5% for the nation as a whole). While there is a variety of factors that conceivably could be important drivers of economic growth in Ho Chi Minh City, since FDI has not fallen much and personal consumption is strong, economic growth in the city can be said to be markedly more vibrant than in other cities and rural communities in Vietnam.

2) Future economic growth

The "Socio-Economic Development Strategy for 2011-2020" approved in the 11th Congress of Vietnam Communist Party in January 2011 identified as an overall goal for the nation making Vietnam basically a modern industrial state by 2020. The nation's political and social conditions are stable and marked by consensus. Democracy, order, and the material and psychological standards of living of the citizenry are improving. The country is able to preserve its independence and sovereignty and maintain its territorial integrity, and Vietnam's position

in international markets is strengthening. Now it is identifying as a goal the creation of a strong foundation for the next stage.

Vietnam's targets in the field of economics are listed below:

- Strong productivity growth, building appropriate production relationships, and integrating a market economy with a socialist orientation.
- Linking economic growth to environmental protection, and growing the green economy.
- Shifting the growth model based on broad-ranging development to a growth model based on development with balance between breadth and depth, focusing on improving quality and efficiency while growing in scale.
- Promoting economic structural transformations, realizing economic restructuring, and in the process of doing so promoting coordination of restructuring of enterprises with market power, focusing chiefly on restructuring in each production and service field in economic zones, to improve domestic production as well as economic value added and competitive strength in products and other areas.
- Achieving the target of an average rate of growth in gross domestic product (GDP) of 7 – 8%/year.
- Growing GDP in 2020 to 2.2 times its 2010 level.
- Achieving real GDP per capita of USD 3,000 – 3,200.
- Securing macroeconomic stability.
- Building modern, effective industrial, agricultural, and service economic structures.
- Ensuring that the relative importance of industry and services to total GDP is roughly 85 percent.
- Achieving a value of high-technology products accounting for approximately 45% of total GDP.
- Ensuring that the value of manufacturing-industry products accounts for approximately 40% of industrial production.
- Developing agriculture in the directions of modernity, effectiveness, and sustainability and supplying numerous high-value-added products.
- Ensuring that workers in the agricultural field account for 30% of all workers in society.
- Achieving a contribution of total productivity to growth of no lower than 35% and a rate of reduction of 2.5 – 3%/year in energy consumption attributable to GDP.
- Realizing savings in use of all resources.

- Integrating infrastructure-related structures and completing a number of modern construction projects.
- Achieving an urbanization rate of 45% or higher.
- Achieving a rate of approximately 50% of all villages satisfying the "new village" standards.

Economic growth in the SKEZ, the target region of this project, is expected to drive achievement of these national-level economic-growth numerical targets as well, and furthermore there also are plans for intensive investment in infrastructure development in this region.

3. Study and Proposal on Implementation Plan

3.1. Objectives of the Project

MOT has granted the project rights of the BHVT Expressway Project to BVEC. However, BVEC had already implemented the NH51 improvement project and therefore their investment power is extremely limited. BVEC is therefore expected to develop a business scheme to ensure operational profitability by receiving joint investments from Japanese and Vietnamese private investors and financial support from JICA PSIF, enabling early and efficient road development, operation, and management. On the other hand, consideration must be given to the issue of reducing the cost borne by the Vietnamese government.

Under such circumstances, the objectives of the development and operation of this project using private funds from Japanese investors and JICA PSIF are as follows:

① To develop the highway network in the South of Vietnam early in combination with the Ho Chi Minh - Long Thanh - Dau Giay Expressway Project and the Ben Luc - Long Thanh Expressway Project, which have already been implemented under ODA of Japanese government

② Similarly, to strengthen the traffic hub function of this area in conjunction with the Cai Mep - Thi Vai International Ports Project and the New Long Thanh International Airport Project, which are supported by the Japanese government.

③ To improve the traffic access to the industry park district, such as Bien Hoa, Long Than and Phu My, where the dynamic entry of Japanese companies has been witnessed, and enhance the socio-economic infrastructure to promote the development of the Ho Chi Minh metropolitan area as a satellite.

④ To make the most of Japanese technologies and know-how in highway operation as a joint project between Japan and Vietnam in expectation of the development and operation of safe and secure expressways. In addition, because expressways are an extremely important social infrastructure and require a large amount of time and cost for maintenance and management, forward-looking construction and control must be carried out to ensure quality and durability.

⑤ To reduce the budget of the Vietnamese government by receiving private investments in expressway development, thus contributing to the acceleration of the infrastructure development and the nation's growth.

⑥ Together to develop the this expressway and Cai Mep – Thi Vai is expected to use as hubport of deep-water port area in the SKEZ supported by JICA is expected to arise synergy effect each other. Besides it is also expected from companies located in industrial parks in surrounding area (including Japanese companies) because it can be realized the efficiency of distribution system.

3.2. Review of the scope of the Project

(1) Confirmation of the system of granting the project right

The survey on the BHVT Expressway Project started in 1996 and was approved by Prime Minister with the letter "No.398/KTN dated January 24, 1996." Moreover, MOT issued a document titled "Decision No.1949/QD-MOT dated July 12, 2010: Approval of the proposal on the BHVT Expressway Construction Project." In order to promote the development of traffic infrastructures with the aim of socio-economic and local traffic development, MOT has granted the project rights to BVEC by considering BVEC the executing organization of BHVT Construction Project, which has been proposed as a BOT project in accordance with Government Ordinance No. 108. With regard to the execution, operation, and management of construction projects, there are some matters that are bound by other laws, regulations, and rules as well as Government Ordinance No. 108, thus necessitating consultation with the relevant organizations.

1) Matters on land acquisition

Financial burden for costs of appropriation of land pursuant to Government Ordinance No. 108 and No. 69 (government and municipality/local people's committee and investor/SPC)

2) Matters on toll revenue

Consultation with MOF in compliance with Circular 90, which stipulates toll revision

3) Other matters on incentive granted to BOT providers

Corporate type of SPC entity (permit on investment to the government/Ministry of Planning and Investment, etc.) and preferential treatment of corporate income tax, value-added tax (hereinafter, "VAT"), and exports/import customs, etc. (consultation with the government/related authorities) under the Enterprise Law

Law on Enterprises:

The Law on Enterprises, 60/2005/GH (November 29, 2005) is a law equivalent to Japan's New Company Law, specifying matters including forms of companies, such as limited-liability companies and joint-stock companies, and company management systems (such as legal representatives and employees, general meetings of shareholders, boards of directors, and boards of corporate auditors), so that Vietnamese companies and foreign companies can do business in identical environments.

(2) Current status of BVEC

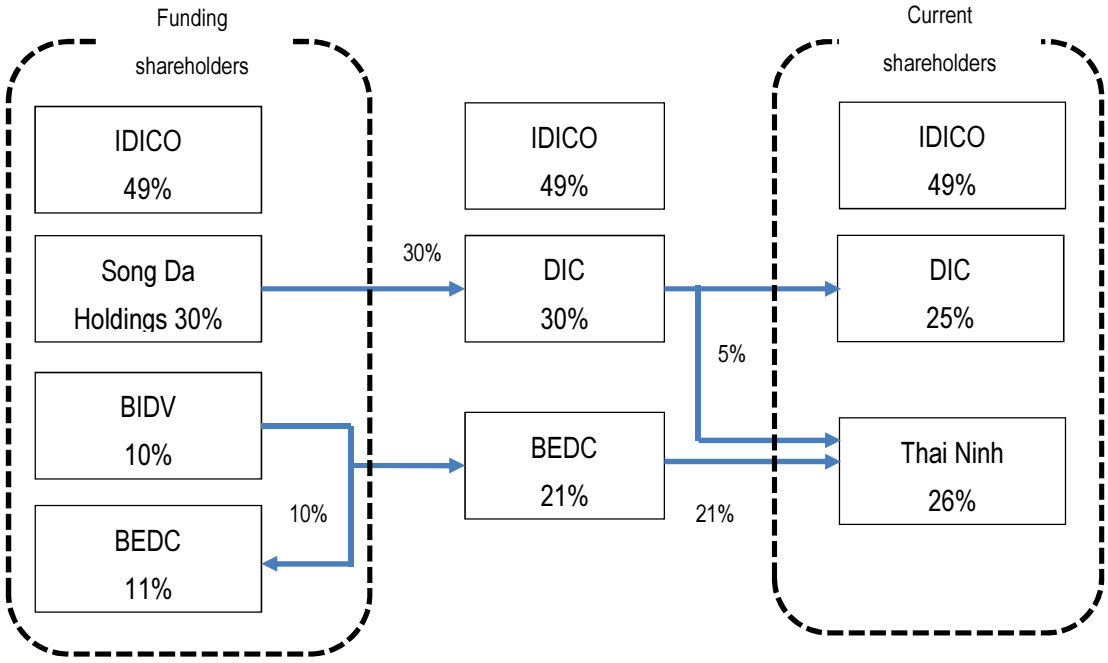
BVEC was established on 23rd December 2008 as the company developing the Bien Hoa-Vung Tau Expressway. At the time of establishment, the major shareholders are i) Vietnam Urban and

Industrial Zones Development Investment Corporation (hereinafter IDICO), ii) Bank of Investment and Development of Vietnam (BIDV), and iii) Song Da Corporation. The rates of capital contribution from the shareholders are IDICO (30%), Song Da Corporation (30%), and BIDV (21%).

On 2 February 2011, Song Da Holdings transferred all its shares to its subsidiary Development Investment Construction Joint Stock Corporation (DIC).

Also, on 8 March 2011, BIDV transferred itd shares in BVEC to its subsidiary BIDV Expressway Development Company (BEDC), and BEDC had 21% shares in BVEC.

At the end of 2011, BEDC and DIC agreed to transfer 21% shares and 5% shares in BVEC to Thai Ninh JSC with price of VND 10,000/share. As a result, current shareholders are IDICO(49%), DIC(25%) and Thai Ninh JSC(26%) as follows.



Source: Information from BVEC

Figure 3.2-1 Changes in BVEC's shareholders

(3) History of BVEC

Acoording to the Government Office Notice No. 54/TB-VPCP dated 4 March 2008, Vice Prime Minister Nguyen Sinh Hung hold the meeting on NH51's expanding project and Bien Hoa-Vung Tau Expressway project on 25 February 2008, at Government Office. Vice Prime Minister expressed the following ideas;

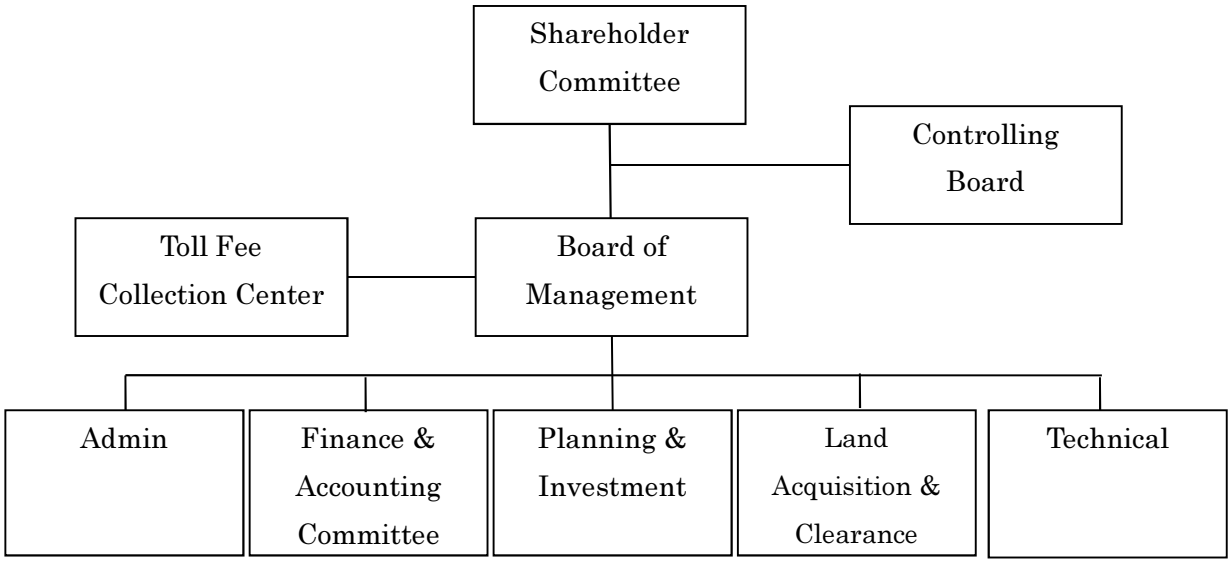
In order to push the implementation of Bien Hoa-Vung Tau Expressway's construction project and NH51's expanding, upgarading project, assigned IDICO to be host, along with BIDV to establish a joint stock company to invest in these 2 projects. MOT shall approve proposals early to let the investors implement projects under current regulations.

BVEC was incorporated on 23 December 2008 with chartered capital of 1,750 billion VND and signed the BOT contract to manage the NH51 expansion and upgrade project with MOT on 19 December 2009. This project was commanced in September 2009 and expected to be completed by December 2012. Also, BVEC acquired the Toll Gate T1 on NH51 for 400 billion VND and start toll fee collection since 1 July 2009.

Regarding BHVT expressway project, BVEC conducted F/S and promote the consultation with MOT to contract project agereement with Government.

(4) The organization structure of BVEC

By end of 2011, BVEC had 141 employees, in which 69 were working in toll fee collection center unit, the rest were assigned into 5 department of NH51 project.



Source: JICA Study Team

Figure 3.2-2 Organization structure of BVEC

(5) Overview of NH51 project

Overview of NH51 project is described by the below table:

Table 3.2-1 Overview of NH51 project

Project	Expantion and ugrade of NH51
Implementer	BVEC
Project method	BOT contract
Contract period	02/08/2009-27/03/2033
Initial investment budget	3,313 billion VND
length	72.7km
width	6 lanes @3.5m/lane
Toll gate	T1(KM11+00) T3 (KM56+45)
Development schedule Commencement Completion	 02/08/2009 02/08/2012 (as originally scheduled)

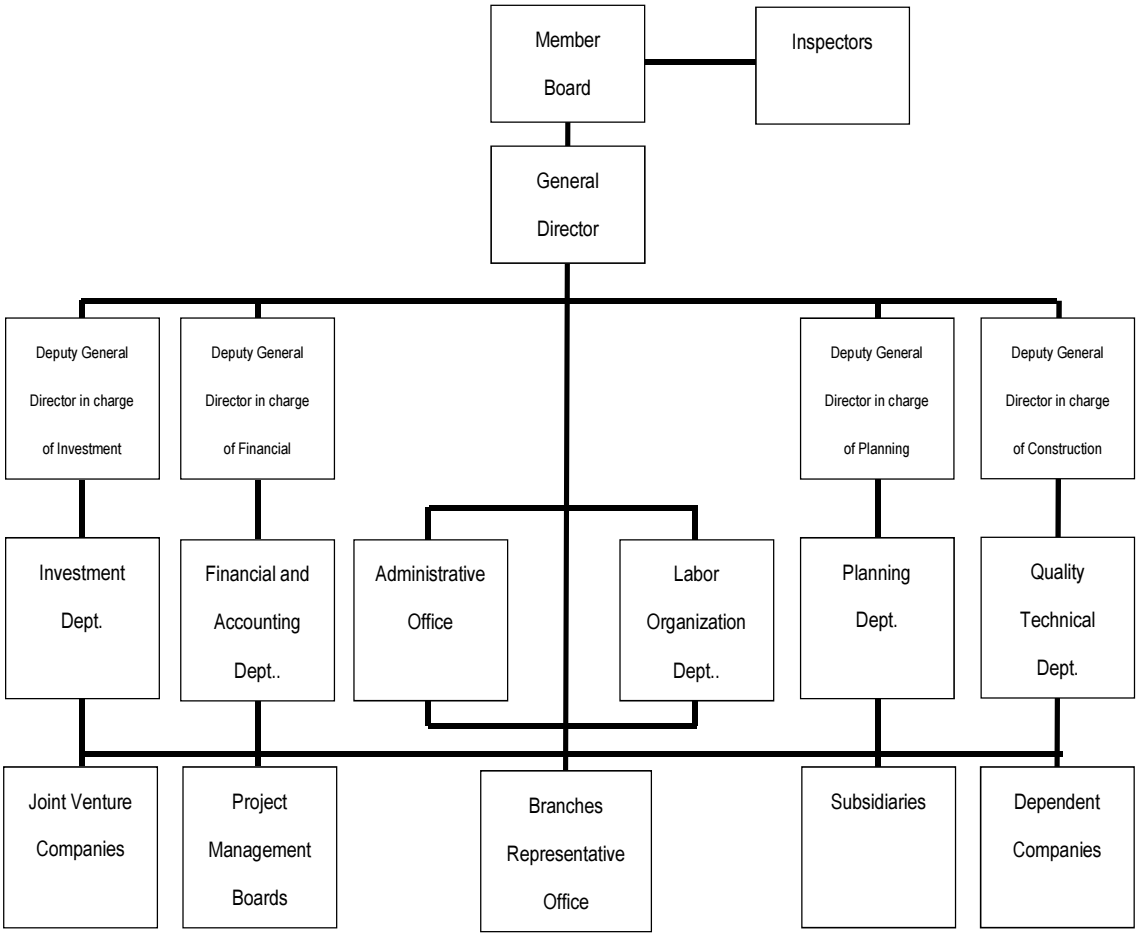
Source: JICA Study Team

(6) BVEC's Shareholders

i) Overview of the IDICO

IDICO is the State Corporation under the Ministry of Construction in accordance with the Decision No.26/2000/QD-BXD dated 6 December, 2000. IDICO have invested and developed projects of industrial zones, urban and residential areas, ports, roads, irrigation works, hydropower plants.

Traffic projects such as An Suong- An Lac route under National Highway No.1A (opened from 2005) and Noi Bai- Vinh Yen route under National Highway No.2(Opened from 2008) has operated by IDICO.



出典: IDICO Website

Figure 3.2-3 Organization structure of IDICO

ii) Overview of the DIC

DIC is listed on the Ho Chi Minh Stock Exchange (HOSE) and the main business of DIC is real estate, infrastructure development and construction, production of construction materials, mining and tourism.

iii) Overview of Thai Ninh J.S.C

Thai Ninh J.S.C. is a private company established as a joint-stock company engaged in construction investment projects. Having purchased BVEC stocks held by BIDV Expressway Development Company (BEDC) and Development Investment Construction Joint Stock Corporation (DIC) at the end of 2011, it now holds 26% of BVEC's shares. The company is not a listed company and its details have not been disclosed to the public.

3.3. Issues related with structuring Project Schemes

This section discusses recognition and issues which would have a large influence on structuring project schemes.

(1) Current Recognition

Vietnam is now experiencing an initial phase of Expressway Era of formation of major sections of the North-South Expressway, Expressway network of geater Hanoi area and of greater Ho Chi Minh area. In doing so, Vietnam should solve the issue on how it should launch this important initial pahse by complementarily utilizing funiding and expertise from Oversea while the government having high country risk rating and fund deficiency.
Especially in construction of expressway sections in and around the urban area, formation of urban expressway netoworks in the future must be properly considered. This BHVT Expressway would also form a part of such urban expressway network in the Greater Ho Chi Minh area.

(2) High Country Risk Rating of Vietnam and its Fund Deficiency

Vietnam is facing, as illustrated in the later section, high country risk issue (such as difficulty to structure hardcurrency commercial loan from outside) and fund deficiency inside the government. Therefore, project scheme should be structured to mitigate these issues.

(3) Large Network Risk

This project is assumed and planned as a major industrial thoroughfarefor Southern key Economic Zone (SKEZ, an area composed of 8 provinces of Ho Chi Minh City, Binh Duong, Dong Nai, Ba Ria Vung Tau, Binh Phuoc, Tay Ninh, Lon An and Tien Giang) which is called an engine of Vietnamese Economy. On the other hand, Bien Hoa- Phu My section of the Expressway should playan important role in connecting Ho Chi Minh City with industrial estates, international port and international airport. This section is also connected with other expressway sections from the City and also has competing route of NH 51. Future traffic volume would be largely affected by the traffic volume and connection timing of each segment, thus assumed to have “High Network Risk”

(4) Construction of Phase 2 by ODA(Phu My- Vun Tau Section)

In the preliminary JICA Study, construction of Phase 2 Section was proposed as publicly funded project including ODA. As described earlier due to high country risk and fund deficiency, possibility should be examined to utiulize the revenue from the Phase 2 Section in drder to mitigate the project risks of the Phase 1 Section.

3.4. Study on risks

3.4.1. Sort out all risks in expressway project

One of the fundamental elements for private investors and lenders to assess the project's feasibility is analyzing the risks involved in the project. General categorization of risks in large infrastructure projects is described in the following table.

Table 3.4.1-1 Categorization of all risks in this project

Categorization of all risks			
I	Risks of design, construction and O&M	a	Land acquisition risk
		b	Environment / Social risk
		c	Technical risk
		d	Project construction risk
		e	O&M risk
II	Project finance risk	a	Sponsor risk
		b	Financing risk
III	Risks of revenue	a	Traffic demand risk
		b	Toll fee risk
		c	Network risk
IV	Risks from external factors	a	Exchange rate fluctuation risk
		b	Interest rate fluctuation risk
		c	Currency conversion / Transfer risk
		d	Change of law / Regulation risk
		e	Political risk
		f	Accident and Disaster risk

Source: JICA Study Team

I Risks of design, construction and O&M

I－a. Land acquisition risk

Land acquisition risk is a risk that actual costs for land acquisition exceeds predicted cost, or land acquisition is not proceeded as planned due to the difficulties of related procedures. In transportation projects such as expressway projects, railway projects, this risk sometimes become problem, since the delay of land acquisition affects start of construction.
Also, in Vietnam, concessionaire should obtain land-use right, because the ownership of land belongs to government. Therefore, costs for land acquisition mean the costs for purchasing the right and resettlement.

I－b. Environment / Social risk

Environmental / Social risk is a risk that project implementation during construction and operation gives negative impact on social and natural environment, or in order to obtain appropriate approvals, related costs would increase or project schedule would be delayed. In general, infrastructure project such as this expressway project must comply with environmental/social regulations set by the country as well as guidelines of lenders and other related stakeholders.

I－c. Technical risk

This gets into the engineering areas of the project. It may come to pass that, due to design errors or improper techniques being adopted, the facility cannot perform the project as was originally planned. If there are complex structures, the risks associated with the Engineering, Procurement and Construction (hereinafter EPC) contractor's performance increases.

I－d. Project Completion risk

This is the risk associated with managing construction within the construction periods and the budget. Major risks in project completion are the follow.

- Land acquisition
- Permission
- EPC contractor risk
- Project construction cost exceeds budget
- The third party risk

With regard to risk allocation of cost over-run caused by delays in land acquisition and approval permission, it is desirable to reflect these things in the contract such as BOT in advance.

I－e. O&M risk

If the O&M company does not have the ability and experience necessary in operating and managing oversea roads, it will result in decreased income or increase dmanagement cost.

II Project finance risks

II－a. Sponsor risk

Sponsor risk is a risk that project can't be implemented anymore due to sponsor, in its managerial and financial capabilities. Although not sponsor but SPC implements the operation, since sponsor will be deeply engaged in long-term operation of SPC, sponsor of the SPC will be

required to have enough knowledge, experience and know-how aside from financial soundness as a matter of course.

II－b. Financing risk

Financing risk is a risk that SPC can't raise funds as planned in terms of amount and financial condition at the planning stage. Especially, since lack of Vietnamese government's and counterparts' fund-raising capability may affect establishment of SPC and project itself, detailed due diligence should be exercised.

III Risks of revenue

III－a. Traffic demand risk

Traffic volume is directly linked to project revenue, and toll revenue is recovery of the main investment funds. Accurately estimating traffic volume is key to the success of the project. It will be one of the most important prerequisite conditions in the balance since calculating the expected return on investment of the company.

III－b. Toll Fee risk

This is a risk that affects the balance of the project if the approved toll fee is below that initially assumed when opening, and if it is not executed at a time when toll fee revision is performed. It is caused by user resistance and when government approval cannot be obtained.

III－c. Network risk

Transportation construction risk is directly linked to the profitability of the project. The traffic volume of the expressway may be affected by forming a network. There may also be competition or additional traffic volume supplied. In the forecasted traffic demand, it is necessary to verify the impact of changes in the network plan. When other alternative transportation for which a network is not formed is developed, the traffic volume may be lower than expected.

IV Risks from external factors

IV－a. Exchange rate fluctuation risk

Exchange rate fluctuation risk is a risk that unexpected losses might occur due to fluctuation of exchange rate and it might have influence on continuing business. This is because, while the revenue of the project is in local currency, repayment of loan by SPC is by foreign currency. Also, there is currency exchange risk on dividend payment to Japanese investors of SPC.

IV－b. Interest rate fluctuation risk

Interest rate fluctuation risk is a risk that unexpected losses might occur due to change of interest rate.

IV－c. Currency conversion / Transfer risk

Currency conversion/Transfer risk is a risk that local currency cannot be converted to hard currency, such as Japanese yen, or converted amount cannot remitted to foreign investors cross borders due to change of guidelines related to the restriction of such monetary movements. Once the change occurs, equity return would go extremely bad.

IV－d. Change of law / regulation risk

Change in law/Regulation risk is that, as a result of change of law and/or cancel of approvals and licenses related to expressway projects, business operation might be hampered.

IV－e. Political risk

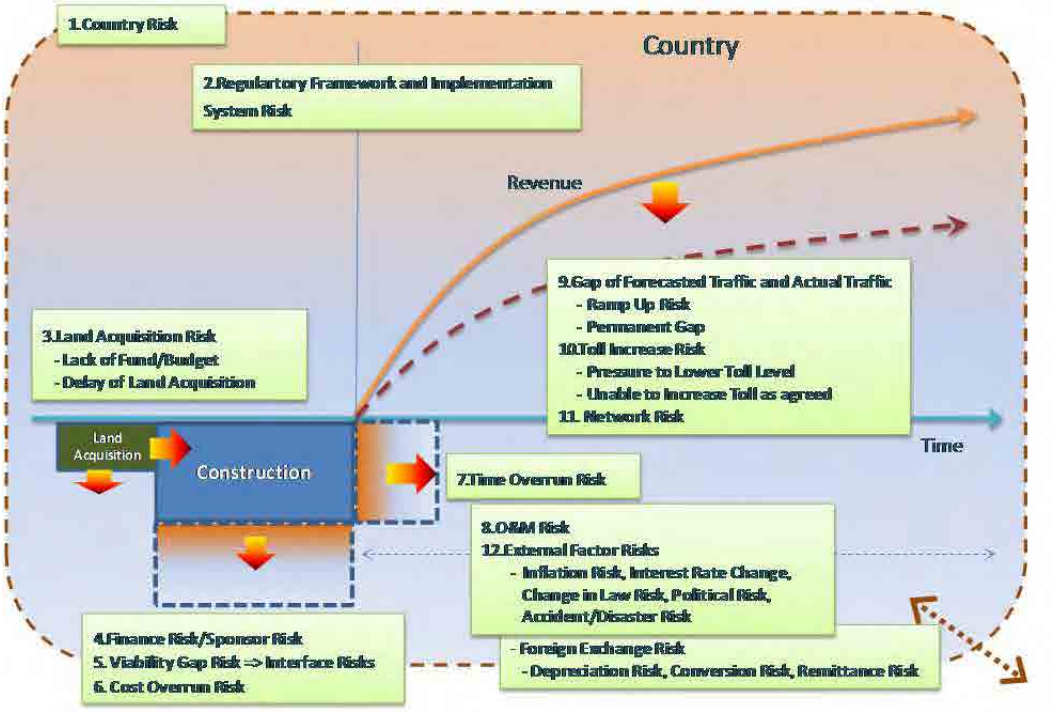
Political risk is a risk that unstable legal condition in the project country and area might hamper or suspend the operation of the project.

IV－f. Accident and Disaster risk

Accident and disaster risk is a risk that accident and natural disaster such as earthquake and fire might stop the operation of a project.

3.4.2. Already occurring project risks in expressway sector in Vietnam and possible controlling measures

Figure 3.4.2-1 shows project risks for privately financed expressway projects in Vietnam. Majority of these risks are already occurring in the on-going expressway projects in Vietnam. How to control these project risks is the critical issue that private investor, especially oversea investor, should consider. It is essential to build the controlling measures of these risks into the project structure. These measures will be discussed in the following section.



Source: JICA Study Team

Figure 3.4.2-1 Already occurring project risks in Vietnam

(1) Country Risk of Vietnam

There are various country risks in Vietnam which includes risks associated with regulatory framework and implementation and administrative capacity of materializing private sector participating expressway projects. However, in the area of financing, low rating of foreign currency borrowing of Vietnam (rated as B2 , speculative by in Moody's). Based on a number of interviews with foreign commercial banks, their basic recognition is that uncovered Vietnamese risk could not be taken in the foreign currency lending. If they are to extend lending in foreign currency, the condition is that i) Guarantee by MOF, ii) 100% foreign exchange guarantee and iii) Risk cover of ECAs must be obtained (ex. SMBC lending to Hanoi Hai Phong Expressway project, although it is said to be a special case). Even for Petro Vietnam with sufficient foreign currency revenue, the foreign commercial banks would take uncovered country risk of up to 3 to 5 years in foreign currency lending. As such, it seems unlikely that the foreign commercial banks to extend foreign currency lending to privately financed expressway project in Vietnam. In terms of mitigating this kind of country risk in financing aspects, available options are to use financing such as Private Sector Loan of donors and International Financial Institutions which could cope with such country risk of Vietnam.

In addition, not only the finance aspect, but the external project risks (such as foreign exchange, change in law, force majure) are also important and would need back up support of donors and IFIs when the investor to negotiate the contractual onditions and government support. Therefore,

it is preferable for the investor to make these donors and IFIs proactively involve in the project as earily stage as possible and should invite these stakeholders as necessary in the meeting of Working Group (WG) in the stage of negotiationsit for contract conditions and government support.

(2) Regulatory Risk

The proposed project scheme described in detail in Section 3.5 would require government support such as the construction of the Phase 2 section by the government and let the private sector enjoy the revnue from the Phase 2 section in order to secure expected project return, which would go beyond the scope and the conditions stipulated in the existing BOT law and the PPP pilot regulation. To this end, implementation of the project based on these current legal framework for privately financed infrastructure project may allow the government to exercise more discretional decision making in view of contract negotiation, thus could foresee difficulty and risks in negotiation. Therefore, project conditions should be secured and fixed on elaborated negotiation with the government on the basis of special mechanism with Prime Minister's approval. Based on this framework the project contract would be entered into with MOT and GGU(Government Guarantee & Undertaking) would be signed between the concessionaire and the government for specific conditions which require the government support for implementing the project.

(3) Land Acquisition Risk

There are the following three types of risks for land acquisition:

① Fund Dificiency Risk

② Budget Allocation Risk

③ Delay Risk in Land Acquisition Procedure

About the land acquisition risk in Vietnam, the fund deficiency risk is being materialized as allocation of budget as a prerequisite for ODA procurement (the local portion: counterpart fund) is facing difficulty and becoming significant obstacle for project implementation. This could be an obstacle for privately financed project as this project (the Phase 1 Section of BHVT Expressway project) in similar manner as the project is assuming the procurement of the ODA fund.

It is necessary in the same manner as the proposal on source of funding for the risk cover as mentioned above to propose proper methodology on how to procure fund source for this land acquisition cost, thus to move the land acquisition process forward.

Naturally, financing of this funding must be done directly by the Government. At present possible method to think of could be such method as a BT scheme which will be described in

detail in the later section and cofinance with ADB finance which could cope with financing of land acquisition cost and so on.

Budget allocation risk could be technically avoided if the budget allocation is linked with the fundto be procured in the above mentioned process. However, it is worthwhile to examine if other issues exist about the budget allocation risk.

For private investor, delay risk in land acquisition process must be separated and isolated from the completion of the expressway construction, so that consideration on project structure and contract conditions are necessary such as making the completion of land acquisition as prerequisite for investment, MOU with exit option for private investor and so on.

(4) Finance/Sponsor Risk

BVEC is a newly established company by IDICO which is a creditworthy public corporation for industrial estate development and SONDA which is one of the largest contractors in Vietnam, as its major shareholder. First issue to consider is its capability of of funding the equity of the project company, which could become as much as 3 billiong Japanese Yen assuming that BVEC wouls holds 51% of the company's equity with the currently estimated total project cost. Answer by BVEC to this query in the interview was funding by initial public offering of the project company for the NH51 expansion BOT project based on its future potential cash flow value. However, considering the following current situation, its possibility would be very small. The total project cost of the NH51 expansion BOT project was estimated at about 200 million USD and at present seems to be experiencing cost over run. The project is a 24 year BOT project abd its debt is 110 million USD with 4 years grace period and 12 years repayment period from BIDV. The revenue size is about 6.3 million USD, with additional O&M expenses required, thus difficult to repay the loan with the above mentioned loan conditions. It is said that the minimum toll level of the first toll gate is scheduled to increase from 10,000VND to 20,000VND and addition of the second toll gate could expand the revenue size. It is essential including these plans to examine the potential profitability of the NH51 expansion project and assess what kind of potential risks involved in the project.

(5) Viability Gap and Interface Risk with Government Construted Section

If the project scheme is to be developed with the condition that the Phase 2 section is constructed by the Government with simultaneous opening with the privately constructed section, there would be the following risks; i) Delay in ODA procurement process, ii) No compensation in case of delay in the government section due to insufficient funding availability or iability of budget allocation, iii) Insufficient reflection of private sector intention to the government constructed facility and function. Especially for the time over run risk which is already

occurring in the ODA funded expressway projects in Vietnam, it is necessary to sxecure the funding source of compensation payment (such as liquidated damage penalty payment for construction delay due to the government reason). The details of controlling measures for such interface risks will be explained in the section 3.5.5.2.

(6) Cost Overrun Risk

Cost overrun risk (increase of construction cost) is generally recognized as risk for private sector investor, though it is considered important for private sector investor to manage this risk since such risk is actually occurring in on-goin construction of a number of expressway sections funded by ODA fund. Ultimate control of this risk is considered very difficult since it is closely related with capability of country's inflation management. However it sould be critical to verify the existence of contractors who could accept fixed price, date certain, lumpsum, turn key contract condition, strict conditions of prequalifying contractors, cost management and compensation mechanism by government based on super inflation clause.

(7) Time Overrun Risk

Time overrun risks (delay and completion risks) occur due to land acquisition and insufficient capacity of contractor and so on, and are actually occurring in many on going construction of expressway sections. If the risk occurs due to the government causes, it is necessary for Vietnamese government to procure funding to cover its compensation of such risk. It has been generally practiced in the past in Vietnam to cover such risk by extending the length of concession period, but it is not essentially appreciated and recognized as effective measure of such risk covering. Therefore, it is essential to simultaneously propose the method of fund procurement for the back up funding.

(8) Accuracy of Traffic Forecast and Network Risk (Traffic Risk)

First of all, traffic forecast of green field expressway could involve risk associated with accuracyof traffic forecast as illustrated in the figure below. This is a result of study conducted by Standard & Poor's in 2005 collecting 104 samples (concession based expressway, tunnel and bridge projects) and surveyed the difference between the traffic forecast level by original F/S and actually materialized traffic level. As a result, average difference of the 104 samples was 0.77 with standard diviation of 0.26, explanining that the traffic is likely to be overestimated by about 23%. Together with this kind of forecast accuracy risk, there is also network risk as described in the following.

From now on, significance and size of impact of these netowrok risks will be analyzed based on the detail traffic forecast.

① Competition risk of NH 51 influencing traffic demand of the BHVT Expressway

② Influence of Inter-Port Road

③ Delay in completion of Ben Luc-Long Tanh Expressway

④ Delay in opening of Long Tanh International Airport

⑤ Delay in completion of connecting section in Ho Chi Minh City for HCM-LT-DG Expressway due to delayed land acquisitio

⑥ Other Network risks

Conservative Base Case will be set on the basis of analyzing these network elements and connection conditions, and analyze possible down side cases of the network risk.

If it is difficult to control this kind of network risks, government guarantee for compensation of down side risk may be necessary. Furthermore, if it is difficult to set guarantee and contract condition for each network risk element properly, mechanism of minimum revenue guarantee may be needed.

In this kind of situation, the issue of country risk is important because even if Vietnamese Government agrees to extend the above mentioned minimum revenue guarantee mechanism, private sector investor would tend to question about effectiveness of such guarantee and securing fund source for such guarantee as the government has difficulty in allocating state budget for land acquisition coast which is a prerequisite for ODA fund procurement, thus the mechanism itself is not likely to work as proposed.

To solve this problem, it is necessary to structure a project scheme which could simultaneously solve the problem by proposing how to secure the funding for potential compensation payment of the minimum revenue guarantee mechanism.

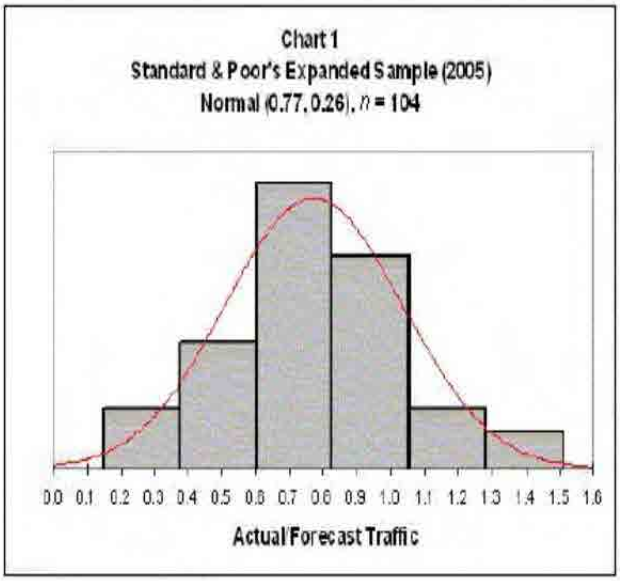
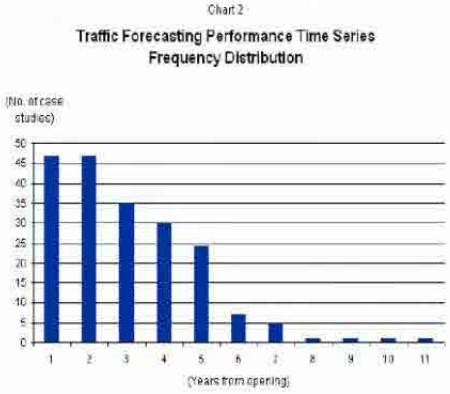


Table 1

Forecast Performance Distribution Statistics For Years 1-5

Years from opening	Mean	Standard deviation
Year 1	0.77	0.26
Year 2	0.78	0.23
Year 3	0.79	0.22
Year 4	0.80	0.24
Year 5	0.79	0.25



Source: Traffic Forecasting Risk Study, Update 2005: Through Ramp-Up And Beyond, Standard and Poor's, August 25, 2005 (104 concession based road, tunnel and bridge)

Figure 3.4.2-2 Accuracy of Traffic Forecast for Green Field Conccession based Expressway Projects

(9) External Factor Risks

There are some external factor risks which seem manageable if appropriate contractual conditions are considered and obtained. However, it is necessary to give careful consideration to management and controlling measures of such external factor risks as drastic inflation risk, change in law and regulation risk, force majure risk, currency depreciation and conversion risks.

3.4.3. Risk Assessment

Table 3.4.3-1 Consideration and Evaluation for each risks

	Evaluation	Evaluation Comments	Mitigation Measure
Regularity Risk	High	In proposed business scheme, setting the terms and consitions beyond the scope of exsisting law such as BOT law and PPP law should be required. At negotiation stage, considering government's level of its discretion and difficulty of judgement, it is assumed that it will take much time for Vietnamese government to make decision.	First of all, private investors have to explain to Vietnamese government the terms to secure feasibility and to participate in this expressway business, and then they need Vietnamese government to understand that, as special mechanism, terms beyond the scope of existing law such as BOT law and PPP law should be set up. Furthermore, since there are many decision-making bodies, Vietnamese government will be required to set up a forum for discussion across those bodies.
Land acquisition risk	High	Land acquisition of this project will be done through negotiations with local people and local people's committee after the result of survey which has been conducted by BVEC in parallel is approved by Vietnamese government. However, in fact, time overruns were observed in other expressway projects in Vietnam due to the delays of land acquisition. Therefore, it is not assumed that implementation of land acquisition is easy. In phase1, estimated costs for resettlement of approximately 800 households will be 9 billion JPY.	It is preferable that Vietnamese government has obligation to acquire land and bear related costs. Besides, additional costs caused by the delay of land acquisition will also be borne by government. However, even in the situation above, it should be stipulated in government guarantee that land acquisition will be done with proper timing. Otherwise, the delay of land acquisition leads to delay of completion of road and increase of related costs.

	Evaluation	Evaluation Comments	Mitigation Measure
		Even if the cost is borne by Vietnamese government, the way of fundraising should be considered a lot. Also, the delay of start of operation means that SPC has to repay principal and interest, though SPC cannot earn enough revenue from the expressway project yet and it affects continuing operation. Therefore, there is no denying that land acquisition risk of this project is too high.	
Environment / Social risk	Medium	EIA which BVEC conducted in the past has been approved by Ministry of Natural Resource and Environment (hereinafter MONRE) (Decision No.306/QD-BTNMT 15th.March.2012). And, in this survey, there is no significant change from the old one. Therefore, it is expected that the process of re-conducting EIA and re-obtaining approval of MONRE would be omitted. And it is unlikely that necessary procedures would be delayed. In order to utilize JICA's PSIF loan, it is required to meet JICA's guidelines for environmental and social considerations. Through this feasibility study, it is expected this expressway project could meet all the conditions of the guideline.	Private companies/SPC should conduct EIA, if needed, and comply with related guideline required by JICA to prevent such risks before they happen. Also, it is preferable that Private companies/SPC obtain clear understanding of local people and government guarantee in preparation for increase of costs due to delay of necessary procedures.

	Evaluation	Evaluation Comments	Mitigation Measure
Technical Risk	Low	In this project, results of review show that there are no special bridges or long-span bridges, and the level of technical difficulty is low for measures on soft ground. Project delays or breaches of contractual obligations have a large impact upon the project. Therefore, the ability and the achievement of EPC contractor should be considered.	It is important to contract with an EPC contractor with experience and credit capability in Vietnam. It should be designed not to use high-tech construction techniques. If high-technology is necessary, it should be contracted with a company that has sufficient technological capability.
Project construction risk （Cost Over-run, Time Over-run）	High	In this project, results of review show that the difficulty of execution management is low. However the completion risk includes exceeding the cost or the time due to land acquisition, license permission, or other aspects that the private sector cannot control. Therefore it should be defined in the risk allocation. On the other hand, there is a high inflation rate in Vietnam in recent years. There is a possibility that the cost will be exceeded when the price levels of project facility construction costs exceed what was expected during the construction period.	It is important to contract with an EPC contractor with experience and credit capability in Vietnam. It should be designed not to use high-tech construction techniques. If high-technology is necessary, it should be contracted with a company that has sufficient technological capability.
O&M Risk	Low	The expressway company that participates in the SPC has O&M ability and experience. It is considered to be managed reasonably because BVEC, which operates and manages Route 51,	It is important to contract with an O&M company with experience and credit capability in operating and managing and with sufficient technological capability in Vietnam. A system in which SPC can support technology and know-how should be

	Evaluation	Evaluation Comments	Mitigation Measure
		participates in the SPC as well. Therefore this risk is low.	established.
Sponsor risk	High	As potential Japanese investors, expressway companies, a trading firm and a consulting firm which have been conducting this feasibility study have expressed their interest and have considered participating in this project actually. Judging from their experiences/past records of expressway project and/or other businesses in Vietnam, it is projected that sponsor risk of this project is comparatively small. On the other hand, those potential investors will have to check way of raising funds, each percentage of investment, etc carefully through sufficient discussion with sole local partner, BVEC.	Each potential investor should consider feasibility of this project carefully and each company's precondition for participation in this project as investor should be shared each other from an early stage. Through such an organization, necessary amount, as equity, will be invested by each company. For BVEC, it is preferable that Japanese investors check their capability of investment carefully through credit report from trusted third-party.
Country Risk	High	There are various country risks in Vietnam which includes risks associated with regulatory framework and implementation and administrative capacity. In the area of financing, it is true that rating of foreign currency borrowing of Vietnam is still low. According to a number of foreign commercial banks, their basic recognition is that uncovered Vietnamese risk could not be taken in the foreign	For loan, SPC will get a concessional finance, so called PSIF, from JICA. For investment, it is better for Japanese investors to check BVEC's capability of getting finance carefully so that BVEC can make sure to invest to SPC. Also, when negotiating the contract, all risks have to be allocated to either public or private.

	Evaluation	Evaluation Comments	Mitigation Measure
		currency lending. Therefore, it seems unlikely that the foreign commercial banks to extend foreign currency lending to privately financed expressway project in Vietnam. Also, considering the fact that Vietnamese government could not arrange finance on local portion due to its fund shortage, country risk is regarded as high.	
Traffic demand risk	High	Considering downward swing risk of demand forecasting and large influence from related traffic networks of this expressway business, from the point of uncertainly, there is no denying that traffic demand risk of this project is too high.	It is needed to exactly understand the bottom line of traffic volume to secure feasibility of this project through sensitive analysis. After understanding the bottom lile, private investors have to negotiate about to what extent they need to have revenue guarantee from Vietnamese government. However, in order for SPC to recieve guarantee actually, proposing ideas for Vietnamese government to get resource to pay is needed.
Toll Risk	High	The Scenario of tariff level and adjustment has a very high impact on the project IRR. However, tariff adjustments will require government approval every time. If tariff levels are not adjusted and the cost factor alone increases, this could eventually lead to financial difficulties for SPC. Therefore this risk is high.	In tariff setting, it is desirable that the government has a minimum toll revenue guarantee. However since the budget must be distributed to the organization, there is a possibility that the guarantee will not be actually paid. Considering situations of any other projects in Vietnam, it might be difficult to apply availability payment method. In order for SPC to change tariffs flexibly and reflect inflation and fluctuation of exchange rate on

	Evaluation	Evaluation Comments	Mitigation Measure
			tariff, the appropriate structure has to be set up. Based on the structure, MOT and MOF are required to approve that SPC change tariffs.
Network Risk	Medium	In the Phase 1 section, there is network risk shown 3.4.2(8). Traffic volume of the expressway may be affected by the formation of a network, or there may be competition or additional traffic volume supplied. In either case, the impact on the balance of the project is very large.	It is necessary to explain to the government the impact of the timing the opening of competitive routes. It is also necessary to explain to government the impact of the balance caused by the delay of the opening of a route which forms a network. This should be included in the network development plan scenario with the concession contract.
Interface Risk	High	In proposed scheme that phase2 section, public section, is open at the same time as section1, if opening of section 2 is delayed by the reason of government's matter, since SPC can't get enough revenue from operation of section2, that will have negative affect on project's feasibility.	The way of coping with interface risk is described in 3.5.2.2 of this report. Basically, the way needs to be mentioned in GGU and concession contract.
Exchange rate fluctuation risk	High	There is a concern that VND itself is unstable, since VND was devaluated in the past. Therefore, if PSIF provided by JICA to SPC directly is on a yen basis and its tenor is long, exchange rate fluctuation risk is very high.	Private companies can't control this risk. Therefore, in case it is difficult for SPC to repay principal, interest and disburse dividend, the effect of fluctuation of exchange rate should be borne by Vietnamese government.

	Evaluation	Evaluation Comments	Mitigation Measure
Interest rate fluctuation risk	Low	This project is proceeded with based on the premise for utilizing JICA's PSIF and interest rate of the loan is fixed. Therefore, in the case, interest rate fluctuation risk will not arise at all.	As stated left, since this project is proceeded with based on the premise for utilizing JICA's PSIF and its interest is fixed, this risk will not arise at all. Even if the loan is co-financed by syndicate organized by JICA and other financial institutions, interest rate of the portion of other financial institutions should be fixed.
Currency conversion / Transfer risk	High	This project is proceeded with based on the premise for utilizing JICA's PSIF and interest rate of the loan is fixed. Therefore, in the case, interest rate fluctuation risk will not arise at all. Even if the loan is co-financed by syndicate organized by JICA and other financial institutions, interest rate of the portion of other financial institutions should be fixed.	Since private companies can't control these risks, private companies should purchase insurance for covering such a risk. Otherwise, government guarantee should be stipulated in investment certificate/concesstion contract. For transfer risk, it should be considered to utilize offshore account.
Change of law / regulation risk	Medium	If legal systems to ensure implementation of expressway project, such as BOT contract, restriction on foreign investment, company act, are changed, the project might not be implemented as planned. Besides, changes in these regulations can sometimes negatively affect the profitability of the project, like repeal of government guarantee, approval and license to other competing ways,	Since private companies can't control these risks, the right to get compensation for unfair change of law should be stipulated in GCU and/or concesstion contract.

	Evaluation	Evaluation Comments	Mitigation Measure
		suspension of preferential treatment, restriction on overseas remittance, etc. Hence, investors will typically discuss this matter in detail with Vietnamese government.	
Political risk	Medium	As an example, in case of MOT's default of its obligations, SPC might face difficulty of continuing business and/or concesion contract between SPC and MOT might be terminated.	Private companies should monitor continuously if situation in Vietnam is stabilized and some political risks should be hedged by purchasing insurance.
Accident and Disaster risk	Low	Accident and disaster risk can be reduced by establishing a system that SPC has a strong structure of operation and maintenance, purchasing liability insurance and getting government guarantee in concession contract.	Like political risk, this risk can be mitigated by purchasing insurance.

Source: JICA Study Team

3.4.4. Risk Allocation among Major Stakeholders

Basic risk allocation is shown in Table 3.4.1-1 based on the project process. Besides the process wise, risk allocation is shown also for important risks.

In principle risks in the privately constructed section are assumed by the private and those in the government constructed section are to be assumed by the government. For the government constructed section, the private sector would conduct cross check for the FS and design which the government prepared in order to reflect the intention of the private sector, and to enjoy a part of revenue form the government constructed section in order to secure expected profitability of the private investment.

On the other hand, the risks which the government would assume in the privately constructed section would be such risks which the private sector is unable to control as land acquisition, construction of access road and other related facilities, assumption of defect risks of the government constructed section and facilities, toll increase and traffic risks. Detailed risk allocation of these risks will be discussed in the section of Security Package (Section 3.8).

Table 3.4.4-1 Basis Risk Allocation

Role/Risk Allocation			BH-LT-NT Section (Private)	NT-PM/NH51-VT Section (Public)
F/S			Private	Public
F/S Cross Check			Private	Public
Finance			Private	Public
Design			Private	Public
Design Cross Check			Private	Public
Land Acquisition			Public	Public
Construction	Infrastructure		Private	Public
	Access Road/Ancillary Facilities		Public	Public
	O&M Facilities (incl. ITS)		Private	Public
O&M	Toll Collection		Private	Public
	Revenue		Private	Private (less O&M expenses)
	Operation and Maintenance		Private	Public
RiskAllocation	Defect of Infrastructure		Private	Public
	Defect of Access Road/Ancillary Facilities		Public	Public
	Defect of O&M Facilities		Private	Public
	Traffic Risk		Private (risk adjusted)	Public
	Toll Increase Risk		Public (risk adjusted)	Public
	Toll Collection Method		Private	Public (Contract)
	Cost Recovery Method	O&M Cost	Private	Public
		Investment Recovery	Private	NA
		Debt Service	Private	NA

: Private Risk

Souce: JICA Study Team

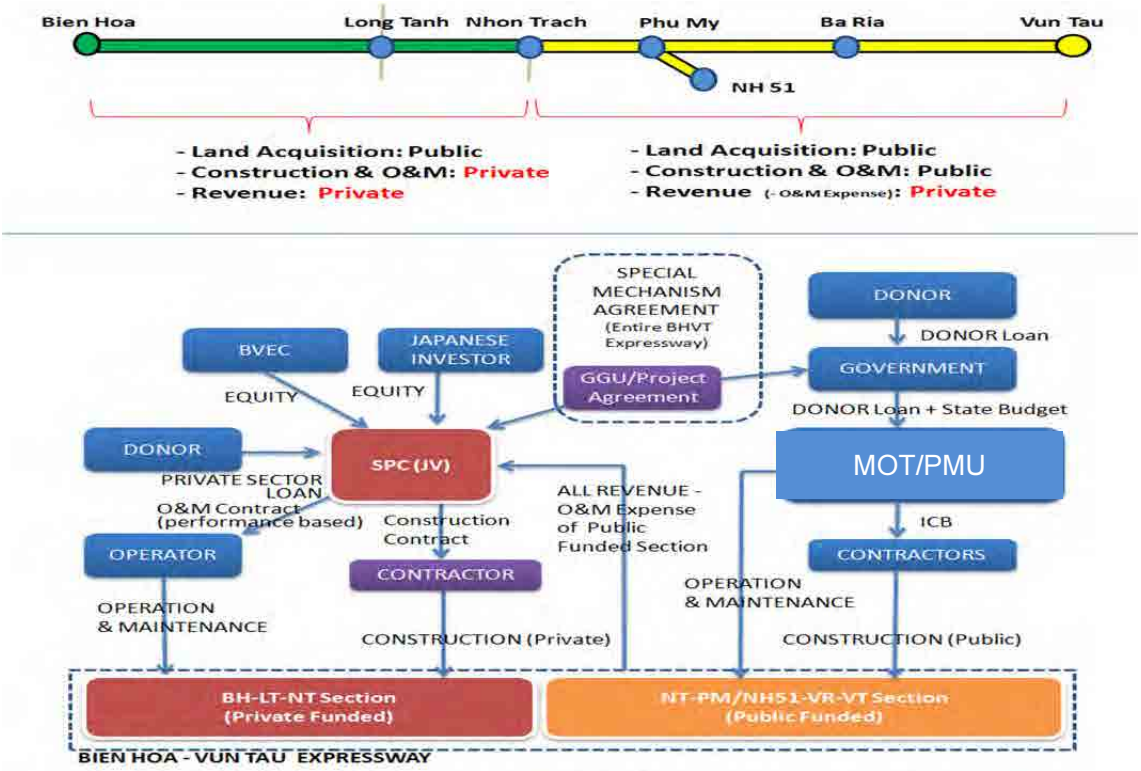
3.5. Proposed Project Scheme and Issues to consider

3.5.1. Proposed Project Scheme

Total project scheme of the BHVT Expressway Project combining both the Phase 1 Section ans the Phase 2 Section is shown in Figure 3.5.1-1. As illustrated in the figure that the land acquisition is to be conducted by the government, the BH-NT section is constructed by the private, the NT-VT section is constructed by the government, O&M service of each section is to be conducted by each, and the private is to receive the revenue of the NT-VT section after deducting the O&M expenses of the same section.

The private sector is to establish a SPC which is a JV between BVEC and the Japanese investors based on the Special mechanism Agreement with the Vietnamese Government, Project Agreement with MOT and GGU(Government Guarantee & Undertaking) with Vietnamese Government for project implementation.

For the privately constructed section, SPC is to procure contractor for construction and to contract an operator for the O&M services. For the government constructed section, the government is to assign MOT/PMU for construction and construct the section using the government budget and ODA funding. The O&M service of the same section would be provided by MOT/PMU who is to be assigned for theservice provisionin the same manner.



Source: JICA Study Team

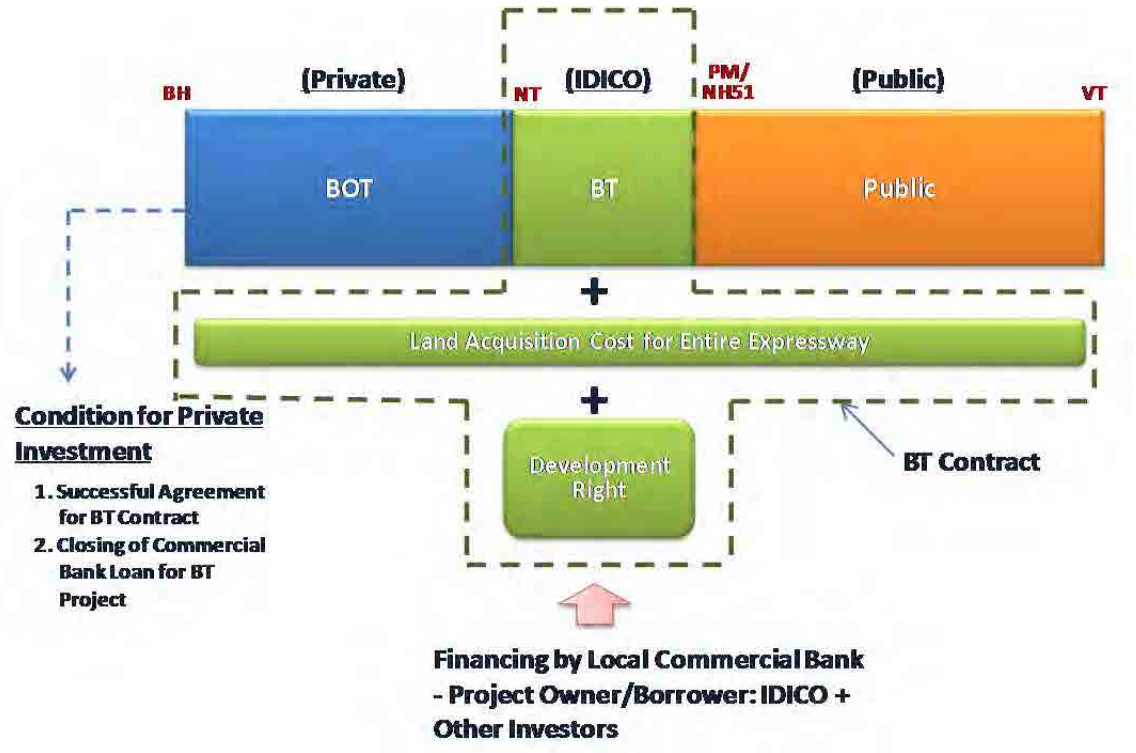
Figure 3.5.1-1 Proposed Project Scheme

3.5.2. Issues to consider for Proposed Project Scheme

3.5.2.1. Financing Method for Land Acquisition Cost by BT Scheme

The proposed project scheme would involve a smaller private section (the BH-NT section) than the project scheme which was p@roposed by the BVEC Pre FS (the BH-PM/HN51 section） and may be assessed as the private section is too small. Therefore, the following BT scheme was elaborated as keeping the private section to be same as proposed in the original Pre FS and at the same time to finance the land acquisition cost of the entire BH-VT Ecpressway by combining the development right along the expressway as illustrated in the following figure.

In this project scheme, creditworthy IDICO (or JV with other investors)instead of the SPC would become the project entity of the NT-PM/NH51 section, and would enter into BT contract with MOT, and obtain the development right of high potential development. Based on this BT contract IDICO would procure commercial loan from local banks to finance the construction of the same section together with the land acquisition of the entire expressway. Repayment of this loan could be basically covered by the install payment from MOF on the BT contract (based on MOF guarantee). The amount of this install payment could be adjusted depending of the potential of the development. Revenue of the same section would be enjoyed the same private investor of the BH-NT section. Construction of the same section is assumed to be conducted by the same contractor of the private construction with SPC to conduct the O&M service of the section. Precedent to the project contract and the investment by the private sector would be the closing of the BT contract and the above mentioned commercial loan agreement. Namely the SPC would only enter into the project contract with MOT after confirming the closing of the BT contract.



Source: JICA Study Team

Figure 3.5.2-1 Financing of Land Acquisition Cost by BT Scheme

3.5.2.2. Controlling Measures for Interface Risk

(1) Kinds od Interface Risks and their Controlling Measures

The Interface Risks involved between the privately constructed Phase 1 section (Private Section) and the government constructed Phase 2 section (Public Section) could be summaraized into 13 risks as described in the following table. Of which the following are considered as more influential and critical;

① Finance Risk

② Delay in Completion of the Public Section

③ Non payment risk of O&M fee for the Public Section

④ Defect and latent defect risks for the expressway section and related facilities constructed by the government such as the access roads and fly overs

⑤ Non performance of renewal investment for the Public Section

Finance Risk: Finance risk is that financing for the Private Section is not able to close due to delay of commitment for the public funding for the Public Section including that of ODA fund. In order to control this risk, it is essential to facilitate strong commitment for this project by donor and related government agencies as early stage as possible.

Delay in completion for Pubulic Section: Delay in completion for the Public Section could delay the opening of the entire expressway and could influence critically about the realization of the expected cash flow for the private investor. In order to control and manage this risk, implementation of detailed milestone management and application of Liquidated Damage Payment Mechanism which impose delay penalty payment on the delay of completion for the Public Section.

Non payment risk of O&M fee for the Public Section: There would be a risk of non payment of the O&M fee to the operator from the revenue of the Public Section, thus the O&M service is to stop. Therefore the revenue from both the Private Section and the Public Section should be managed in an integrated manner in the bank account of SPC. In this way, SPC could surely secure the residual revenue from the Public Section after deducting the O&M fee for the Public Section.

Defect and latent defect risks for the expressway section and related facilities constructed by the government such as the access roads and fly overs: Latent defect risk of the Public Section which is found after the defect liability period of the contractor could become serious problem. To cover this risk, the private sector would require compensation from the government if the government is unable to restore it or ask the private to restore it on behalf of the government. It would be necessary for the private to make proposal as to how the government to secure the funding source of this compensation payment.

Non performance of renewal investment for the Public Section: When renewal investment is not conducted by the government for the Public Section as schesuled, it could become a large risk to the private sector. Therefore, in the same manner as mentioned in the compensation payment for the defect risk, it is necessary for the private to make proposal for the method of compensation payment and hoe to secure funding source for this payment.

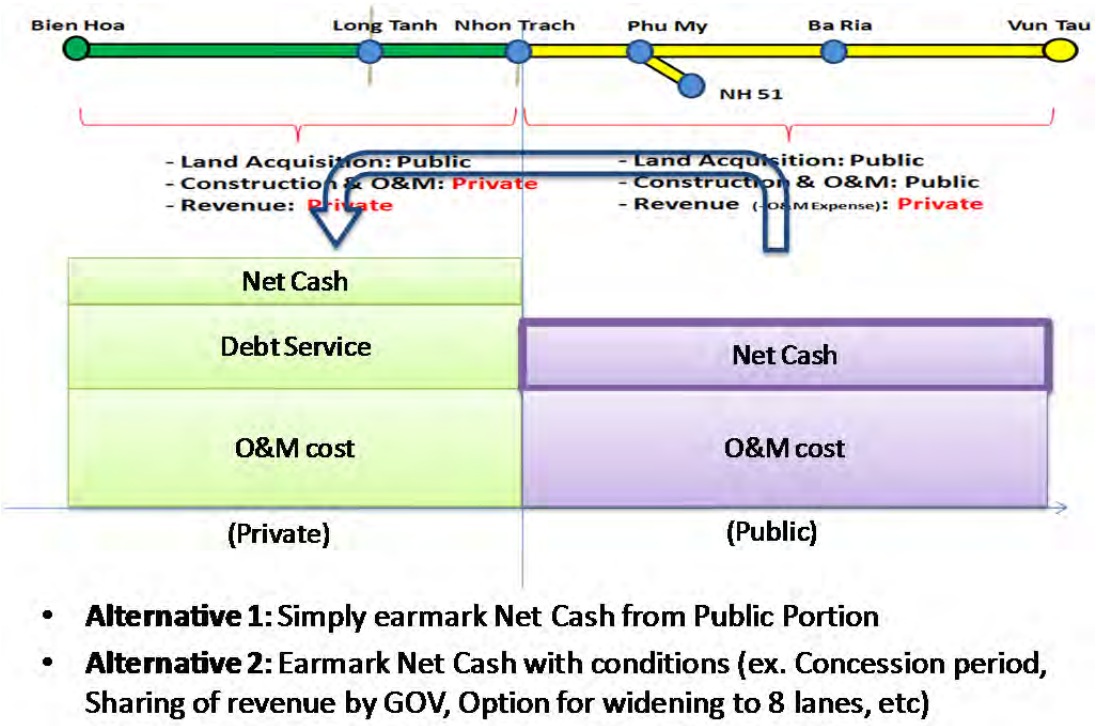
Table 3.5.2-1 Management Measures for Interface Risks

Project Risks	Issues	Measures	Impact
1. FS Review	-Intention and specification not appropriately reflected to public portion	-Thorough FS review must be conducted	**Med**
2. Detailed Design	-Intention and specification not appropriately reflected to public portion	-Timing of D/D must be coordinated	**Med**
3. Finance	-Delay of ODA commitment may negatively affect financial closing of loan for private	-Materialize strong involvement of Donor/IFI as early as possible	**Large**
4. Land Acquisition	-May affect progress/completion of construction	-Coordination mechanism must be established to manage delay risk	**Med**
5. Construction Coordination	- Access road/ancillary Facilities incl. flyovers may not be constructed as expected by private	-Application of independent engineer/coordination mechanism	**Med**
6. Delay in Completion	-Construction of public portion is delayed to affect opening of expressway and cash flow	-Application of mile stone management thru coordination mechanism -Application of liquidated damage and compensation mechanism	**Large**
7. Completion/Hand Over	- Quality of facilities for public portion is uncertain	-Application of physical completion and operational completion check	**Med**
8. Training/SPC Management	- Coordination and operation of O&M activities may not effectively synchronized	-Training and headquarters management must be synchronized with CLCIPM	**Med**
9. O&M Coordination	-O&M activities and Info sharing incl. ITS may become ineffective	-Application of O&M coordination mechanism with CL CIPM	**Med**
10. Payment of O&M Fee	-Payment of O&M fee may become uncertain to negatively affect O&M activities	-Application of single bank agent and account system to manage payment	**Large**
11. Defect of Public Portion	-Defect of public portion may negatively affect O&M activities of expressway	-Government guarantee for defect repair, preparation of back up funding for risk cover from cash flow	**Large**
12. Rehabilitation Investment	-Necessary rehabilitation of expressway facilities may not be conducted which negatively affect O&M activities of expressway	-Budget planning and government guarantee, preparation of back up funding from cash flow	**Large**
13. Hand Over for Termination	-Large repair and rehabilitation may be necessary for hand over of private portion	-Detailed hand over assessment from 5 year before termination, accrual of cash flow for final repair	**Med**

Source: JICA Study Team

(2) Management Method of Revenue from Public Section

Proposed project scheme presuppose that the SPC would enjoy the revenue from thePublic Section, however there could be two way of managing it. One way is to receive the remittance of the balance of the revenue after deducting the O&M fee automatically into the bank account of SPC. The other way is that if there is some problem for the private to simply receive the balance of the revenue, there may be some conditions attached to receive the revenue. For example, limitation of the duration of such right, sharing of the revenue of upside above certain level, obligation of investment requirement for future expansion to 8 lanes, etc. There may be possible to reserve a part of revenue and use as funding source for specific risk cover mentioned in the later section (such as compensation payment for the risks due to the government reasons). Details of these conditions and mechanisms should be discussed at the Working Group (WG) to be established in near future with the investors and finalized by confirming the opinions of related stakeholders including the Vietnamese Government as early as possible.



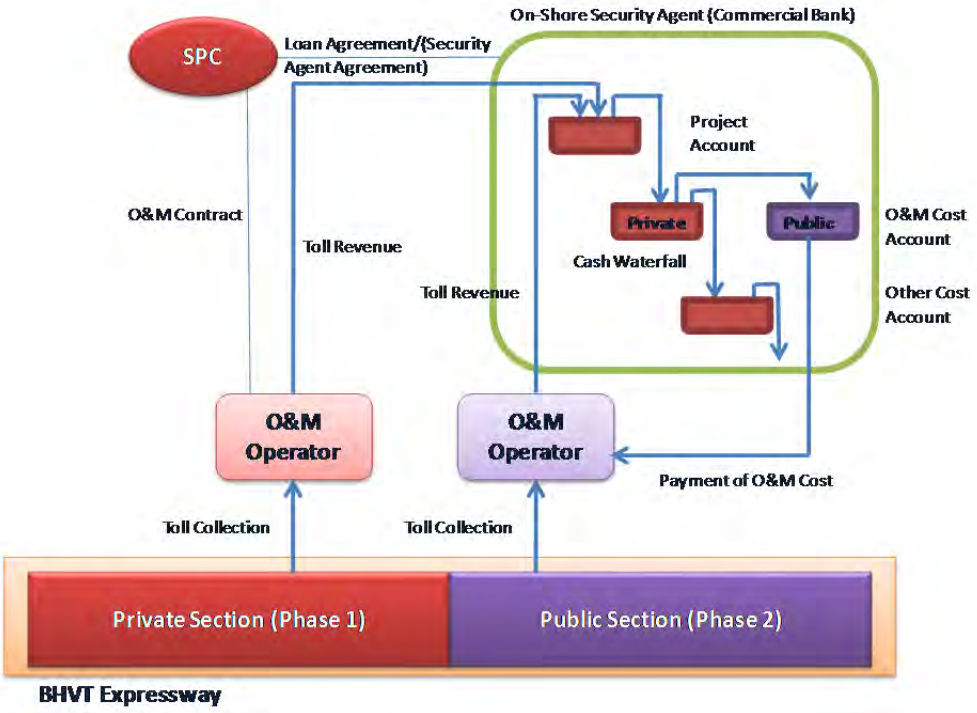
Source: JICA Study Team

Figure 3.5.2-2 Management Method of Revenue from Public Section

(3) Integrated Management of Private Section Revenue and Public Section Revenue in one account

SPC would need to manage both revenues from the Public Section and the Private Section in an integrated manner for the following reasons: i) putting security on the SPC' s cash flow, ii) risk management on non payment risk of the O&M fee and non performance of budget allocation for renewal investment of the Public Section, and iii) securing funding source for compensation payment for the risks due to the government reason.To this end, as illustrated in Figure 3.5.2-3 the security agent of SPC (commercial bank) would open an bank account(s) for the integrated management of the both revenues, and the revenues of the BH-VT Expressway would be transferred in a lump, then the O&M fee would be reserved in the " O&M fee payment account" based on cash water fall rule (priority of payment), and to be paid to the O&M operator of the Public Section.

At the same time, it is more preferable that the funding requirement of future renewal investment would be reserved in the "Renewal investment reserve account for the Public Section" and the required amount would be paid to the contractor from this account on the basis of renewal investment schedule agreed beforehand.



Source: JICA Study Team

Figure 3.5.2-3 Integrated Management of Private Section Revenue and Public Section Revenue

3.5.2.3. Management Measure for Revenue Risk

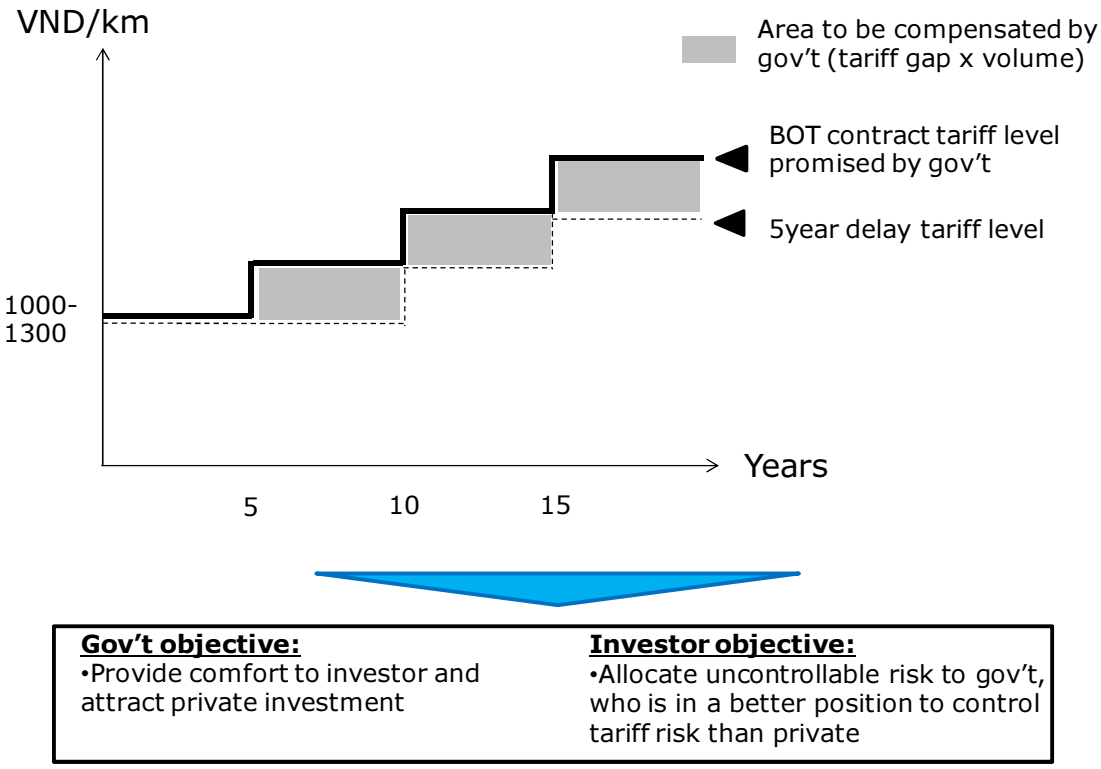
Revenue of an expressway is defined as P（Price: toll）X Q（Quantity:traffic）,thus needs to manage both risks.

(1) Management Measure for Toll Adjustment Risk

It is assumed that initial toll level (by vehicle type) and adjustment timing and levelwould be stipulated in the project contract as agreed condition between the public and the private. Therefeore, as illustrated in Figure 3.5.2-4 regardless of transition of traffic level, if the toll adjustment is not conducted as agreed in the contract by vehicle type, there would be a gap of revenue level between the current toll and the adjusted toll level. If the toll is not adjusted with the O&M expenses increase based on inflation, expected profit of SPC would decrease and could become critical business risk for SPC.

As this risk is not controllable for the private, if the toll level is not adjusted basedonthe contract, the gap of expected revenue should be compensated by the government. Toll adjustment formula and the schedule must be stipulated in the project contract and methods of government payment and caluculationfor revenue loss must be clearly stipulated in the contract. In addition, in order to secure the funding source for government compensation, possibility must be

examined to reserve a part of the Public Section revenue and to be used for risk cover mechanism as mentioned earlier.



Source: JICA Study Team

Figure 3.5.2-4 Compensation Mechanism for Toll Adjustemnt RIsk

(2) Minimum Revenue Guarantee Mechanism and Revenue Stability Fund

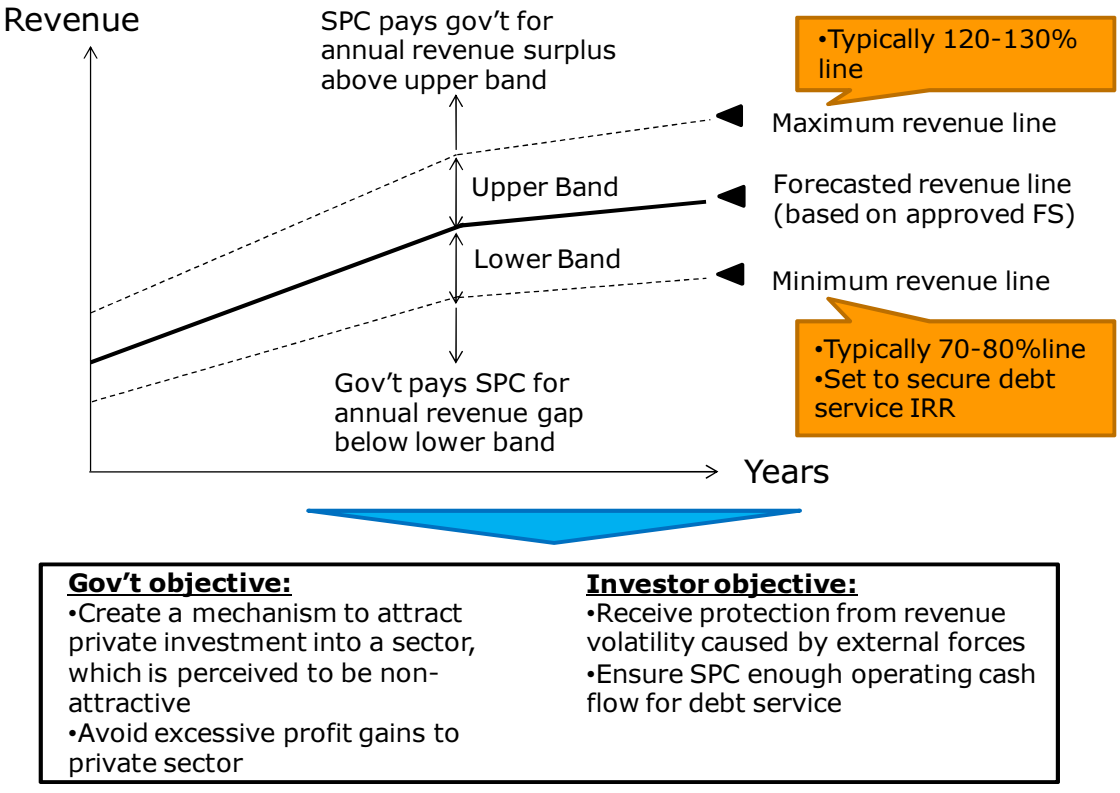
Traffic risk is most critical project risk as it could directly affect revenue size to a large extent. About this risk forecast traffic level is initial indicator, however actual forecast traffic volume is composed of various vehicle types (it is 5 vehicle types excluding motorbike in case of Circular 90), thus very difficult to forecast the volume including the vehicle composition accurately. Therefore, given the toll adjustment as pre condition (compensation of toll adjustment risk is defined as mentioned before), a guarantee mechanism which used revenue line as secondary inidicator (parameter) is being used in many countries which have experienced the privately financed expressway projects and have proven effective.

As illustrated in Figure 3.5.2-5, in this mechanism agreed base revenue line is set and two bands (upper and lower) are defined at 20 to 30% apart from the base revenue line. As for the down side risk, if the actual revenue is lower than the lower band (70% to 80 % from the base revenue

line) the government would compensate the deficit revenue amount (for example in case of Korea, the government guarantee range is from 70% to 50%, and below 50% is private risk, amely the project default), and for the upside return, surplus above the upper band (120 to 130% fo the base revenue line) would be shared between the public and the private.

As this mechanism is to cover the ultimate risks for green field expressway project such as initial phase risk (demand forecast is far from realized level, expected growth of traffic is slow:Ramp up risk) and to facilitate participation of the private sector, it is appropriate that application of this mechanism be limited to initial 10 years of project concession period (many countries limit application of this mechanism to initial years of concession).

Other issue is to secure funding source for government guarantee payment when the actual revenue becomes lower than the lower band. As mentioned in the section of the integrated revenue management (section 3.5.2.2(3)), a aprt of the Public Section revenue could be reserved in the independent bank account as the revenue stability fund and to be used as the funding source for risk cover. It is possible to reserve surplus proceed for the revenue share into this stability fund account when the actual revenue is higher than the upper band, and to be used supplimentarily for the same risk cover purpose.



Source: JICA Study Team

Figure 3.5.2-5 Minimumu Revenue Guarantee Mechanism

3.5.2.4. Compensation Mechanism for Risk Cover due to Government Reason

Project agreement with the private sector usally includes a mechanism of compensation payment for the damage which the private sector is given due to the government reason. In order to facilitate private sector participation into the BH-VT Expressway project it is essential to build in this compensation mechanism by the government for the risks due to the government reason.

There are two major items. Firstly GGU items (Government Guarantee and Undertaking, usually in a form of agreement) as important agreement between the private and the government is, prior to the project agreement, treated as condition precedent to the project agreement which the private sector requires to the government. Namely, if these items are not agreed the private sector is not to invest and to enter into the project agreement with the government. After the project agreement becomes effective regardless of GGU items as stipulated in the project agreement or not, breach of the GGU items by the government is subject to the compensation payment. Basically the project agreement is coupled with the GGU agreement. Naturally, there are various GGU items which may become prerequisite for project structure or may be concluded before the project agreement, may be included in the project agreement and so on. Therefore, it is necessary to examine beforehand nature and contents of GGU items and treat them accordingly.

Secondly, as illustrated in Table 3.5.2-2, there are items which require compensation when the risk materializes due to the government reason which are stipulated in the project agreement such as delay in completion of the Public Section, toll adjustment and network risk, and other risks which need government compensation.

Basically it is necessary to secure the funding source for these compensation payments by the Vietnamese Government in order to attain effectiveness of these government promises by reserving a part of revenue of the Public Section for the compensation payment.

Table 3.5.2-2 Mechanism of Compensation Payment

1. Treatment of GGU (Government Guarantee & Undertaking) items	**2. Contract conditions which need compensation**
(1) Before contract agreement	(1) Delay in completion of Phase 2 construction by GOV
Treated as Condition precedent for contract agreement (ex. Land acquisition, Special mechanism, government permits/approval, delay in competing projects, ODA procurement and rearrangement for Phase 2, commitment of financial supports, approval of toll rate, etc)	(i) Payment of liquidated damage (ii) Compensation for material delay
(2) After contract agreement	(2) Latent defect of Phase 2 facility

1. Treatment of GGU (Government Guarantee & Undertaking) items	2. Contract conditions which need compensation
Bleach of above mentioned GGU items => Compensation by GOV	(3) Bleach of toll increase as agreed
	(4) Revenue decrease below agreed threshold level
	(5) Bleach of obligation for rehabilitation investment for Phase 2 section
	(6) Change in law
	(7) Default events by government cause and Force Majeure (i) During construction (ii) In operation
	(8)Other items which require the compensation payment by GOV due to the government reason

Source: JICA Study Team

3.6. Economic and Financial analysis

3.6.1. Assumptions for the construction scenario of neighboring roads

The Project plans to traverse the eastern part of greater Ho Chi Minh, high density area for industrial zones where many Japanese companies settled. It is one of the most important traffic junctions, which provides access to the prospective new Ho Chi Minh international airport under construction with the support of Japanese ODA and also the nation's largest seaport of Cai Mep – Thi Vai.

As a consequence, high traffic demand is expected as the Vietnam's economy grows, but there are many infrastructure projects including the supports from ODA, surrounding this area. The construction of these neighboring roads may affect positively to the traffic demand of the Project by providing access to the traffic network, but it may sometimes affect negatively as a competing road. The traffic demand of the Project is highly depends on the construction scenario of the neighboring roads, which can be identified as the most influential risk factor.

The picture blow shows the Base Case scenario for the construction and opening years of the neighboring road, referred from the Master Plan (Decision No. 1745/QD-BGTVT) in August 2011.

It is widely recognized in road sector that there is an inevitable risk for the delay of construction in each road project. As a part of the risk analysis, we will calculate the impact to the traffic demand of the Project by using System for Traffic Demand Analysis (STRADA), which is a JICA's simulation software for the traffic demand forecast. Then, it will be elaborated to the financial cash flow model for the analysis of profitability.

The direct competitor to the Project is the new railway to be operational in 2020, which traverse almost all the way through the Project, but it does not appear in the Master Plan of the road construction. Moreover, the widening of National Highway 51(NH51), which runs parallel to the Project will be completed shortly. Such a competitor can be thread to the Project, but it may also provide a potential opportunity because the authority tends to respect the pricing autonomy for the toll tariff where there is a competitive toll road. Specifically, the Vice-Prime Minister Nguyen Sinh expressed his idea (Notice No.54 / TB-VPCP) that the government decides the toll level of NH51 while the investors decide that of BH-VT expressway.

The Table 3.6.1-1 is assumed the demarcation of construction responsibility and cost sharing from the discussion with BVEC, who is our local partner and has the toll concession for NH51. As of today, nothing is officially decided yet for such demarcation but it is reasonable to consider the best estimation because Transport Engineering Design Inc (TEDI), Vietnam's leading state own consulting company agrees.

Table 3.6.1-1 Demarcation of construction responsibility and cost sharing

Items	Responsible organizations		
	MOT	BVEC	VEC
Elevating of HCM-LT-DG Expressway at LT JCT			○
Ramp-ways of Long Thanh JCT		○	
Flyover crossing BH-VT expressway (local road)	○(by railway project)	○	
Access Road between BH-VT Expressway and NH51 at Nhon Trach JCT (in 2017)			○
IC and Access Road to LT Airport	○(by airport project)		
Widening of BH-VT expressway	Separate BOT project. To be implemented after opening.		

Source: JICA study team

3.6.2. Economic Analysis

(1) Pueposes

The purpose of economic evaluation is to assess socio-economic validity of the project.

(2) Methodology for analysis

1) Basic Concept of Economic Analysis

Economic analysis is done by calculating economic benefits and costs of "with" and "without" project.[3] The assumptions for computing the economic benefits and costs are the same as those for financial analysis and see the financial analysis section for detailed explanations of the assumptions.

From these economic benefits and costs, Economic Internal Rate of Return (E-IRR) will be calculated for evaluation of the project. Also by converting this economic benefits and costs into present value, Benefit Cost Ratio (B/C) and Economic Net Present Value (ENPV) are calculated.

2) Methodology for Calculation of Economic Benefit

As economic benefits, shortening traveling time, reduction of traveling costs, reduction of traffic accidents, improvement of comfort ability of driving, functioning of alternative road in case of disaster, shortening the arrival time of emergency vehicle, and increment of production, employment and income are expected. In this economic analysis, shortening Traveling Time Cost (TTC) and Vehicle Operating Cost (VOC) which can be measured with certain accuracy and can be converted to money value are utilized for calculation of the economic benefits.

(a) Benefit for Reduction of TTC

Benefit for reduction of TTC is calculated by that TTC without the new road minus TTC with the new road.

Benefit of Reduction of TTC ＝(TTC without New Road) －(TTC with New Road)

TTC is calculated by multiplying Unit TTC and traveling time and traffic volume.

TTC(VND) ＝Unit TTC(VND/vehicle/time) ×Travel Time(hour) ×Traffic(vehicle)

[3] The methodology of this economic analysis refers to "Cost Benefit Analysis Manual" published by Ministry of Land, Infrastructure, Transport and Tourism of Japan in 2008.

(b) Benefit for Reduction of VOC

Benefit for reduction of VOC is calculated by that VOC without the new road minus VOC with the new road.

Benefit of Reduction of VOC＝（ VOC without New Road）－（ VOC with New Road）

VOC is calculated by multiplying Unit VOC and traveling distance and traffic volume.

VOC（ VND）＝Unit VOC（ VND/vehicle/km）×Traveling Distance（ km）×Traffic Volume（ vehicle）

3) Calculation Method of Economic Cost

The project costs include construction cost for road (including land acquisition) and operation and maintenance costs. Ideally, economic cost should be calculated by shadow price which reflect social value of goods and services of the country; however, actual calculation of shadow price is difficult. Therefore, Standard Conversion Factor (SCF) is used to convert the nominal cost to economic costs. In this economic analysis, 0.85 is used as SCF which is commonly used in infrastructure project in Vietnam.

(3) Assumption of Economic Analysis

1) Common Assumption

Common Assumptions for the economic analysis is shown in Table 3.6.2-1.

Table 3.6.2-1 Common Assumption

Item	Assumption	Remarks
Social Discount Rate	12%	Refer to ADB(1997) Guideline for Economic Analysis for Project
Project Period	Until 2050 (30 years after Phase 2(Public) opens)	Operation start years; Phase 1(BOT): 2017 Phase 2(Public): 2020
Other assumptions	Same as Financial Analysis	
Price Standard Year	2012	Inflation during project period is not concerned

Source：JICA Study Team

2) Assumption of Economic Benefit

(a) Traffic Demand

Traffic Demand is based on Chapter 4.

(b) Unit TTC

The study team used Unit TTC which is set in the study "Socialist Republic of Viet Nam PPTA For HCMC – Long Thanh – Dau Giay Expressway" done by ADB in 2007 for this economic analysis. The original data was converted to the price of year 2011 by using price index.

Table 3.6.2-2 Unit TTC (VND/vehicle/hour)

Type of Vehicles	Unit TTC
Car <12 seats (Car + Taxi)	55,450
Small Bus <12 seats	28,700
Medium Bus <12-30 seats	65,700
Heavy Bus >31 seats (Large Bus)	136,600
Truck < 2 ton (Pickup)	43,900
Truck 2 - 4 tons (2 axle)	43,900
Truck 4 - 10 tons (2 axle)	43,900
Truck 10 - 18 tons (3 axle)	82,100
Truck >18 ton (container)	144,700

Source:: JICA Study Team

(c) Unit VOC

The study team used VOC which is set in the study "Study on the Second My Thuan Bridge Construction Project Final Report done by Ministry of Economic, Trade, and Industry (METI) in 2007". The original data was converted to the price of year 2011 by using price index.

Table 3.6.2-3 Unit VOC

(VND/Vehicle/km)

Speed (km/hour)		below 10	10～20	20～30	30～40	40～50	50～60	60～70	70～80	80～90	90～100	100 and over
Types of vehicles	Car <12 seats (Car + Taxi)	6,912	4,198	2,748	2,249	1,960	1,842	1,862	1,779	2,005	2,139	2,281
	Small Bus <12 seats	9,210	10,352	3,907	3,069	2,642	2,518	2,560	2,508	2,878	3,138	3,422
	Medium Bus <12-30 seats	9,210	10,352	3,907	3,069	2,642	2,518	2,560	2,508	2,878	3,138	3,422
	Heavy Bus >31 seats (Large Bus)	9,210	10,352	3,907	3,069	2,642	2,518	2,560	2,508	2,878	3,138	3,422
	Truck < 2 ton (Pickup)	17,881	10,946	7,388	5,600	4,761	4,434	4,357	4,081	4,735	5,159	5,621
	Truck 2 - 4 tons (2 axle)	17,881	10,946	7,388	5,600	4,761	4,434	4,357	4,081	4,735	5,159	5,621
	Truck 4 - 10 tons (2 axle)	17,881	10,946	7,388	5,600	4,761	4,434	4,357	4,081	4,735	5,159	5,621
	Truck 10 - 18 tons (3 axle)	17,881	10,946	7,388	5,600	4,761	4,434	4,357	4,081	4,735	5,159	5,621
	Truck >18 ton (container)	17,881	10,946	7,388	5,600	4,761	4,434	4,357	4,081	4,735	5,159	5,621

Source: JICA Study Team

3) Assumption of Economic Cost

Construction and O&M costs are referred from Financial Analysis, which are elaborated later in "3.6.3.1(3)4) Sources and Uses of funds" and "Annual cost assumptions" respectively. In order to calculate economic cost for construction, firstly VAT is subtracted and then SCF 0.85 is multiplied for local portion of the construction cost. For calculation of economic costs of O&M, VAT is subtracted from O&M costs. The table below shows the comparison between financial and economic cost

Table 3.6.2-4 Economic Benefits and Costs (bil VND)

	Costs			**Benefits**			**Ben - Costs**	**Discounted**	
	Capex	Opex	**Total**	VOC	TTC	**Total**		Costs	Benefits
2013	597		**597**			**0**	**-597**	533	0
2014	2,650		**2,650**			**0**	**-2,650**	2,112	0
2015	2,587		**2,587**			**0**	**-2,587**	1,842	0
2016	2,792		**2,792**			**0**	**-2,792**	1,774	0
2017	8,354		**8,354**			**0**	**-8,354**	4,740	0
2018	4,051	141	**4,192**	179	484	**663**	**-3,529**	2,124	336
2019	4,811	141	**4,951**	360	597	**956**	**-3,995**	2,240	433
2020		141	**141**	540	710	**1,249**	**1,109**	57	505
2021		141	**141**	618	1,169	**1,787**	**1,646**	51	644
2022		141	**141**	696	1,360	**2,057**	**1,916**	45	662
2023		141	**141**	775	1,552	**2,326**	**2,186**	40	669
2024		141	**141**	853	1,743	**2,596**	**2,456**	36	666
2025		153	**153**	931	1,935	**2,866**	**2,713**	35	657
2026		153	**153**	1,286	2,227	**3,513**	**3,360**	31	719
2027		945	**945**	1,640	2,519	**4,159**	**3,214**	173	760
2028		239	**239**	1,994	2,811	**4,805**	**4,566**	39	784
2029		239	**239**	2,349	3,103	**5,452**	**5,212**	35	794
2030		239	**239**	2,703	3,395	**6,098**	**5,859**	31	793
2031		440	**440**	2,629	4,938	**7,567**	**7,127**	51	879
2032		239	**239**	2,555	4,982	**7,537**	**7,298**	25	781
2033		239	**239**	2,481	5,027	**7,508**	**7,268**	22	695
2034		239	**239**	2,407	5,071	**7,478**	**7,239**	20	618
2035		239	**239**	2,333	5,115	**7,448**	**7,209**	18	550
2036		239	**239**	2,403	5,269	**7,672**	**7,432**	16	505

	Costs			Benefits			Ben -	Discounted	
	Capex	Opex	**Total**	VOC	TTC	**Total**	**Costs**	Costs	Benefits
2037		945	**945**	2,475	5,427	**7,902**	**6,957**	56	465
2038		239	**239**	2,549	5,590	**8,139**	**7,900**	13	427
2039		239	**239**	2,626	5,757	**8,383**	**8,144**	11	393
2040		239	**239**	2,705	5,930	**8,634**	**8,395**	10	362
2041		239	**239**	2,786	8,550	**11,335**	**11,096**	9	424
2042		239	**239**	2,869	8,806	**11,676**	**11,436**	8	390
2043		239	**239**	2,955	9,071	**12,026**	**11,787**	7	358
2044		239	**239**	3,044	9,343	**12,387**	**12,147**	6	330
2045		239	**239**	3,135	9,623	**12,758**	**12,519**	6	303
2046		239	**239**	3,229	9,912	**13,141**	**12,902**	5	279
2047		239	**239**	3,326	10,209	**13,535**	**13,296**	5	256
2048		239	**239**	3,426	10,515	**13,941**	**13,702**	4	236
2049		239	**239**	3,529	10,831	**14,359**	**14,120**	4	217
2050		239	**239**	3,635	11,156	**14,790**	**14,551**	3	199
E-IRR(%) Total							**12.4%**	**16,235**	**17,087**

Source: JICA Study Team

(4) Result of Economic Analysis

1) Result of Economic Analysis

Table 3.6.2-5 shows the result of economic analysis. EIRR was 15% which is higher than social discount rate of 12%. B/C is more than 1.0 and ENPV is positive. The result of economic analysis shows that this project gives high socio-economic benefit to the society.

Table 3.6.2-5 Result of Economic Analysis

Indicator	Result	Remarks
Economic Internal Rate of Return(EIRR)	12.4%	Higher than social discount rate (12%)
Benefit Cost (B/C)	1.1	Higher than 1.0
Economic Net Present Value (ENPV)	853 bil VND	Positive number

Source: JICA Study Team

The mathematical definitions of each indicator are as follows:

- CBR(B/C)=(Present Value(PV) of Economic Benefit)÷（PV of Economic Costs）

- ENPV=（PV of Economic Benefit）－（PV of Economic Cost）
- Economic IRR=（Discount rate which makes Economic benefit (PV) zero）

(5) Economic Analysis for on-going competing project (Inter-port Road & Phuoc An Bridge) under survey for JICA's ODA loan

We suspend the request to postpone Inter-port Road project after the discussion with Vietnamese authority, especially with Mr. Dong, Vice Minister at MOT meeting. However, anticipating the future change in the negotiation process, we leave this paragraph in the proposed government supports measures for reference purpose.

1) Background for this economic analysis for competing project

The Cai Mep - Thi Vai Inter-port Road is identified in the master plan for road network construction in Southern Key Economic Area to be opened in 2017. It includes as a core part for the construction of Phuoc An Bridge, which is under survey for JICA's ODA loan.

The Study team considers that the Cai Mep - Thi Vai Inter-port Road is a competing project for BH-VT expressway because it is planned to provide access between Ho Chi Minh City and Cai Mep and Thi Vai International Port. Therefore, in view of the BOT project scheme that is feasible for international private investors, the Study team requests that the opening of the Cai Mep – Thi Vai Inter-port Road should be postponed until 2030 or later. If this request from the Study team is not satisfied, it would be difficult to construct BH-VT expressway with private sector investment because the project scheme shall be structured under the financial cashflow simulation analysis. This special condition will be integrated in the economic analysis for the construction of Inter-port Road.

2) Case setting for "With" and "Without"

Generally, the economic analysis shall be conducted by comparing the "With case" and "Without case" for the economic benefits and costs. For example, With/Without cases in the normal type of economic analysis for the construction of the Inter-port Road shall be assumed as the table below;

Table 3.6.2-6 With/Without for normal conditions

Case name	Construction of Inter-port Road	Other conditions
With	Yes	same
Without	No	

Source: JICA Study Team

However, considering the fact that the construction of BH-VT expressway would be difficult if Inter-port Road is constructed as scheduled in the master plan, it would be appropriate to assume the With/Without case as the table below;

Table 3.6.2-7 With/Without for this economic analysis

Case name	Construction of Inter-port Road	Construction of BH-VT exp'way	Other conditions
With	Yes	No	same
Without	No	Yes	

Source: JICA Study Team

3) The calculation of economic benefit of Inter-port Road

From the With/Without cases assumed in the previous section, the economic benefits shall be systematically calculated by applying the output data from traffic demand forecast. The annual economic benefits are indicated as the table below;

Table 3.6.2-8 With/Without for this economic analysis (bil VND)

	Benefits				**Benefits**				**Benefits**		
	VOC	TTC	**Total**		VOC	TTC	**Total**		VOC	TTC	**Total**
2018	100	-266	**-166**	2028	-1,477	-2,428	**-3,905**	2038	-2,210	-5,351	**-7,562**
2019	-200	-282	**-481**	2029	-1,972	-2,801	**-4,773**	2039	-2,277	-5,512	**-7,789**
2020	-500	-297	**-797**	2030	-2,466	-3,175	**-5,641**	2040	-2,345	-5,677	**-8,022**
2021	-399	-589	**-988**	2031	-2,377	-4,640	**-7,018**	2041	-2,415	-8,186	**-10,601**
2022	-298	-769	**-1,066**	2032	-2,289	-4,704	**-6,993**	2042	-2,488	-8,431	**-10,919**
2023	-196	-948	**-1,145**	2033	-2,200	-4,769	**-6,969**	2043	-2,562	-8,684	**-11,247**
2024	-95	-1,128	**-1,223**	2034	-2,111	-4,833	**-6,945**	2044	-2,639	-8,945	**-11,584**
2025	6	-1,308	**-1,301**	2035	-2,023	-4,897	**-6,920**	2045	-2,718	-9,213	**-11,932**
2026	-488	-1,681	**-2,169**	2036	-2,083	-5,044	**-7,128**	2046	-2,800	-9,490	**-12,290**
2027	-983	-2,055	**-3,037**	2037	-2,146	-5,196	**-7,342**	2047	-2,884	-9,774	**-12,658**

Source: JICA Study Team

4) The evaluation of economic benefit of Inter-port Road

As indicated in the table 3.6.2-8, the economic benefits, not the profit after deducting the costs, are calculated with negative values through thirty years of the project period. It is mostly because of a large opportunity loss incurred by not constructing BH-VT expressway, which appears in Without case.

The Study team does not have recent project information of Inter-port Road[4]. However, as all the calculated value show negative before deducting any costs through the project period, it is inefficient to construct Inter-port Road from socio-economic point of view because no indicators, including E-IRR, B/C, ENPV satisfy the criteria even if we were to assume zero construction costs for the project.

As a reference, the table below shows the results of economic analysis before consideration of construction cost. None of the key indicators, such as E-IRR, B/C, ENPV, justify the construction of inter-port road without BH-VT expressway.

Table 3.6.2-9 Preliminary result of Economic Analysis for Inter-port road(before consideration of construction cost)

Indicator	Result	Remarks
Economic Internal Rate of Return(EIRR)	Error by negative value	Higher than social discount rate (12%)
Benefit Cost (B/C)	Error by negative value	Higher than 1.0
Economic Net Present Value (ENPV)	-13,398 VND	Positive number

Source: JICA Study Team

On the other hand, it should be reconfirmed that the conclusion of inefficiency is valid only under the special conditions for With/Without cases, which were used in this economic analysis. The Study team has no intension to mention for the economic analysis under the normal situation of With/Without cases.

[4] Some non-recent information is available in METI's report, March 2011, "Study on Phuoc An Bridge Construction Project on Cai Mep – Thi Vai Inter-port. Road in the Socialist Republic of Vietnam," (www.meti.go.jp/meti_lib/report/2011fy/E001614.pdf)

3.6.3. Financial Analysis

3.6.3.1. Confirmation of basic frameworkPurposes

(1) Purpose

As mentioned in the previous chapters, prior to the Preliminary Survey was conducted in June 2011. In the Preliminary Survey, five projects was short-listed as the most probable expressway projects in southern Vietnam area for the private sector participation, and then compared them from maturity assessment and profitability view point. The Preliminary Survey concluded that Bien Hoa – Vung Tau express is the top ranked project among the five short-listed ones. However, the construction of whole section of Bien Hoa – Vung Tau expressway was not justified from the profitability view point. The Preliminary Survey recommended to divide into two phases, i.e. The BOT construction scheme by introducing private sector investors for the section of Bien Hoa – Phu My － NH51 intersection (Phase 1), which traverse the competitive industrial zones, then the ODA construction scheme for the section of Phu My – Vung Tau (Phase 2), which required higher construction cost because of softsoil treatment and bridges.

In this F/S Study, we will review and justify the recommendations of the Preliminary Survey through its own economic and financial analysis.

In this sub chapter of financial analysis, we will first demonstrate that Project IRR is too low for private sector investors for the construction of whole section. Then, we will recalculate Project IRR by limiting the construction only to the Phase 1 and show that it achieves the minimum requirement for bundle of hurdle rates, which is generally expected by the private sector investors for infrastructure investment in Vietnam.

(2) Methodology for analysis

The financial simulation will be conducted for the SPC, which construct and operate the project under the BOT scheme.

The financial statements of SPC, including the balance sheet, income statement and cash flow statement will be prepared under certain assumptions from the establishment of SPC until the end of BOT concession period. By using the annual financial simulations, the Project IRR will be calculated whole through the project life, which evaluates the profitability of the BOT project.

(3) Assumptions for Base Case

The assumptions for this financial analysis will be shown as below; 1) phasing of construction section, 2)scope of business, 3)timeline for the Project, 4) sources and uses of funds, 5)annual cost assumptions, 6) revenue assumptions and 7) inflation and foreign exchange rates.

1) Phasing of construction section

The maps in the Figure 1.2.2.-1 and the Table 1.2.2.-1 show the summary of the phasing for the construction section.

The Phase 1 section starts from Bien Hoa, traverse the nation's most competitive industrial zones to Phu My as well as new Ho Chi Minh international airport, which is currently under construction with ODA and goes to Cai Mep – Thi Vai seaport via access road.

Phase 2 provides access from Phu My to Vung Tau, the famous touristic resort. The relatively large satellite cities in the area ensures a certain degree of traffic demand, but high construction cost due to the softsoil treatment and bridges is expected to deteriorate the Project profitability. The detail will be shown by in due course through the financial analysis of cash flow simulation.

The number on the map below indicates the five short-listed projects in the Previous F/S Study.

2) Scope of business

The scope of business for the Base Case is shown in the Table 3.6.3-1.

Table 3.6.3-1 Scope of business for Base Case

Items	Scope of business	
	Whole section	Phase 1 only
Construction section	Bien Hoa ～Vung Tau	Bien Hoa ～Phu My ～NH51
Operation and maintenance section	Bien Hoa ～Vung Tau	Bien Hoa ～Phu My ～NH51

Source: JICA Study Team

3) Timeline for the Project

The timeline for the Project in this financial analysis is shown in the Table 3.6.3-2

Table 3.6.3-2 Timeline for the Project in this financial analysis

	Year / period	
Construction period	Phase 1	Phase 2
	2013～2017	2015～2019
Operation start year（toll revenue）	2017	2020
End of BOT period	2046（30 years after operation start year）	
Base year for inflation	2012	

Source: JICA Study Team

4) Sources and Uses of funds

The financial structure of the Project is shown as below;

a) Possible Loan Options

In order to develop a financial plan, debt/equity ratio, interest, tenor, repayment of principle, and other loan conditions are important factors that should be carefully examined. These conditions can be determined solely based on negotiation with JICA if the entire amount is raised through JICA's PSIF, but there is also a possibility of combining PSIF and other available loans. This paragraph will examine the feasibility of available loan options.

i) Loan from financial institutions in Vietnam

Until recently, the government of Vietnam had been imposing a tight monetary policy, including the total lending limit regulations for bank loans, to control inflation, especially since 2010. Under the circumstance, private companies seeking funds for infrastructure development projects had difficulties in procuring loans from financial institutions in Vietnam.

This situation changed at the end of 2012, when the inflation rate started to settle. Since then, the government has been gradually easing its monetary policy. Though depending on loan conditions, it is now easier for private companies to obtain a loan from financial institutions for infrastructure projects.

However, there was a case where an interest rate for other toll road project was determined by adding 3% to the procurement interest rate of financial institutions. Since the interest rate for 10-year government bond is approximately 10%, the expected interest rate should be at least 13% or greater. Furthermore, the actual interest rate is likely to be close to 15%, because the maximum interest rate for long-term loans is to be set at 15%. In fact, it is said that there had been a recent case where interest rate of 14% or greater was demanded by a financial institution in another infrastructure development project.

In addition to the above concern, the interest of loans from financial institutions in Vietnam for this project would be floating rate, as can be seen in some other infrastructure development projects. Although the risk of exchange-rate fluctuations is not likely, we need to accept the risk of interest rate fluctuations affected by severe fluctuations of inflation rate in Vietnam.
Moreover, the maximum tenor is limited to 15 years.
Based on the above considerations, we can conclude that getting loans from financial institutions in Vietnam would reduce the profitability of the project, while it does not necessarily mitigate project risks. Bank loans from financial institutions in Vietnam are not needed, if JICA's PSIF can cover the full amount of the funds needed to implement the project.

ii) Loans from ADB

The Asian development bank (ADB) also has been providing PSIF loans since 1980's. ADB's PSIF loans are available for toll road projects in Vietnam as well.
There would not be much advantage in terms of interest rate, however, because ADB's PSIF loans could not make their interest rates significantly lower than the interest rates of commercial bank loans in competitive financial markets.
The maximum tenor of ADB's PSIF, in principle, is limited to 15 years, which is shorter than 20 years tenor of JICA's PSIF.
Furthermore, loans on the local currency basis are only available for Thailand, China, India, Kazakhstan, Indonesia, Philippines, Malaysia and a few other countries. Vietnamese dong-based loans are currently not available.
Based on these considerations, it can be said that ADB's PSIF loan would not mitigate the risk of currency exchange fluctuation, nor offer much interest rate advantage, hence there would be only small advantage in utilizing ADB's PSIF.

iii) 2-step loans utilizing JICA's PSIF

As for loans from JICA's PSIF, two types of financing are possible: direct yen-based lending from JICA, or "2-step" loan, in which JICA provides yen-based loan to financial institutions in Vietnam and they lend money to project companies on Vietnamese dong basis.
Until recently, the 2-step loans have not been practical since no financial institutions in Vietnam were willing to accept 2-step loans due to the stringent total lending limit, restriction on loans based on foreign currencies, or other regulations.

However, more and more financial institutions in Vietnam are showing interests in 2-step loans since the country's tight monetary policy has been gradually eased recently.
Having said that, loan conditions of Vietnamese dong-based 2-step loans greatly depend on how the Vietnamese financial institutions would digest the risk of exchange rate fluctuations. Specifically, combining yen-dollar swap transaction and dollar-dong swap transaction is one option. But the liquidity of dollar-dong swap transaction is extremely low, which might cause huge deviation of swap rate between transactions. Furthermore, the dollar-dong swap balance of each financial institution might be varying accordingly. Therefore, it is very difficult to objectively and reasonably estimate output interest rates of the 2-step loan at this moment. Thus, loan conditions of 2-step loan would be heavily dependent on managerial decisions of each financial institution in Vietnam.
In addition, maximum amount of the 2-step loan can be limited to around 1 billion yen at for some financial institutions, based on the limited volume of dollar-dong swap transaction.
Also, the term of the swap transaction is likely to be limited to around 3 years. Even though the interest rate can be fixed during the swap contract term, loan conditions might change significantly at every renewal of the contracts. The risk of interest rate fluctuations might become higher than expected in a long term, accordingly.
Therefore, it is considered that 2-step loan utilizing JICA's PSIF can be useful for small scale projects but not suitable for large projects like this one.
As studied in the above, from i) to iii), we conclude at this moment that the entire funding should be directly financed by JICA's PSIF on yen basis. In a case where JICA's PSIF cannot cover the entire loan requirement, the above mentioned loan options can be utilized.

a) Sources and Uses

The Table 3.6.3-3 shows the Sources and Uses of fund for the Project SPC, established for BOT of Bien Hoa - Phu My expressway[5].
It is assumed 70% of CAPEX would be financed by the loan from JICA PSIF regime and the remaining 30% would be equity contribution from equity as a joint venture of Vietnamese operator and Japanese investors.

[5] Anticipating the significant growth of the traffic volume in the future, the Project prepare the widening of the lanes from 4 to 6 and the land acquisition will be carried out for 6 lane from the initial construction phase. However, in order to minimize the initial investment, the construction costs are assumed for only 4 lanes and the widening cost in the future is considered as a separated project and excluded in this financial analysis.

Table 3.6.3-3 Sources and Uses of fund for the Project SPC

Uses	VND bil	Sources	VND bil	%
Total CAPEX[6]	11,386	PSIF loan	7,970	70%
		Equity	3,416	30%
Total	11,386	Total	11,386	100%

Source: JICA Study Team

b) Uses of funds

The table 3.6.3-4 shows the breakdown of CAPEX for the construction of expressway by the Project SPC.

Table 3.6.3-4 Breakdown of CAPEX

Items		VND bil	
		Phase 1 only	Whole section
Construction	Local currency	5,286	10,876
	Foreign currency	1,393	2,807
Physical contingency		668	1,368
Price escalation (contingency for inflation)		2,037	6,181
Value Added Tax		938	2,123
Others (interest payment during construction etc.)		1,064	6,501
CAPEX (excluding land acquisition)		11,386	29,856

Source: JICA Study Team

※Land acquisition cost (VND 2,847 bil) should be paid by GOV.

※The construction costs are indicated as of the 2012 price without inflation. .

c) Terms and condition for loan

JICA study team preliminary assumed the terms and conditions of the PISF loan by JICA as in the table 3.6.3-5. The definitive conditions are subject to the further negotiation with relevant parties and maybe modified accordingly.

[6] The breakdown of the total CAPEX is shown as below;
VND 11,386 billion = VND 10,582 billion (Project Cost at page 5-112)
– VND2,225 billion (land acquisition/compensation cost at page 5-112)
– VND 72billion(physical contingency etc)
+ VND2,037billion (price escalation)
+ VND1,064billion(interest payment during etc)

Table 3.6.3-5 Terms and conditions for PSIF loan

Items	
Applicable interest rate	2%p.a.
Maturity	20 years (grace:5years)
Repayment	Linear amortization

Source: JICA Study Team

5) Annual cost assumptions

In this financial analysis, the annual costs are assumed to be consists of a) O&M costs (including periodical renovation) and b) tax related payment. The breakdown and details of each cost are shown as below;

a) O&M costs

The SPC's annual payments for the maintenance costs and operations costs for Phase 1 only and whole section are shown in the table3.6.3-6 and table 3.6.3-7 respectively.
The renovation costs for ITS (VND 55bil) for every fifteen years and O&M vehicle (160VND bil) for every ten years will be accounted in the cash flow projection.

Table 3.6.3-6 O&M costs(Phase 1)

Items	2017	2020	2025	2030
Maintenance costs(VND bil)	91.5	115.3	176.0	343.8
Operating costs (VND bil)	7.4	7.7	10.8	13.4

Source: JICA Study Team

※the costs are denominated as of 2012 price. It will be adjusted by inflation assumption in the cash flow projection model.

Table 3.6.3-7 O&M costs(whole section)

Items	2017	2020	2025	2030
Maintenance costs(VND bil)	248.6	313.2	477.8	939.9
Operating costs (VND bil)	8.2	7.7	10.8	13.4

Source: JICA Study Team

※the costs are denominated as of 2012 price. It will be adjusted by inflation assumption in the cash flow projection model.

b) Tax related payments

The major taxes relating to the Project are the enterprise income tax and the value added tax. The details are described as below;

① Enterprise income tax

The enterprise income tax and its possible preferential treatments for this project are shown in Table3.6.3-8. Since the preferential treatments listed on No.3 and 4 of the table are usually approved by the authority, we assumed the preferential treatments of corporate income tax shall be approved on the financial simulation.

Table 3.6.3-8 Summary of enterprise income tax

No.	Related Provisions	Laws and Regulation
1	Standard tax rate: 25%	Tax Law[7] 10.1
2	Maximum carry forward: 5 years	Tax Law 16.1
3	Newly set up enterprises under investment project in [development of the State's infrastructure works of special importance] are entitled to the tax rate of 10% for fifteen years. [Tax rate incentives specified in this Article is counted from the first year an enterprise has turnover.]	Tax Law 13.1 to 13.6
4	Newly set up enterprises under investment projects in [development of the State's infrastructure works of special importance] are entitled to tax exemption for no more than four years and a 50% reduction of payable tax amounts for no more than nine subsequent years.	Tax Law 14.1to 3
5	With respect to an investment project in the form of BOT, the duration of use of fixed assets shall be fixed from the date of commissioning use of the fixed assets up until termination of the project.	Circular guiding regime on management, use and calculation of depreciation of fixed assets（12.1）[8]

Source: JICA Study Team

[7] Law on Enterprise Income Tax (No. 14/2008/QH12)

[8] Circular guiding regime on management, use and calculation of depreciation of fixed assets (No. 203-2009-TT-BTC). Maximal duration of use of road for non-BOT project is 20 years based on the above-mentioned circular.

* As the result of preference treatment, the applicable tax rates for enterprise income tax are 0% from operation start year to 4th year, 5% for 5th to 13rd year, 10% for 14th to 19th year and 25% after 20th year.

② Value Added Tax (VAT)

The summary of the VAT applicable to the Project is shown in the Table 3.6.3.-9.

Table 3.6.3-9 Summary of VAT

No.	Outline	Laws/Regulations
1	Standard tax rate: 10%	Law on VAT[9] 8.3
2	Toll tariff is taxable and already included to the toll tariff Price exclusive of VAT = Payment price / (1 + goods or service tax rate (%))	Law on VAT 7.1
3	VAT is payable to the authority after deducting the SPC's VAT paid together with O&M cost or other expenses.	

Source: JICA Study Team

6) Revenue assumptions

The revenues for this project shall be generated from the toll from the Bien Hoa - Vung Tau expressway, as mentioned previous section in 2) scope of business

a) Traffic volume forecast (see detail in Chapter 4.1 Traffic Demand Forecast)

The estimation for the wide-range network of the roads shall be based on the Origin – Destination table in the existing Master Plan. We refer to HOUTRANS in Ho Chi Minh City area, VITRANSS2 outside of Ho Chi Minh City area. The specific demand shall be based on its development plan for the new facilities such as seaport, airport and industrial parks.

For the estimation of future Origin – Destination tables, it shall be also based on the development plan for seaport, airport etc for industry related traffic demand. The assumptions for population growth and demographic in HOUTANS shall be employed for non-industrial demand.

[9] LAW ON VALUE-ADDED TAX No. 13/2008/QH12

Table 3.6.3.-10 shows the tendency for the traffic demand. This table is a simplified illustration for the large picture of the traffic volume by simply calculating the average of each station. But, in the financial analysis, the detailed cashflow simulation is conducted by calculating the toll revenue from the traffic volume in each station in consideration of the distance between the stations.

In the table, it is interesting to see that the traffic volume for trucks (2t over) is decreasing from 2017 to 2020. It is due to the opening of Phase 2(public section) in 2020 and the average of traffic volume in each section is technically deceased. In Phase 1(BOT section) expects a heavy traffic for large trucks since its opening in 2017 because it is a industrial expressway to connect between Ho Chi Minh City and Cai Mep – Thi Vai port. On the other hand, Phase 2 expects mostly passenger cars because its destination Vung Tau is a city for beach resort. As the result of arithmetic calculation, the simple average volume of traffic deceases temporally in 2020.

Table 3.6.3-10 Traffic volume forecast （average PCU / day）

Type of Vehicle	2017	2020	2025	2030
Car	67,219	100,925	163,459	242,073
Bus	18,429	23,893	28,447	33,283
Truck (2t)	291	200	695	1,835
Truck (2t～4t)	4,268	2,943	10,192	26,932
Truck (4t～10t)	1,390	957	3,319	8,773
Truck (10t～18t)	410	284	981	2,592
Truck (18t～)	1,220	841	2,913	7,696
Total	93,227	130,043	210,006	323,184

Source: JICA Study Team

b) Toll tariff assumptions

The toll tariff is assumed categorized for seven different types of vehicle.

In this financial analysis, the same toll tariff is assumed as Ho Chi Minh City – Trung Luong expressway, which started toll collection in February, 2012 as the nation's first expressway. According to MOF document (No.77 / BC BTC) for Ho Chi Minh City – Trung Luong expressway, the toll tariff for a car is set for 1,000VND/km in 2012, which shall be increased by 30% every five years. It is also mentioned the tariff table by category of vehicle by stipulating the existing regulation (Circular No.90/2004/TT-BTC).

Table 3.6.3-11 Applicable Toll tariff（VND/km）
for 1,000VND/km　(2012 price, 30% increase every 5 years)

Type of Vehicle	2017-2021	2022-2026	2027-2031	2032-2036
Car	1,300	1,690	2,197	2,856
Bus	2,860	3,718	4,833	6,283
Truck (2t)	1,300	1,690	2,197	2,856
Truck (2t～4t)	1,950	2,535	3,296	4,284
Truck (4t～10t)	2,860	3,718	4,833	6,283
Truck (10t～18t)	5,200	6,760	8,788	11,424
Truck (18t～)	7,800	10,140	13,182	17,137

Source: JICA Study Team

7)　Inflation

For the foreign currency, it is understood that most of the procurement are import from Japan. Therefore the annual inflation of 1% is assumed for Japan because of the so-called “inflation target of 1%” by the Bank of Japan.

For the local currency, the inflation in Vietnam in 2011 was as high as approximately 19%, but it was assumed as exceptionally high year. After 2012, the inflation in Vietnam becomes as stable as 8%, which is the average of last ten years until 2020. Then, gradually decrease by 0.5% every year after 2021, as the nation’s economy moves to the phase of stable growth. The inflation will be finally flatten after 2030 at 3%

Table 3.6.3-12 Inflations assumptions

Period	Inflation(%)	Period	Inflation(%)
2012 – 2013	10.0%	2025	5.5%
2014	9.0%	2026	5.0%
2015 – 2020	8.0%	2027	4.5%
2021	7.5%	2028	4.0%
2022	7.0%	2029	3.5%
2023	6.5%	2030-2046	3.0%
2024	6.0%		

Source: JICA Study Team

This inflation assumption is only applicable to the initial construction costs and annual O&M costs etc. but it doesn’t directly influence the toll tariff, which is assumed to increase by 30%[10] every five years.

(1)　The result of cash flow projection for Base Case

[10] The increase of 30% every five years corresponds to approx.5.4% in CAGR, which is not sufficient compared to the annual inflation of 8-9% in Vietnam.

Table 3.6.3-13 Result of financial analysis for base case

	Whole section	Phase1 only
Project IRR	5.4%	9.2%

Source: JICA Study Team

The result of cash flow projection, based on the assumptions in the previous sub-sections, for whole section of Bien Hoa - Vung Tau expressway, the Project IRR is as low was 5.4% and therefore we confirmed as same as the Preliminary Survey that it is difficult to implement the Project under BOT scheme.

On the other hand, the Project IRR for Bien Hoa - Phu My section only (Phase 1) is 9.2%, which is same as the latest F/S study by TEDI. The expected profitability measure by Project IRR does not justify the BOT implementation of the Project, however it can be somehow possible if there is sufficient support from the government of Vietnam. In this context, it is worth continuing this F/S study to pursue the detailed the Project structure, which are mutually agreeable between private sector investors and the government of Vietnam.

It is also mentioned that general investment decision consists of both analysis for risk and return while the financial analysis in this chapter has concentrated only on the profitability measured by Project IRR so far. In the DFR, we also elaborate our qualitative analysis for the risk in order to materialize the Project.

Table 3.6.3-14 Assumptions for financial analysis

Summary of assumptions

(1) operation start	(5) toll rate
2017:BOT for Phase 1 (Bien Hoa - **Phu My**)	*referred from HCMC-Trung Luong expressway*
concession for 30 years after operation start	・**VND1,000** /km/pcu (2012 price)
2020:Public for Phase 2 (**Phu My** - Vung Tau)	・to be increased by 30% every 5 years
(2) road network scenario	*(MOF, Document No.77 / BC-BTC)*
referred from Master plan	
(Decision No. 1745/QD-BGTVT, Aug.2011)	2012 - 16: 1,000 VND/km/pcu
2014:HCM-LT-DG & BH-BP	2017 - 21: 1,300 VND/km/pcu (+30%)
2017:BL-LT & **Inter-port road**	2022 - 26 : 1,690 VND/km/pcu (+30%)
2020:LT airport & **BH-VT railways**	2027 - 31: 2,167 VND/km/pcu (+30%)
2023:RR3	・・・ continues...
2025:RR4	
(3) government responsibility	(6) Inflation in Vietnam
Land acquisition(2,638 bil VND) is responsible for GoV.	2012 - 13: 10%
	2014: 9%
(4) conversion rate	2015-20: 8%
JPY 1 = 263 VDN	2020-30: Decreased by -0.5%
referred from SBV web site as of June end in 2012	2030 after: 3%

3.6.3.2. Viability improvement of the project scheme.

(1) Purposes

In the previous section, the Project IRR is calculated to 5.4% (whole section) and 9.2% (Phase 1 only) from the financial cashflow model under the base case assumptions. Considering that the current coupon rate of Vietnamese government bond is approximately 10.2%, which is the expected return for the least risky assets in the nation, the Project IRR for the project is too low to implement by private sector investors. It is reasonable for them to buy the Vietnamese bond, instead of investing to the project because the government bond provides higher return and less risky. It seems to be difficult to implement this project under the current structure.

In this context, it is indispensable to improve the profitability from the various government supports for implementation of the projects. In this section, we discuss the screening of viable project scheme with government supports only from the profitability criteria. Then, the risk analysis follows later part of this chapter to finalize our proposed project scheme.

(2) Methodology of screening

1) Basic concept of screening procedure

Generally, there are two famous notions for investment decision making process by private sector investors, which are "risk" and "return". In this section, we focus on the "return" for the screening of the candidate project scheme, which qualify the profitability criteria.

For example, the textbook of financial theory tells us that the government bond is the least assets in the nation. If an investor is considering a project whose expected profitability is lower than the coupon rate of the government bond, then it is advised that the investor should not invest to the project, but buy the government bond. In this example, we reached the conclusion even before the risk analysis process because the profitability was too low.

In the business practice of investment decision by private sector investors, it is often observed so-called "hurdle rate", or the pre-fixed target profitability criteria for screening purpose. The investors conduct the extensive risk analysis only to the candidate projects, which qualify the hurdle rate. In other words, the potential project whose expected profitability is below the hurdle rate, it is necessary to combine the government supports or other similar measures to achieve the hurdle rate.

It is also mentioned that the notion of hurdle rate should be understood as an approximated number, not a strict screening criteria. For example, if a hurdle rate is set to 20%, it is not appropriate to decline the proposed project whose expected profitability is 19% because the hurdle rate of 20% should be a rounded number for daily business uses. It may be worth going through the risk analysis process before making final decision to the project. On the other hand, it should be stressed that the hurdle rate is only for the screening process before the extensive risk analysis. A project with higher expected return may be declined in the extensive risk analysis process.

2) Hurdle rate setting

(a) Project IRR vs. Equity IRR

In the practical business discussion, it is often observed that the hurdle rate is based on either Project IRR or Equity IRR, or sometimes both of them. In this section, we discuss the rationales for using Project IRR and setting our hurdle rate "Project IRR should be 20% or more".

Before starting the discussion, we would like to quickly confirm the mathematical definitions. Both Project IRR and Equity IRR are the notions of the internal rate of return (IRR) for the whole project period. The biggest difference[11] between them is that the cashflow for the calculation of IRR. From the investors' point of view, Equity IRR is calculated by cashflow from the payment of initial equity contribution and the reception of

[11] Other differences include minor adjustments relating tax calculation. It is mostly due to that the interest payments are tax deductible while the dividend payments are not.

dividends after the business inauguration. Project IRR is calculated by cashflow from the business operation before the debt services.

In the financial theory, it is naturally considered that the investors make investments to the project if the expected Equity IRR is greater than the hurdle rate. However, in the daily business it is often based on the Project IRR, which corresponds to the hurdle rate based on Equity IRR, for the convenience of the negotiation, especially in our case of negotiation for infrastructure project in a developing country where investors often request the government supports due to insufficient profitability of the project. The reason why Project IRR is more convenient in the negotiation is that the cashflow base for Project IRR is much simple without any influence of debt structure while that for Equity IRR is calculated after the debt service, including interest payment and repayment of the debt.

For example, we assume the situation where the investors are facing the negotiation with the government not to construct the competing expressway. “If the government were to construct the competing expressway to our project, it deteriorates Equity IRR by 5% from our financial simulation.” The investors may claim “We need an indemnity for this risk”. But the government may reply “We compensate for 2%. Then, the investors should discuss with JICA / banks for better conditions for loan for the remaining part.”, which confuses the discussion.

In addition, there are also other advantages for the government to use Project IRR. The government may limit the support if the project is successful and achieves its target profit. It is sometimes stipulated in the BOT contract that the investors should abandon or pay-back certain part of the support if the project achieves the target profit, which is systematically calculated by the pre-determined mathematical formula. It is theoretically natural to use the Equity IRR for the pre-determined formula, but it is often observed in the business practice for Project IRR, or sometimes more simple indicators such as total turnover or EBITDA without any doubt for accounting manipulation.

Moreover, if the government were to improve the project profitability, it is necessary to the compare the profitability across the various projects in the nation. Equity IRR may be used if all the loan conditions are pre-determined for all the projects in the nation, but it is a very rare case. It is practical to use Project IRR to compare among various projects in the nation because its calculation base is the cashflow before the debt service.

In conclusion, we use Project IRR for hurdle rate setting because it is more practical for daily business occasions both for investors and the government.

(b) Rationales for the hurdle rate of 20%

The reasons for the hurdle rate of Project IRR = 20% or more are mentioned as below;

(i) Interest rate for Vietnamese government bond (10 years): approximately 10% (as of December 2012)

(ii) Risk premium for green field expressway project: approximately 5%

(iii) Country risk(S&P: BB-, Moody's:B2) and forex(VND/JPY[12]) risk: approximately 5%

By adding (1)-(3), the hurdle rate is calculated to approximately 20%[13] or more.

(c) Market level of profitability in Vietnam

Some people in Vietnam informally expressed their views that the hurdle rate of Project IRR=20% was unrealistically high compared to the typical profitability of infrastructure projects in Vietnam.

Responding to such views, we refer to the track record in Vietnam for the foreign investment to expressway projects and to calculate the average Project IRR of the similar projects in the nation. However, we find out as we have already seen in the previous chapters that there is no BOT project in Vietnam since 2009 when the BOT law(decree No.108, 108/2009/ND-CP) was enacted. If we were to expand the road sector projects, not limiting to expressway projects, there is only one project as below;

- GS Engineering & Construction, Korean company, invests in BT(Build and Transfer) form for Tan Son Nhat – Binh Loi – Outer Ring Road, to be open in 2013. In BT form, which lacks the notion of "Operation" from BOT, the investor does not take operation risk, including the toll revenue risk influenced by traffic demand forecast.

Over the three years since BOT law in 2009, there are no foreign investors involved to the BOT projects in Vietnamese road sector. It should be needed the innovative new idea of government supports in order to attract foreign investment and materialize the BOT project in the nation.

3.6.3.3. Proposed government support measures by JICA study team

(1) Postpone the competing project of "Inter-port Road" until 2030, including Phuc Anh Bridge by ODA from Japan.

[12] From 1992 to 2011, it is 6.2% for the average annual devaluation of VND against JPY. Therefore, 5% of forex risk is somehow favorable for Vietnam.

[13] In November 2011, we had an informal interview with BITEXCO, the national investor for Phan Thiet – Dau Giay expressway with loan from World Bank. According to BITEXCO, the target IRR was 15%(they did not mention either Project IRR / Equity IRR), which corresponds to our hurdle rate 20% - forex risk 5%.

We suspend the request to postpone Inter-port Road project after the discussion with Vietnamese authority, especially with Mr. Dong, Vice Minister at MOT meeting.
However, anticipating the future change in the negotiation process, we leave this paragraph in the

As mentioned in the Economic Analysis section, the road sector master plan for Ho Chi Minh area includes the competing project of Inter-port Road including the construction of Phuc Anh Bridge by ODA from Japan. Phuc Anh Bridge is considered as one of the top priority project, by short-listed in the ODA projects.
Inter-port Road is one of the most competing road to our BH-VT expressway in the sense of providing road transportation access between Ho Chi Minh City and Cai Mep – Thi Vai international sea port area. It is also mentioned that Inter-port Road is planned for public construction, including ODA from Japan and therefore the toll fee will be maintained in a low level to stimulate the local economy while the toll fee for BH-VT expressway should be charged to recover the initial construction cost under the BOT scheme.
From the view point of investors' to BH-VT expressway, it is expected to increase the traffic volume by absorbing the traffic between Ho Chi Minh City and Cai Mep – Thi Vai international sea port area from the postpone of Inter-port Road. Therefore, it is commended to postpone the Inter-port Road until 2030(currently scheduled for 2017) to secure the robust traffic demand to BH-VT expressway and the viability of the project.
It is also recommended from the socio-economic point of view as discussed in the chapter of economic analysis that BH-VT expressway should be constructed first by securing the viability as BOT project, and then construction of Inter-port Road should follow several years after the inauguration of BH-VT expressway.

(2) Government supports: category 1(supports relating to Phase 2)

To improve the profitability of the project, three measures are requested as below;

(a) Acceleration of Phase 2 construction and transfer its profit to BOT project

It is requested to accelerate the construction of Phase 2 section and harmonize the inauguration at the same time as Phase 1 in order to maximize the traffic demand by offering the complete road network.
Moreover, the profit from Phase 2 section, which is calculated by the toll revenue minus operating cost shall be transferred to BOT business for the viable project implementation of Phase 1.

(b) Postpone Phase 1 until 2020

Considering the ODA procedures, it is practical to assume that Phase 2 section will be open in 2020. Therefore, it is recommended for Phase 1 to postpone the opening to 2020 from 2017 in order to harmonize the inauguration of both sections for Phase 1 and 2.

From (a) and (b) above, the Project IRR will be improved to 12.7% from its initial level of 9.2%(Phase 1 only), which is not sufficient to achieve the hurdle rate of approximately 20%. Therefore, additional measure of (c) will be requested.

(c) Excluding BOT and transfer to public construction of the sub-section of Nhon Trach – Phu My(+ access road to NH51)

In order to improve Project IRR, both (a) and (b) are concentrated on profit improvement. However, in this section we seek for the profitability improvement by reducing the initial investment amount.
For instance, the change in construction modality can be considered in each sub-sections divided by the inter-changes. A part of Phase 1 section may be excluded from BOT construction modality, but changed to public or BT construction. A possible combination of sub-sections is illustrated in Figure 3.6.3-1. In this figure, the Project IRR for whole section is important as we requested in (a) for transfer of Phase 2 profit to BOT business. It is also mentioned the profit of BOT section only for the reference purpose.
In the Base Case, the BOT section consists of the three sub-sections divided by the inter-changes. Here, we calculate the Project IRR for each combination of the sub-sections, either one or two sub-sections. The result shows over 20% of Project IRR for each case, which consists of only one sub-section but it is not practical because BOT section is too short. We choose the best Project IRR among the combination of two sub-section, which is the Option 4 by excluding Nhon Trach – Phu My (+access road to NH51).

Regarding this request, some issues were raised in the government of Vietnam, especially MOT because the reduction of BOT section directly resulted in the increase of public construction. It is true that the increase of government spending seems to be difficult, but we will continue the discussion with MOT for feasible structure, including the introduction of BT scheme as shown in the figure 3.5.2-1 in the previous chapter.

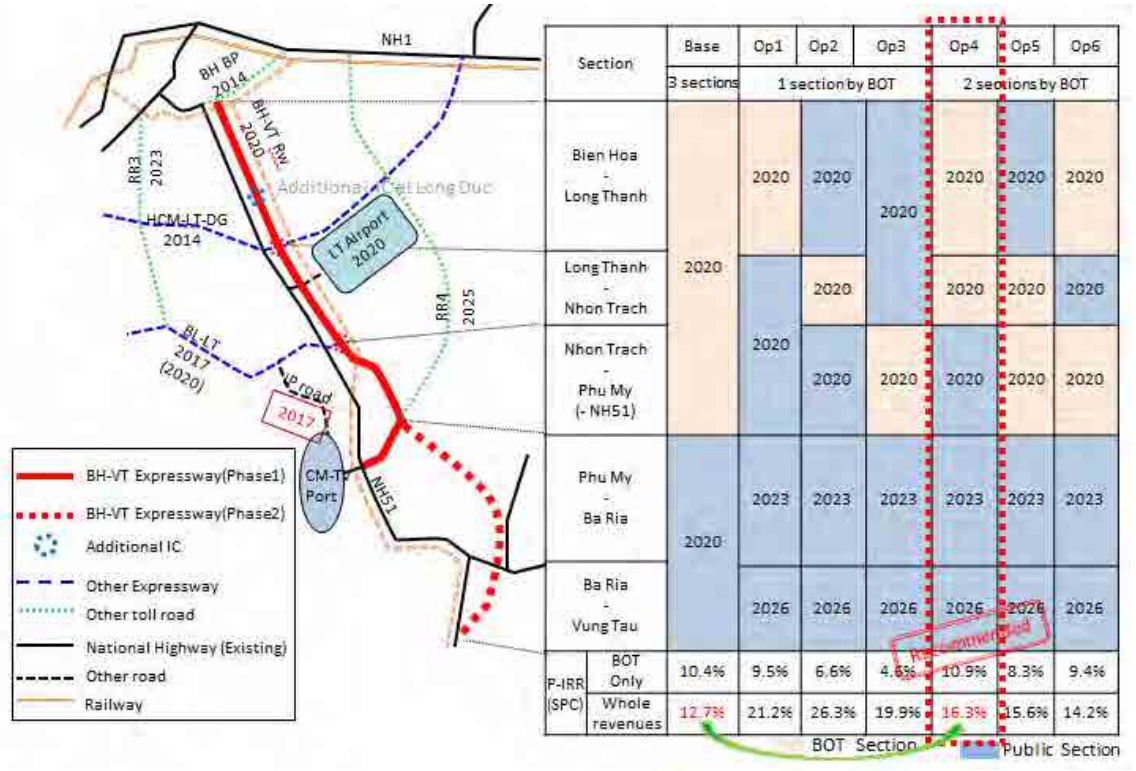


Figure 3.6.3-1 Comparison of sub-sections by Project IRR

Source: JICA study team

From the supportive measures, the Project IRR improves 9.2% to 12.7%, then 16.3% for all (a) to (c).

In other words, even with all the measures in Category 1, Project IRR remains 16.3% and cannot achieve the hurdle rate of 20%. Therefore, we will seek for other measures in the next section.

(3) Government supports: category 2(various other supports)

Category 1(supports relating to Phase 2) significantly improve the Project IRR, but it does not achieve the hurdle rate of 20%. Therefore, we request the various additional supportive measures as below;

(a) Postpone BH-VT railway project until 2030 (+0.64% of Project IRR improvement)

There is a plan to construct a BH-VT railway with target opening of 2020, which runs along the BH-VT expressway. Unlike Inter-port Road, which will be financed by Japanese ODA, information is limited for the detail of plan and the progress of project but we expect 0.64% of Project IRR improvement from our financial simulation.

(b) Upgrading of access road to NH51 to expressway standard (+0.29% of Project IRR improvement)

Under the currently plan, it is not charge the toll fee for the access road from Phu My inter-change to NH51. But it certainly deteriorates the profitability of the project because a significant construction costs are necessary even for the access road while the toll fee will not be charged. In this context, we request that the access road will be upgraded to expressway standard and the toll fee will be charged accordingly.

By implementing this measure, we expect 0.29% of Project IRR improvement.

(c) Public construction of overpass bridges in BOT section (+0.57% of Project IRR improvement)

The construction of overpass bridges is requested to the government, including BOT section. We expect 0.57% of Project IRR improvement but the effect is not limited to that. In the negotiations for land acquisition, we anticipate the additional request for construction of overpass bridges and other facilities for the local community. Some of them should be accepted for smooth implementation of land acquisition process, but it results in a certain degree of cost over-run. To avoid such risk, it is requested to the government to manage most of the operations in relation to the land acquisition process because the government is better positioned for the negotiations with local authority.

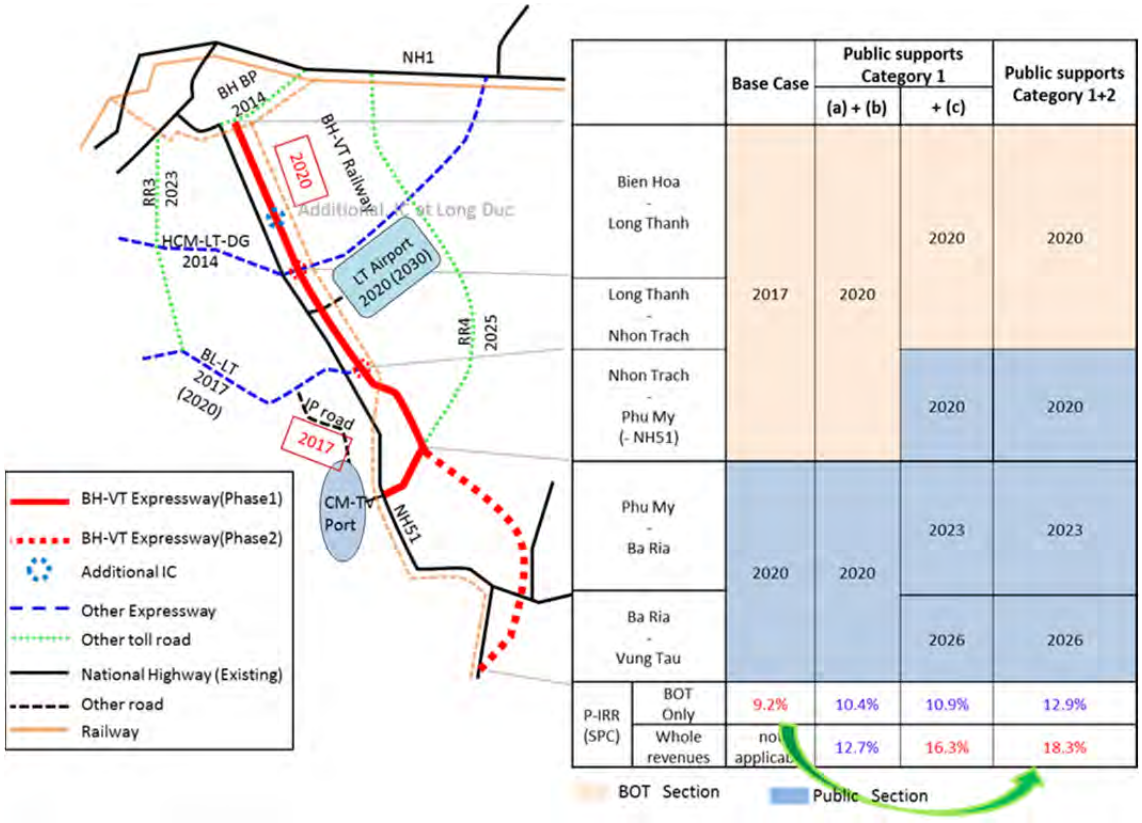
(d) Increase in toll tariff (+0.50% of Project IRR improvement)

For financial analysis, it is assumed the toll tariff of 1,000VND/km for a car as of the price in 2012, which will be increased by 30% in every five years. We assumed the same tariff system as Ho Chi Minh City – Trung Luong expressway, which opened in February 2012 as the first expressway in the nation. The second expressway opened in June 2012 for Cau Dai – Ninh Binh with toll tariff of 1,500VND/km. The lower of the two tariff systems, which is 1,000VND/km was assumed for our financial simulation model, but it is requested to increase 1,500VND/km to the government of Vietnam.

It should be also mentioned that the increase in the toll tariff has a negative impact in traffic demand. Such influences will be quantified in the STRADA, the computer software for the traffic volume estimation. We concluded that the toll tariff of 1,500VND/km maximize the profit of BOT section after running the various cases of financial simulation, such as 2,000VND/km results in the profit decrease because the traffic demand decreases. Therefore, we conclude that the optimal price is 1,500VND/km.

From the additional supportive measures above, we confirmed the Project IRR improvement to 18.3%, which achieves the hurdle rate of approximately 20%.

The figure below illustrates the trace of the Project IRR improvement to achieve the hurdle rate.



		Base Case	Public supports Category 1		Public supports Category 1+2
			(a) + (b)	+ (c)	
Bien Hoa - Long Thanh		2017	2020	2020	2020
Long Thanh - Nhon Trach					
Nhon Trach - Phu My (- NH51)				2020	2020
Phu My - Ba Ria		2020	2020	2023	2023
Ba Ria - Vung Tau				2026	2026
P-IRR (SPC)	BOT Only	9.2%	10.4%	10.9%	12.9%
	Whole revenues	not applicable	12.7%	16.3%	18.3%

BOT Section　Public Section

Figure 3.6.3-2 Comparison of sub-sections by Project IRR

Source: JICA study team

(4) Summary of proposed Project scheme by JICA study team

From the profitability criteria in the financial analysis, the table below shows the summary of proposed Project scheme by JICA study team.

For reference, the table also shows the comparison of BOT construction of all the Phase 1 section, but with the supportive measures of category both 1 and 2. It is anticipated that the government of Vietnam expects the private sector investors to construct the whole section of Phase 1 by BOT modality, but it is difficult to implement from financial point of view with only approximate Project IRR of 15%. Therefore, it seems to inevitable to reduce the BOT construction section.

Table 3.6.3-15 Summary of proposed Project scheme

_ _		**Base Case with supports (Reference)**	**Proposed structure**
Public supportive measures		Category 1+2, <u>except</u> 1(c) Reduction of BOT section	Category 1+2
BOT section (remaining shall be public construction)		BH – Phu My (Phase 1 - whole)	BH – Nhon Trach (excl.NT-PM)
Length for BOT section (Reference) *Ph.1(37.6km)+Ph.2(28.4km)*		37.6km	29.4km
Operation start year(2017 in initial plan)		in 2020	
Network construction plan for neighboring highways		Master Plan[14], <u>Except</u> Inter-port Road & BH-VT Railway to be opened in 2030	
P-IRR	Whole revenue (transferring public profit to SPC)	**15.2%**	**18.3%**
	(Reference) BOT revenue only	*12.2%*	*12.9%*
VND (bil)	SPC – Total financing (with price escalation, excl. land acquisition)	13,841 bil VND	6,907 bil VND
	Land acquisition cost for GoV *(as of 2012, without price escalation)*	*2,638 bil VND (Phase 1+2)* *(same initial payment for GoV)*	

Source: JICA study team

Table 3.6.3-16 Sources and Uses of fund for the SPC under proposed project scheme

Uses	VND bil	Sources	VND bil	%
Total CAPEX[15]	7,642	PSIF loan	5,347	70%
		Equity	2,295	30%
Total	7,642	Total	7,642	100%

Source: JICA Study Team

[14] Decision No. 1745/QD-BGTVT, Aug.2011

[15] The breakdown of the total CAPEX is shown as below;
VND 7,642 billion = VND 5,347 billion (Table 3.4.3-15 SPC-Total financing (with price escalation, excl.lnad acquisition) + VND735billion(interest payment during etc)

Considering the construction of BH-VT expressway as the whole section, BOT project proposed by JICA study team is illustrated in relation to the public construction as the figure and the table below;

It is mentioned that ODA financing are assumed for the public construction and it is practical to consider the construction in three phases of typical ODA project volume because the public section seems to be too large in terms of initial investment. The inauguration of 1st phase of public construction is targeted in 2020, same as BOT project. Therefore, the land transport access to the Cai Mep – Thi Vai sea port will be secured from the first year of operation of BH-VT expressway.

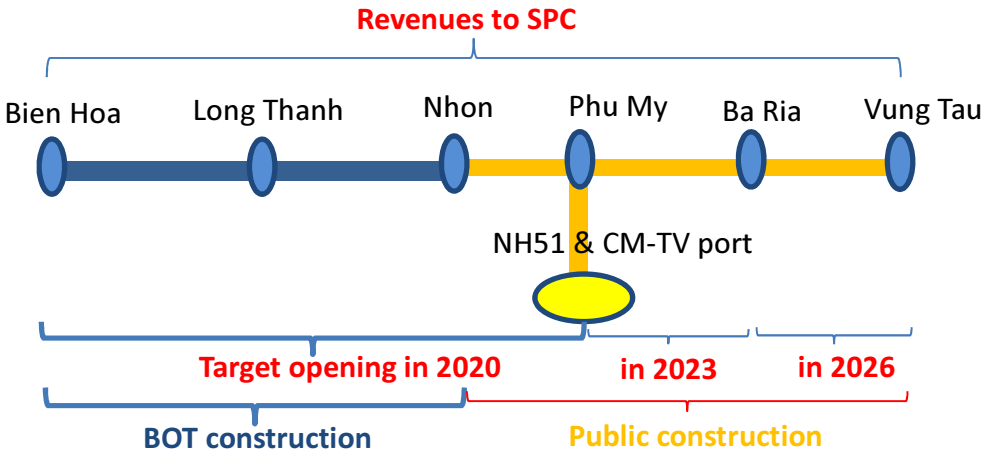


Figure 3.6.3-3 illustration of BOT and public section in BH-VT expressway

Source: JICA study team

Table 3.6.3-17 BOT and public section in the proposed project scheme

–	**BOT section** (Bien Hoa – Nhon Trach)	**Public section** (Nhon Trach – Vung Tau)
Length	29.4km	36.6km +7.7km (upgrade)
Operation start year	in 2020	in 2020, 2023, 2026 (3 phases)
Project costs with inflation	7,747 bil VND (excl. land acquisition)	27,018 bil VND (incl. land acquisition)

–	**BOT section** (Bien Hoa – Nhon Trach)	**Public section** (Nhon Trach – Vung Tau)
without inflation, price of 2012	4,461 bil VND (excl. land acquisition)	12,902 bil VND (incl. land acquisition)
Land acquisition (without inflation, price of 2012)	2,638 bil VND (whole section)	
Net Present Value of profit (=toll revenue – O&M costs) (as of 2012, discount rate of 20%)	1,174 bil VND (53% of whole section)	1,052 bil VND (47% of whole section)

Source: JICA study team

In terms of the project costs, public section represents significant amount even in the price of 2012 without inflation. It is mostly because of the softsoil treatment cost for Phu My – Vung Tau section in addition to the land acquisition cost. On the other hand, BOT section expects higher revenue because it runs through the industrial zone, new international airport and Cai Mep – Thi Vai sea port while public section provides access to the regional city of Ba Ria and beach resort of Vung Tau. The expected net present value of the profit is slightly higher in BOT section despite the lower project costs for construction. Therefore, we confirm that it is necessary to introduce public construction section in a part of BH-VT expressway.

3.6.3.4. Sensitivity analysis

(1) Purposes and methodology

In this section, we conduct the sensitivity analysis based on the "proposed project scheme" in the previous chapter and review the impact of the parameter changes such as traffic volume, cost and so on. More specifically, the quantative analysis will be conducted in comparison of Project IRR for the changes in the input parameters, which can be categorized in two types as below;
First, the traffic volume forecast as an example, the impact to the Project IRR will be examined for the differences between the ex-ante forecast and the real traffic volume. It is true that the advanced scientific methodology are employed for the traffic volume forecasting, but still it is hard to assume that the forecasting volume coincides exactly the real traffic. The sensitivity analysis is conducted to review the impact to the Project IRR by changing the traffic volume parameters.
Second, the changes in scenario assumption, for example, the delay of the surrounding highway in the master plan might have significant impact to the Project IRR. This is another type of sensitivity analysis because the traffic volume will be re-forecasted by STRADA with the scenario change and the Project IRR will be re-calculated accordingly. If there is a delay of

opening the new international airport occurs, new traffic volume forecasting will be conducted and the Project IRR will be re-calculated by using the new traffic volume forecasting.
In the same methodology, the impact to the Project IRR will be calculated from the increase in the toll tariff. Generally, there is a negative impact on the traffic volume if the toll tariff increases. It is not appropriate to calculate the Project IRR by increasing the toll tariff with the un-changed traffic volume forecast because it over-estimates the traffic volume. It should be re-forecasted the traffic volume by using STRADA under the new toll tariff, and then the Project IRR should be re-calculated accordingly. By using this methodology, we also seek for the profit maximizing toll tariff in the process of sensitivity analysis.

(2) Impact of change in forecasted parameters

The sensitivity analysis is conducted for the change in forecasted parameters in the base case, especially examined the resistance for probable downside risk. As indicated in Table 3.6.3-18, the traffic volume and inflation have significant impact to the Project IRR.

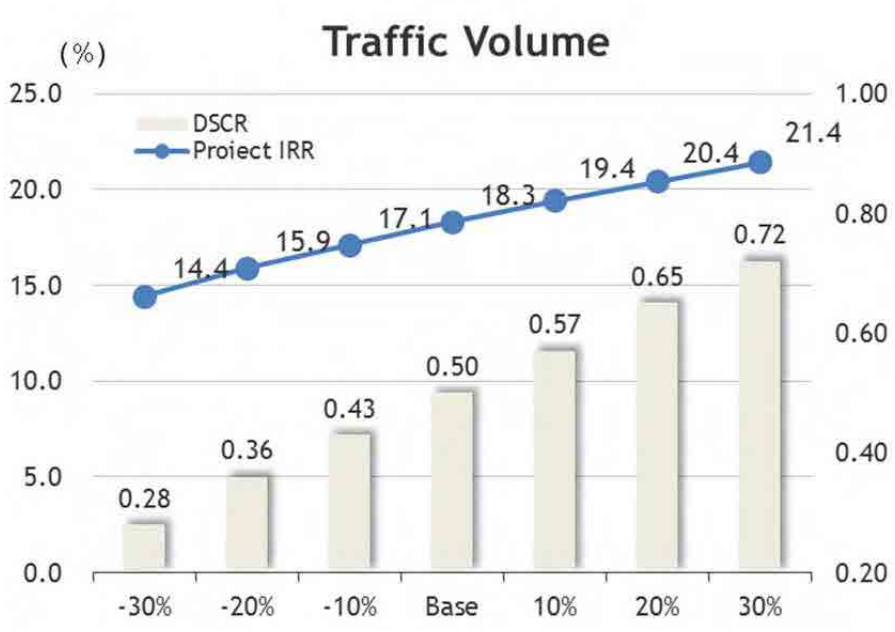
Table 3.6.3-18 Result of sensitivity analysis in comparison of forecasted parameters

Base Case		18.3%	
Changing parameter	range	Project IRR	decrease/increase
traffic volume	-30%	14.4%	-3.9%
	+30%	21.4%	3.1%
inflation	x 1.5 times	14.9%	-3.4%
	x 0.5 times	21.1%	2.8%
toll increase	once every 7 years	15.8%	-2.5%
	once every 10 years	13.9%	-4.4%
CAPEX	+20%	17.2%	-1.1%
	-10%	18.9%	0.6%
OPEX	+20%	17.8%	-0.5%
	-10%	18.5%	0.2%

Source: JICA study team

(a) Impact of change in traffic volume

If the realized traffic volume increased/decreased by 30% from the forecasted, the Project IRR will be in the range of between 14.4% and 21.4%.



Source: JICA study team

Figure 3.6.3-4Impact of change in traffic volume

(b) Impact of change in inflation

If the realized inflation rate increased/decreased by 0.5 time of the forecasted, the Project IRR will be in the range of between 14.9% and 21.1%.

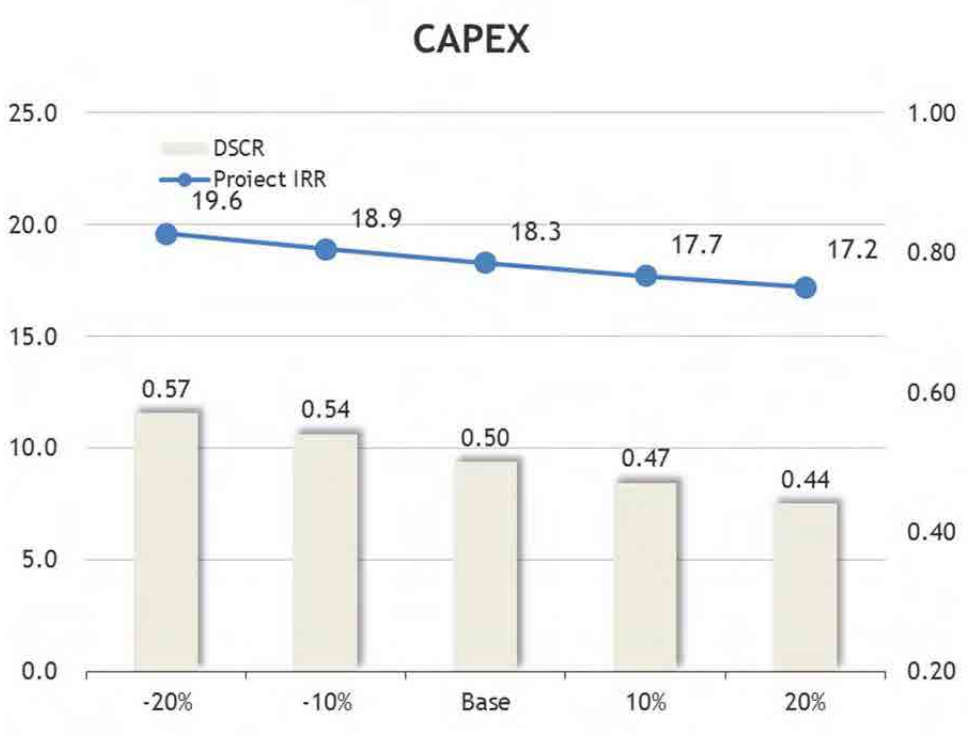
Table 3.6.3-19 Impact of change in inflation

Base Case	x 1.0 times	18.3%	
Parameter	Range	Project IRR	Changes
inflation	x 1.5 times	14.9%	-3.4%
	x 0.5 times	21.1%	2.8%

Source: JICA study team

(c) Impact of change in CAPEX

If the realized CAPEX changes in the range of between -10% and 20% from the forecasted, the Project IRR will be in the range of between 17.2% and 19.6%. It is also mentioned that the forecasted CAPEX includes already 10% of physical contingency and it is unlikely that CAPEX exceed more than 20% in the due course.

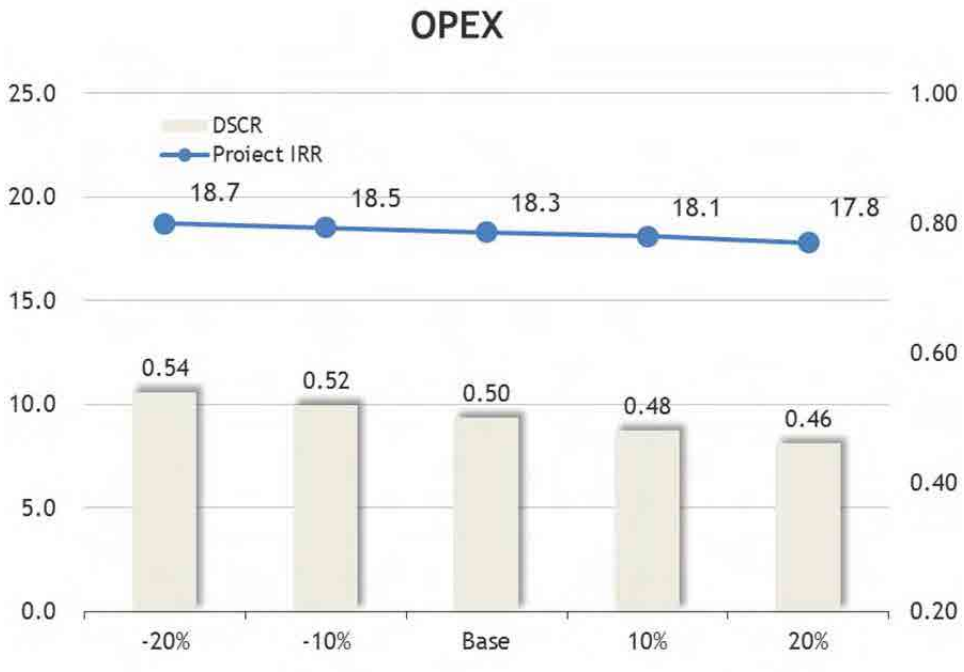


Source: JICA study team

Figure 3.6.3-5 Impact of change in CAPEX

(d) Impact of change in OPEX

If the realized CAPEX changes in the range of between -10% and 20% from the forecasted, the Project IRR will be in the range of between 17.8% and 18.7%.



Source: JICA study team

Figure 3.6.3-6 Impact of change in OPEX

(e) Impact of change in BOT concession period

The BOT concession period is assumed for thirty years after inauguration under the financial analysis. If the concession period is increased / decreased by five years, the Project IRR will be in the range of between 17.8% and 18.4%.

Table 3.6.3-20 Impact of change in BOT concession period

Base Case	x 1.0 times	18.3%	
Parameter	Range	Project IRR	Changes
inflation	x 1.5 times	14.9%	-3.4%
	x 0.5 times	21.1%	2.8%

Source: JICA study team

(3) Change in assumption scenario

(a) Impact of change in toll tariff

In the Base Case, the toll tariff is assumed for 1,000VND/km (price of 2012) which will be increased by 30% every five years. The Table 3.6.3-21 in the previous section shows the applicable toll tariff for each year and each category of vehicle.

If the toll tariff increases from 1,000VND to 3,500VND (price of 2012, to be increased by 30% every five years), the Project IRR will be in the range of between 13.6% and 18.3%. Therefore, the profit maximizing toll tariff is 1,500VND/km.

Table 3.6.3-21 Impact of change in toll tariff

Base Case	1,500VND	18.3%	
Parameter	Range	Project IRR	Changes
toll tariff	1,000VND	**17.8%**	-0.5%
	1,500VND	**18.3%**	0.0%
	2,000VND	**17.3%**	-1.0%
	2,500VND	**16.1%**	-2.2%
	3,000VND	**15.0%**	-3.3%
	3,500VND	**13.6%**	-4.7%

Source: JICA study team

(b) Impact of change in tariff increase interval

It is stipulated for the regulation of HCMC-Trung Luong expressway that the toll tariff may be increased up to 30% every five years. If the interval of five years should be extended to seven or ten years for some reasons, the Project IRR will be 15.8% or 13.9% respectively. Strictly speaking, if there is a delay of tariff increase, it would result in a decrease in tariff after consideration of inflation and the traffic volume should be adjusted to increase. However, we use the same traffic volume forecast in this analysis for both simplicity and prudent reasons.

Table 3.6.3-22 Impact of change in tariff increase interval

Base Case	once every 5 years	18.3%	
Parameter	Range	Project IRR	Changes
toll increase interval	once every 7 years	15.8%	-2.5%
	once every 10 years	13.9%	-4.4%

Source: JICA study team

(c) Impact of delay in construction of surrounding road network

In this section, we assume the delay in inauguration of Inter-port Road, BL-LT highway and HCMC new international airport. In each scenario, the inauguration will be delay until 2023, 2026 or 2030. The results are shown in the tables below;

Table 3.6.3-23 Impact of delay in Inter-port Road

Base Case	Open in 2017	18.3%	
Parameter	Range	Project IRR	Changes
Delay of IP road	Open in 2023	**18.8%**	0.5%
	Open in 2026	**20.4%**	2.1%
	Open in 2030	**20.8%**	2.5%

Source: JICA study team

Table 3.6.3-24 Impact of delay in BL-LT highway

Base Case	Open in 2017	18.3%	
Parameter	Range	Project IRR	Changes
Delay of BL-LT	Open in 2023	**19.0%**	0.7%
	Open in 2026	**19.4%**	1.1%
	Open in 2030	**19.6%**	1.3%

Source: JICA study team

Table 3.6.3-25 Impact of delay in HCMC new international airport

Base Case	Open in 2017	18.3%	
Parameter	Range	Project IRR	changes
Delay of new airport	open in 2023	**18.2%**	-0.1%
	open in 2026	**18.2%**	-0.1%
	open in 2030	**17.9%**	-0.4%

Source: JICA study team

3.6.4. Conclusion of financial analysis

In the viability improvement, we proposed the project scheme which improve the Project IRR from 9.2% to 18.3%[16] fro BH-VT expressway.

The assumptions for the proposed project scheme are confirmed and re-stated as below;

(1) Operation start year

In 2020: Bien Hoa – Nhon Trach(BOT) & Nhon Trach – Phu My – NH51(public)

In 2023: Phu My – Ba Ria(public)

In 2026: Ba Ria – Vung Tau(public)

(2) Construction of neighboring roads and facilities: same as Mater Plan (Decision No. 1745/QD-BGTVT)

(3) Toll tariff for NH51: 20,000VND[17]

(4) Foregin exchange rate: JPY1=268VND(June 2012, State Bank of Vietnam's web site)

(5) Inflation:

[16] In our initial proposal, it was prepared for Project IRR = 20.8%, which excees the hurdle rate of approximately 20% by including the request to postpone Inter-port Road until 2030. But it was severly opposed by Vietnamese govement and we exclude this effect (+2.5%) in this report for the reasons expediency. We leave the further negotiation to the Investors Group

[17] Tariff increased from 10,000VND in December 2012

Table 3.6.4-1 Inflations assumptions

Period	Inflation(%)	Period	Inflation(%)
2012 – 2013	10.0%	2025	5.5%
2014	9.0%	2026	5.0%
2015 – 2020	8.0%	2027	4.5%
2021	7.5%	2028	4.0%
2022	7.0%	2029	3.5%
2023	6.5%	2030-2046	3.0%
2024	6.0%		

Source: JICA Study Team

(6) Land acquisition: Government of Vietman is responsible including the cost(2,638 bil VND, priece of 2012)

(7) Request for the government supports(to be discussed)

1) Category 1: relating to Phase 2(public). (Project IRR=16.3% from 9.2%)

(a)same opening year for Phase 1(BOT) and 2(public)

(b)opening year should be in 2020.

(c)Reduce the Phase 1(BOT) section to Bien Hoa – Nhon Trach. And transfer the Phase 2 profit (= toll revenue – O&M cost) to BOT business as a part of Viability Gap Funding.

2) Category 2: others

(a) Postpone the opening of BH-VT railways until 2030 (+0.64%)

(b)Upgrade the access road to NH51 and charge the toll fee(+0.29%)

(c)Public construction of overpass bridges including BOT section(+0.57%)

(d)Increase of toll tariff to 1,500 VND in price of 2012 with 30% increase every 5 years(+0.50%)

Table 3.6.4-2 Applicable Toll tariff（VND/km）
for 1,500VND / km (2012 price, 30% increase every 5 years)

Type of Vehicle	2017-2021	2022-2026	2027-2031	2032-2036
Car	1,950	2,535	3,296	4,284
Bus	4,290	5,577	7,250	9,425
Truck (2t)	1,950	2,535	3,296	4,284
Truck (2t～4t)	2,925	3,803	4,943	6,426
Truck (4t～10t)	4,290	5,577	7,250	9,425
Truck (10t～18t)	7,800	10,140	13,182	17,137
Truck (18t～)	11,700	15,210	19,773	25,705

Source: JICA Study Team

3.7. Government Support

As discussed in Chap. 3.5 a variety of support from GoV are required to make the project viable to Japanese investors. Here the support items are divided into two categories depending on the coverage of the BOT law 108 (Nov.27, 2009): (i) supports to be covered by the BOT law and (ii) supports not be covered by the BOT law.

Article 6 of the BOT law prescribes the GoV provide financial support for land acquisition, construction of supporting facilities and other related works to assist the project implementation. In this respect the following items of support are covered by the law:

(1) To acquire the land and provide it to SPC for free
(2) To construct supporting facilities at the side of GoV, including (i) elevating HCM-LT-DG, (ii) expressway at LT JCT, (iii) an access road between BH-VT expressway and NH51 at NT JCT and (iv) overpass bridges across the expressway in BOT section
(3) To revise in the project scope from the original plan, including (i) upgrading the access road from Phu My IC to NH51, to toll road level, and (ii) extending the public section in Phase 2 to Nhon Trach - Vung Tau.
(4) To increase the toll rate from VD1,000/km to VD1,500/km in 2012.

The second category of supports which are unable to be provided by the BOT law includes:

(5) To construct and operate the Phase 2 (public work section) at the side of GoV
(6) To transfer the net revenue (gross revenue – OM costs) from the Phase 2 operation
(7) Not to open competing public projects (inter-port road including Phuc An bridge and BH-VT railway) before 2030

Special arrangement of support for the second category items is needed to make them to be realized.

Meanwhile, the BOT law (article 6) stipulates direct funding support (state budget) is available up to 49% of the total investment capital cost, excluding the costs of land acquisition and supporting works. This ratio is calculated at 82.6% taking into consideration Phase 1 (BOT section) cost of VD 7,747 bn and Phase 2 (public section) cost of VD 24,975 bn, excluding the land acquisition costs. This ratio is clearly beyond the 49% limit.

Thus the BOT law is hard to apply to the project. Therefore a special mechanism by issuing decrees from GoV is needed to make the required supports realizable and implementable.

The government supports identified are obviously documented in the project agreement between the SPC and MOT. The agreement must be securitized by the government guarantees and undertaking (GGU) under a special mechanism agreement. An example of a part of GGU prescribing the above-mentioned government support is presented in Appendix 1.

3.8. Examination of Security Package

In this section a security package which is required for financing the projectwillbeexamined.

(1) Composition of Security Package

Security package is defined as an aggregate of the following for securing financing from lenders: i) Government guarantee and support for securing viability of project and susatainability, ii) Security charge and collataral for rights and project related contracts, iii) Mechanisms and contracts needed to namage cash flow.

Proposed security package is composed of three tiers as illustrated in the following figure.

First tier is as explained in detail in the financial analysis section the government guarantee and supports to secure the expected project profitability by the private sector, requesting items to the government in order to structure the project, and sponsor supports which are required by the lenders.

Second tier is requesting items to the government for risk management of criticalproject risks.

Third tier is the items which are necessary for securing rights and assets and for cash flow managemnt such as contracts and security charges by the lenders.

Source: JICA Study Team

Figure 3.8-1 Three Tier Structure of Security Package

(2) Outline of Security Package

First Tier: Arrangements to maintain the viability and sustainability of the SPC operation

Government guarantee, government grant, sponsor support and provisions in related contracts (ex. EPC contract, O&M contract, toll collection outsourcing agreement, currency conversion agreement, insurance, etc.) will be included in this layer. These elements will be fundamental countermeasures to ensure the payment of principal and interest to the lenders because SPC will operate and generate cash flow under these contracts. Generally, all the basic details of the government support should be considered and agreed before the establishment of the SPC.

Each item written in the below section will mainly be determined in major project related contracts, but those contract documents will also be subject of lender's due diligence, so it should be considered and agreed during the period from the establishment of the SPC to the actual lending for these items.

Sponsor support such as sponsor loan and obligation of capital contribution may be settled before the establishment of the SPC as agreements between shareholders. However, lenders may request obligation of capital contribution or construction completion guarantee which will be recoursed to shareholders for loan origination.

In addition, these sequences are different by each project, and it is intended to have certain flexibility.

Seconf Tier: Arrangement for management and mitigation of project risks

In addition to the First Tier, there are arangement of government request and necessary mechanisms which are essential to manage the project risks which could affect critically about the sustainability of the project.

Generally sequence of these arrangements are various and flexible. However, it is preferable that agreement be obtained for necessary government request and support items before large capital injection.

Third Tier: Arrangements for lenders to manage the project assets

In cases of poor performance of the SPC or default of the SPC, the lenders should have the right to manage the project assets of the SPC. Setting collateral to the SPC share, securities relating on project contracts, onshore/offshore account securities and setting collateral on fixed assets will be included in this layer. Approval from the State Bank of Vietnam (SBV), account management method and arrangements which will be written in the loan agreement such as compliance matters of SPC should also be determined besides setting collateral to assets in the arrangements for lenders to manage the project assets.
Generally, these arrangements will be agreed during theloan origination.

Table 3.8-1 First Tier of Security Package: Arrangement for Securing Project Viability

Item	Contract	Description	Notes / Issues
Government Guarantee: General Items			
Currency exchange	GGU	The SPC's right to exchange the full amount of VND revenue to JPY and/or USD.	The GOV will only guarantee the currency exchange amount up to 30% of the sales from each project due to the lack of foreign exchange reserves. The GOV keeps a dicisive policy in recent contract negotiations on this subject and intends foreign currency funding by the market without government guarantees.
Overseas remittance	GGU / Project Agreement	The SPC's right for overseas remittance.	
Prevent nationalization	GGU / Project Agreement	To prevent the nationalization of assets of SPC. Total amount will be compensated in case of nationalization.	
Additional nontaxability	GGU / Project Agreement	SPC will not be affected by adverse tax changes and will enjoy the benefit of favourable tax changes.	
Change of law	GGU / Project Agreement	SPC will enjoy the benefit of favourable changes of law and will receive compensation in case of adverse tax changes.	
Development of Infrastructure, Public Services and Utilities	GGU / Project Agreement	Government guarantee on necessary development onrelated infrastructure, public services and utilities regarding the expressway development.	Identify and confirm subject infrastsucture, public services, and utilities and stipulate in the agreement about the method of compensation in case of bleach of the GGU items.

Item	Contract	Description	Notes / Issues
Fulfillment of contractual obligations by the state owned entities.	GGU / Project Agreement	SPC may enjoy benefits from state owned entities based on various contracts. The SPC will receive compensation if the state owned entity and/or the government does not fulfill the contract obligation.	The government has a restraint policy on this kind of guarantees.
Guarantee for project acquisition (buy out)	GGU / Project Agreement	For any occasion of bleach of contract by the government or event of force majeure, if the issue does not settle by the period that has been agreed in advance, the government will acquire the project.	There are similar clauses in contracts of other existing infrastructure projects in Vietnam.
Complementary support from the government	GGU / Project Agreement	There may be cases that government support is required to reduce risks such as currency exchange rate risk, inflation risk and so on.	Discussion is required with the government.
Government Incentives			
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 and has to be negotiated in other cases.	
Corporate income tax incentives	IC and GGU or PA	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	Considered for preferential investment sectors and granted on a case-by-case basis. Note there has not been much recent relevant experience on this.

Item	Contract	Description	Notes / Issues
		years. Tax losses to be carried over for a period of up to five years. Permitted to accelerate depreciation of fixed assets up to twice the rate of depreciation as stipulated by law.	
Import duty exemption	IC and GGU or PA	Exemption from import duties for goods and services imported for the construction, operation and maintenance (subject to some conditions).	
No tax on profit remmitance	IC and GGU or PA	Supplementing the right to remit.	
Rights along expressway	GGU or PA	Advertising business rights and other development rights along expressway are provided to the SPC or sponsor as an incentive. Specific conditions to be specified in GGU or PA.	
Government Guarantee: Specific Items			
Initial land use rights acquisition and resettlement compensation	GGU / PA	Land acquisition by government with appropriate timing and free land rent to use	It is necessary to propose financing method for landacquisition
Application of special toll level	GGU / PA	Application of 1500VND /km/pcu in 2012 price	MNegotiation and agreement with MOF and MOT is necessary
Devekipment of access road	GGU / PA	Elevated structure of HCM-LT-DG Expressway at LT JCT(Public construction)	Adjustment with VEC and the railway side is necessary
Development of	GGU / PA	Development of access road from NH51 to NT JCT	

Item	Contract	Description	Notes / Issues
access road		forBHVT Expressway (Public construction)	
Development of PM IC-NH51 Section with expressway standard	GGU / PA	Development of PM IC-NH51 section with expresswaystandard and inposition of toll (Public development with revenue to be enjoyed by the private)	Adjustment for the development with expressway standard and for imposition of toll are necessary
Flyover development for Private Section	GGU / PA	Developmeny of flyovers for Private Section by government	Adjustment is necessary to include them for ODA funding
Extension of Public Setion	GGU / PA	In addition to original Public Section (Phase 2), the section of NT-PM/NH51 is to become as a part of the new Public Section (addition)	Additional FS may be necessary as the Public Section decided in the original FS is different from the proposed Public Section
Supplementary revenue for the private from the public Section	GGU / PA	Revenue from the pUblic Section will be given totheprivate after deducting the O&M fee	Special mechanism with Prime Minister's approval is necessary
Simultaneous development and opening of Public Section and Private Section	GGU / PA	First phase of Public Section development which is originally scheduled to open in 2030 in Pre F/S, is to open with the Private Section in 2020	Adjustment with MOT is necessary
Change of schedulefor development of Inter-port Road (postponement)	GGU / PA	Change of opening of Inter-Port Road including Phuoc An Bridge from 2017 to 2030	Adjustment with MOT and related organization is necessary
Change of opening for the BHVT railway (Postponement)	GGU / PA	Change of opening of the BHVT railway from 2020 to 2030	Adjustment with MOT and related organization is necessary

Item	Contract	Description	Notes / Issues
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 lender would provide working capital facility as well in common, 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 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.
Insurance			
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.	

Item	Contract	Description	Notes / Issues
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 bleach 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.)	
Contractor obligation			
EPC performance obligation	EPC contract, completion bond	The EPC contract would have to include bankable provisions dealing with a number of issues including completion risk, bonds, retentions and liquidated damages regimes.	
O&M performance obligation	O&M contract	O&M contractor fee would 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 somewhat differently.

Source: JICA Study Team

Table 3.8-2 Second Tier of Security Package: Arrangement for Management and Mitigation of Project Risks

Item	Contract	Description	Notes / Issues
Government Guarantee			
Prime Minister's approval on Special Mechanism	GGU / PA	It is necessary for project iimplementation to obtainspecial mechanism on Prime Minister's approval since the proposed project scheme would require government supports which could go beyond the scope of current BOT law and PPP pilot regulation	As this is essential precondition for project structuring ,possibility of obtaining this approval must be examined before the GGU/PA discussion and negotiation
Financing and budget allocation of land acquisition cost based on proposal by the private	GGU / PA	Financing and budget allocation of the land acquisition cost using the proceed procured by government on the basis of the proposal by the private sector	Possible financing method is to be proposed
Integrated mamagement of Public Sector revenue and Private Sector revenue in consolidated account	GGU / PA	Integrated mamagement of Public Sector revenue and Private Sector revenue in consolidated account by agent bank of bank loan extended to SPC	It is necessary to build in payment mechanism of O&M fee and the renewal investment
Minimumu revenue guarantee mechanism and revenue stability fund	GGU / PA	Minimum revenue guarantee payment and compensation mechanism for toll adjustment and traffic risks, and method to secure funding sources	Comprehensive sdjustment is necessary with related agencies beyond MOT sucha s PM office, MOF, MPI and so on
Compensation	GGU / PA	Compensation payment mechanism stipulated ing the	Comprehensive sdjustment is necessary with related agencies

Item	Contract	Description	Notes / Issues
payment mechanism by government for bleach of GGU items and imperformance of government obligations		project agreement and GGU for Force Majure and bleach of government obligations	beyond MOT sucha s PM office, MOF, MPI and so on

* Statements here represent the approach generally taken as modified by current circumstances. In reality, each project will be approached and documented somewhat differently.

Source: JICA Study Team

Table 3.8-3 Third Tier of Security Package: Arrangement for cash flow and project asset management for lenders

Item	Contract	Description	Notes / Issues
Cash flow control mechanism			
Foreign loan registration	State Bank of Vietnam(SBV) registration	Foreign loans of more than 12months must be registered with SBV. This will be required for remitting the proceeds of security enforcement out of the country.	
Conversion structure	Conversion bank agreement	Mechanisms and conditions for currency conversion of VND to USD within onshore account would be agreed.	The effect of PM's instruction to guarantee conversion limited to 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 incentive (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 in 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 incentive.	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 reserve account	Loan agreement	The SPC will establish an offshore debt service reserve account (DSRA), which must be funded before lower ranking payments (such as profits remittance) from cash waterfall.	

Item	Contract	Description	Notes / Issues
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 according to 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, they would have to be subordinated.	
Guarantee of debt up to completion	Loan agreement or separate Completion Guarantee Agreement	Sponsor guarantees the debt until financial completion (generating stable operational cashflow satisfying financial covenants) occurs.	
Mortgage and Security			
Registration of security over assets	National Register of Security Interests	Security over assets in Vietnam should be registered with the National Register 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 the 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 is some dispute with government (e.g. no adjustment to tariff).
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 the SPC default.	The relevant equipment in this case may be limited and difficult to transfer.
Mortgage of land use rights and	Mortgage agreement with the	Lender's right to retain control of land use rights and structures on land during the course of	The law prohibits the grant of mortgages over land to foreigners. There have, in the past, been exceptions

Item	Contract	Description	Notes / Issues
structure on land	SPC	concession period, in the event of the SPC default.	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 entity (negative protection). This will allow the operational cashflow to continue to flow in, 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 Colleting Contract is also important in the aspect of maintaining cashflow.	
Direct Agreements with all major project counterparties	Direct Agreement	Each mortgage of a project contract (including the GGU and the BOTA) would 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 in the 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.

* Statements here represent the approach generally taken as modified by current circumstances. In reality, each project will be approached and documented somewhat differently.

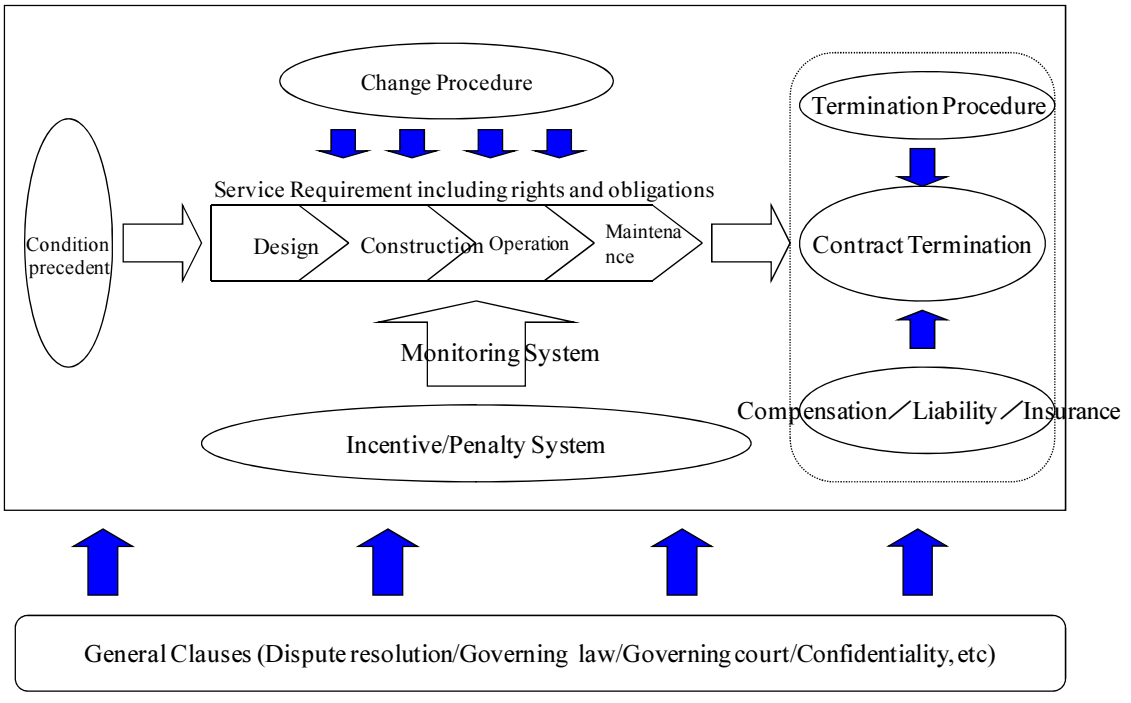
Source: JICA Study Team

3.9. Term Sheet on Major Contract Conditions

(1) Basic Composition of PPP Contract

Typical composition of a PPP contract is, as illustrated in Figure 3.9-1, focused on stipulation of service requirements of the subject PPP project which include the rights and obligations of both the public and the private. The composition would include: i) Conditions to make the contract effective and enforceable, ii) Service requirements which the public would wish the private to perform, iii) How to change the contents when necessary, iv) Monitoring, incentive and penalty mechanism in order to make the private to perform in accorance with the requirement by the public and v)Termination procedure and consditons of contract including termination within concession period.

In order to support the above mentioned arrangement, there are general clauses such as dispute resolution, governing law, governing court, confidentiality and so on. In addition as annex to the contract such documents as land right/obligation related documents, design/construction requirements, service requirements, financial analysis, traffic forecas, toll collection/adjustment/payment, encironmental impact statement, etc. would be attached.



Source: JICA Study Team

Figure 3.9-1 Typical Composition of PPP Contract

(2) Outline of Major Contract Conditions (Term Sheet)

Term Sheet is a list table about main topics on contract target, method, term and so on. It is often used for mutual understanding and agreement on major items of general framework and basic conditions of the contract between the parties before the official signing of the contract. Below is an outline of a draft Term Sheet.

Table 3.9-1 Outline of Major Contract Conditions (Term Sheet)

No	Item	Contents
0.	Face	- What is the name of contract?
1.	Tabel of contents (composition)	- How is the contract composed?
2.	Related parties	- MOT or agent of MOT who owns the asset - JVC（SPC） as concessionaire - Other related agencies based on the Special Mechanism (If necessary)
3.	Project purpose and agreement by related parties	- MOT would commission SPC to conduct design, finance, construct, O&Mof the BHVT Expressway and to coordinate with design, construction and operation of the Public Section
4.	Definition	- Definition of the words used in the contract (general composition)
5.	CPnditions precedent	- Conditions are stipulated to make the contract effective and enforceable - Stipulate the conditions precedent to be perform by each the public and the private - Conditions precedent for government obligation are the following GGU items to be preagreed (including inter governmental pre-adjustment): * First Tier Security Package Government Guarantee and Undertaking (GGU: General, Specific and Incentives) * Second Tier Security Package GGU * Third Tier Security Package which needs pre agreement by the government and related government agensies GGU items to be concluded and performed before the contract would become conditions precedent to the contract. Among the above mentioned conditions, there are i) Items which needs to be pperform before the contract, ii) items which needs agreement before the contract, iii) items to be performed between the contract and opening, iv) items to be performed afte the opening throughout the concession period and so on. Therefore these GGU items should be examined beforehand and categorized in sequence and natures as categorized into condition precedents and subject of the contract itself, etc.
6.	Project milestone ans COtract period	- Major milestones for the project - Construction period plus operation period[30]year, scheduled opening is [*] - Necessary coordination with Public Section is stipulated
7.	Land acquisition and landuse	- Schedule of land acquisition and method of land use approval

No	Item	Contents
	conditions	- Necessary coordination with Public Section is stipulated
8.	ICE,IDC and Establishmentand operation of Project Coordination Meeting	- Role of Independent Certification Engineer (ICE) (Details in Appendix) - Role of Independent Design Checker (IDC) (Details in Appendi) - Reporting System (Details in Appendix) - Role and operation of the Project Coordination Meeting composed of therelated parties and government agencies and other stakehilders - Necessary coordination with Public Section is stipulated
9.	Design	- Design organization and approval procedure for each Sections, phases - Procedure for design change - Necessary coordination with Public Section is stipulated
10.	COnstruction	- Commencement of construction ans its scope - Preparation for construction such as land use approval, etc - Information sharing and monitoring during construction - Change procedure for construction scope - Delay in completion procedure - Defect liability of Public Section, defect liability of Private Section - Necessary coordination with Public Section is stipulated
11.	Completion check and comissioning	- Procedure of completion check by ICE between the related parties - Comisioning procedure (hand over of facilities, opening preparation, opening procedure) - Necessary coordination with Public Section is stipulated
12.	Toll	- Setting up of initial toll level and adjustment mechanism (Details in Appendix) - Necessary coordination with Public Section is stipulated - Minimum revenue guarantee and revenue stability fund mechanism (Details in Appendix)
13.	Operation and Maintenance	- Scope and government obligation about O&M including operation license(if necessary) - Scope of operation (Details in Apppendix) - Scope of Maintenance (Details in Appendix) - Change procedure for scope of O&M - Necessary coordination with Public Section is stipulated - Project organization and subcontract organization - Safety, emergency, user related services, monitoring, etc - Other O&M related services
14.	Suspension of constructionand O&M	- Prohibition of unnecessary suspension order or involvement for construction and O&M by the government

No	Item	Contents
15.	Liability for third party	- Responsibility, role and methodology for problem solution regarding expressway users and third party
16.	Joint operation and management comitiee	- Organization and operation rules for joint operation and management comitie - Reporting, discussion about important issues about opetation and business plan, monitoring related issues, etc
17.	Government support and guarantee	- Out of GGU items stipulated in the Security Package, items which are necessary to repeat in the project agreement would be stipulated
18..	Change in law	- Government is to understand about all risks related to change in law andto agree to compensate the damage given to the concessionaire and or the investor by change in law risk
19.	Force Majure	- Identify and confirm Force Majure events - Conditions and contract termination procedure by FM are stipulated
20.	Termination of contract	- Defaulting events by concessionaire - Conditions and termination procedures by defaulting events - Termination requirement by government default - Conditions and procedures of government default - Termination procedure in case of expiration ocf concession
21.	Extension of concession period	-Right, condition and procedure of extension of concession period
22.	Representation and waranties	- Representation and warranties for government - Representation and warranties for JVC(SPC)
23.	Dispulte resolution	- Procedure ans organization for dispult resolution (for example Singapore International Arbitration Centre, etc)
24.	Governing law	- Law governing the contract
25.	Waiver of sovereign immunity	-GOV and its related agencies agree not to claim and hereby expressly waives immunity to the fullest extent for its property, assets or revenues immunity (whether by reason of sovereignty or otherwise) in respect of its obligations under the project agreement from service of process, suit, jurisdiction or any court judgement, order, award, attachment (before or after judgement or award), set-off, execution of a judgement or other legal process
26.	Other items	- Effectiveness of contract, transfer of rights, change of sherholding structure, confidentiality, direct agreement with lender, step in procedure, etc

Source: JICA Study Team

3.10. Status of discussion with Vietnamese stakeholders

1) MOT Meeting

Date: 17 January, 2013

Attendance:

MOT: Dupty Minister- Nguyen Ngoc Dong, General Director of PPP Management Dept.- Le Anh Tuan,

BVEC: Deputy General Director- Tran Duy Nhan

TEDI: Vice General Director- Le Van Dich, Vice Chief of Expressway Design Dept.- Nguyen Manh Ha,

JICA Office for Private Sector Partnership: Director- Yasui Takehiro,

JICA Vietnam office: Advisor- Bui Liem,

JICA Study Team: Team- Leader Tsuji Takehiko, Dupty Team Leader- Miyake Hiromichi and Tsuboi Shinji, Member- Ishimoto Ichizuru, Iwasaki Masayoshi, Kikuchi Kenichi, Ema Tomohiro, Imada Shinpei and Hiarata Kenji,

JEXWAY: Senior Director- Nakamura Takeo

NEXCO-Central Vietnam Office: Chief Reprensentative- Hata Shunji

Topics: Interim Report from JICA Study Team on Bien Hoa- Vung Tau Expressway project and discussion about proposed Government supports for the project.

Comments from Dupty Minister of MOT as follows;

- MOT should review and consider if MOT should report to the Government with previous proposal based on BOT scheme or another project scheme proposed from JICA Study Team.
- JICA Study Team should define necessary financial supports from government to ensure project viability.
- The hurdle rate of project IRR 20% proposed from JICA Study Team is more than expecred.
- It is impossible to postpone the competing project, Phuoc An Bridge project in Inter-port road.

2) MOT Meeting

Date: 27 Feburuary, 2013

Attendance:

MOT: Dupty Minister- Nguyen Ngoc Dong, General Director of PPP Management Dept.- Le Anh Tuan, Dupty General Director- Hang from Planning and Investment Dept., Thang

from Science and Technology Dept., Them from Infrastructure Dept., Thuyen from International Cooperation Dept. and Ha from Construction Management Dept.
BVEC: General Director- Pham Van Hien, Deputy General Director- Tran Duy Nhan
TEDI: Vice General Director- Le Van Dich, Vice Chief of Expressway Design Dept.- Nguyen Manh Ha,
JICA Office for Private Sector Partnership: Director- Yasui Takehiro,
JICA Vietnam office: Representative-Watanabe Daisuke,
JICA Study Team: Team- Leader Tsuji Takehiko, Dupty Team Leader- Miyake Hiromichi and Tsuboi Shinji, Member- Hiarata Kenji,
JEXWAY: Senior Director- Nakamura Takeo
NEXCO-Central Vietnam Office: Chief Reprensentative- Hata Shunji

Topics: Draft Final Report from JICA Study Team on Bien Hoa- Vung Tau Expressway project.

Comments from Dupty Minister of MOT as follows;

- MOT should report the project plan to the Government after this meeting.
- MOT seek JICA-ODA loan from JICA to implementation Phu My-Vung Tau Section project as public works.

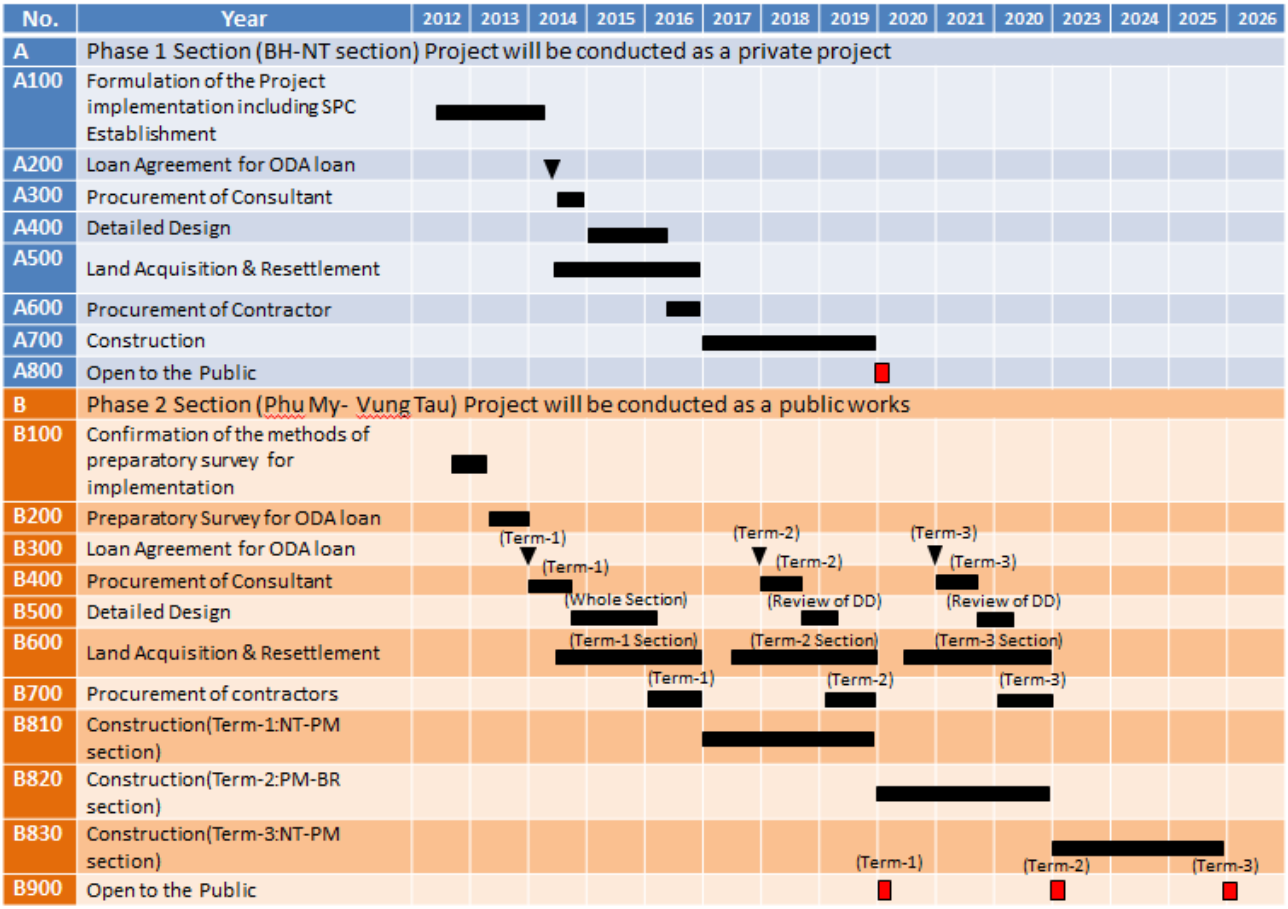
3.11. Suggested next step

(1) Tentative Implementation Roadmap

In developing the implementation roadmap, it is very important that adjustment of the schedule on both public works and private works.
In other words, it is proposed to conclude the Loan Agereement of JICA PSIF for Phase1 project after the completion of ODA Loan Agreemen for Phase2 project.
As a result, Bien Hoa to Nhon Trach as Phase 1section and Nhon Trach to Phu My as Phase 2 Term1section will be opened at the same time in 2020.
In addition, Phase 2 Section assumed the ODA is divided into three terms and they will be opened in 2020, 2023 and 2026 by public works.
In Phase1 project

- Project agreement will be contracted in 2014
- Construction will be started in 2017 after the completion of land acquisition and detailed design.
- Phase1section will be opened in 2020

Table 3.11-1 Tentative Impementation Roadmap

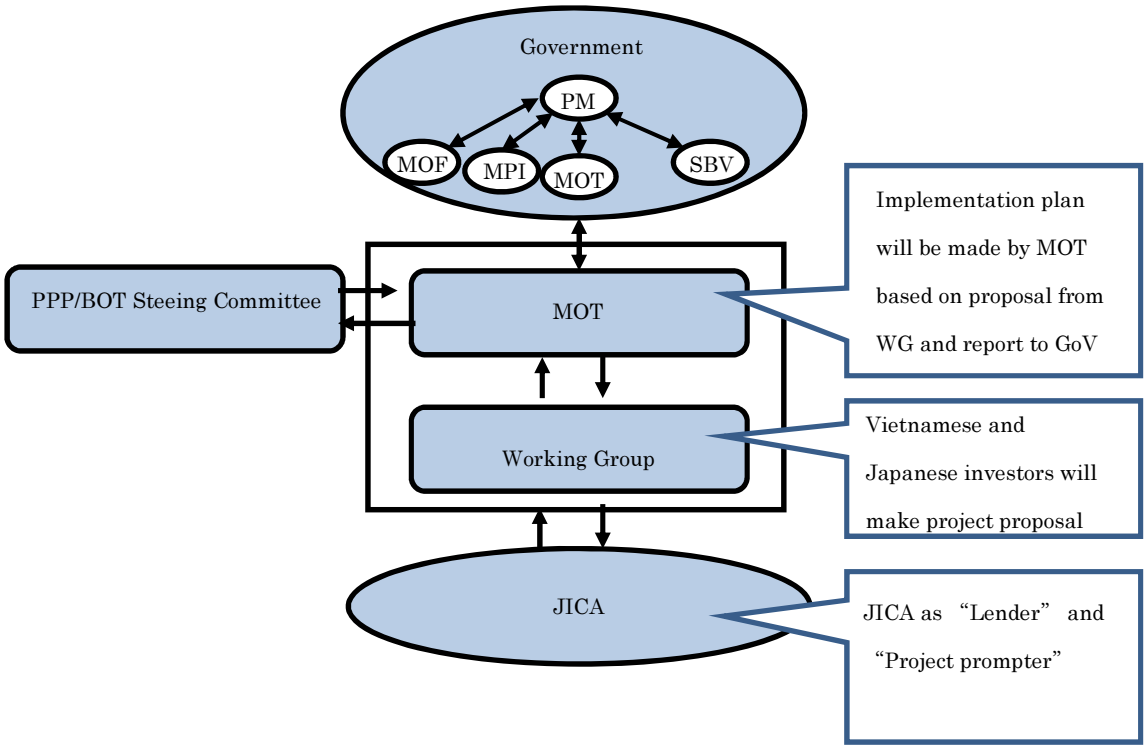


Source: JICA Study Team

(2) Organizational structure to promote the project

As a next step, the practices related to project implementation will be transferred from JICA study team to working group (WG) established by Vietnamese and Japanese inveters in March2013 after completion of JICA study.

The WG will make project proposal including finance plan under an agreement reached between Vietnamese and Japanese investers, then implementation plan will be finalized by MOT based on the project proposal from WG and submitted to Government for project approval from Prime Minister.



Source: JICA Study Team

Figure 3.11-1 Proposed organizational Sturucture

4. Implementation of survey and review for improvement of project viability and profitability

4.1. Traffic Demand Forecast

4.1.1. Traffic Survey

Traffic survey consisted by roadside survey and logistics interview survey was carried out to understand the present traffic condition around the study area and to obtain the basic data for the traffic demand forecast. Overview of the conducted traffic survey is shown in Table 4.1.1-1.

Table 4.1.1-1 Overview of Traffic Survey Components

Survey Type	Objectives	Description of Survey		Quantity
		Hour	Day	
(1) Roadside Traffic Survey	To obtain the actual traffic volumes and trip information around the study area	-	-	-
i) Traffic Volume Count Survey	To obtain traffic volumes by vehicle classification	24 hours from 7 A.M.	2 selected days	6 stations (on NH51)
		16 hours from 7 A.M.	1 typical weekday	12 stations
ii) Origin – Destination (OD) Interview Survey	To capture trip information by sampling interview	16 hours from 7 A.M.	1 typical weekday	6 stations (on NH 51)
		12 hours from 7 A.M.	1 typical weekday	12 stations
(2) Logistics Interview Survey	To capture trip behavior and demand for the expressway of logistics sector by sampling interview	-	-	-
i) Interview to Industrial Park management company	To capture overall profile and current trip information of each IP, and their future plan	-	-	70 companies
ii) Interview to Industrial Park tenant company	To capture current trip information, future plan and demand for the expressway	-	-	402 companies
iii) Interview to port management company	To capture current trip information, future plan and demand for the expressway	-	-	21 companies

Source: JICA Study Team

(1) Roadside Traffic Survey

1) Implementation

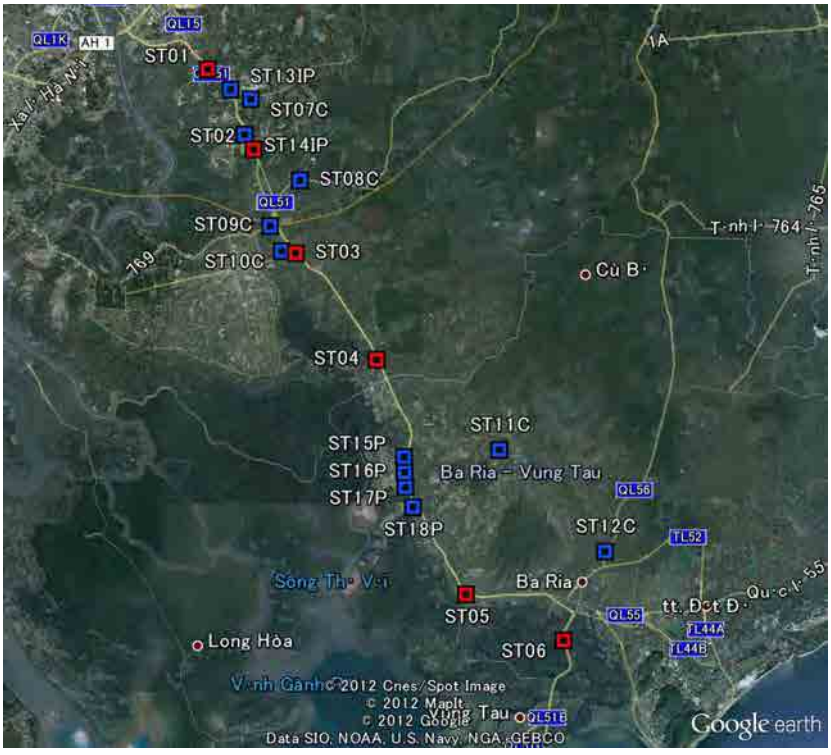
Location

Roadside traffic survey was carried out at 18 stations, including 6 stations on NH51 and the others on its connecting roads, as shown in Table 4.1.1-2 and Figure 4.1.1-1.

Table 4.1.1-2 Location of Roadside Traffic Survey Station

Station ID	Road No.	Description of Location (Between / Landmark)	
ST01	NH51	Intersection of NH51 and NH15	Entrance of KCN Tam Phuoc
ST02	NH51	Entrance of KCN Long Thanh	North end of split of NH51
ST03	NH51	Access to Khon Trach (North	Phuoc Thai
ST04	NH51	Phuoc Thai	Entrance of KCN Go Dau
ST05	NH51	Entrance of Cai Mep Port	Diversion to Long Son
ST06	NH51	Ba Ria	Vung Tau
ST07	(Rural Road)	Rural road on south of KCN Tam Phuoc	
ST08	PH769	PH769	
ST09	(Access Road)	Access to Khon Trach (North)	
ST10	(Access Road)	Access to Khon Trach (South	
ST11	(Rural Road)	Tân Thành	Châu Pha
ST12	NH56	NH56	
ST13	(Access Road)	Entrance of KCN Tam Phuoc	
ST14	(Access Road)	Entrance of KCN Long Thanh	
ST15	(Access Road)	Entrance of Thi Vai Port	
ST16	(Access Road)	Entrance of Thi Vai Port	
ST17	(Access Road)	Entrance of Thi Vai Port	
ST18	(Access Road)	Entrance of Cai Mep Port	

Source: JICA Study Team



Source: JICA Study Team

Figure 4.1.1-1 Location Map of Roadside Traffic Survey Station

Schedule

Survey had been conducted from April 20, 2012 until May 5, 2012. Traffic count survey was continuously carried out for 48 hours from Friday morning at the stations on NH51, to see the fluctuation of traffic volume for weekday and holiday. For the other stations, traffic count survey was carried out for 16 hours on a typical weekday.

OD interview survey was carried out from morning on a weekday, for 16 hours at the stations on NH51, and for 12 hours at the others.

Table 4.1.1-3 Schedule of Roadside Traffic Survey

Station ID	Traffic Count Survey		OD Interview Survey
	Weekday	Holiday	
ST01	April 20, 2012 (Fri)	April 21, 2012 (Sat)	April 20, 2012 (Fri)
ST02	April 20, 2012 (Fri)	April 21, 2012 (Sat)	April 20, 2012 (Fri)
ST03	April 20, 2012 (Fri)	April 21, 2012 (Sat)	April 20, 2012 (Fri)
ST04	May 04, 2012 (Fri)	May 05, 2012 (Sat)	May 04, 2012 (Fri)
ST05	May 04, 2012 (Fri)	May 05, 2012 (Sat)	May 04, 2012 (Fri)
ST06	May 04, 2012 (Fri)	May 05, 2012 (Sat)	May 04, 2012 (Fri)
ST07	April 23, 2012 (Mon)	-	April 23, 2012 (Mon)
ST08	April 24, 2012 (Tue)	-	April 24, 2012 (Tue)
ST09	May 03, 2012 (Thu)	-	May 03, 2012 (Thu)
ST10	April 24, 2012 (Tue)	-	April 24, 2012 (Tue)
ST11	April 25, 2012 (Wed)	-	April 25, 2012 (Wed)
ST12	April 25, 2012 (Wed)	-	April 25, 2012 (Wed)
ST13	April 23, 2012 (Mon)	-	April 23, 2012 (Mon)
ST14	May 03, 2012 (Thu)	-	May 03, 2012 (Thu)
ST15	April 24, 2012 (Tue)	-	April 24, 2012 (Tue)
ST16	April 24, 2012 (Tue)	-	April 24, 2012 (Tue)
ST17	April 25, 2012 (Wed)	-	April 25, 2012 (Wed)
ST18	April 25, 2012 (Wed)	-	April 25, 2012 (Wed)

Source: JICA Study Team

Methodology

i) Traffic Count Survey

Surveyors sitting roadside recorded the number of vehicles passing through the road by direction on the prepared survey form. Vehicles were classified into 11 types as listed below. The traffic volume was recorded every 15 minutes.

Classification of vehicle type

- Bycycle
- Motorcycle
- Car, Van, Taxi
- Mini Bus ($\leq$ 24 seats)
- Large Bus ($\geq$ 25 seats)

- Pickup truck
- 2-Axle truck
- 3-Axle truck
- 4 or more axle truck
- Trailer truck
- Others

ii) OD Interview Survey

Vehicles were flagged down by police and were lead to roadside space for safe interview. The driver was then interviewed based on the questionnaire. Interview items consist of 1) origin and destination of the trip, 2) trip purpose, 3) number of passenger, 4) willingness to pay, and for freight traffic, 5) loading capacity, 6) loading type, 7) loading status, and 8) commodity type.


Source: JICA Study Team

Picture 4.1.1-1 Survey Photos of Roadside Traffic Survey

Survey Resul**t**

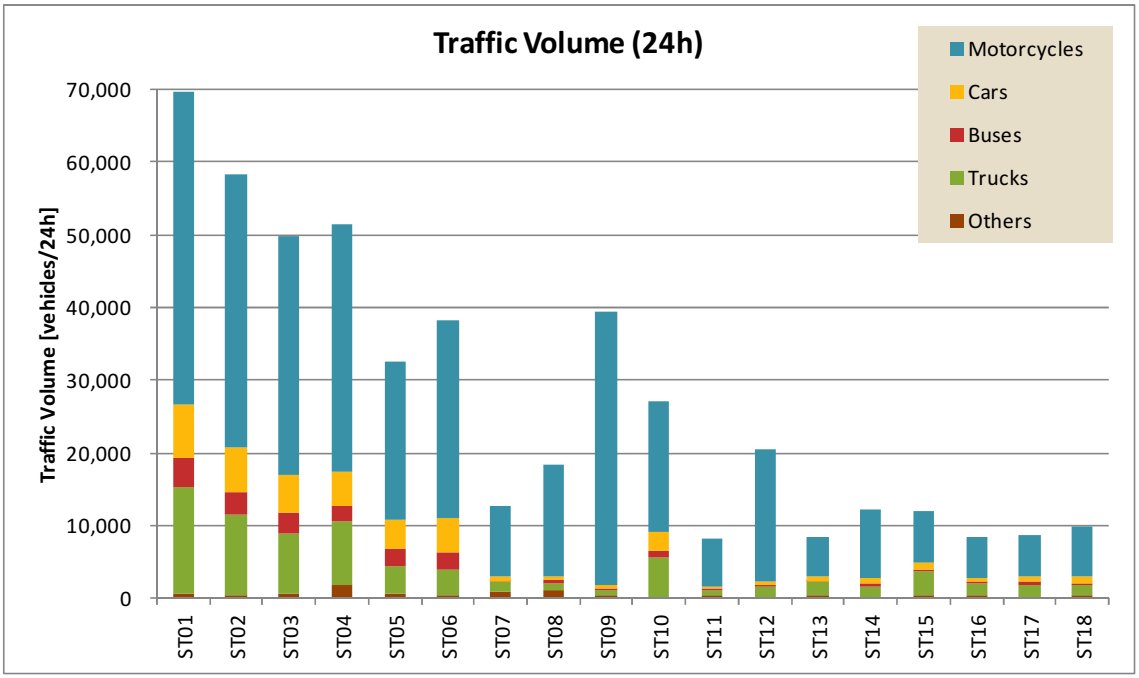
i) Traffic Count Survey

Survey results are shown in Table 4.1.1-4 and in Figure 4.1.1-2. Traffic volume is larger in the northern section of NH51, and becomes smaller in the southern section. The access roads to Khon Trach (ST09 and ST10) have larger traffic, compared with other roads except NH51.

Table 4.1.1-4 Result of Traffic Count Survey (24 hours)

Station ID	Motorcycle	Car	Bus	Truck	Others	Total
ST01	43,010	7,422	4,051	14,594	670	69,747
ST02	37,686	6,208	3,021	10,976	483	58,374
ST03	32,838	5,252	2,883	8,315	579	49,867
ST04	34,017	4,718	2,312	8,688	1,803	51,538
ST05	21,787	4,137	2,326	3,736	664	32,650
ST06	27,092	4,784	2,376	3,672	278	38,202
ST07	9,872	634	49	1,264	953	12,772
ST08	15,214	587	348	1,093	1,025	18,267
ST09	37,559	532	195	788	317	39,391
ST10	17,976	2,613	900	5,328	202	27,019
ST11	6,717	312	82	735	415	8,261
ST12	18,344	511	210	1,262	251	20,578
ST13	5,354	677	148	1,748	474	8,401
ST14	9,517	802	394	1,353	227	12,293
ST15	7,293	844	289	3,335	301	12,062
ST16	5,485	647	162	1,701	341	8,336
ST17	5,891	681	283	1,701	224	8,780
ST18	6,978	837	241	1,526	316	9,898

Note: Result of 16 hours survey (at ST07~ST18) were expanded based on the 24 hours survey result at the closest station.
Source: JICA Study Team



Note: Result of 16 hours survey (at ST07~ST18) were expanded based on the 24 hours survey result at the closest station.

Source: JICA Study Team

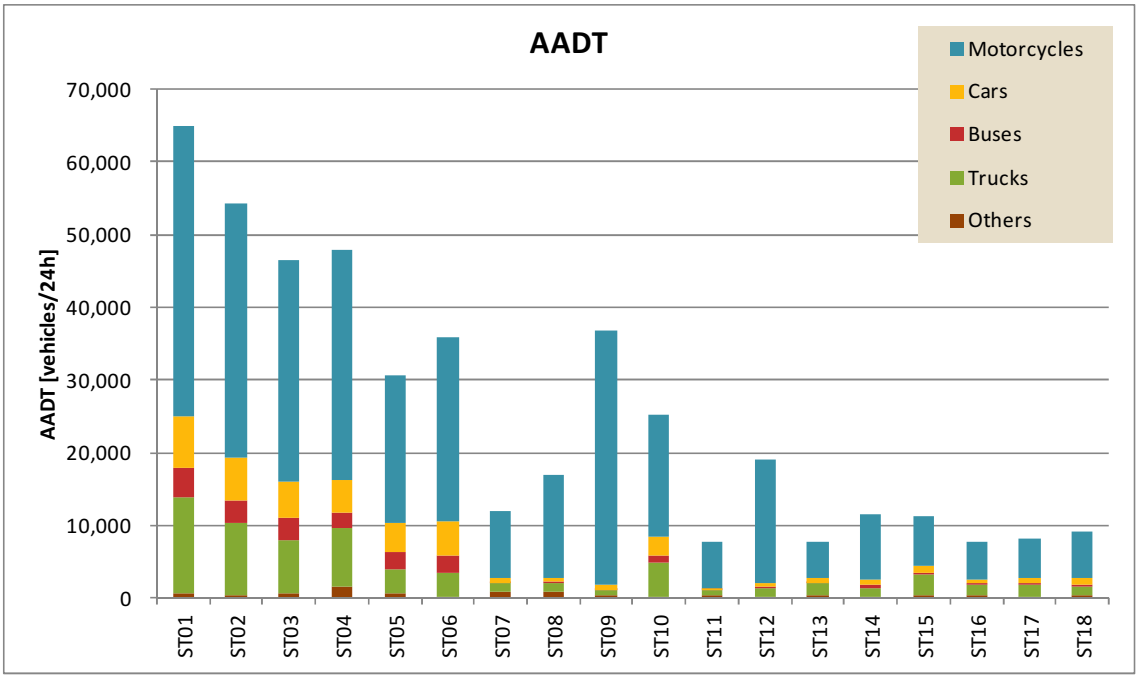
Figure 4.1.1-2 Result of Traffic Count Survey (24 hours)

The result was converted into Anual Average Daily Traffic (AADT) by incorporating the daily traffic volume data at toll collection gate on NH51 since 2010. AADT is shown in Table 4.1.1-5 and Figure 4.1.1-3.

Table 4.1.1-5 AADT at Survey Station

Station ID	Motorcycle	Car	Bus	Truck	Others	Total
ST01	40,091	7,054	4,054	13,151	625	64,975
ST02	35,129	5,901	3,024	9,890	449	54,393
ST03	30,609	4,992	2,885	7,494	541	46,521
ST04	31,709	4,484	2,314	7,830	1,680	48,017
ST05	20,309	3,932	2,328	3,367	619	30,555
ST06	25,254	4,546	2,378	3,309	259	35,746
ST07	9,202	603	49	1,139	888	11,881
ST08	14,181	557	348	985	956	17,027
ST09	35,010	505	195	710	296	36,716
ST10	16,756	2,483	900	4,801	188	25,128
ST11	6,261	296	82	662	388	7,689
ST12	17,099	486	210	1,137	234	19,166
ST13	4,990	643	148	1,575	442	7,798
ST14	8,871	762	394	1,218	211	11,456
ST15	6,798	802	289	3,004	280	11,173
ST16	5,113	615	162	1,533	318	7,741
ST17	5,491	648	283	1,534	209	8,165
ST18	6,504	796	241	1,375	295	9,211

Source: JICA Study Team



Source: JICA Study Team

Figure 4.1.1-3 AADT at Survey Station

ii) OD Interview Survey

The interview result is utilized for the traffic demand forecast. Overview of interviewees is briefed here.

Sample Rate

Total sample rate was 2.3%, and the sampling rate except motorcycle was 5.7%, as shown in Table 4.1.1-6. This low rate is probably because of the huge number of motorcycle obstructing the polices to stop vehivles, and also because of the shortage of police supporting for the survey.

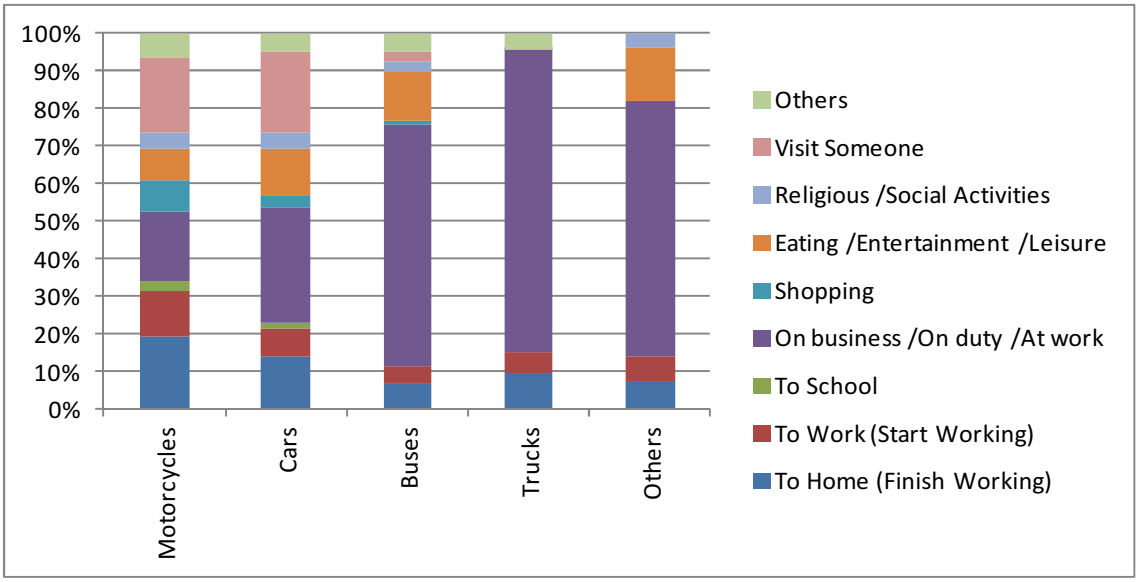
Table 4.1.1-6 Sample Rate for OD Interview Survey

Station ID	Motorcycle	Car	Bus	Truck	Others	Total	Total (w/o Motorcycle)
ST01	0.5%	1.5%	2.0%	3.0%	1.9%	1.2%	2.4%
ST02	0.5%	2.0%	4.3%	4.0%	0.0%	1.5%	3.4%
ST03	1.1%	3.0%	4.5%	6.0%	0.8%	2.3%	4.7%
ST04	1.4%	7.3%	7.6%	5.7%	3.5%	3.0%	6.4%
ST05	1.8%	2.9%	6.1%	25.3%	0.0%	4.7%	11.2%
ST06	0.8%	4.5%	8.1%	21.3%	0.0%	3.7%	10.8%
ST07	5.5%	12.5%	25.7%	8.0%	22.2%	6.4%	10.3%
ST08	0.2%	10.9%	2.2%	9.6%	0.0%	1.3%	8.5%
ST09	0.4%	4.2%	9.7%	17.0%	1.0%	0.9%	10.7%
ST10	0.9%	1.7%	3.3%	2.2%	0.0%	1.3%	2.1%
ST11	1.0%	22.9%	0.0%	11.9%	0.0%	2.7%	12.9%
ST12	1.0%	5.2%	6.9%	9.1%	0.0%	1.6%	7.5%
ST13	0.5%	3.1%	8.0%	10.0%	0.0%	3.2%	8.0%
ST14	0.2%	3.3%	8.7%	14.6%	1.7%	2.4%	9.9%
ST15	1.3%	3.8%	0.0%	6.3%	0.0%	2.7%	5.2%
ST16	1.9%	4.9%	1.6%	4.9%	0.0%	2.7%	4.5%
ST17	3.2%	8.2%	9.3%	11.0%	0.0%	5.0%	9.5%
ST18	0.9%	3.5%	3.2%	6.8%	0.0%	2.0%	5.0%
全体	1.0%	3.7%	5.0%	7.2%	1.7%	2.3%	5.7%

Source: JICA Study Team

Trip Purpose

Trip purpose by mode is shown in Figure 4.1.1-4. Commuting and business purpose are major for all modes, while private purpose such as shopping and leisure are also major for motorcycles and cars.



Source: JICA Study Team

Figure 4.1.1-4 Trip Purpose by Mode

(2) Logistics Interview Survey

1） Implementation

Interviewed Companies

i) Industrial Park management company

ii) Industrial Park tenant company

70 industrial parks in Binh Duong Province, Dong Nai Province, Ho Chi Minh City, Ba Ria - Vung Tau Province were selected, and their 70 management companies and 402 tenant companies were interviewed. The interviewed industrial parks are listed in Table 4.1.1-7.

Table 4.1.1-7 Interviewed Industrial Park

NO.	Industrial Park	No. of Interviewed Tenants	NO.	Industrial Park	No. of Interviewed Tenants
Binh Duong Province (23 IPs)			**Dong Nai Province(24 IPs)**		
1	Bao Bang (My Phuoc 5)	4	40	Thanh Phu	4
2	My Phuoc 1	3	41	Bien Hoa 1	8
3	My Phuoc 2	10	42	Bien Hoa 2	7
4	My Phuoc 3	12	43	LOTECO (Long Binh Industrial Park)	7
5	Tan Dong Hiep B	7	44	Amata	16
6	Ascendans Protrade Singapore Tech	0	45	Song May	10
7	Rach Bap An Dien	1	46	Ho Nai	9
8	Thoi Hoa	0	47	Bau Xeo	0
9	Dong An 2	7	48	Song Thao	0
10	Phu Gia	1	49	Dau Giay	0
11	VSIP 2, VSIP 2 expansion	9	50	Giang Dien	0
12	Nam Tan Uyen	10	51	Tam Phuoc	8
13	Dat Quoc	5	52	Long Thanh	7
14	Kim Huy	0	53	An Phuoc	4
15	Song Than 3	8	54	Long Duc	0
16	Dai Dang (Da Den)	10	55	Loc An - Binh Son	0
17	Viet Huong 1	3	56	Nhon Trach 1	4
18	VSIP 1	10	57	Nhon Trach 2	4
19	Song Than 2	4	58	Nhon Trach 2 Loc Khang	4
20	Tan Dong Hiep A	0	59	Nhon Trach 3 Phase 2	7
21	Dong An	9	60	Nhon Trach 5	5
22	Song Than 1	10	61	Nhon Trach 6	4
23	Viet Huong 2	7	62	Go Dau	5
Ho Chi Minh City(16 IPs)			63	Ong Keo	0
24	Tay Bac Cu Chi	13	**Ba Ria - Vung Tau Province(7 IPs)**		
25	Tan Thoi Hiep	8	64	My Xuan B1, Tien Hung	0
26	Quang Trung Software City	9	65	My Xuan A	9
27	Vinh Loc	8	66	My Xuan A2	7
28	Tan Binh	8	67	Phu My 1	7
29	Le Minh Xuan	16	68	Phu My 2	1
30	Tan Tao	17	69	Cai Mep	0
31	Hiep Phuoc	8	70	Phu My 3	0
32	Tan Thuan	6			
33	Cat Lai 2	7			
34	Saigon Hi-Tech Park	10			
35	Linh Trung 1	0			
36	Binh Chieu	4			
37	Linh Trung 2	8			
38	Xuan Thoi Son	6			
39	Binh Dang	7			

Source: JICA Study Team

iii) Port Management Company

21 Port Management Companies based in Ho Chi Minh City, Dong Nai Province and Ba Ria - Vung Tau Province were interviewed. The interviewed port terminals are listed in Table 4.1.1-8.

Table 4.1.1-8 Interviewed Port Terminals

Ho Chi Minh City (7 terminals)	
1	Ben Nghe terminal
2	Sai Gon terminal
3	Cat Lai (Tan Cang) terminal
4	Hiep Phuoc terminal
5	Tan Thuan Dong terminal
6	Sai Gon shipping terminal
7	Lotus terminal
Dong Nai Province (5 terminals)	
8	Go Dau B terminal
9	Vedan Phuoc Thai terminal
10	Phu Dong terminal
11	Dong Nai terminal
12	Go Dau A terminal
Ba Ria - Vung Tau Province (9 terminals)	
13	Tan Cang Cai Mep Port (TCCT, TCIT)
14	CMIT Port
15	Phu My terminal
16	SITV Port
17	Vietsovpetro termnial
18	Cang container quốc tế Việt Nam
19	PTSC petroleum terminal
20	SP-PSA Port

Source: JICA Study Team

Schedule

Logistics Interview Survey was carried out from April 17, 2012 until May 12, 2012.

Methodology

Request letter and questionnaire were delivered to the interviewed companies in advance, and then the interviewer visited the company to carry out the interview. Main interview items are presented in Table 4.1.1-9.

Table 4.1.1-9 Main interview items for Logistics Interview Survey

	IP management company	IP tenant company	Port management company
General	- Total area, area under lease, remaining area - Number of tenants, remaining tenant capacity - List of tenants and their business - Number of employees of management company and tenants - Residence area of employees of management company and tenants - Yearly total amount of goods of IP	- Business overview - Number of employees - Residence are of employees - Goods and its material - Yearly total amount of goods	- Business overview - Number of employees - Residence are of employees - Yearly total amount of goods
Current Traffic	- Origin and Destination of management company - Yearly total volume of enter/exit traffic and its type composition - Transport served for employees by management company and tenants	- Origin and Destination - Route (composition of land and river logistics) - Unit / daily / yearly costs of logistics - Yearly total volume of enter/exit traffic and its type composition - Transport served for employees	- Origin and Destination - Route (composition of land and river logistics) - Unit / daily / yearly costs of logistics - Yearly total volume of enter/exit traffic and its type composition - Transport served for employees
Others	- Expansion plan for IP - Other plan for next business - Demands for BHVT Expressway - Opinion on road network	- Willingness to pay - Demands for BHVT Expressway - Opinion on road network	- Expansion plan for port - Other plan for next business - Willingness to pay - Demands for BHVT Expressway - Opinion on road network

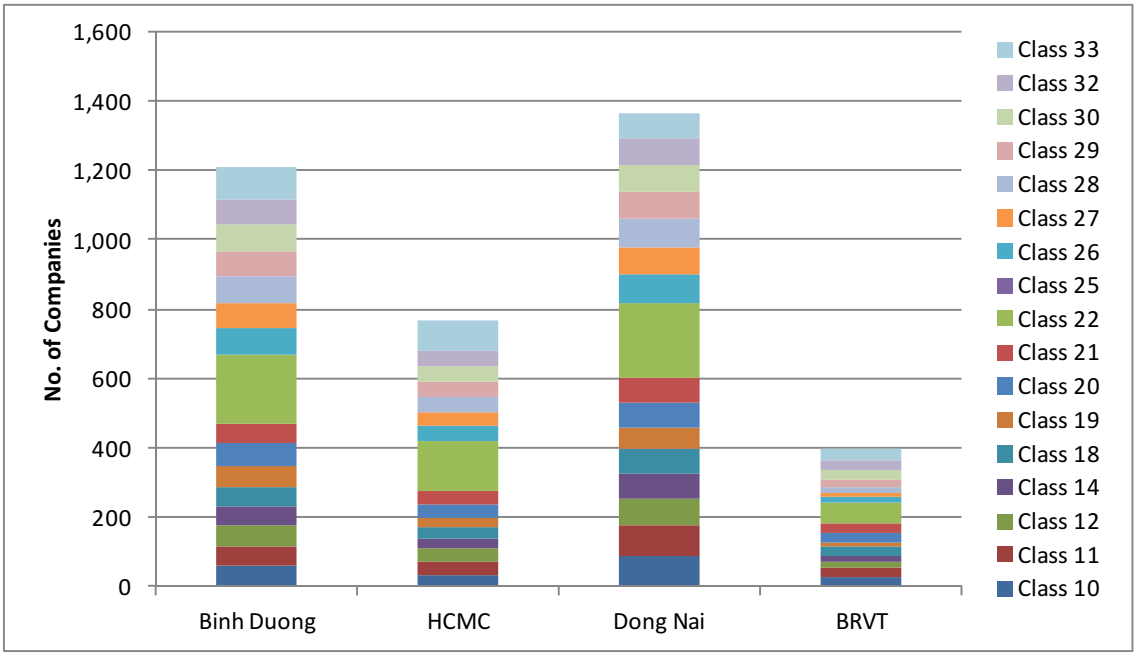
Source: JICA Study Team

2) Survey Result

The interview result is utilized for the traffic demand forecast. Overview of interviewees is briefed here.

Overview of Tenants in Interviewed Industrial Parks

The total number of tenants in interviewed industrial parks is 3,743, and the most major sector based on the Vietnam Standard Industrial Classification 2007 (VSIC 2007) is Sector 9 (Manufacture of rubber and plastics products), engaged by 622 companies.



Source: JICA Study Team、

Class 10	Manufacture of food products
Class 11	Manufacture of beverages
Class 12	Manufacture of tobacco products
Class 14	Manufacture of wearing apparel
Class 18	Printing and reproduction of recorded media
Class 19	Manufacture of coke and refined petroleum products
Class 20	Manufacture of chemicals and chemical products
Class 21	Manufacture of pharmaceuticals, medicinal chemical and botanical products
Class 22	Manufacture of rubber and plastics products
Class 25	Manufacture of fabricated metal products (except machinery and equipment)
Class 26	Manufacture of computer, electronic and optical products
Class 27	Manufacture of electrical equipment
Class 28	Manufacture of machinery and equipment n.e.c
Class 29	Manufacture of motor vehicles
Class 30	Manufacture of other transport equipment
Class 32	Other manufacturing
Class 33	Repair, maintenance and installation of machinery and equipment

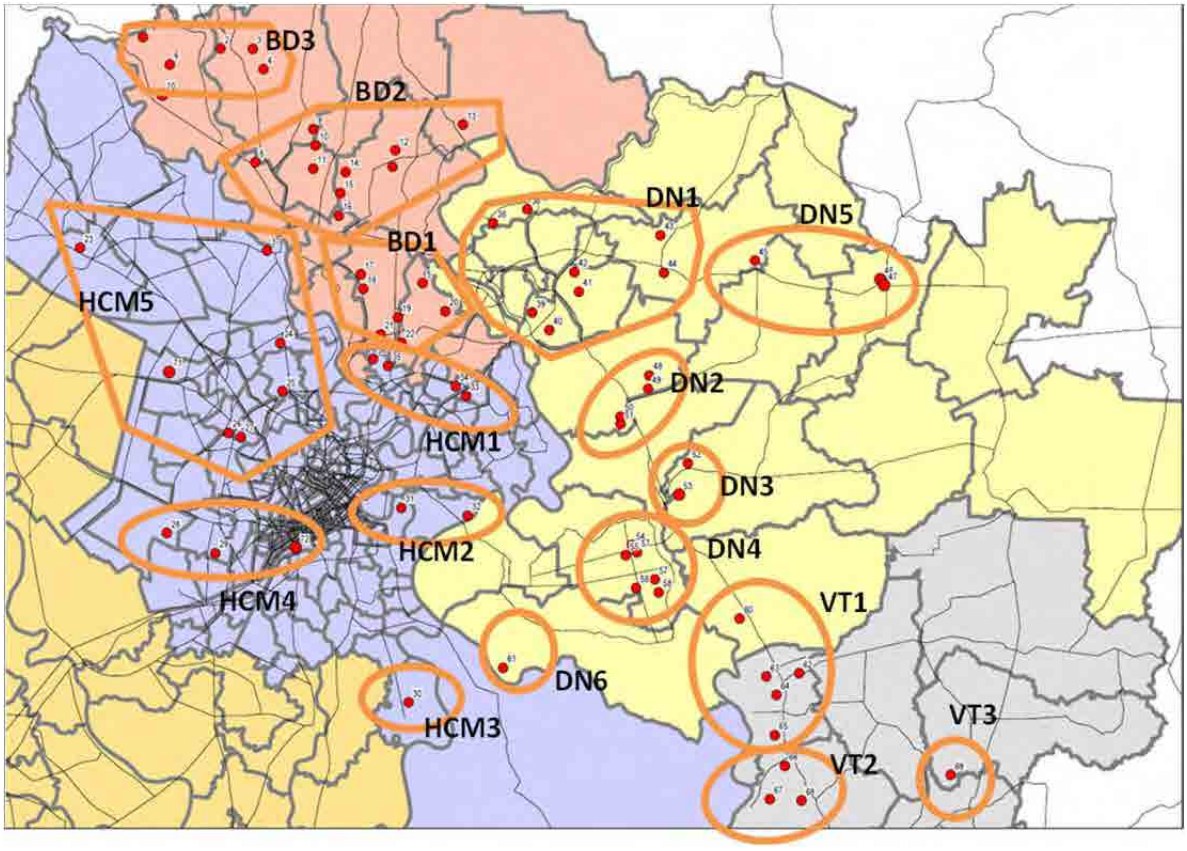
Source: Prepared by Study Team based on Vietnam Standard Industrial Classification 2007 (VSIC 2007)

Figure 4.1.1-5 Tenant Companies by Classification in Industrial Park

4.1.2. The evaluation of growth potential on industrial zone

A large number of industrial zones stand in the investigation target area of BHVT expressway project, especially on the periphery of National Highway 51 in accordance with government policy, geographical conditions, and so on. Further new and expansion projects are planned in the area aftertime. Since the heavy traffic demands are anticipated from the development of new and existing industrial zones in the area, we conducted the interviews and taking the documents of master plans for the development projects from four industrial zone authorities, e.g. Ho Chi Minh City Export processing & Industrial Zones Authority, Binh Duong Industrial Zones Authority, Dong Nai Industrial Zones Authority and Ba Ria Vung Tau Industrial Zones Authority, whose traffic volume will be severely impacted by the development of the area. We also worked out the interviews with important operation company of industrial zone and the on-site inspection of Cai Mep Thi Vai International Ports in Ba Ria Vung Tau province. On the basis of these works, we evaluated the growth potential of each industrial zone group. The followings are the method of grouping and evaluation.

The industrial zones on the periphery of our target area are sectionalized into seventeen groups in accordance with geographical conditions as per the following Figure 4.1.2-1.



Source: JICA Study Team

Figure 4.1.2-1 The groups of industrial zone

Each sectionalized industrial zones is given the evaluation score about the following five categories. In terms of the growth potential of industrial zone, we set down A as an excellent factor, B as a good factor, C as a neither good nor bad factor and D as a bad factor for contributory point to the growth potential of industrial zone.

Category 1) Prioritized industrial area or expansion planned area:

Prioritized industrial zones which were described by industrial zones authority or in their master plan for industrial development project are given A. Industrial zones which were included in the development plan of industrial zones are given B. The other industrial zones are given C in principle, but especially, the cancelled industrial zones are given D.

Category 2) Geographical conditions:

Site locations with shorter distance from main facilities and major roads are given A, B, C or D in sequence.

Category 3) Available capacity:

Tenant availabilities with larger land area including expansion plan are given A, B, C or D in sequence.

Category 4) Recent trend of tenant and prospective tenant:

Industrial zones which concluded a tenant contract with major company in these days or have a plan to absorb the major company who has secured permission of advance last year or later are given A.

Category 5) Good promotion factor to tenant:

Foreign investors except for Japanese company are likely to put their investment on hold, meanwhile, Industrial zones which have rental factory and allocate Japanese person in charge have become a trend of investment. These industrial zones are given A, and other industrial zones which have other investment promotions are given B.

We finally make an overall evaluation to each group of industrial zones in terms of its growth potential on the basis of aforesaid evaluation score on each industrial zone. We set down A for a group of industrial zones whose growth potential is expected greatly, B for a group of industrial zones whose growth potential is expected to some extent, C for a group of industrial zones whose growth potential is not expected and D for a group of industrial zones who is likely to decline. The following Table 4.1.2-1 is the results of overall evaluation on growth potential of each group of industrial zones;

Table 4.1.2-1 The evaluation of growth potential on groups of industrial zone

Group	Province	Industrial Zone	Overall Evaluation
BD1	Binh Duong Province	Tan Dong Hiep B	**B**
	Binh Duong Province	Viet Huong 1	
	Binh Duong Province	VSIP 1	
	Binh Duong Province	Song Than 2	
	Binh Duong Province	Tan Dong Hiep A	
	Binh Duong Province	Dong An	
	Binh Duong Province	Song Than 1	
BD2	Binh Duong Province	Thoi Hoa	**B**
	Binh Duong Province	Dong An 2	
	Binh Duong Province	Phu Gia	
	Binh Duong Province	VSIP 2, VSIP 2 expansion	
	Binh Duong Province	Nam Tan Uyen	
	Binh Duong Province	Dat Quoc	
	Binh Duong Province	Kim Huy	
	Binh Duong Province	Song Than 3	
	Binh Duong Province	Dai Dang (Da Den)	
BD3	Binh Duong Province	Bao Bang (My Phuoc 5)	**A**
	Binh Duong Province	My Phuoc 1	
	Binh Duong Province	My Phuoc 2	
	Binh Duong Province	My Phuoc 3	
	Binh Duong Province	My Phuoc 4	
	Binh Duong Province	Ascendans Protrade Singapore Tech	
	Binh Duong Province	Rach Bap An Dien	
	Binh Duong Province	Viet Huong 2	

Group	Province	Industrial Zone	Overall Evaluation
HCM1	Ho Chi Minh City	Saigon Hi-Tech Park	**C**
	Ho Chi Minh City	Linh Trung 1	
	Ho Chi Minh City	Binh Chieu	
	Ho Chi Minh City	Linh Trung 2	
HCM2	Ho Chi Minh City	Tan Thuan	**B**
	Ho Chi Minh City	Cat Lai 2	
HCM3	Ho Chi Minh City	Hiep Phuoc	**B**
HCM4	Ho Chi Minh City	Le Minh Xuan	**C**
	Ho Chi Minh City	Tan Tao	
	Ho Chi Minh City	Binh Dang	
HCM5	Ho Chi Minh City	Tay Bac Cu Chi	**C**
	Ho Chi Minh City	Tan Phu Trung	
	Ho Chi Minh City	Tan Thoi Hiep	
	Ho Chi Minh City	Quang Trung Software City	
	Ho Chi Minh City	Vinh Loc	
	Ho Chi Minh City	Tan Binh	
	Ho Chi Minh City	Dong Nam	
	Ho Chi Minh City	Xuan Thoi Son	
DN1	Dong Nai Province	Thanh Phu	**A**
	Dong Nai Province	Bien Hoa 1	
	Dong Nai Province	Bien Hoa 2	
	Dong Nai Province	LOTECO (Long Binh Industrial Park)	
	Dong Nai Province	Amata	
	Dong Nai Province	Song May	
	Dong Nai Province	Ho Nai	

Group	Province	Industrial Zone	Overall Evaluation
DN2	Dong Nai Province	Giang Dien	**A**
	Dong Nai Province	Tam Phuoc	
	Dong Nai Province	Long Thanh	
	Dong Nai Province	Long Thanh High Tech Park	
	Dong Nai Province	An Phuoc	
DN3	Dong Nai Province	Long Duc	**A**
	Dong Nai Province	Loc An - Binh Son	
DN4	Dong Nai Province	Nhon Trach 1	**A**
	Dong Nai Province	Nhon Trach 2	
	Dong Nai Province	Nhon Trach 2 Loc Khang	
	Dong Nai Province	Nhon Trach 3 Phase 2	
	Dong Nai Province	Nhon Trach 5	
	Dong Nai Province	Nhon Trach 6	
DN5	Dong Nai Province	Bau Xeo	**C**
	Dong Nai Province	Song Thao	
	Dong Nai Province	Dau Giay(Dau Day)	
	Dong Nai Province	Cam My	
	Dong Nai Province	Gia Kiem	
	Dong Nai Province	Suoi Tre	
DN6	Dong Nai Province	Ong Keo	**C**
VT1	Dong Nai Province	Go Dau	**A**
	Ba Ria - Vung Tau Province	Phuoc Binh	
	Ba Ria - Vung Tau Province	My Xuan B1, Tien Hung	
	Ba Ria - Vung Tau Province	My Xuan A	
	Ba Ria - Vung Tau Province	My Xuan A2	

Group	Province	Industrial Zone	Overall Evaluation
	Ba Ria - Vung Tau Province	Phu My 1	
VT2	Ba Ria - Vung Tau Province	Phu My 2	**B**
	Ba Ria - Vung Tau Province	Cai Mep	
	Ba Ria - Vung Tau Province	Phu My 3	
VT3	Ba Ria - Vung Tau Province	Chau Duc	**C**

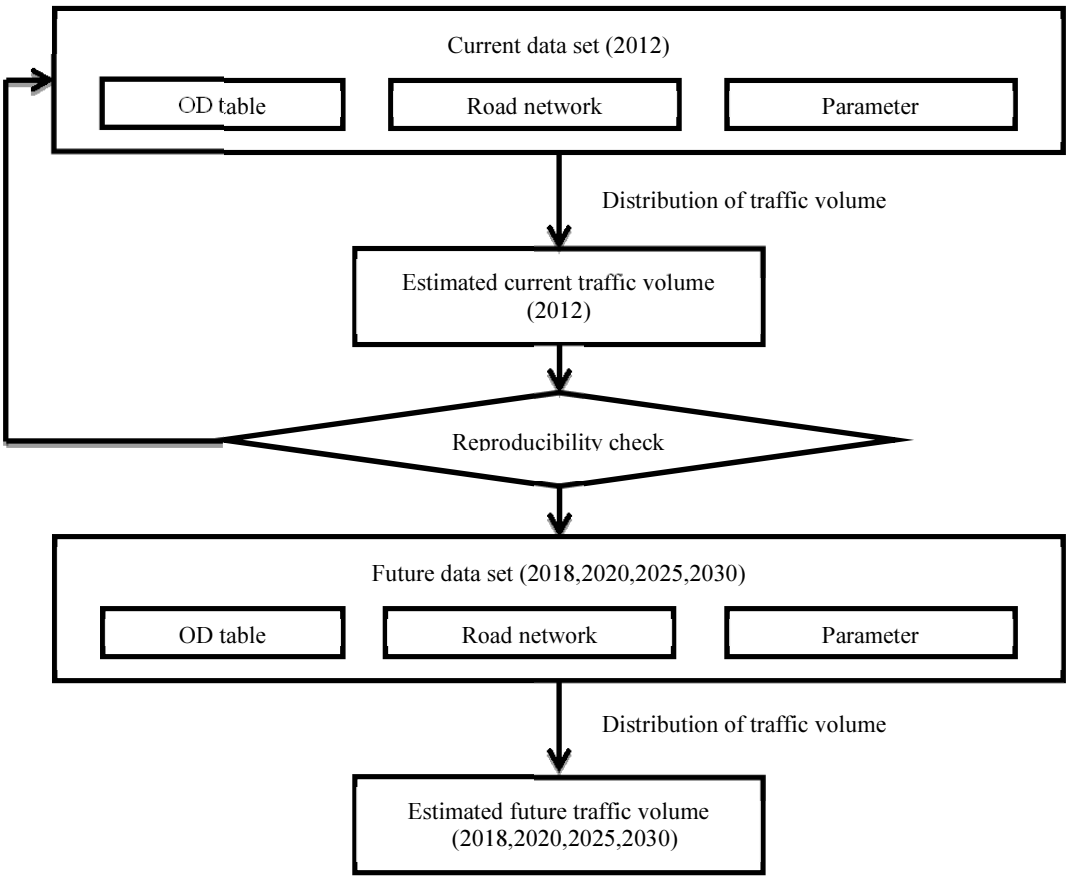
Source: JICA Study Team

4.1.3. Basic Methodology of Demand Forecast

In demand forecast for this study, wide-area road network around BHVT expressway should be taken into consideration, since BHVT expressway, the target road for this study, forms a road network with national highway 51 running in parallel with BHVT expressway, Bien Hoa bypass, HCMC-Long Thanh-Dau Giay expressway, Ben Luc-Long Thanh expressway and other roads in areas around HCMC.

Therefore, this study utilizes the following two traffic demand forecasts conducted by JICA, which cover the wide-area road network including the target area. One is HOUTRANS, "the Study on Urban Transport Master Plan and Feasibility Study in HCM Metropolitan Area". Another is VITRANSS2, "The Comprehensive Study on the Sustainable Development of Transport System in Vietnam". Traffic volume and interview data obtained in traffic survey for this study is also used to reflect the latest traffic condition around BHVT expressway.

The basic methodology of demand forecast is shown in Figure.4.1.3-1.



source：JICA StudyTeam

Figure 4.1.3-1 The flow of traffic demand forecast

4.1.4. Development of the current OD table

The OD table of current situation is created following steps listed below.（Figure.4.1.5-1）

ⅰ）The OD table of the project area is developed utilizing traffic data (traffic count and OD interview data) obtained in the survey conducted along NH51.

ⅱ）It is expected that the traffic currently running other roads will also use the BH-VT expressway when the road network in the project area is formed. Thus the current OD table for the broad HCMC region surrounding the project area is made based on the HOUTRANS OD table in 2003, as well as HOUTRANS traffic generation model utilizing the socioeconomic indicator (population, employed population and student population).

iii）In order to reflect the observed traffic condition, a part of the OD table made in the second step is replaced with the OD table data for the project area made in the first step. Then the inter-provincial traffic data from VITRANSS2 is added and adjusted to develop the current OD table.

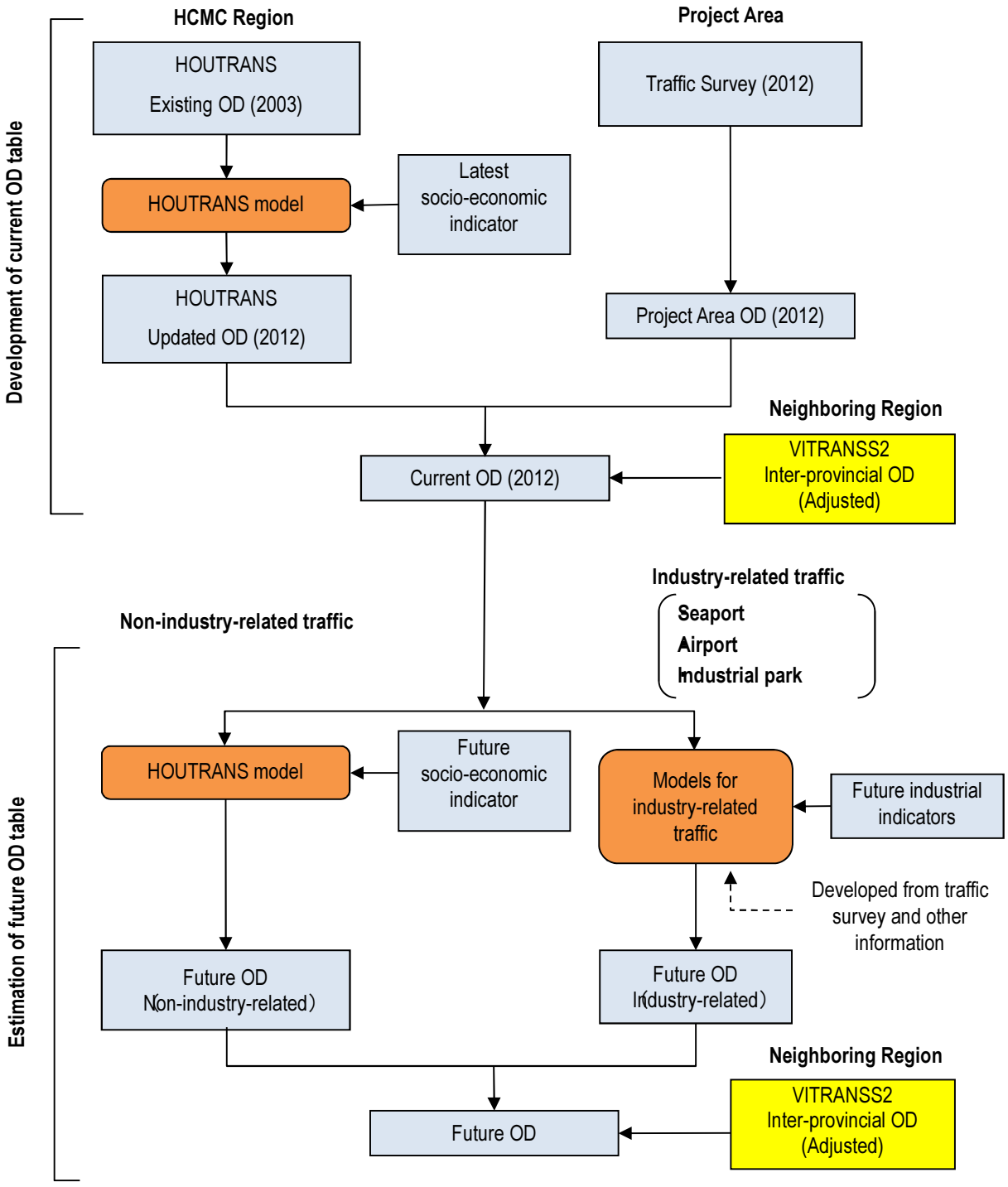
4.1.5. Estimation of the future OD table

It is assumed that the traffic in the target area highly relates to traffic to an airport, seaports, and industrial parks. Such industry-related traffic demand can affect traffic on BHVT expressway significantly. Therefore, future OD tables are generated for both industry-related traffic and non-industry-related traffic separately, in consideration of the independent future planning of each industry.（ Figure.4.1.5-1）

ⅰ）Non-industry traffic is estimated by utilizing HOUTRANS model.

ii）Industry-related traffic is estimated for three categories: airport-related traffic, seaport-related traffic, and industrial park-related traffic.
In the estimation of future industry-related traffic, a forecast model is used. This model is developed using industrial indicators (such as handling volume at ports and industrial output volume of the district), based on the result of traffic survey and interviews conducted for this survey, as well as the data from other studies and plans. Future industrial-related traffic is estimated by applying future industrial indicators to the model. As for airport-related traffic volume, reliable forecasts made in other studies are utilized.

iii）Non-industry-related traffic (or all traffic outside the project area) mentioned in the first step and industry-related traffic described in the second step are integrated and adjusted based on VITRANSS2 inter-provincal traffic to develop the future OD table for the target years.



Source: JICA Study Team

Figure 4.1.5-1 Approch for OD table development

(1) Demand forecast of Non-industry-related traffic

Non-industry-related traffic is estimated with HOUTRANS model using three sock-economic indexes: population, the number of workers and number of students.

Based on the Population and Housing Census conducted in 2009 and the future population in all provinces estimated by MPI, future population in each province is estimated. The population in each district is allocated in accordance with socio-economic development plans of major cities and past trends.

The number of workers and number of students in each district are calculated respectively by reference to the population pyramid and land use plans of each province.

(2) Demand forecast of Industry-related traffic

Along the BHVT expressway, large-scale projects such as Cai Mep–Thi Vai international port and Long Thanh international airport are being planned, and a lot of industrial parks are in operation or being planned. Traffic related to these projects is considered to have a great impact on BH-VT expressway and neighboring road network, and less dependent on socio-economic indexes such as population. Thus, future traffic volume is estimated for the above industrial projects-related traffic and non-industry-related traffic obtained by HOUTRANS model respectively.

ｉ）Seaport access traffic

As for seaport-related truck traffic, traffic demand is estimated based on the data on Master Plan “Detailed Plan on the Seaport Group in Southeast Vietnam (Group 5)” issued by MOT, following the prosedures listed below.

- The current truck traffic relating to seaports around the project area is calculated based on the data of traffic survey.
- Seaports are divided into several groups according to geographic conditions, and future handling volume for each group is calcurated based on the data of Master Plan (low growth scenario).
- Future traffic volume is estimated from the current traffic volume by adopting the aforementioned growth rate.

The future seaport access traffic is showen in Table.4.1.5-1.

Table 4.1.5-1 Estimated seaport access traffic

			Estimated Port Handling Volume (mil ton/year)			Growth Rate in Port Demand		PCU/day (Truck using NH51 or BH-VT expressway, in&out)		
			2012	2020	2030	2020/2012	2030/2012	2012 (actual)	2020	2030
HCMC	I	Saigon river	38.0	7.8	13.1	0.2	0.3	91	19	31
	II	Dong Nai river	32.8	23.3	39.0	0.7	1.2	1,915	1,361	2,275
	III	Nhe Be river	10.6	9.5	15.9	0.9	1.5	101	90	151
	IV	Soai Rap river	9.9	29.4	49.1	3.0	5.0	95	279	469
S	V	Soai Rap river within Long An province and Tien Giang Province	-	17.1	28.6	-	-	-	-	-
	Total		91.3	87.1	145.7	1.0	1.6	2,202	1,749	2,926
Dong Nai	I	Dong Nai river	2.6	18.9	31.5	7.3	12.2	168	1,222	2,044
	II	Nha Be river	0.3	2.2	3.7	8.3	13.9	17	145	243
	III	Long Tau river	0.2	6.3	10.6	40.3	67.4	10	410	685
	IV	Thi Vai river	4.3	12.1	20.2	2.8	4.7	684	1,916	3,207
	Total		7.3	39.5	66.1	5.4	9.0	879	3,693	6,179
Vung Tau	I_north	Cai Mep-thi Vai river	30.8	95.9	160.3	3.1	5.2	441	835	1,209
	I_south							81	793	1,517
	II	Dinh river and Ganh Rai bay	2.0	12.5	20.9	6.3	10.6	758	4,799	8,021
	III	Con Dao	0.2	0.0	0.0	0.1	0.1	-	-	-
	Total		32.9	108.4	181.2	3.3	5.5	1,280	6,427	10,747
Bing Duong (Binh Duong General Terminal)[1)]			-	-	-	1.8	3.0	108	193	323
Port Group 5			131.5	235.0	393.0	1.8	3.0	8,830	23,931	40,027

Source: The Detailed Plan on the Seaport Group in Southeast Vietnam (Group5) (No.1745/QD-BGTVT,2011) & JICA Study Team

ⅱ）Airport access traffic

In the project area the Long Thanh International Airport (LTIA) is in the planning stage. It is scheduled to open in 2020.

The future airport access traffic is estimated with reference to the Long Thanh International Airport Master Plan (2010) and the data of the traffic survey (traffic count and interview) at Tan Son Nhat International airport in 2010.

The future airport access traffic is showen in Table.4.1.5-2.

Table 4.1.5-2 Estimated airport access traffic

Airport	Mode	2010 (per day)			2020 (per day)			2030 (per day)		
		Pax	Ton	PCU	Pax	Ton	PCU	Pax	Ton	PCU
LTIA	MC	-	-	-	8,892	-	1,778	14,290	-	2,858
	Car	-	-	-	22,130	-	11,937	33,722	-	18,288
	Bus	-	-	-	57,091	-	5,387	93,417	-	8,864
	Truck	-	-	-	-	1,199	3,773	-	2,220	6,983
	Total	-	-	-	88,114	1,199	22,875	141,429	2,220	36,993
TSNIA	MC	54,229	-	12,514	40,084	-	8,017	58,426	-	11,685
	Car	44,938	-	31,053	32,771	-	22,433	48,944	-	34,375
	Bus	24,478	-	6,437	15,732	-	2,928	21,994	-	4,093
	Truck	-	742	2,533	-	1,199	1,739	-	2,220	3,380
	Total	123,645	742	52,538	88,587	1,199	35,118	129,364	2,220	53,534
Total		123,645	742	52,538	176,700	2,399	57,992	270,793	4,439	90,527

Source: Long Thanh International Airport Master Plan (Southern Airport Corporation, 2010) & JICA Study Team

ⅲ）Traffic from/to industrial parks

Since the number of industrial parks around the BHVT expressway shows an upward trend, the traffic from/to industrial parks is expected to increase with the development of industrial parks. The future traffic from/to industrial parks is estimated by means of multiplying the current traffic based on the traffic survey by the growth rate of the industrial output volume derived from the future provincial Gross Regional Domestic Product (hereinafter GRDP). The procedures are as below.

- As the growth rate of industrial output was 1.5 times faster than the growth rate of GRDP secondary sector during the period from 2008 to 2011, the gross growth rate of industrial output is set as 7.2% for the period from 2012 to 2020, and as 6.2% from 2020 to 2030.
- The industrial output growth rate of each group is set by adding +2.5% for groups evaluated as level A, 0% for B, and -2.5% for C.
- With an assumption that the proportion between the traffic from/to industrial parks and the industrial output in each industrial park group is similar, the future traffic is estimated by expanding current traffic according to the industrial output growth rate.

The future traffic from/to industrial parks is showen in Table.4.1.5-3.

Table 4.1.5-3 Estimataed traffic from/to industrial parks

IZ Area		Evaluation of Potential	GRDP(Secondary) (Bil VND, 1994 Const)			Annual Increase of GRDP (Secondary) (%)		Annual Increase of Industrial Output		PCU/day (Truck using NH51 or BH-VT expressway, in&out)		
			2012	2020	2030	12-20	20-30	12-20	20-30	2012 (actual)	2020	2030
Binh Duong	I	B	9,458	16,163	34,650	6.9	7.9	7.2	6.2	1,694	2,963	4,791
	II	B						7.2	6.2	757	1,324	2,141
	III	A						9.7	8.7	380	799	1,557
	Total	-						-	-	2,831	5,086	8,488
HCMC	I	C	57,558	83,232	122,277	4.7	3.9	4.7	3.7	202	293	391
	II	B						7.2	6.2	1,380	2,414	3,903
	III	B						7.2	6.2	0	0	0
	IV	C						4.7	3.7	222	322	430
	V	C						4.7	3.7	112	162	217
	Total	-						-	-	1,916	3,190	4,940
Dong Nai	I	A	21,159	33,173	67,561	5.8	7.4	9.7	8.7	1,526	3,209	6,251
	II	A						9.7	8.7	5,044	10,608	20,662
	III	A						9.7	8.7	84	177	344
	IV	A						9.7	8.7	4,614	9,704	18,901
	V	C						4.7	3.7	26	38	50
	VI	C						4.7	3.7	0	0	0
	Total	-						-	-	11,294	23,735	46,208
Vung Tau	I	A	21,788	27,749	40,630	3.1	3.9	9.7	8.7	3,134	6,591	12,838
	II	B						7.2	6.2	11,125	19,458	31,462
	III	C						4.7	3.7	13	19	25
	Total	-						-	-	14,272	26,068	44,325
Total		-	109,962	160,316	265,118	4.8	5.2	7.2	6.2	30,313	58,079	103,962

Source: JICA Study Team

4.1.6. Prerequisites for demand forecast

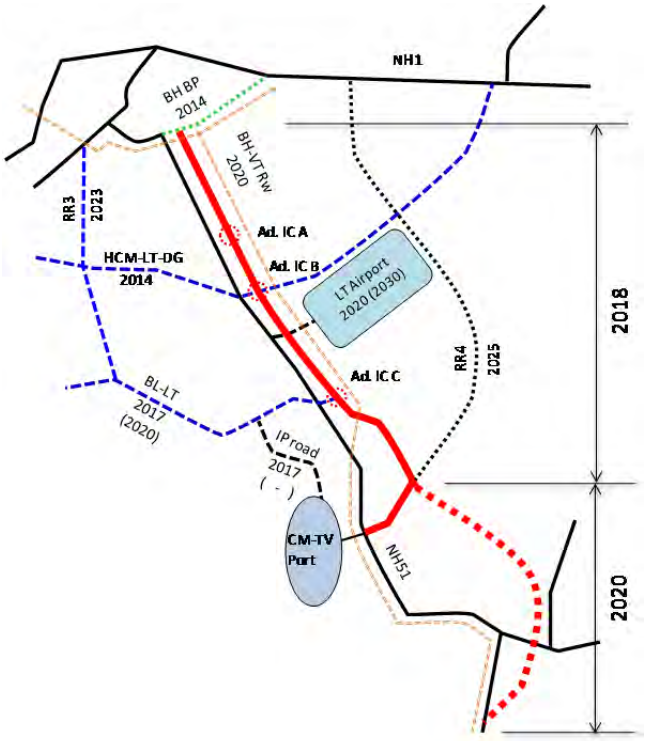
(1) Road network

The development plan for the peripheral road network of the project area is created according to the information and written reports from authorities concerned. The design data of major arterial roads are shown in Table.4.1.6-1 and Figure.4.1.6-1.

Table 4.1.6-1 Expressway and Ring Road Projects

Project	Length (km)	Class	No. of Lanes	Expected Schedule	2012	Assumed Number of Lanes (Base Case)			
						2018-	2020-	2025-	2030-
Expressway									
Bien Hoa–Vung Tau	76	Expressway	4 lanes	−20 (−18 (phase 1))					
Bien Hoa–Phu My					-	4	4	4	4
Phu My–Vung Tau					-	-	4	4	4
Phu My–NH51		Class II			-	4	4	4	4
HCMC–Long Thanh–Dau Giay	55	Expressway	6-8 lanes	−30 (−14 (phase 1))					
HCMC–Long Thanh					-	4	4	4	8
Long Thanh–Dau Giay					-	4	4	4	6
Ben Luc–Long Thanh	58	Expressway	8 lanes	−30 (−17 (phase1))					
Ben Luc–NH51					-	4	4	4	8
NH51–Long Thanh					-	4	4	4	8
Ring Road 3 and 4									
RR3 Tan Van-Nhon Trach	26	Urban Expressway	8 lanes	−30 (−23(phase 1))	-	-	4	4	8
		Class III	4 lanes		-	-	4	4	4
RR4 Phu My-Trang Bom	46	Urban Expressway	8 lanes	−25	-	-	-	-	-
		Class IV	4 lanes		-	-	-	4	4
Other Road									
Bien Hoa Bypass	17	Class I	4 lanes	-14	-	4	4	4	8
NH51	74	Class I	6 lanes	-12	4-6	6	6	6	6
Inter Port Road	12	Class III	4 lanes	-17	-	4	4	4	4

Source: Study team



Source: JICA Study Team

Figure 4.1.6-1 Expressway network scenario

(2) Toll rate

Tolls for expressways including BHVT expressway are assumed to follow the toll rate of HCMC-Trung Luong expressway, with a 30% increase every five years. Toll rates set for 2017 are shown in Table.4.1.6-2.

The toll for NH51 is set up based on the present toll rate. (The minimum distance between two toll booths on successive roads must be 70km or longer, and 20,000 VND for one-time charge stipulated in the case of car)

Tolls for other toll roads, such as Bien Hoa Bypass, Ring Road 3 and the service road for Ring Road 4, are set as a distance-based charge system in accordance with Circular No.90/2004/TT-BTC (The minimum distance between two toll booths on successive roads must be 70km or longer, and 10,000 VND for one-time charge stipulated).

Table 4.1.6-2 Toll rate

Toll Rate Regime		Motorcycle	Car	Bus	Truck
Current Toll System (Open System)	VND	0	10,000	22,000	40,000
Toll Index		0	1.00	2.20	4.00
Expressway	VND/km	-	1,300	2,860	5,200
NH51	VND/km	0	286	629	1,143
BH Bypass and RR3 & RR4 Sevice Road	VND/km	0	143	314	571

Source: JICA Study Team

(3) Willingness-to-pay

Drivers' willingness-to-pay is set as shown in Table4.1.6-3 based on the results of interviews conducted in the traffic survey.

In the calculation of future traffic demand in this study, inflation is not taken into consideration, since both toll rate and willingness-to-pay are considered to increase in proportion to the price growth.

Table 4.1.6-3 Willingness-to-pay

USD/hour

Motorcycle	Car	Bus	Truck
2.07	5.00	9.17	8.84

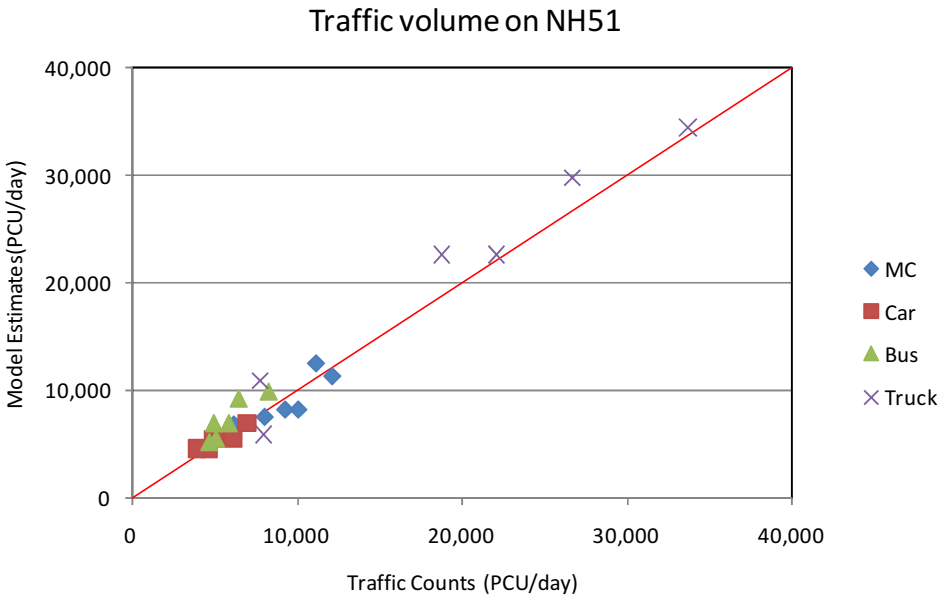
Source: JICA Study Team

(4) Reproducibility of demand forecast model

In order to check the reproducibility of the demand forecast model, the estimated traffic volume with developed OD input data in 2012 are compared with the counted traffic volume from traffic

survey in 2012. The comparison of each traffic volume at the traffic survey spot on NH51 is shown in Figure.4.1.6-2.

Since both traffic volumes basically matches, the model is considered adequate.



Source: JICA Study Team

Figure 4.1.6-2 Comparison of estimated/counted traffic volume

4.1.7. Future traffic volume

Estimated results of future traffic volume from 2018 to 2030 are given as follows.

Table 4.1.7-1 Traffic volume of BHVT expressway

PCU/day

Section	2018	2020	2025	2030
Bien Hoa - Long Thanh	32,268	27,839	34,971	69,784
Long Thanh - LT Airport	34,830	31,185	50,876	75,764
LT Airport - Nhon Trach	34,830	21,359	40,870	57,607
Nhon Trach - Phu My	21,473	32,611	65,579	80,367
Phu My - NH51	21,473	9,703	20,171	25,030
Phu My - Ba Ria	-	22,908	33,072	46,030
Ba Ria - Vung Tau	-	16,742	24,041	34,982

Source: JICA Study Team

Estimated traffic volumes of each vehicle type and in target year are given as follows.

Table 4.1.7-2 Traffic volume of BHVT expressway with various vehicle types（2018）

PCU/day

Section	Car	Bus	Truck	Total
Bien Hoa - Long Thanh	16,564	11,826	3,878	32,268
Long Thanh - LT Airport	19,065	12,351	3,414	34,830
LT Airport - Nhon Trach	19,065	12,351	3,414	34,830
Nhon Trach - Phu My	12,648	8,344	481	21,473
Phu My - NH51	12,648	8,344	481	21,473
Phu My - Ba Ria	-	-	-	-
Ba Ria - Vung Tau	-	-	-	-

Source: JICA Study Team

Table 4.1.7-3 Traffic volume of BHVT expressway with various vehicle types（2020）

PCU/day

Section	Car	Bus	Truck	Total
Bien Hoa - Long Thanh	15,981	9,838	2,020	27,839
Long Thanh - LT Airport	18,198	9,336	3,651	31,185
LT Airport - Nhon Trach	12,605	7,347	1,407	21,359
Nhon Trach - Phu My	17,689	10,645	4,277	32,611
Phu My - NH51	3,599	1,833	4,271	9,703
Phu My - Ba Ria	14,090	8,812	6	22,908
Ba Ria - Vung Tau	10,306	6,436	0	16,742

Source: JICA Study Team

Table 4.1.7-4 Traffic volume of BHVT expressway with various vehicle types（2025）

PCU/day

Section	Car	Bus	Truck	Total
Bien Hoa - Long Thanh	19,168	8,741	7,062	34,971
Long Thanh - LT Airport	29,571	12,459	8,846	50,876
LT Airport - Nhon Trach	24,851	10,981	5,038	40,870
Nhon Trach - Phu My	33,471	13,564	18,544	65,579
Phu My - NH51	6,935	1,935	11,301	20,171
Phu My - Ba Ria	21,950	9,805	1,317	33,072
Ba Ria - Vung Tau	16,652	7,389	0	24,041

Source: JICA Study Team

Table 4.1.7-5 Traffic volume of BHVT expressway with various vehicle types（2030）

PCU/day

Section	Car	Bus	Truck	Total
Bien Hoa - Long Thanh	32,133	12,340	25,311	69,784
Long Thanh - LT Airport	41,076	14,530	20,158	75,764
LT Airport - Nhon Trach	33,265	12,201	12,141	57,607
Nhon Trach - Phu My	45,142	13,960	21,265	80,367
Phu My - NH51	9,697	2,073	13,260	25,030
Phu My - Ba Ria	28,721	9,563	7,746	46,030
Ba Ria - Vung Tau	22,891	7,438	4,653	34,982

Source: JICA Study Team

Estimated traffic volumes of BHVT expressway and NH51 are given as follows.

Table 4.1.7-6 Traffic volume of BHVT expressway and NH51

PCU/day

Section	2012 (Actual)	2018	2020	2025	2030
■Bien Hoa - Vung Tau Expressway					
Bien Hoa - Long Thanh	-	32,268	27,839	34,971	69,784
Long Thanh - LT Airport	-	34,830	31,185	50,876	75,764
LT Airport - Nhon Trach	-	34,830	21,359	40,870	57,607
Nhon Trach - Phu My	-	21,473	32,611	65,579	80,367
Phu My - Ba Ria	-	21,473	9,703	20,171	25,030
Ba Ria - Vung Tau	-	-	22,908	33,072	46,030
■NH51					
Bien Hoa - Long Thanh	65,028	51,867	51,160	64,529	66,437
Long Thanh - LT Airport	-	43,896	41,901	46,535	51,196
LT Airport - Nhon Trach	41,365	47,298	48,438	48,633	54,164
Nhon Trach - Phu My	42,336	56,185	54,382	61,957	76,645
Phu My - Ba Ria	23,907	39,254	25,588	35,409	34,914
Ba Ria - Vung Tau	26,176	27,097	14,731	24,370	27,969
■Bien Hoa - Vung Tau Expressway & NH51					
Bien Hoa - Long Thanh	65,028	84,135	78,999	99,500	136,221
Long Thanh - LT Airport	-	78,726	73,086	97,411	126,960
LT Airport - Nhon Trach	41,365	82,128	69,797	89,503	111,771

Section	2012 (Actual)	2018	2020	2025	2030
Nhon Trach - Phu My	42,336	77,658	86,993	127,536	157,012
Phu My - Ba Ria	23,907	39,254	48,496	68,481	80,944
Ba Ria - Vung Tau	26,176	27,097	31,473	48,411	62,951

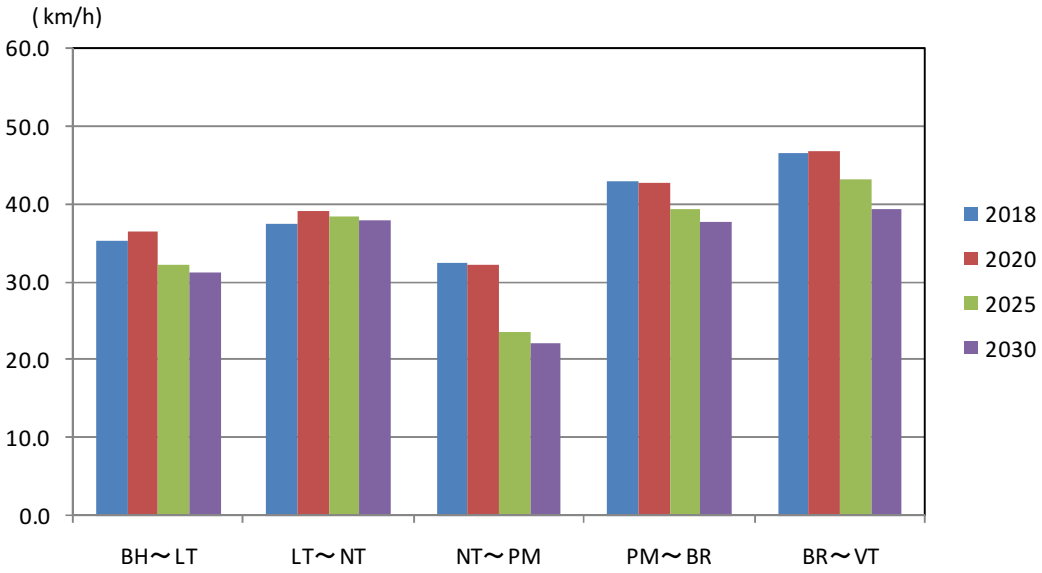
Source: JICA Study Team

4.2. Inquest of transportation planning

It is predicted that the traffic of BHVT expressway is greatly affected by construction methodology and the availability of the Long Thanh international airport and peripheral roads such as Ben Luc–Long Thanh expressway and Inter-port road.
This chapter examines the effects of these factors.

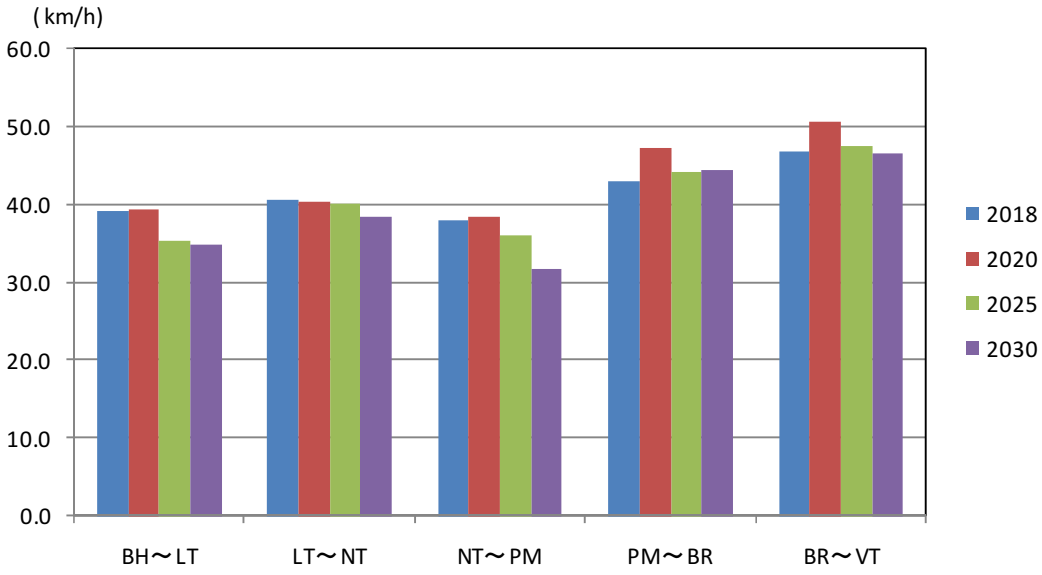
(1) BHVT Expressway

The transportation planning of BHVT expressway was checked based on the result of the projected traffic demand.
First, the necessity of BHVT expressway was checked based on the effect of the absence of BHVT expressway on NH51. Since traffic capacity of each road is determined by traffic demand forecast technique, estimated traffic volume does not exceed the capacity. Then, our attention was paid to the average running speed of traffic as shown in the following figure. If BHVT expressway is not constructed, the average running speed of traffic on NH51 decrease by 5-10km/h compared to the case where BHVT expressway is available. Furthermore, the average running speed of traffic on NH51 is expected to be below half of that on BHVT expressway. Therefore, it is thought that the necessity for the BHVT expressway is high, for it ensures high-speed traffic service.
Then, the required number of lanes on BHVT expressway was checked. By reference to the estimated traffic volume and the hourly peak rate obtained in the traffic survey of each section, reference hourly peak traffic volume was calculated and used to check the required number of lanes. Since the hourly traffic capacity of four-lane expressway is about 4000 PCU/hour according to the design criteria (TVCN4054) of Vietnam, six lanes may be needed in some sections in 2025 and 2030. From the viewpoint of minimizing the initial investment, it is reasonable to pursue the plan of widening BHVT expressway in the future while monitoring the actual traffic volume and congestion.



Source: JICA Study Team

Figure 4.2-1 Average running speed of traffic on NH51 (without BHVT expressway)



Source:JICA Study Team

Figure 4.2-2 Average running speed of traffic on NH51 (with BHVT expressway)

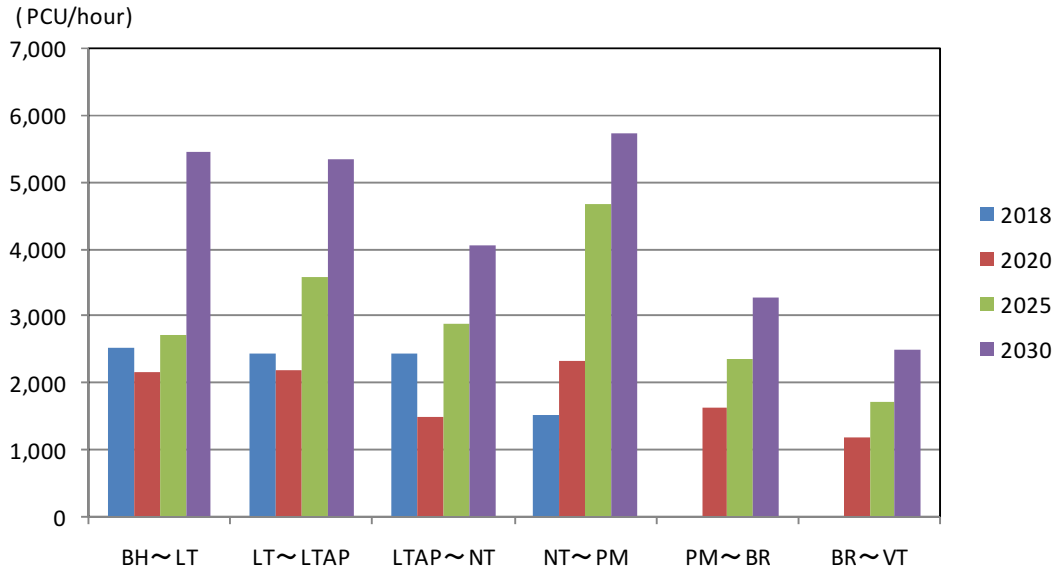
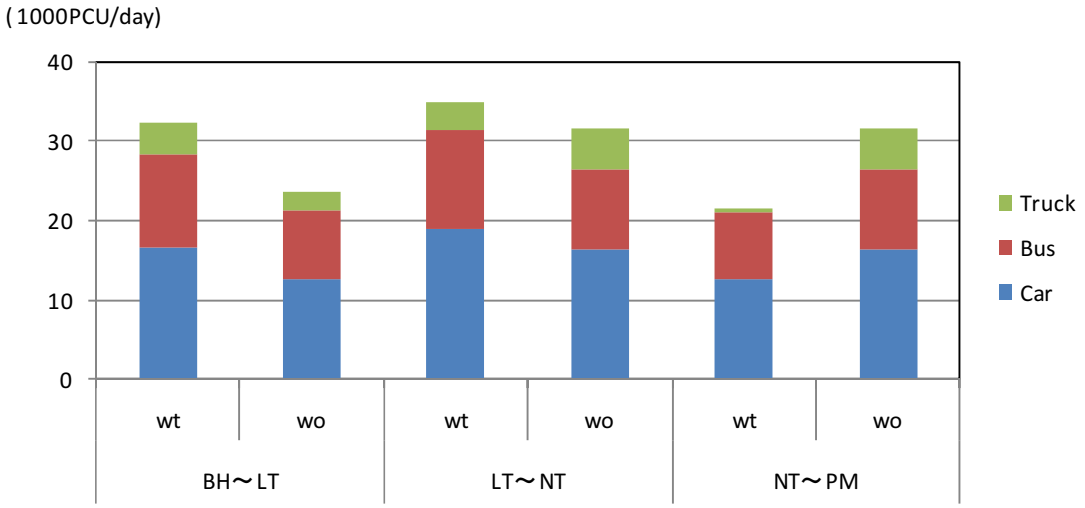


Figure 4.2-3 Reference hourly peak traffic volume of BHVT expressway

(2) Ben Luc-Long Thanh Expressway

Second, the effect of delay in construction of peripheral roads and airport was checked. Since the more time advances, the more traffic runs and the more the capacities of roads in project area are saturated, the check with the presence or absence of such roads or airport was conducted for the first service year of each plan.

Then, the effect of delay in the start of service of Ben Luc-Long Thanh expressway (BL-LT expressway), which connects to BHVT expressway directly, on BHVT expressway, was checked. If the completion of BL-LT expressway is delayed, traffic running between Ho Chi Minh City and Ba Ria Vung Tau province needs to travel via Ho Chi Minh City-Long Thanh-Dau Giay expressway (HCMC-LT-DG expressway). As a result, traffic is estimated to increase in the section between Nhon Trach and Phu My due to route changes from NH51 to the BHVT expressway. Traffic in the section between Long Thanh and Phu My is estimated to decrease slightly, because the increased traffic volume is canceled by the reduction of traffic using BL-LT expressway from Long Thanh. Since HCMC-LT-DG expressway is projected to suffer from congestion caused by traffic from BL-LT expressway, the traffic of BHVT expressway between Bien Hoa and Long Thanh is likely to decrease due to route changes to the route via NH1.

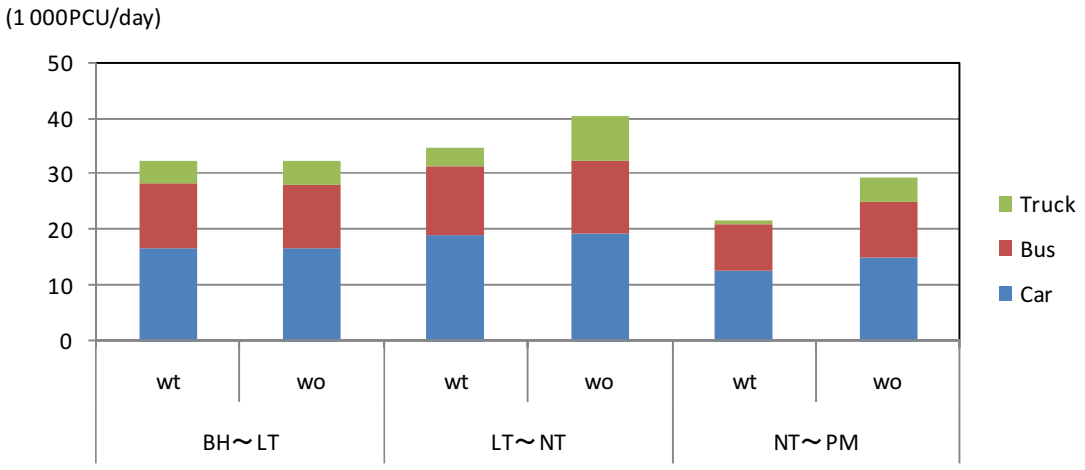


Source: JICA Study Team

Figure 4.2-4 Traffic volume with/without Ben Luc–Long Thanh Expressway in 2018

(3) Inter-port road

The effect of the Inter-port road, which runs parallel to BHVT expressway, was then checked. Without the Inter-port road, traffic volume in the section between Nhon Trach and Phu My is estimated to increase by about 1.5 times of that on BHVT expressway, and the increase in traffic volume is also expected in the section between Long Thanh and Nhon Trach, where a part of traffic shifted from the Inter-port road start to use BHVT expressway. In these sections, the majority of the increased traffic is trucks.

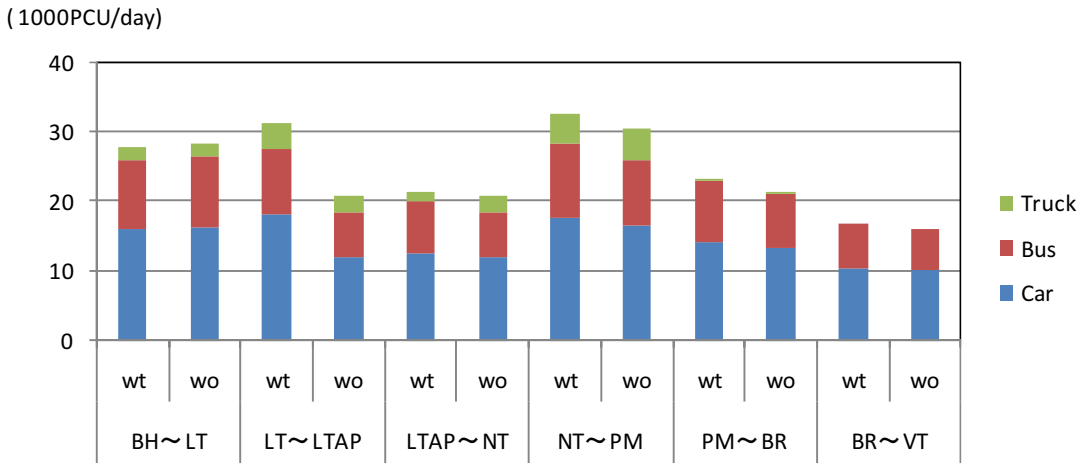


Source:JICA Study Team

Figure 4.2-5 Traffic volume with/without Inter-port road in 2018

(4) Long Thanh International Airport (LTIA)

The effect of the Long Thanh International Airport (LTIA), which is scheduled to be in service in 2020, was checked. In the case without LTIA, the traffic between Ho Chi Minh City region and LTIA, which occupies the great portion of traffic from/to LTIA, is expected to decrease. This decrease in traffic may also cause the reduction of the traffic by about 10,000 PCU in the section between Long Thanh JCT and LTIA IC, by which LTIA is connected to HCMC-LT-DG expressway.



Source: JICA Study Team

Figure 4.2-6 Traffic volume with/without Long Thanh International Airport in 2020

4.3. Inquest of BHVT expressway promotion

This chapter examines measures to promote the utilization of BHVT expressway, including installation of additional IC and application of expressway standard to the connecting road between Phu My IC and NH51 intersection, in order to improve the business profitability and convenience for road users.

(1) Additional IC

Change in traffic volume due to the installation of an additional IC (Long Duc IC) planned between Bien Hoa IC and Long Thanh IC is shown in the figure below.

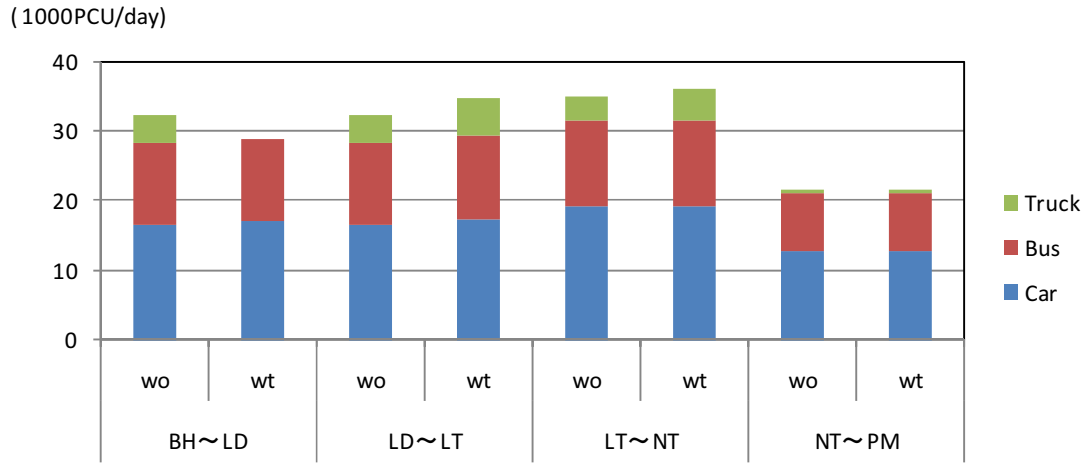
Traffic from/to places with high traffic demand, such as an industrial complex between Bien Hoa and Long Thanh, is expected to use Long Duc IC to change their route from NH51 to BHVT expressway. On the other hand, traffic in sections north of Long Duc IC, especially trucks, is estimated to decrease, and the traffic using Bien Hoa IC is expected to shift from BHVT expressway to NH51. From the viewpoint of traffic volume, there are both sections with

increased traffic and sections with reduced traffic. Based on this, it is necessary to conduct financial analysis to assess the improvement of business profitability, including a construction cost of the additional IC. The access traffic volume at Long Duc IC in 2018 is projected to be 7,300 PCU/day.

As a result of the financial analysis, it was found that the project IRR was falling (about-0.2%) a little, and thus the traffic demand forecast indicates that the increase in traffic due to added Long Duc IC is inadequate to compensate for the construction cost of the additional IC.

However, the greater convenience of land transport due to the improved accessibility to expressway that may be achieved by the additional IC will be an advantage for Japanese companies that have expanded or will expand their business to this area. In addition, since the additional IC offers a detour route at the time of a road closure and allows shorter routes for maintenance vehicles to travel to the destination, the expressway service level is expected to be improved.

Additional ICs for other two proposals is not discussed in this chapter. This is because these additional ICs have been examined to supplement functions of the existing junction, or as a measure against the delay in the construction of IC. The function to promote the utilization of the expressway is not expected for these additional ICs.



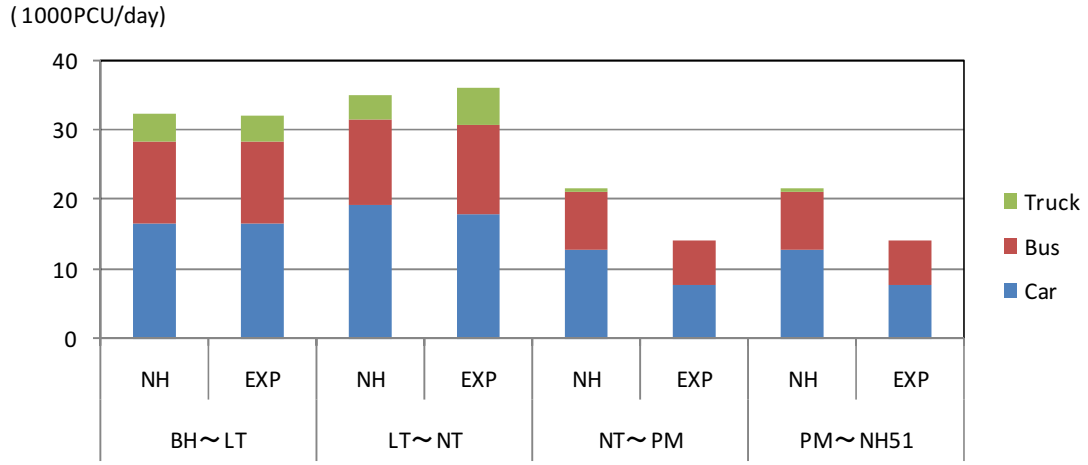
Source: JICA Study Team

Figure 4.3-1 With/without Long Duc IC in 2018

(2) Adoption of expressway standard

In the current plan, the connecting road between Phu My IC and NH51 intersection IC is planned to be build with the national highway standard. This connecting road is not very good as an access road for BHVT expressway, as it is designed to accommodate motorcycles and have the open access intersection on the way, as well as having the lower speed limit than that of expressways.

In the following paragraph, therefore, applying expressway standard to the connecting road to enable high-speed driving was examined as a measure to promote the utilization of BHVT expressway. The change in traffic volume in this case is shown in the figure below.
Since the expressway standard is applied in this case, however, the connecting road is treated as a toll expressway in the traffic demand forecast. This has caused reduction in traffic volume in the section between Nhon Trach and Phu My. Although the convenience of high-speed transportation is ensured for expressway users, no significant increase is observed in other sections, meaning the measure does not contribute to the promotion of the utilization of BHVT expressway under the condition.



Source: JICA Study Team

Figure 4.3-2 Highway/expressway standard for connecting road in 2018

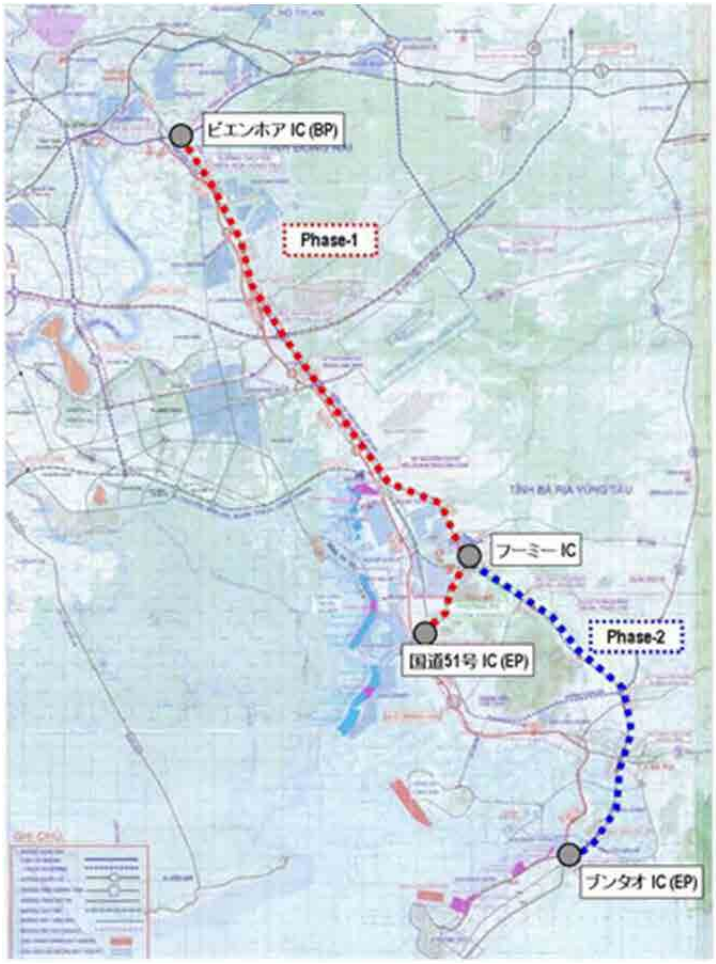
5. Basic Design for Higher Viability

5.1. Outline of the Existing Feasibility Study

5.1.1. Outline of the Plan of Bien Hoa – Vung Tau Expressway Project

The Feasibility Study (hereinafter BVEC F/S) for the BHVT 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. Afterwards, the addition and the correction to F/S were executed by TEDI, and the revised edition was submitted in October, 2012.

The BHVT Expressway is a toll expressway of 68.6km long connecting Bien Hoa city of the capital of the Dong Nai province and Vung Tau city of the capital of the Ba Ria-Vung Tau province. National Highway of 9.2km long from Phu My IC which is located in Ba Ria-Vung Tau province to the NH51 intersection connected with the access road to the Cai Mep-Thi Vai port is included in this project. The section from Phu My IC to the intersection with seaside road (connecting to Cua Lap Bridge) is planned as an expressway, and the section from this intersection to the NH51 intersection in Vung Tau city which is the end point of the project is planned as the urban road. The stage construction is planned as phase 1 for the section from Bien-Hoa IC to Phu My IC and the section from Phu My IC to NH 51 intersection connecting to Cai Mep-Thi Vai port, and as phase 2 for Phu My IC to NH51 intersection of the Vung Tau city. The BHVT expressway is connected with HCM-Long Thanh-Dau Gai expressway by Long Thanh IC, and with Ben Luc-Long Thanh expressway by Nhon Thach IC. The location map and outline of BHVT Expressway of BVEC F/S are shown in Figure 5.1.1-1 and Table5.1.1-1



Source: JICA Study Team

Figure 5.1.1-1 Location Map of BHVT Expressway project (F/S)

Table 5.1.1-1 Outline of BHVT Expressway project (F/S)

Project section	Phase		Phase	
	BH IC to PM IC	PM IC to NH51 intersection connecting to Cai Mep-Thi vai Port	Phu My IC to Vung Tau intersection	Vung Tau intersection to NH51 intersection
Section(km)	0+000-37+600	37+600-46+800	37+600-66+000	66+000-68+653.42
Length(km)	37.6	9.2	28.4	2.65342
Road Classification	Expressway Class A	National Highway Class II	Expressway Class A	Main Urban Road
Design Standard	TCVN5729 (1997)	TCVN4054 (2005)	TCVN5729 (1997)	TCXDVN104 (2007)
Design Speed	120km/h	100km/h	120km/h	80km/h
No.of lanes	4(when opened)	4 (when opened)	4	4

	6 to 8 (when fully completed)	6 (when fully completed)		
Interchange/ Intersection	Bien Hoa IC (km0+000) Long Thanh IC (km17+760)	NH51 Intersection (km46+360)	Phu My IC(km37+800) Ba Ria IC(km53+050) Vung Tau Intersection(km66+000)	,NH51 Interswction (km68+653.42)
Service Area	Phu My SA (km36+500)	None	None	None
Toll Gate	Main Road (km1+200) Long Thanh IC	Main Road (km39+200)	Main Road (km65+260)	None

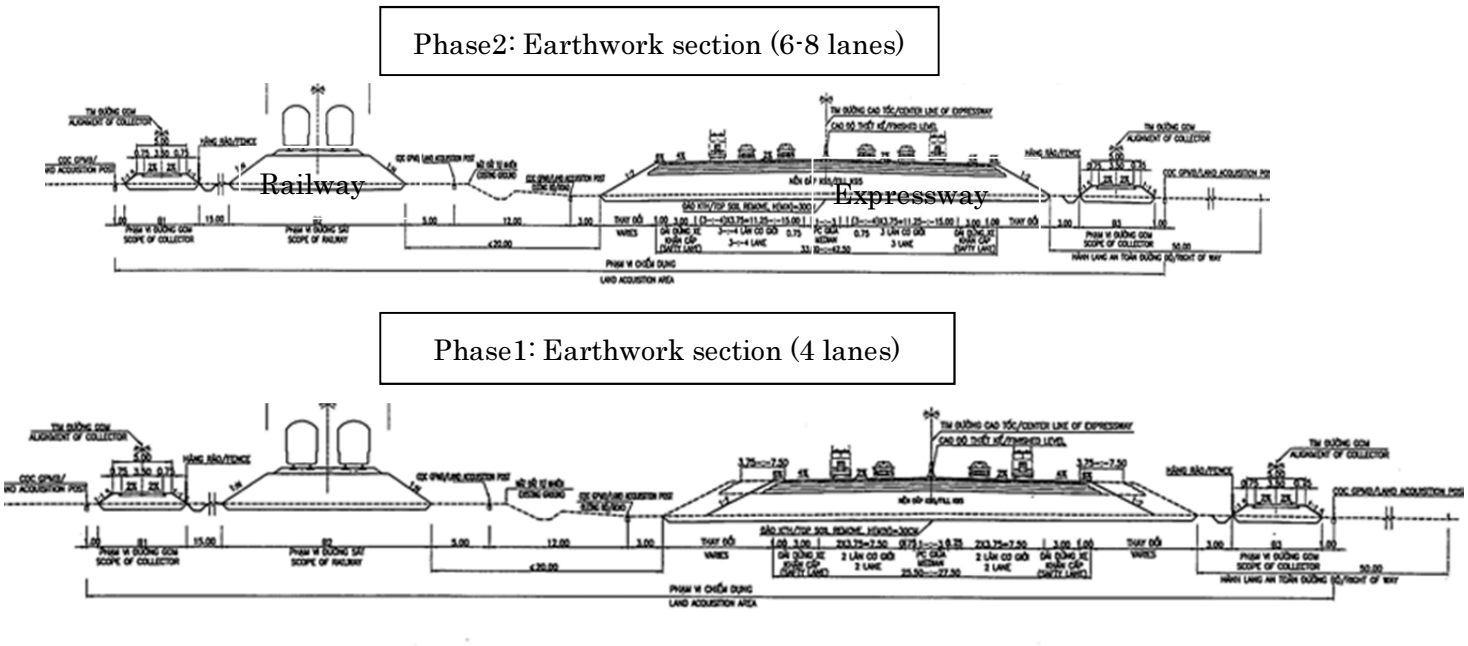
Source: JICA Study Team

5.1.2. Typical Cross Section

(1) Bien Hoa IC (Km0+000) - Phu My IC (Km37+600) Section

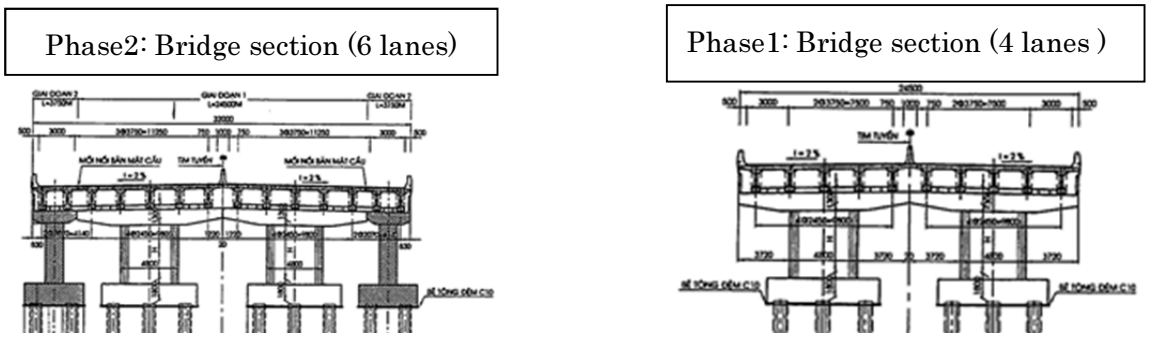
The expressway is planned as 4 lanes for phase 1 and 6 to 8 lanes for phase 2. The planned Bien Hoa - Vung Tau Railway runs parallel to the expressway, which is located at the east side of the expressway between Bien Hoa IC and the boundary of Dong Nai Province and Ba Ria-Vung Tau Province. The alignment of expressway is planned controlling the railway.

The typical cross section for embankment section and bridge section are shown in Figure 5.1.2-1 and Figure5.1.2-2, respectively.



Source: BVEC F/S

Figure 5.1.2-1 Typical Cross Section of Embankment Section for Bien Hoa IC (Km0+000) - Phu My IC (Km37+600)

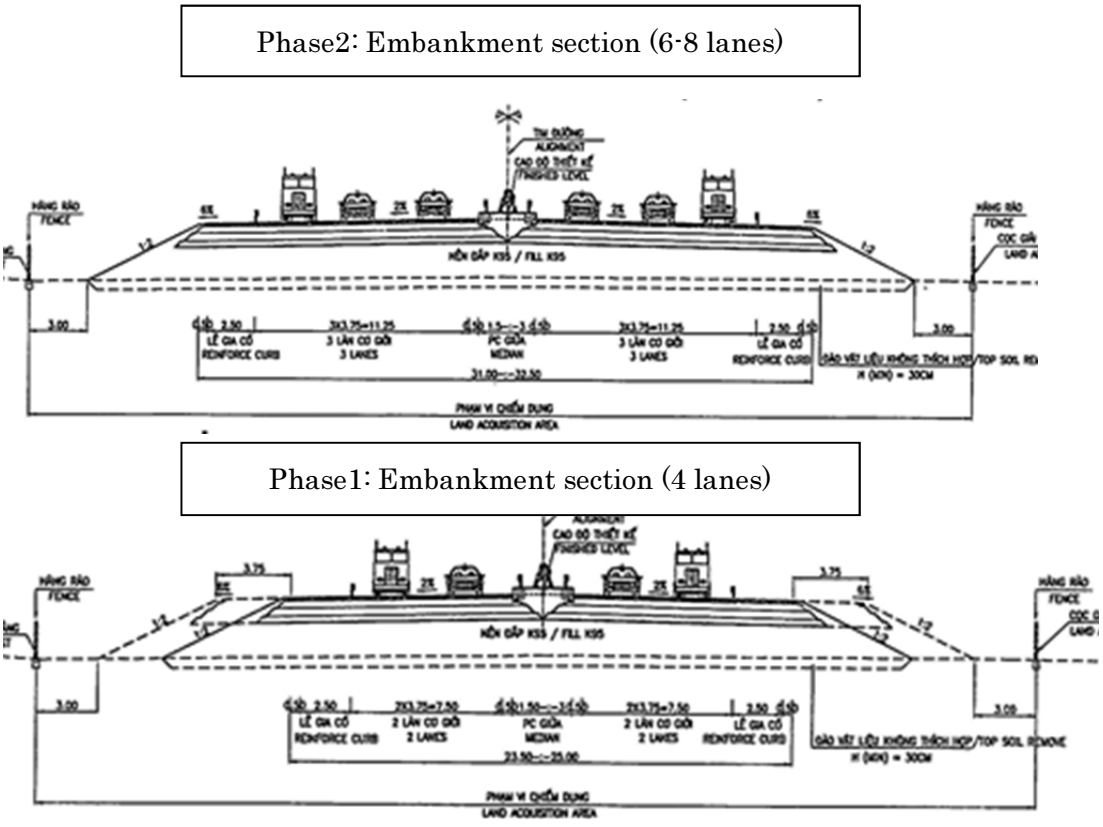


Source:BVEC F/S

Figure 5.1.2-2 Typical Cross Section of Bridge Section for Bien Hoa IC (Km0+000) - Phu My IC (Km37+600)

(2) Phu My IC (Km37+600)-NH51 intersection (Km37+600) Section

This section is classified as National Highway and planned 4 lanes for phase 1 and 6 lanes for phase 2. The typical cross section for embankment section is shown in Figure 5.1.2-3. The Bridge is not planned in this section.

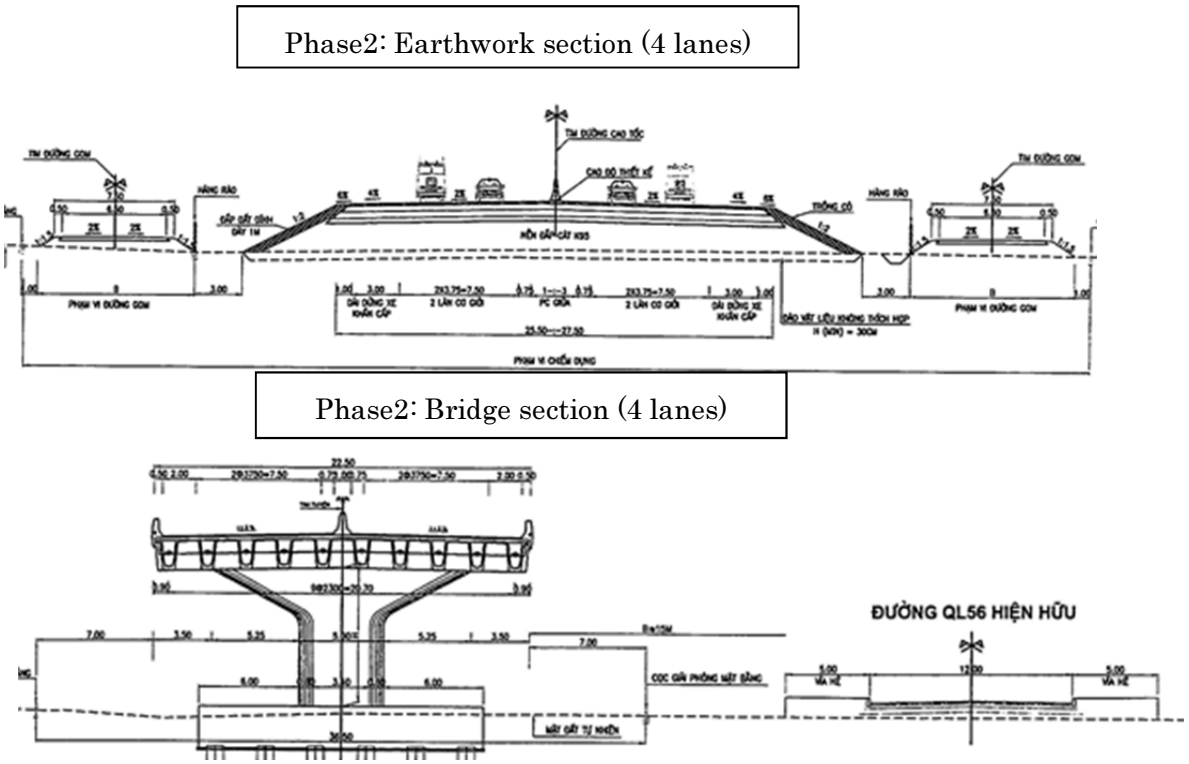


Source: BVEC F/S

Figure 5.1.2-3 Typical Cross Section of Phu My IC (Km37+600)-NH51 intersection (Km37+600)

(3) Phu My IC (Km37+600) -Vung Tau intersection (66+000) Section

The expressway is planned to construct as 4 lanes in the phase 2 stage. The typical cross sections for embankment section and bridge section are shown in Figure 5.1.2-4.

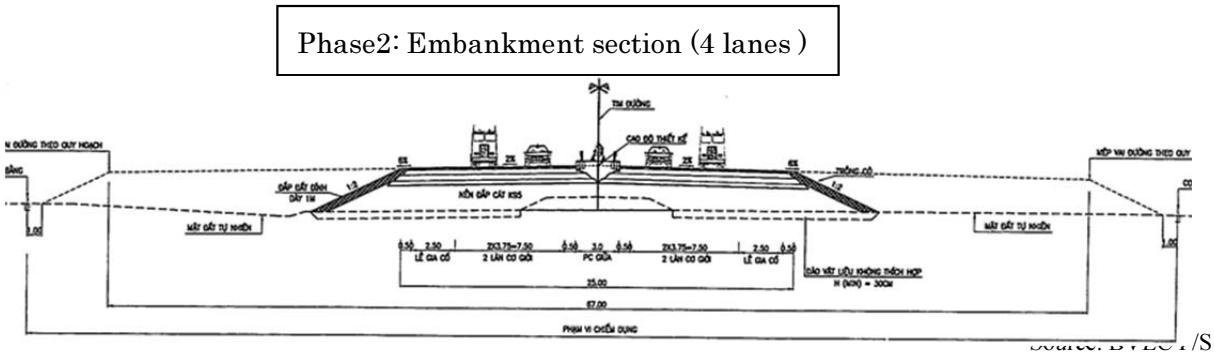


Source: BVEC F/S

Figure 5.1.2-4 Typical Cross Section for Embankment section and Bridge section for Phu My IC (Km37+600) -Vung Tau intersection (Km66+000)

(4) Vung Tau intersection (Km66+000) – NH51 intersection (68+653.42) Section

The urban road is planned to construct as 4 lanes in phase 2 stage. The typical cross section for embankment section for phase 2 is shown in Figure 5.1.2-5. The Bridge is not planned in this section.



Source: BVEC / S

Figure 5.1.2-5 Typical Cross Section for Embankment section for Phase 2 for Vung Tau intersection (Km66+000) – NH51 intersection (Km68+653.42)

5.2. Review of the Existing Feasibility Study

5.2.1. Documents and Information Received

The planning and design were reviewed based on the latest F/S documents and information which were received from BVEC and TEDI.

+ Final Report (October of 2012)

+ Final Drawings of Route and Work Design (October of 2012)

Composition of the Final Report and drawings are shown in Table 5.2.1-1.

Table 5.2.1-1 Composition of F/S Final Reports and Drawings

Volume I	Final Report: Project Presentation PART 1 : NECESSITY OF INVESTMENT CHAPTER 1 : PROJECT OVERVIEW CHAPTER 2: SOCIO-ECONOMIC DEVELOPMENT ORIENTATION AND REALITIES OF THE STUDY AREA CHAPTER 3 : OTHER RELEVANT PLANNINGS AND PROJECTS CHAPTER 4 :TRAFFIC SURVEY AND TRANSPORT DEMAND FPRECAST CHAPTER 5 :NECESSITY FOR INVESTMENT PART 2 : NATURAL CONDITIONS OF THE STUDY AREA CHAPTER 6 : NATURAL CONDITIONS OF THE STUDY AREA CHAPTER 7 : SURVEY OF CONSTRUCTION MATERIAL SOURCES PART 3 : ANALYZING TO SELECTION SCALE,MAIN TECHNICAL STANDARDS CHAPTER 8 :SELECTION OF SCALE,MAIN TECHNICAL STANDARDS CHAPTER 9 :STUDY OF ALIGNMENT OPTION PART 4 : WORK ITEMS UNDER THE PROJECT; ANALYSIS AND SELECTION OF ENGINEERING & TECHNOLOGY OPTIONS CHAPTER 10 :MEASURES AND RESULTS OF ALIGNMENT AND INTRESECTION DESIGN

	CHAPTER 11 : MEASURES AND RESULTS OF BRIDGE AND TUNNEL DESIGN CHAPTER 12 :SOLUTIONS AND RESULTS OF DESIGN FOR WORKS MANAGEMENT AND EXPLOITATION PART 5 : IMPLEMENTATION SOLUTIONS CHAPTER 13 :LAND USE DEMAND.LAND CLEARANCE PLAN AND RESETTLEMENT CHAPTER 14 :EXECUTION SEGMENT,EXECUTION PROGRESS AND PROJECT MANAGEMENT FORM CHAPTER 15 :PLAN OF OPERATING INCIDENTA MAINTENANCE PART 6 : ENVIRONMENT IMPACT ASSESSMENT CHAPTER 16 : ENVIRONMENT IMPACT ASSEEMENT CHAPTER 17 :TOTAL INVESTMENT OF THE PROJECT CHAPTER 18 :EVALUATION OF ECOMOMIC EFECT OF THE PROJECT CHAPTER 19 :EVALUATION OF FINANCIAL EFFICIENCY OF PROJECT CHAPTER 20 : CONCLUSION AND RECOMMENDATION Appendix:Total Investment
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

5.2.2. Scope of Review of BVEC F/S

As mentioned in foregoing section, BHVT Expressway project is divided into Phase 1 and Phase 2. The BHVT Expressway plays 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.

- 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 BVEC 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.
- Project cost of Phu My – Vung Tau section is 87.7% of the project cost of Bien Hoa – Phu My section.
- Estimated FIRR for Bien Hoa – Phu My section in BVEC F/S is 9.2% even in expectation of income from road side development right.

As described in paragraph 1.2,2,1, therefore, the scope of the study for the BOT/PPP project is limited to the Phase 1 Section (Bien Hoa IC - Phu My IC and NH 51 intersection), and Phase 2 Section (Phu My IC - Vung Tau IC) is considered to be developed by public investment project using governmental funds including ODA.

Accordoing to the above scope of the study, the F/S of Phase 1 section was reviewed from viewpoints of the investors and several design changes for reduction of the construction cost and improvement of safety were proposed in this study. As for the F/S of Phase 2 section, it was preliminary reviewed and proposed scope of the next study (e.g. preparatory study in case of ODA project).

Subsequently, the F/S for the Phase 1 section was reviewed considering the following items. Review results are also reported in this chapter.

- ✓ Highway Planning and Design;
- ✓ Bridge Planning and Design;
- ✓ Road Structure Design;
- ✓ Soft Soil Treatment Design
- ✓ Construction Planning;
- ✓ Construction Cost Estimate;
- ✓ O&M Plan;

5.2.3. Confirmation of result of BVEC F/S and collection of latest information

(1) BVEC F/S Reports and Drawings

The reports and the drawings concerning the obtained BHVT Expressway project are as shown in Table 5.2.1.-1

(2) Site Reconnaissance

The site reconnaissance was carried out the locations of Phase 1 for Bien Hoa IC connecting with Bien Hoa Bypass at the beginning point of the project, Long Thanh IC connecting with HCM-Long Thanh-Dau Gay Expressway,Non Trach IC connecting with Ben Luc-Long Thanh Expressway and NH51 Intersection connecting with Cai Mep-Thi Vai Port access Road.

Moreover, Site reconnaissance was carried out the locations of Phase 2 for Ba Ria IC connection with Ba Ria Ring Road, the continuous long viaduct and the long span bridge crossing over river, soft soil area , Vung Tau intersection and NH51 intersection.

(3) Information

1) Selection of the optimum route alignment

The route alignment of expressway between km3+500-km6+100 was determined after the comparative study to avoid the pumping station and factories, and between km11+900 and km17+300 which runs near cemetery was determined in the area of cemetery after study the distance from railway. Consequently, the route was approved by Dong Nai Province.

2) Typical Cross Section of Phase1

The method of exterior widening from 4 lanes to 6/8 lanes for the embankment in Phase 2 was approved by MOT.

3) The changing of crossing method of BHVT Expressway and HCM-Long Thanh-Dau Giay Expressway in the area of Long Thanh IC

The Bien Hoa-Vung Tau railway which is parallel to the BHVT Expressway is planned on the ground. Therefore vertical alignment of the BHVT Expressway is required to change from overpass to underpass, and this change was approved by MOT. Then modification of basic design of F/S and the study of Long Thanh IC connecting the BHVT Expressway and the HCM-Long Thanh-Dau Giay Expressway are conducting by TEDI. The construction of the HCM-Long Thanh-Dau Giay Expressway is under implementation. Therefore change of construction from embankment to viaduct is required when construction of the BHVT Expressway will start during . opening the traffic on the HCM-Long Thanh-Dau Giay Expressway.

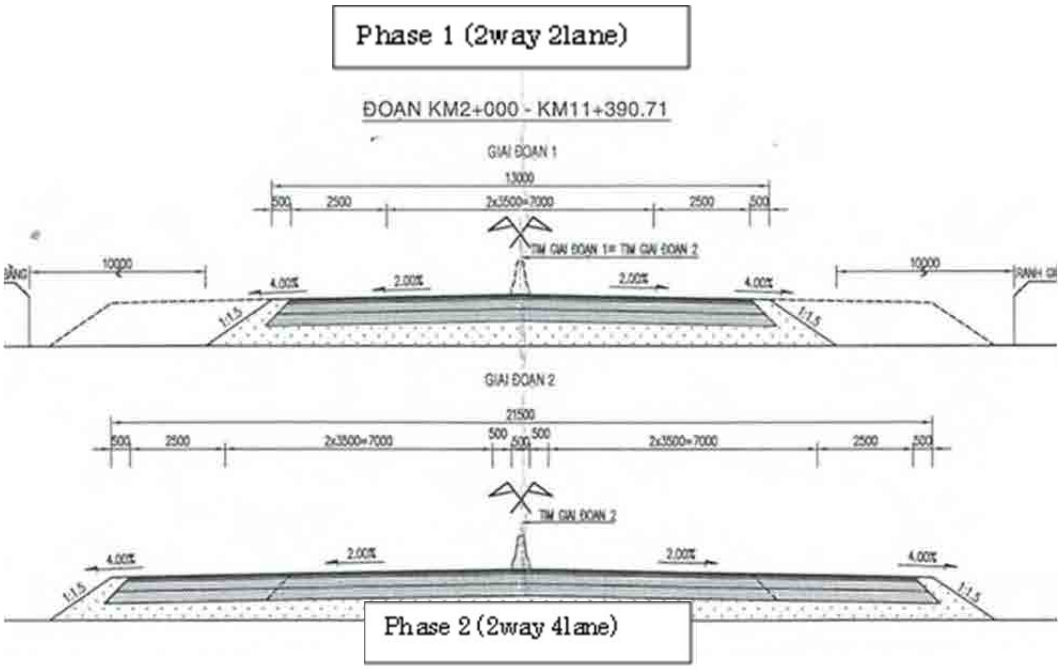
4) Construction of Nhon Trach IC

It was confirmed that Nhon Trach IC belongs to the Ben Luc-Long Thanh Expressway project and will be constructed in Phase 2 of this project. And the detailed design of this project is reviewing now.

5) Relocation of Toll Gate between Phu my IC and NH51 intersection connecting Cai mep-Thi Vai port access road. The Toll Gate is relocated from before NH51 intersection to after Phu My IC

6) Construction of Bien Hoa City Bypass

The Bien Hoa City Bypass which is connected to the BHVT Expressway at Bien Hoa IC is planned as a national highway with 4 lanes and design speed 80km/h. Typical cross section is shown in Figure 5.2.3-1. The construction of the Bypass is under construction.



Source: D/D of Bien Hoa Bypass

Figure 5.2.3-1 Typical Cross Section of Bien Hoa Bypass

7) Construction of Cai Mep-Thi vai Port Access Road

The Cai Mep-Thi Vai Port access road which is connected to NH51 Intersection is planned as a provincial road with 4 lanes and design speed 80km/h. The typical cross section is shown in Figure 5.2.3-2. Construction of the road is under construction.

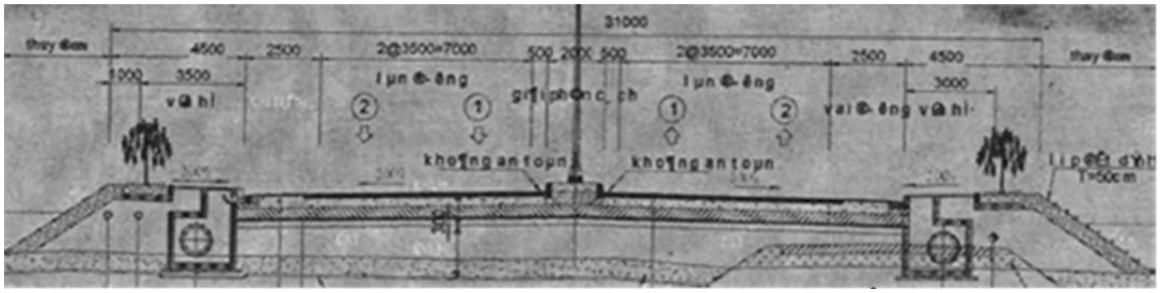


Figure 5.2.3-2 Typical Cross Section of Cai Mep-Thi vai Port access road

8) Construction of widening of NH51 between Bien Hoa and Vung Tau

NH51 is a national highway of 85.62 km long from Bien Hoa city to Vung Tau city. The widening from 4 lanes to 6 lanes is under construction. It is scheduled to be completed at the end of 2012. Pictures of 6 lanes of NH51 were shown below.

Picture 5.2.3-1

Picture 5.2.3-2

5.2.4. Natural Condition Survey in F/S

The following surveys were conducted for the design in BVEC F/S.

- **Topographic Survey**

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

The topographic survey including plan, profile, cross section survey were executed for the design of Long Duc IC in this study.

- **Geological Survey**

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

- **Hydrological Survey**

The hydrological survey was executed for the design of embankment, bridge and culvert in BVEC F/S. The meteorological data such as rainfalls, rainfall intensities, air temperature, and wind speed were collected.

- **Material Survey**

The material survey of construction materials supply including investigation, sampling of construction materials, mines and laboratory tests were executed for the design of earthwork and pavement in BVEC F/S.

5.2.5. Design Standards and Design Policy in BVEC F/S

(1) Design Standards6pt

1) Highway Design Standards

TCVN 5729(1997) was applied for the expressways , TCVN4054(2005) was applied for national highways and TCXDVN104(2007) was applied for urban road. The geometric design criteria for expressway, national highway and urban road are summarized in Table 5.2.5-1, Table 5.2.5-2 and Table 5.2.5-3

Table 5.2.5-1 Geometric Design Criteria for Expressway

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:Phase1,6-8:Phase2	() is at particular section for the flyover crossing	F/S
		Formation Width (m)	25.5(27.5):phase1 33.0(42.5):phase2		F/S
		Travelled Way Width(m)	2 x 7.5:Phase1 2x11.25(15.0):phase		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
	t Dist	Stopping Sight Distance (m)	230 (160)		TCVN5729
7	Horizontal Alignment	Horizontal Curve			
		Desirable Minimum Radii of Horizontal Curve	1000		TCVN5729
		Absolute Minimum Radii of Horizontal Curve	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 5.2.5-2 Geometric Design Criteria for National Highway

	Design Element		Type /Value	Remarks	Reference
1	Expressway Classification		National Highway Class II		TCVN4054
2	Terrain		Flat		TCVN4054
3	Design Speed (km/h)		100		TCVN4054
4	Cross-Sectional Elements	Number of Travelled Way	4:phase1,6:phase2		F/S
		Formation Width (m)	23.5(25.0):phase1 31.0(32.5):phase2		F/S
		Travelled Way Width(m)	2x7.5:phase1 2x11.25:Phase2	() is at particular section for the 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 length of super-elevation		
		Minimum Length for Desirable Min. Radius (m)			TCVN4054
		Minimum Length for Absolute Min. Radius (m)	Runoff		TCVN4054
8	Vertical Alignment	Maximum Grade (%)	4.0	()is in difficult situation	TCVN4054
		Minimum Grade (%)	0.5(0.3)		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

Table 5.2.5-3 Geometric Design Criteria for Urban Road

Design Elements			Type /Value	Remarks	Reference
1	Expressway Classification		Main Urban Road Primary		TCXDVN 104
2	Terrain		Flat		TCXDVN104
3	Design Speed (km/h)		80		TCXDVN104
4	Cross-Sectional Elements	Number of Travelled Way	4		F/S
		Formation Width (m)	25.0		F/S
		Travelled Way Width(m)	2 x 7.5	() is at particular section for the flyover crossing	TCXDVN104
		Outer Shoulder Paved Width (m)	2.5		TCXDVN104
		Outer Shoulder Earthen Width (m)	0.5		TCXDVN104
		Median Width (m)	3.0		TCXDVN104
		Median Marginal Strip (m)	0.5		TCXDVN104
		Crossfall of Roadway (%)	2.0		TCXDVN104
		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)	100		TCXDVN104
7	Horizontal Alignment	Horizontal Curve			
		Desirable Minimum Radii of Horizontal Curve (m)	400		TCXDVN104
		Absolute Minimum Radii of Horizontal Curve (m)	250		TCXDVN104
		Superelevation (Se)			
		Maximum Se for Desirable Min. Radius (%)	4.0		TCXDVN104
		Maximum Se for Absolute Min. Radius (%)	8.0		TCXDVN104
		Minimum Radii w/o Superelevation (m)	>2500		TCXDVN104
		Transition Curve	shall not be smaller than lenth of super-elevation		TCXDVN104
		Minimum Length for Desirable Min. Radius (m)			TCXDVN104
		Minimum Length for Absolute Min. Radius (m)			TCXDVN104
8	Vertical Alignment	Maximum Grade (%)	5.0	()is in difficult situation	TCXDVN104
		Minimum Grade (%)	0.5(0.3)		TCXDVN104
		Critical Maximum Length of Grades			
		For 4.0 % (m)	700		TCXDVN104
		Minimum Length of Grade (m)	150		TCXDVN104
		Vertical Curve			
		Minimum Length of Vertical Curve (m)	70		TCXDVN104
		Minimum Radius of Crest Curve (m)			
		Absolute Minimum Radius (m)	3000		TCXDVN104
		Desirable Minimum Radius (m)	4500		TCXDVN104
		Minimum Radius of Sag Curve (m)			
		Absolute Minimum Radius (m)	2000		TCXDVN104
		Desirable Minimum Radius (m)	3000		TCXDVN104
9	Lateral Clearance (m)		Travelled width		TCXDVN104
	Vertical Clearance (m)		4.75		

Source: JICA Study Team

2) Drainage design Criteria

TCVN5729(1997) was applied for expressways , TCVN4054(2005) was for national highways and TCXDVN104(2007) was applied for the urban road.

3) Pavement design criteria

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

4) Traffic safety facility design criteria

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

5) Lighting design criteria

TCXDVN259 was applied for the lighting design

5.2.6. Design Policy

The following cost reduction policy in the BVEC F/S aims to improve the profit of the toll road. The design policy is shown in Table 5.2.6-1.

Table 5.2.6-1 Design Policy in the BVEC 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 main road.
2	Apply absolute minimum width of media strip in order to reduce the earthwork volume.
3	Apply high embankment at the abutment in order to reduce the bridge length.
4	Excavate six-lane width at cut sections in order to utilize excavated soil for embankment with short hauling distance.
5	Build full box culverts considering the length of phase-2, in phase-1.

Source: BVEC F/S

5.2.7. Review of Highway Design

(1) Horizontal Alignment of Expressway Section

The design elements of the horizontal alignment of the expressway section from KM 0+000 to KM 66+000 are shown in Table 5.2.7-1.

The minimum radius of horizontal curve is 1200 m and minimum length of transition curve is 133.50 m (clothoid parameter is 400.25 m) is applied. These designed values satisfy the criteria.

Table 5.2.7-1 Horizontal Alignment of Expressway Section (Phase 1 and Phase 2)

No.		Station	Coordinate		Beginning Radius (m)	Clothoid Parameter (m)	Ending Radius (m)	Length (m)
			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	TS	4+314.05	1202084.850	409611.952	0.000		0.000	133.50
10	TS	4+314.05	1202084.850	409611.952	0.000	400.250	-1200.000	133.50
11	SC	4+447.05	1201952.391	409611.952	-1200.000		-1200.000	358.310
12	CS	4+805.36	1201608.829	409708.895	-1200.000	400.250	0.000	133.50
13	ST	4+938.36	1201489.744	409768.082	0.000		0.000	860.019
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	TS	14+332.38	1192987.956	413605.613	0.000	632.46	2000.000	200.00
31	SC	14+532.38	1192810.558	413697.922	2000.000		2000.000	167.15
32	CS	14+699.54	1192656.948	413763.713	2000.000	632.46	0.000	200.00
33	ST	14+899.54	1192467.731	413828.429	0.000		0.000	35.60
34	TS	14+953.13	1192433.862	413839.385	0.000	632.46	-2000.000	200.00
35	SC	15+135.13	1192244.645	413904.101	-2000.000		-2000.000	184.45
36	CS	15+319.58	1192075.470	413977.426	-2000.000	632.46	0.000	200.00
37	ST	15+519.58	1191898.876	414071.265	0.000		0.000	698.76
38	TS	16+218.34	1191287.375	414409.391	0.000	1732.05	-10000.000	300.00
39	SC	16+518.34	1191025.569	414555.869	-10000.000		-10000.000	421.89
40	CS	16+940.23	1190663.998	414773.194	-10000.000	1732.05	0.000	300.00

No.		Station	Coordinate		Beginning Radius (m)	Clothoid Parameter (m)	Ending Radius (m)	Length (m)
			X	Y				
41	ST	17+240.23	1190411.801	414935.660	0.000		0.000	1200.93
42	TS	18+441.15	1189405.493	415591.072	0.000	1732.05	-10000.000	300.00
43	SC	18+741.15	1189154.934	415756.052	-10000.000		-10000.000	558.45
44	CS	19+299.60	1188700.551	416080.586	-10000.000	1732.05	0.000	300.00
45	ST	19+599.60	1188463.213	416264.077	0.000		0.000	2706.95
46	TS	22+306.56	1186329.955	417930.453	0.000	1341.64.	6000.000	300.00
47	SC	22+606.56	1186092.011	418113.149	6000.000		6000.000	18.19
48	CS	22+624.75	1186077.383	418123.964	6000.000	1341.64	0.000	300.00
49	ST	22+924.75	118532.954	418297.888	0.000		0.000	2539.76
50	TS	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
68	CS	40+563.03	1173004.964	429459.901	-7000.000	2439.26	0.000	850.00
69	ST	41+413.03	1172490.299	430136.203	0.000		0.000	3970.92
70	TS	45+383.95	1170150.004	433344.188	0.000	1673.320	5000.00	560.00
71	SC	45+943.95	1169811.623	433790.294	5000.00		5000.00	1379.350
72	CS	47+323.30	1168802.380	434724.104	5000.00	1673.320	0.000	560.000
73	ST	47+883.30	1168331.383	435026.881	0.000		0.000	25.090
74	TS	47+908.39	1168310.026	435040.053	0.000	1673.320	-5000.000	560.000
75	SC	48+468.39	1167839.028	435342.830	-5000.000		-5000.000	1454.720

No.		Station	Coordinate		Beginning Radius (m)	Clothoid Parameter (m)	Ending Radius (m)	Length (m)
			X	Y				
76	CS	49+923.11	1166782.470	436335.303	-5000.000	1673.320	0.000	560.000
77	ST	50+483.11	1166450.851	436786.460	0.000		0.000	1928.470
78	TS	52+411.58	1165337.899	438361.372	0.000	678.233	2000.000	230.000
79	SC	52+641.58	1165201.607	438546.599	2000.000		2000.000	1184.180
80	CS	53+825.76	1164239.835	432907.495	2000.000	678.233	0.000	230.000
81	ST	54+055.76	1164018.058	439268.320	0.000		0.000	2320.58
82	TS	56+376.34	1161768.768	4398839.100	0.000	866.023	2500.00	300.000
83	SC	56+676.34	1161476.613	439907.049	2500.000		2500.000	1431.110
84	CS	58+107.45	1160071.700	439769.341	2500.000	866.023	0.000	300.000
85	ST	58+407.45	1159798.300	439645.957	0.000		0.000	722.610
86	TS	59+130.06	1159145.726	439335.601	0.000	1081.665	-3000.000	390.000
87	SC	59+520.06	1158790.049	439175.800	-3000.000		-3000.000	874.58
88	CS	60+394.64	1157942.144	438974.436	-3000.000	1081.665	0.000	390.000
89	ST	60+784.64	1157552.596	438957.259	0.000		0.000	913.690
90	TS	61+698.33	1156639.140	438936.793	0.000	836.660	2500.000	280.000
91	SC	61+978.33	1156359.415	438925.299	2500.000		2500.000	577.340
92	CS	62+555.67	1155794.146	438814.317	2500.000	836.660	0.000	280.000
93	ST	62+835.67	1155530.841	438719.195	0.000		0.000	939.600
94	TS	63+775.27	1154653.253	438383.510	0.000	758.288	2500.000	230.000
95	SC	64+005.27	1154440.078	438297.250	2500.000		2500.000	579.240
96	CS	64+584.51	1153953.389	437986.911	2500.000	758.288	0.000	230.000
97	ST	64+814.51	1153785.250	437830.024	0.000		0.000	1705.200
98	TS	66+519.71	1152561.011	436643.024	0.000	836.660	2500.000	280.000

Source: BVEC F/S

(2) Horizontal Alignment of Urban Road

The design elements of the horizontal alignment of the urban road section from KM 66+000 to KM 68+653.42 are shown in Table 5.2.7-2.

The minimum radius of horizontal curve is 1050m and the minimum length of transition curve is 150.00 m(clothoid parameter is 396.863 m) is applied. These designed values satisfy the criteria.

Table 5.2.7-2 Horizontal Alignment of Urban Road Section (Phase 2)

No.		Station	Coordinate		Beginning Radius (m)	Clothoid Parameter (m)	Ending Radius (m)	Length (m)
			X	Y				
99	ST	64+814.51	1153785.250	437830.024	0.000		0.000	1705.200
100	TS	66+519.71	1152561.011	436643.024	0.000	836.660	2500.000	280.000
101	SC	66+799.71	1152363.687	436444.424	2500.000		2500.000	444.580
102	CS	67+244.29	1152092.892	436092.564	2500.000	836.660	0.000	280.000
103	ST	67+524.29	1151951.447	435850.966	0.000		0.000	1146.110
104		68+670.40	1151390.936	434851.273	0.000			

Source: BVEC F/S

(3) 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 5.2.7-3.

The minimum radius of horizontal curve is 1050 m and the minimum length of transition curve is 150.00 m(clothoid parameter is 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 (clothoid parameter is 148.324 m) is applied before the intersection with NH51.

Table 5.2.7-3 Horizontal Alignment of National Highway Section (Phase 1)

No.		Station	Coordinate		Beginning Radius (m)	Clothoid Parameter (m)	Ending Radius (m)	Length (m)
			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

No.		Station	Coordinate		Beginning Radius (m)	Clothoid Parameter (m)	Ending Radius (m)	Length (m)
			X	Y				
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: BVEC F/S

(4) Vertical Alignment of Expressway Section

The design elements of the vertical alignment of the expressway section from KM 0+000 to KM 66+000 (Phase1 and Phase2)are shown in Table 5.2.7-4.

The maximum grade is 4%; the 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 the minimum vertical curve radius for crest is 4000 m near Bien Hoa IC, which is located at the beginning point of the expressway.

Table 5.2.7-4 Vertical Alignment of Expressway Section (Phase1 and Phase2)

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	1.05	201.880	4000
VIP2	1+056.250	Sag	7.161	-4.00	224.920	5000
VIP3	1+590.840	Crest	9.834	0.50	200.000	20000
VIP4	2+040.840	Sag	7.584	-0.50	220.000	20000
VIP5	2+592.580	Crest	10.895	0.60	180.000	20000
VIP6	3+038.710	Sag	9.556	-0.30	197.960	6000
VIP7	3+565.840	Crest	25.370	3.00	299.900	12000
VIP8	4+065.840	Sag	27.870	0.50	194.920	6000
VIP9	4+419.110	Crest	41.118	3.75	501.900	12000
VIP10	5+142.000	Sag	38.009	-0.43	125.240	30000
VIP11	5+629.760	Crest	37.912	-0.02	216.760	20000
VIP12	6+390.840	Sag	29.540	-1.10	168.000	8000
VIP13	6+840.840	Crest	34.040	1.00	100.000	20000
VIP14	7+285.840	Crest	36.265	0.50	192.660	12000
VIP15	7+937.320	Crest	29.033	-1.11	167.280	12000
VIP16	8+527.840	Sag	14.270	-2.50	149.980	5000
VIP17	9+088.600	Sag	17.074	-0.50	205.960	10000
VIP18	9+528.820	Crest	28.344	2.56	259.160	12000
VIP19	10+343.350	Crest	31.602	0.40	180.000	20000
VIP20	10+833.350	Crest	29.152	-0.50	120.000	20000
VIP21	11+528.350	Crest	21.507	-1.10	102.240	60000
VIP22	12+297.350	Sag	11.741	-1.27	100.220	6000
VIP23	12+657.350	Crest	13.181	0.40	200.000	20000
VIP24	13+182.350	Sag	10.031	-0.60	105.000	35000
VIP25	13+936.950	Sag	7.767	-0.30	223.060	15000

VIP	Station (KM)	Crest/Sag	EL(m)	Grade(%)	V. Curve	
					Length(m)	Radius(m)
VIP26	14+300.590	Crest	12.094	1.19	327.680	12000
VIP27	14+696.780	Sag	5.993	-1.54	204.360	10000
VIP28	15+648.850	Crest	10.753	0.50	100.000	20000
VIP29	16+269.670	Sag	10.753	0.00	124.980	5000
VIP30	16+770.920	Crest	23.284	2.50	600.000	12000
VIP31	17+170.390	Sag	13.298	-2.50	130.200	8000
VIP32	17+577.290	Sag	9.758	-0.87	205.820	10000
VIP33	17+988.970	Crest	14.657	1.19	286.340	12000
VIP34	18+384.620	Sag	9.908	-1.20	168.120	15000
VIP35	19+193.420	Sag	9.262	-0.08	118.860	150000
VIP36	19+699.520	Sag	9.262	0.00	171.640	15000
VIP37	20+055.690	Crest	13.322	1.14	274.620	12000
VIP38	20+355.690	Sag	9.902	-1.14	153.620	10000
VIP39	20+785.690	Crest	11.579	0.39	133.800	15000
VIP40	21+461.690	Sag	8.199	-0.50	100.000	20000
VIP41	22+061.690	Sag	8.199	0.00	100.000	50000
VIP42	22+615.690	Sag	9.307	0.20	139.460	15000
VIP43	22+924.440	Crest	12.796	1.13	269.260	12000
VIP44	23+277.440	Sag	8.878	-1.11	169.120	8000
VIP45	23+700.410	Crest	13.107	1.00	224.880	20000
VIP46	24+336.440	Sag	12.344	-0.12	111.180	30000
VIP47	24+887.440	Crest	13.722	0.25	265.460	17000
VIP48	25+506.440	Sag	5.551	-1.32	186.920	6000
VIP49	25+806.440	Crest	10.951	1.80	324.000	12000
VIP50	26+106.440	Sag	8.251	-0.90	168.000	8000
VIP51	26+624.440	Crest	14.467	1.20	150.380	12000
VIP52	27+460.310	Sag	14.049	-0.05	123.420	50000
VIP53	27+825.310	Sag	12.954	-0.30	115.000	10000
VIP54	28+393.570	Crest	17.784	0.85	182.920	12000
VIP55	28+836.590	Sag	14.816	-0.67	293.580	25000
VIP56	29+293.470	Crest	17.100	0.50	318.460	12000
VIP57	29+740.970	Sag	7.497	-2.15	257.700	5000
VIP58	30+356.820	Crest	25.955	3.00	636.000	12000
VIP59	30+923.820	Sag	12.914	-2.30	162.800	14000
VIP60	31+391.730	Sag	7.579	-1.14	206.820	5000
VIP61	31+786.320	Crest	19.417	3.00	575.980	12000
VIP62	32+266.320	Sag	10.777	-1.80	169.520	8000
VIP63	32+796.320	Sag	12.473	0.32	140.500	12000
VIP64	33+145.320	Crest	17.673	1.49	256.960	12000
VIP65	33+601.320	Sag	14.709	-0.65	224.080	10000
VIP66	33+901.320	Crest	19.479	1.59	130.720	12000
VIP67	34+292.320	Crest	21.434	0.50	180.000	15000
VIP68	34+902.320	Sag	17.164	-0.70	152.500	5000
VIP69	35+502.320	Crest	31.262	2.35	282.000	12000

VIP	Station (KM)	Crest/Sag	EL(m)	Grade(%)	V. Curve	
					Length(m)	Radius(m)
VIP70	35+802.320	Sag	31.262	0.00	—	—
VIP71	36+308.320	Sag	32.173	0.18	—	—
VIP72	36+643.320	Crest	33.848	0.50	241.980	12000
VIP73	37+003.300	Crest	28.376	-1.52	177.940	12000
VIP74	37+275.670	Sag	20.205	-3.00	179.960	6000
VIP75	37+692.520	Sag	20.205	0.00	128.980	6000
VIP76	38+232.940	Crest	31.825	2.15	157.680	20000
VIP77	38+779.770	Crest	39.262	1.36	388.560	17000
VIP78	39+527.610	Sag	41.496	-0.92	211.240	12000
VIP79	40+612.700	Crest	46.305.	0.84	111.400	50000
VIP80	41+066.430	Sag	46.305	1.06	246.740	40000
VIP81	41+612.630	Crest	55.482	1,68	172,710	20000
VIP82	42+001.350	Crest	58.630	0.81	312,400	20000
VIP83	43+467.64	Sag	47.633	-0.75	165.000	6000
VIP84	43+853.310	Crest	55.347	2.00	599.98	12000
VIP85	44+754.65	Sag	28.307	-3.00	899.80	30000
VIP86	45+642.46	Crest	28.307	0.00	170.00	17000
VIP87	45+942.46	Sag	25.307	-3.00	120.00	12000
VIP88	46+760.92	Sag	25.307	0.00	250.00	50000
VIP89	47+274.92	Crest	27.877	0.50	250.00	50000
VIP90	47+722.31	Crest	27.877	0.00	254.98	17000
VIP91	48+258.79	Sag	19.829	-1.50	792.68	30000
VIP92	48+878.59	Crest	26.895	1.14	364.70	20000
VIP93	49+653.36	Crest	21.627	-0.68	163.74	20000
VIP94	50+121.35	Sag	14.607	-1.50	260.50	20000
VIP95	51+528.68	Sag	11.792	-0.20	237.62	14000
VIP96	51+828.68	Crest	16.292	1.50	360.00	12000
VIP97	52+128.68	Sag	11.792	-1.50	227.44	14000
VIP98	53+154.82	Sag	13.023	0.12	285.00	12000
VIP99	53+833.00	Crest	29.985	2.50	449.98	12000
VIP100	54+715.16	Sag	18.962	-1.25	170.16	30000
VIP101	55+383.49	Sag	14.418	-0.68	213.48	30000
VIP102	57+356.94	Crest	15.010	0.03	125.22	70000
VIP103	59+213.75	Crest	12.224	-0.15	149.33	30000
VIP104	60+578..91	Sag	3.350	-0.65	214.78	10000
VIP105	60+878.91	Crest	7.851	1.50	360.00	12000
VIP105	61+183.71.	Sag	3.279	-1.50	215.00	10000
VIP106	61+558.51	Crest	5.715	0.65	156.00	12000
VIP107	61+858.51	Sag	3.765	-0.65	195.00	30000
VIP108	62+339.74	Sag	3.765	0.00	179.96	6000
VIP109	62+796.96	Crest	17.482	3.00	720.00	12000
VIP110	63+257.51	Sag	3.665	-3.00	179.96	6000
VIP111	64+333.81	Sag	3.665	0.00	149.98	6000
VIP112	64+727.31	Crest	13.503	2.50	600.00	12000
VIP113	65+110.41	Sag	3.925	-2.50	149.98	6000
VIP114	67+287.19	Sag	3.925	0.00	200.00	40000

Source: F/S

(5) Vertical Alignment of Urban Road Section

The design elements of the vertical alignment of the urban road section from KM 66+000 to KM 68+653.42 (Phase2)are shown in Table 5.2.7-5.

The maximum grade is 0.5%; the minimum vertical curve radius for crest is 20000 m; and 40,000m for sag. These designed values satisfy the criteria.

Table 5.2.7-5 Vertical Alignment of Urban Road Section (Phase2)

VIP	Station(KM)	Crest/Sag	EL(m) (m)	Grade(%) (%)	V. Curve	
					Length (m)	Radius (m)
VIP113	65+110.41	Sag	3.925			
VIP114	67+287.19	Sag	3.925	0.00	200.00	40000
VIP115	67+776.70	Crest	6.373	0.50	200.00	20000
VIP116	68+342.21	Sag	3.545	-0.50	200.00	40000
VIP117	68+529.08		3.545			

Source: BVEC F/S

(6) 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 5.2.7-6.

The maximum grade is 2.62%; the 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%; the minimum vertical curve radius for crest is 4000 m; and 4000 m for sag before the intersection with NH51.

Table 5.2.7-6 Vertical Alignment of the National Highway (Phase1)

VIP	Station(KM)	Crest/Sag	EL(m) (m)	Grade(%) (%)	V. Curve	
					Length (m)	Radius (m)
	37+0.000		27.890			
VIP1	37+275.67	Sag	19.620	-3.00	179.960	6000
VIP2	37+692.510	Sag	19.620	0.00	128.980	6000
VIP3	38+637.000	Crest	39.926	2.15	969.000	255000
VIP4	39+453.300	Sag	26.457	-1.65	399.440	47000
VIP5	40+142.150	Sagt	20.947	-0.80	499.500	37000
VIP6	41+203.300	Sag	26.783	0.55	197.960	6000
VIP7	41+644.030	Crest	38.330	2.62	299.900	12000
VIP8	42+187.260	Crest	38.982	0.12	397.680	48500
VIP9	43+387.270	Sag	30.603	-0.70	149.98	100000
VIP10	44+449.160	Crest	24.743	-0.55	251.160	16000
VIP11	45+103.300	Sag	10.886	-2.12	202.460	12500
VIP12	45+669.620	Crest	8.055	-0.50	149.980	100000
VIP13	46+072.290	Sag	5.437	-0.65	185.940	4000

VIP14	46+338.290	Crest	16.077	4.00	320.000	4000
VIP15	46+603.020	Sag	5.488	-4.00	159.400	4000
VIP16	46+800.000		5.488	-0.01		

Source: BVEC F/S

(7) Location and type of Interchange and Intersection

The locations and types of interchanges/intersections are summarized in Table 5.2.7-7. The interchanges are planned to connect expressway and other road. The intersections are planned at the terminal which connect to NH51. The layout and description of the interchange and intersection of Phase1 are shown below.

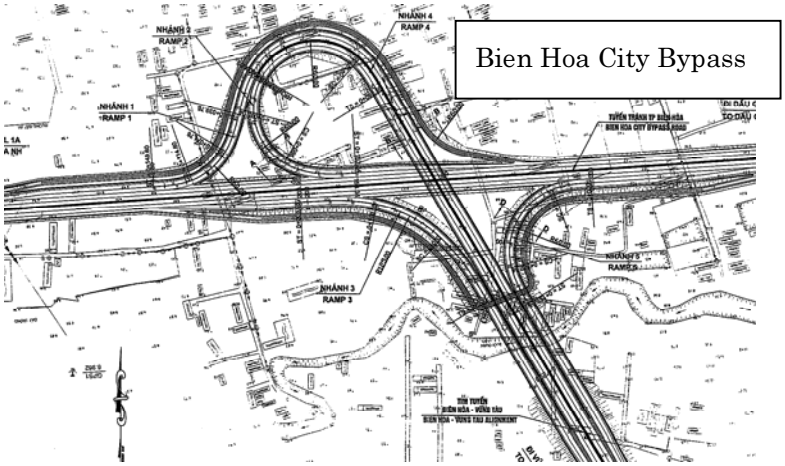
Table 5.2.7-7 Locations and Types of Interchanges and Intersections

No.	Interchange	Chainnage	Type	Interval	Rampway		Remarks
					Design Speed	Minimum Radius	
1	Bien Hoa IC (Connecting with Bien Hoa City Bypass)	km0+000	Trumpet		V=40km/h	R=60m	Constructing in Phase1
2	Long Thanh IC (Connecting with Ho Chi Minh-Long Thanh - Dau Giay Expressway)	km17+760	Double Trumpet	17.76km	V=60km/h	R=125m	Constructing in Phase1
3	Long Thanh Airport International IC	Km21+300	Trumpet	3.54km			
4	Nhon Trach IC (Connecting with Ben Luc-Long Thanh Expressway)	km29+400	Trumpet	8.1km	V=60km/h	R=125m	Construction in Phase2 of Ben Luc-L Thanh Expressway project
5	Phu My IC (Connecting with Extension of Bien Hoa-Vung Tau Expressway)	km37+800	Trumpet	8.4km	V=50km/h	R=125m	Constructing in Phase2
6	NH51 Intersection in Phu My City (Connecting with NH51 and Cai Mep-Thi Vai Pport Access Road)	km46+360	At grade Intersection with Flyover	8.56km	V=80km/h (Flyover)		Construction in Phase1
7	Ba Ria IC (Connecting with Ba Ria Ring Road)	km53+050	Trumpet	15.25km	V=40km/h	R=60m	Construction in Phase2
8	Vung Tau Intersection (Connecting with Vung Tau City Road)	km66+000	At grade Intersection (Three legs)	12.95km			Construction in Phase2
9	NH51 Intersection in Vung Tau City (Connecting with NH51)	km68+653.42	At grade Intersection (Round about)	2.65342 km			Construction in Phase2

Source: BVEC F/S

1) Bien Hoa IC

The plan of Bien Hoa IC is shown in Figure 5.2.7-1.



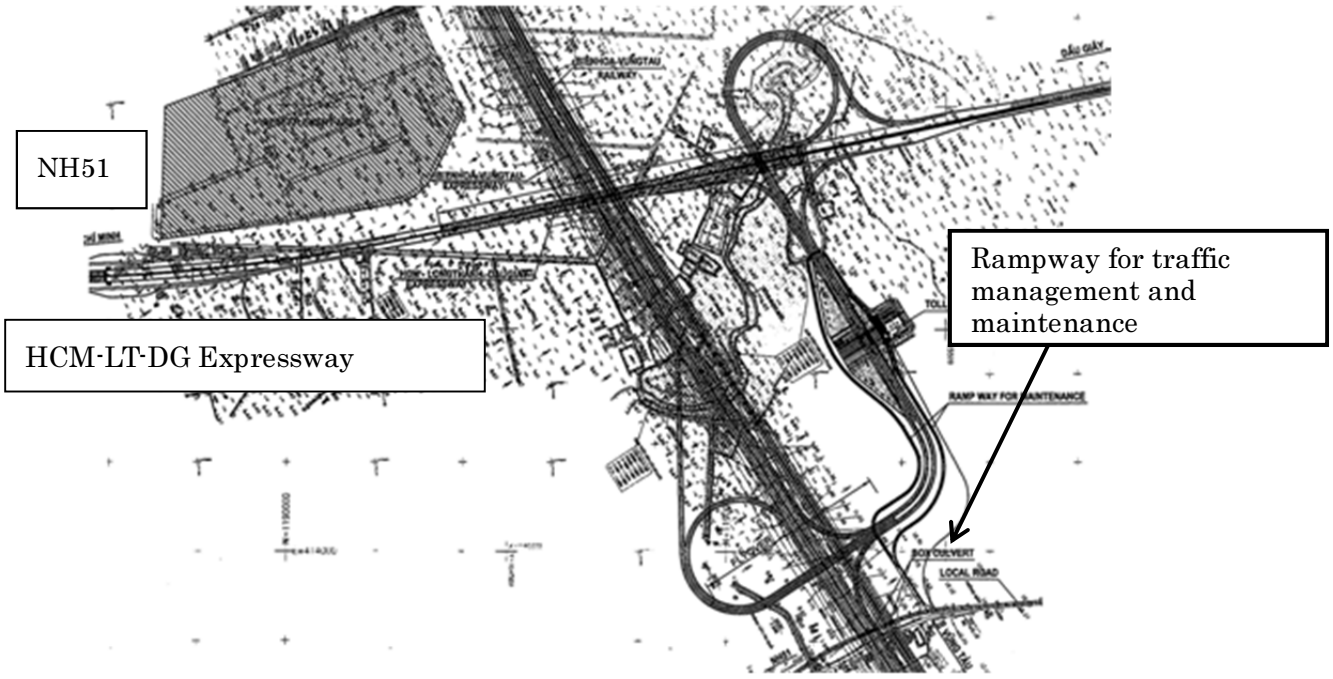
Source: BVEC F/S

Figure 5.2.7-1 Bien Hoa IC

+ 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

The plan of Long Thanh IC is shown in Figure 5.2.7-2.



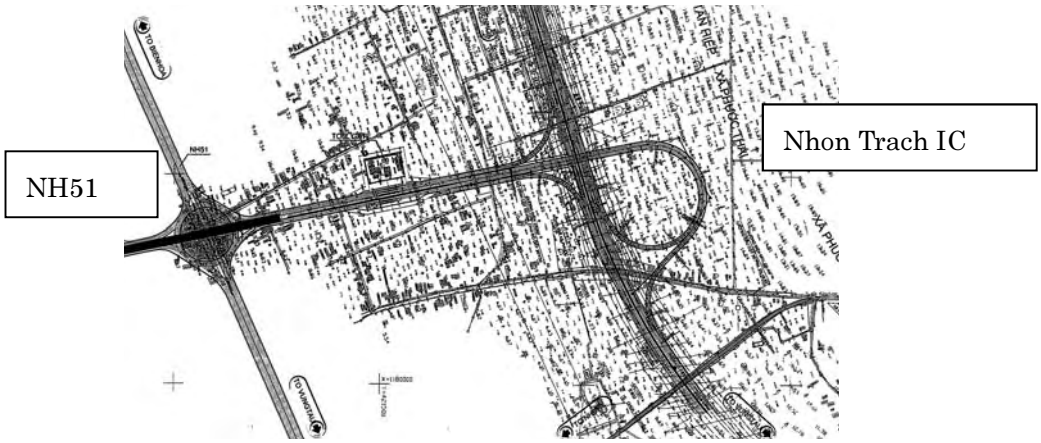
Source: BVEC F/S

Figure 5.2.7-2 Long Thanh IC

- The Bien Hoa-Vung Tau Railway was planned on the ground therefore vertical alignment of the HCM-Long Thanh- Dau Giay Expressway was modified to overpass the Railway. The BHVT Expressway which is planned in parallel to the railway was changed to on the ground and it's vertical alignment was modified. And this is approved by MOT.
- The location and type of Long Thanh IC is studying based on this modification considering development plan of surrounding area by TEDI.
- The double trumpet type located in the south of the HCM-Long Thanh-Dau Giay Expressway was selected as the optimum type. And Basic Design of Long Thanh IC is executing by TEDI.
- NH51 IC of HCM-Long Thanh-Dau Giay Expressway is located near Long Thanh IC. Therefore, it is necessary to study weaving between these interchanges considering traffic safety and capacity.
- Long Thnah JCT is connecting with BHVT Expressway and HCM-Long Thanh-Dau Giay Expressway. And it is connected with NH51 at NH51 IC of HCM-Long ThanH -Dau Giay, which is inconvenient to connect with BHVT Expressway and NH51 and to implementation of traffic management and maintenance work because of 4km long driving between BHVT Expressway and NH51. To solve this issue, the rampway is planned connecting from the toll gate of Long Thanh JCT and the local road which is located in the south of HCM-Long Thanh-Dau Giay Expressway,and U-turn road is connecting to rampway.

3) Nhon Trach IC

The plan of Nhon Trach IC is shown in Figure 5.2.7-3.



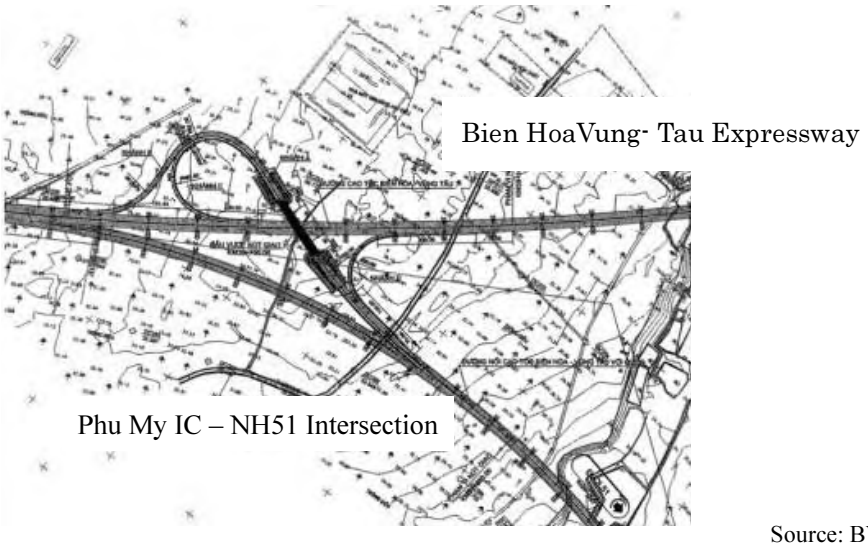
Souce: BVEC F/S

Figure 5.2.7-3 Nhon Trach IC

- Nhon Trach IC is connecting with BHVT Expressway, Ben Luc-Long Thanh Expressway and NH51.
- The construction of Nhon Trach IC is planned in Phase 2 of Ben Luc-Long Thanh Expressway Project. Therefore it is concerned that construction of Nhon Trach IC will be delay for the construction of BHVT Expressway Project.
- Nhon Trach IC was planned "Trumpet –A" type (loop rampway is connecting to acceleration lane) is avoiding the cemetery in the north of the loop rampway.
- NH51 IC and Toll Gate are planned along the Ben Luc-Long Thanh Expressway near Bien Hoa IC. Therefore, it is necessary to study the rampway alignment connecting Interchange, Toll Gate and Intersection of NH51 considering traffic safety.
- Toll gate on the thruway is required at the connecting section between Ben Luc - Long Thanh Expressway and BHVT Expressway.

4) Phu My IC

The plan of Phu My IC is shown in Figure 5.2.7-4.



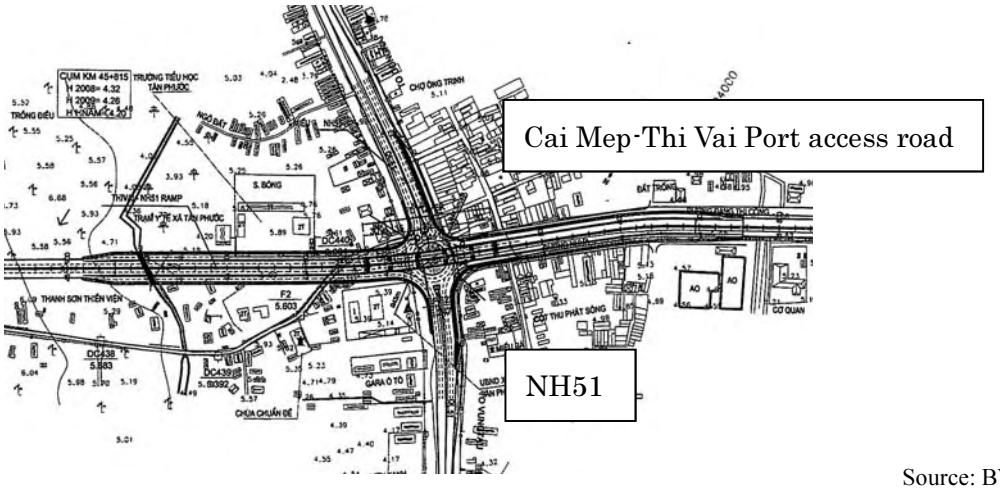
Source: BVEC F/S

Figure 5.2.7-4 Phu My IC

- Phu My IC is planned on the extension of the BHVT Expressway in phase2.
- It is necessary to change the traffic flow (NH51 Intersection→Bien Hoa) from main road to rampway for Phase2 construction.

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

The plan of NH51 Intersection is shown in Figure 5.2.7-5.



Source: BVEC F/S

Figure 5.2.7-5 NH51 Intersection

- The roundabout intersection connecting with NH51 and Cai Mep -Thi Vai Port access road is planned.
- Design speed of National Highway is reduced to 80km/h near the roundabout intersection because of the viaduct crossing over it.
- It is necessary to study channelization and signalization based on the Traffic Volume considering traffic safety and capacity.
- At the roundabout intersection, sight distance will not be ensured depending on the location of abutment of flyover bridge. Traffic safety shall be paid attention on this issue.

(8) Number of Lane of Toll Gate

Number of lanes of the toll gate is calculated based on the forecasted traffic volume shown in Table 5.2.7-8. When traffic volume is revised, it is necessary to perform recalculation.

Table 5.2.7-8 Number of Lanes of Toll Gate

	Main Road			Interchange		
	Expressway (km1+200)	National Highway (km45+250)	Expressway (km65+260)	Long Thanh IC	Nhon Trach IC	Ba Ria IC
Phase	1	1	2	1	1	2
Entrance	3	6	4	7	3	3
Exit	5	12	7	11	4	3

Source: Drawing BVEC F/S

5.2.8. Earth Work Design (Embankment/Cutting Slope)

The ratio of embankment slope is decided to be 1:2, and the berm shall be installed when the height of the embankment exceeds 6 m. The ratio of cutting slope of soil layer is decided to be 1:1, and the berm

shall be installed when the height of the embankment exceeds 6 m. The ratio of cutting slope of rock layer is decided to be 1:0.75, and the berm shall be installed when the height of the embankment exceeds 8m. These values are in accordance with TCVN5729 and TCVN 4054.

5.2.9. Drainage Design

The side ditch is planned to be installed at the toe and at the berm of the cutting slope. The u-ditch with grating cover is planned to be installed at the marginal strip (safety lane) to collect rain water on the superelevated curves.

The 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. The length of box culverts to be constructed are planned to accommodate 6 lanes of the road way in Phase-2. The size of box culverts and pipe culverts are decided considering the hydrological frequency for the culverts, which is 1% for expressways, and 2% for national highways, in accordance with TCVN5045. The planned box culverts and pipe culverts for Expressway and National Highway are summarized respectively in Table 5.2.9-1 and Table 5.2.9-2.

Table 5.2.9-1 Summary of Planned Box Culverts and Pipe Culverts (Expressway Phase1 and Phase2)

	Box-culvert			Pipe-Culvert		
	Location	Size	length(m)	Location	Size	Length(m)
1	1+190.88	2.0x205	46	1+926.66	D1.5	48
2	3+007.86	2.0x2.0	54	3+363.39	D.5	42
3	3+169.65	2.0x2.0	45	4+584.81	D1.2	36
4	3+650.00	2.0x2.0	45	7+200.00	D1.2	52
5	3+948.46	2.0x2.0	55	7+600.00	D1.2	40
6	5+015.43	1.2x1.2	38	14+532.00	D1.2	45
7	6+354.04	2(3.0x3.0)	47	17+790.00	D1.2	42
8	7+871.22	1.2x1.2	34	22+205.27	D1.2	41
9	9+270.62	3.0x3.0	38	22+384.18	D1.2	34
10	10+300.00	1.2x1.2	35	31+950.00	D1.2	35
11	10+820.99	1.2x1.2	32	32+975.53	2D1.5	41
12	11+460.00	1.2x1.2	35	33+512.52	D1.2	39
13	11+879.00	1.2x1.2	33	39+466.00	D1.2	57
14	12+177.24	1.2x1.2	32	52+469.22	D.1.2	36
15	13+158.74	1.2x1.2	33	53+0.076	D1.50	36
16	15+506.00	2(2.5x2.5)	45	66+542	D1.0	21
17	15+560.00	1.2x1.2	33	66+760	D10	21
18	15+910.00	1.2x1.2	36	67+856	D100	
19	18+441.16	1.2x1.2	40			
20	18+880.00	1.2x1.2	40			
21	19+210.00	1.2x1.2	40			
22	21+750.00	1.2x1.2	40			
23	21+967.23	1.2x1.2	30			
24	23+136.25	1.5x1.5	33			
25	24+500.00	1.2x1.2	40			
26	25+457.83	2(3.0x3.0)	45			
27	26+008.72	2(3.0x3.0)	50			
28	26+580.00	1.5x1.5	36			
29	27+422.03	3.0x3.0	50			
30	28+800.00	2(2.0x2.0)	40			

	Box-culvert			Pipe-Culvert		
	Location	Size	length(m)	Location	Size	Length(m)
31	32+367.93	1.2x1.2	36			
32	34+834.54	2(3.0x3.0)	40			
33	35+475.82	1.2x1.2	38			
34	36+300.00	1.2x1.2	33			
35	45+770.00	2.5x2.5	36			
36	48+352.06	2.5x2.5	38			
37	48+987.90	3.0x3.0	38			
38	49+772.96	3.0x3.0	42			
39	51+237.14	2.0x2.0	36			
40	64+200.00	2(3.0x3.0)	42			

Source: JICA Study Team

Table 5.2.9-2 Summary of Planned Box Culverts and Pipe Culverts (National Highway Phase1)

	Box-culvert			Pipe-Culvert		
	Location	Size	length(m)	Location	Size	Length(m)
1	39+460.00	2.5x2.5	42	40+680.00	2D1.25	31
2	40+158.00	2(3.0x3.0)	27	41+260.00	D1.5	43
3	40+380.00	2.0x2.0	26	42+300.00	D1.35	37
4	41+590.00	2.0x2.0	37	44+300.00	D1.5	27
5	42+870.00	2.0x2.0	48			
6	43+140.00	3.0x3.0	41			
7	43+938.00	2(2.0x2.0)	76			
8	45+450.00	2(2.0x2.0)	27			
9	46+000	2.0x2.0	48			

Source: JICA Study Team

5.2.10. Pavement Design

(1) General

The 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 the expressways and the national highways. For other crossroads, the design axle load is 100 kN.

(2) Design Traffic

The forecasted traffic volume on the expressways and the national highways in 2030 is shown in Table 5.2.10-1.

Table 5.2.10-1 Forecasted traffic volume on Expressway in 2030

Unit: Vehicle/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

The elastic modulus corresponding to section is shown in the Table 5.2.10-2.

Table 5.2.10-2 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

The pavement structure for the expressways and the national highways are calculated based on Standard 22TCN211-06 as shown in Table 5.2.10-3. The pavement structure for rampway (asphalt concrete) and toll plaza (cement concrete) are also shown in said table.

Table 5.2.10-3 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