DEFINITIONS AND ABBREVIATIONS

(1) Agencies

AASHOTO	American Association of State Highway and Transportation Officials
ADB	Asian Development Bank
CPRGS	Comprehensive Poverty Reduction and Growth Strategy
DDOT	District Department of Transport
DRVN	Directorate of Roads for Vietnam
EPZ	Export Processing Zone
ERC	Environmental Research Center
HCMC	Ho Chi Minh City
HPPC	Hai Phong People's Committee
IBRD/WB	International Bank for Reconstruction and Development/World Bank
JICA	Japan International Cooperation Agency
L/A	Loan Agreement
LGU	Local Government Unit
MOD	Ministry of Defense
MOF	Ministry of Finance
MOHC	Ministry of Health Control
MONRE	Ministry of Natural Resources and Environment
MOP	Ministry of Public Security
MOT	Ministry of Transport
MOTE	Ministry of Training and Education
MPI	Ministry of Planning and Investment
MPMU2	Maritime Project Management Unit No.2
NOT	National Organization of Transport
PC	People's Committee
PCI	Pacific Consultants International
PDI	Project Implementation Division
PDOT	Thai Nguyen Provincial Department of Transport
PMU2	Project Management Unit No.2
PPC	Provincial People's Committee
PPIC	Provincial Planning and Investment Committee
PTA	Provincial Transport Authorities
RRMC	Road Repair and Management Company
RRMU	Regional Road Management Unit
SAPROF	Special Assistance for Project Formation
SEAGAMES	South East Asian Games
TEDI	Transport Engineering Design Incorporation
TID	Traffic Inspection Department
TMD	Traffic Management Department
TP	Transport Police
TPB	Transport Police Bureau
TRANCO	Transport Company
VIDIFI	Vietnam Infrastructure Development and Finance Investment Joint Stock Company
VITRANSS	Vietnam Transport Development Strategy Study
VRA	Vietnam Road Association, Ministry of Transport
NTSC	National Transport Safety Committee
UNDP	United Nations Development Program
WB	World Bank

(2) Technical, Traffic and Economic Terms

AC	Asphalt Concrete
ADT	Average Daily Traffic
B/C	Benefit/Cost
CBR	California Bearing Ratio
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
FIRR	Financial Internal Rate o Return
FR	Feeder Road
FS	Feasibility Study
GDP	Gross Domestic Product
GRDP	Gross Regional Domestic Product
HWL	High Water Level
IC	Interchange
ICB	International Competitive Bidding
IRI	International Roughness Index
LCB	Local Competitive Bidding
MSS	Movable Scaffolding System
MD	Man-Day
MM	Man-Month
MCI	Maintenance Control Index
NH	National Highway
NPTS	National Program for Traffic Safety
NPV	Net Present Value
OD	Origin Destination
ODA	Official Development Assistance
O&M	Operation & Maintenance
PAP	Project Affected People
PCU	Passenger Car Unit
RAP	Resettlement Action Plan
ROW	Right of Way
SBS	Span by Span
TCVN	Standard of Vietnam
TSAS	Traffic Safety Audit System
TV-LH HWY	Tan Vu-Lach Huyen Highway
USD	US Dollar
VLSS	Vietnam Living Standard Survey
VND	Vietnam Dong
VOC	Vehicle Operation Cost

1. INTRODUCTION

1.1. Background of the Project

In northern Vietnam, various foreign and domestic companies are contributing to the economic development in the region connecting the capital city of Hanoi and the coastal city of Hai Phong. Supporting the activities of these companies are the main ports in the region, Cai Lan Port and Hai Phong Port, which were rehabilitated under Japanese ODA Loan. The total capacity of these ports has been expanded to 75 million tons. However, considering the rapid socio-economic development in the region and that the required expansion of these ports is technically and socially difficult, it is urgently needed to develop a new port to cover the future demand of cargo volume which is expected to surpass 100 million tons in 2020.

Under these circumstances, the Ministry of Transport (MOT) in Vietnam requested JICA for an ODA Loan to support the project which consists of construction of container terminals for Lach Huyen Port, and the access road and bridge to the port. This scope is intended to implement the plans proposed in the feasibility studies related to both the port development and the road development. In response to this request, JICA is now carrying out a preparatory survey for the project formation in order to verify the necessity and validity of the project, mainly for the port portion, starting from October 2009.

In addition to the port development, JICA carried out a preparatory survey for the road and bridge portion, i.e., Tan Vu - Lach Huyen Highway. This includes review and update of the feasibility study (F/S) which is being finalized by MOT.

1.2. Objectives of the Survey

In order to assist the project formation for the road and bridge portion, this survey aims to complement the F/S and EIA by reviewing and updating the validity of the implementation plan from the viewpoints of scope, work methodology and work schedule, on the basis of a Japanese ODA loan with STEP scheme application.

1.3. Survey Area

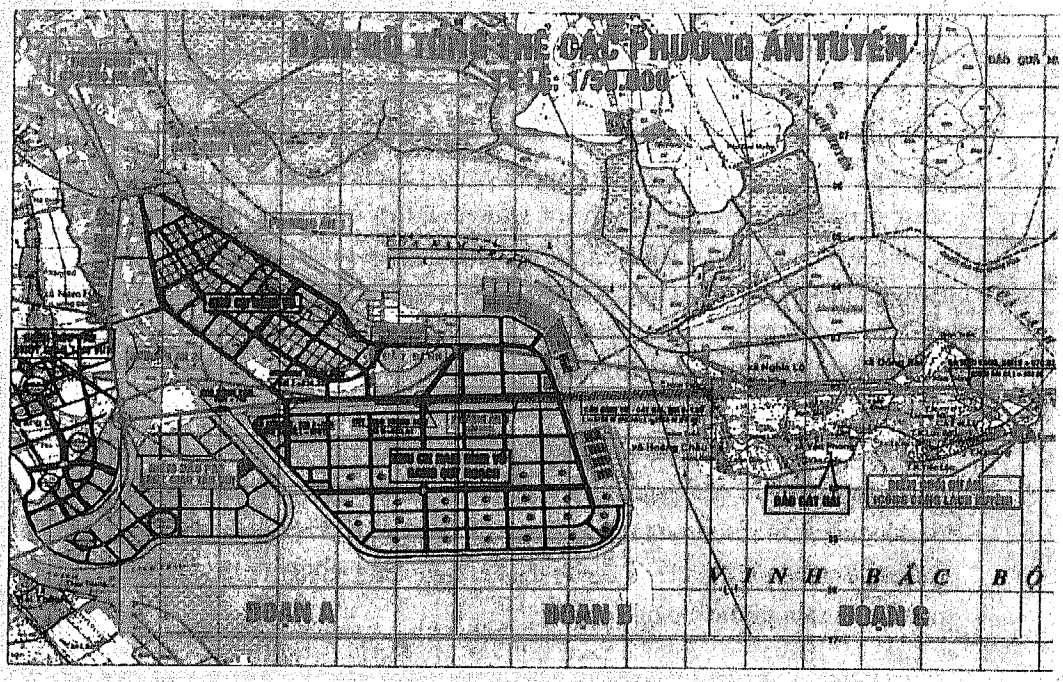
The study area covers the section between Tan Vu and Lach Huyen as shown in Figure 1.3-1.

Table 1.3-1 Study Areas

Proposed beginning point:	End point of Hanoi- Hai Phong Expressway at Tan Vu, Hai Phong City.
Proposed ending point:	Lach Huen International Gateway Port on Cat Hai Island, Hai Phong City.
Length of Route:	About 16 km in total, including the 5.44-km Cat Hai Bridge.

Presently, Dinh Vu Industrial Zone is actively being developed in accordance with the master development plan of Hai Phong City. Traffic volume from the industrial zone, through the

urban area, to National Highway No.5, is increasing rapidly due to the development of the industrial zone. As a result, traffic congestion often occurs and adversely affects the regional economic activities.



Source: Hai Phong City Master Plan

Figure 1.3-1 Study Area

1.4. Study Revision Chronicle

The Draft Final Report was submitted on 7 June 2010. Subsequently, a JICA Follow-up Mission had been carried out from 7 to 18 June 2010 on the basis of the report.

The materials for discussions between the JICA mission and MOT are attached in Appendix-9. Updates of the study in accordance with the result of discussions between the JICA mission and MOT are attached in Appendix-10.

2. PROJECT OUTLINES

2.1. Project Objectives

The Lach Huyen International Gateway Port Construction Project consists of the following two work portions:

(1) To build a new international deep-sea port and related basic infrastructure in Lach Huyen area at Cat Hai District in Hai Phong City, in order to respond to the rapid increase of demand in cargo volume, thereby contributing to economic development and greater competitiveness in the international market, and

(2) To build a road and bridge section between Tan Vu District in Hai Phong City and the Lach Huyen Port.

This Survey covers the abovementioned road and bridge work portion, i.e., Tan Vu – Lach Huyen Highway Construction Project.

2.2. Tentative Project Outlines

The scope and schedule of the project were updated during the discussion between JICA and MOT from June 7 to June 18, 2010. The updated scope and schedule are summarized in Appendix-10.

2.2.1. Overview of the Project

Tan Vu – Lach Huyen Highway Construction Project is a new highway construction investment project aimed at connecting developing areas, which have been planned and constructed rapidly in the southeast of Hai Phong City including new Lach Huyen International Port and Dinh Vu Industrial Zone, to Hanoi – Hai Phong Expressway which has been under construction.

The project area is located in the jurisdiction of Hai Phong City, which is the third largest city in Vietnam with a population of 1.9 million and population density of 1,250 persons/km^2 as of 2008. Hai Phong City is located in the mouth of the Red River, approximately 100 km away from the capital Hanoi. Hai Phong City serves as the primary seaport for the northern focal economic region in Vietnam.

The project is very necessary for the development program of Dinh Vu – Cat Hai Economic Zone with the aim of connecting Lach Huyen International Port and Nam Dinh Vu Industrial Zone to Hanoi – Hai Phong Expressway. In the Statement No. 6061/BGTVT-KHDT dated August 18, 2008 sent to the Prime Minister, the Ministry of Transport (MOT) has evaluated that "this project is very important to be conducted simultaneously with the project of building the Hanoi – Hai Phong Expressway, meeting the needs of regional development and implementating the Lach Huyen International Gateway Port".

The project was originally planned to be delivered as a build-operate-transfer (BOT) scheme project financed by Vietnam Infrastructure Development and Finance Investment Joint Stock Company (VIDIFI). The draft feasibility study (F/S) report was prepared for the BOT scheme in July 2009. However, project ownership was transferred to MOT in December 2009 through

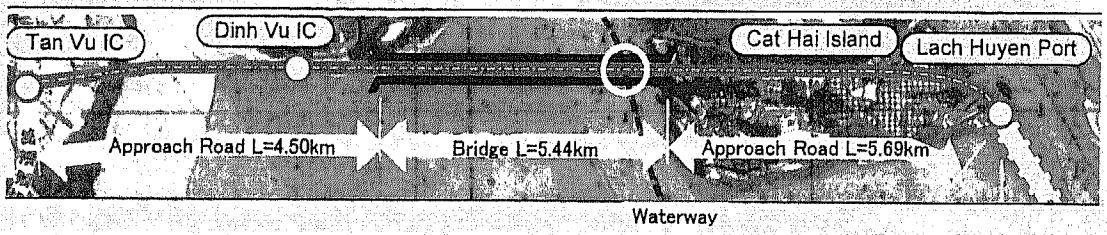
Letter No.8677/VPCP-KTN. The F/S report was then officially handed over from VIDIFI by Notice No. 73/TB-BGTVT dated March 3, 2010. Since the transfer, the project has been prepared as a project financed under Japanese ODA Loan.

2.2.2. Summary of Construction Works

(1) Route

In the F/S, the project route was 15.63 km long, including three main sections as follows:

- Section 1: Tan Vu Intersection to the west abutment of the approach bridge, 4.50 km long, consisting of embankment section with the Cam River box-culvert and Dinh Vu Intersection.
- Section 2: Bridge section, 5,442.9 km long, consisting of west approach bridge (Hoi An side, 4,433.7 m), main bridge (490.0 m) and east approach bridge (Cat Hai side, 519.2 m).
- Section 3: The east abutment of the east approach bridge to the end point, 5.69 km long, consisting of embankment section with one underpass box-culvert, four waterway box-culverts and 1,100 m of slope protection works (stone masonry).



Source: Study Team

Figure 2.2-1 Route and Location of Major Components

(2) Design Standard

The highway is designed according to TCVN 4054 - 2005, design grade III, plain terrain, and design speed of 80 km/h.

(3) Construction Components

The major construction components are shown in Table 2.2-1 below. The plans and drawings are presented in Appendix-1 "Drawings". **(Table 2.2-1 is updated in Appendix-10).**

Table 2.2-1 Major Construction Components

Construction Components		Contents
Length	Total Length	15.630 km
	Bridge Length	Total: 5.443 km Approach Bridge, Hai An side: 4,434 m (including 2 flyovers) Main Bridge: 490 m Approach Bridge, Cat Hai side: 519 m
	Road Length	10.19 km (Hai An side: 4.50 km, Cat Hai side: 5.69 km)
Number of Lanes		4-lane (6-lane in the 2nd stage)
Width	Width of Road Width of Bridge	29.50m 14.5m (Stage Construction) **(See Appendix-10)**
Structure Type	Main Bridge Approach Bridge Flyover	Pre-stressed concrete (PC) box girder with V-shaped pier Pre-stressed concrete box girder with double wall pier Pre-stressed concrete box girder with double wall pier
Intersection (IS)	Tan Vu IS Din Vu IS	At-grade (Grade-separated in the 2nd stage) At-grade (Grade-separated in the 2nd stage)
Other Major Components		Pavement construction Soft ground treatment Culvert construction
Consulting Service		Construction Supervision

Source: Study Team

(4) Applied Technical Specifications

1) Road Works

Stage construction method is applied in order to reduce the initial investment cost. Earthworks will consider a 6-lane construction from the initial stage. However, the pavement works will be limited to 4-lane construction at the initial stage and 6-lane in the second development stage.

Cross section elements of the project road are summarized in the following tables:

Table 2.2-2 Cross Section Elements of Road (1), 1st Stage Construction (4-lane)

Component	Width (m)
Carriageway	2@3.50×2=14.0
Median strip	2@3.75+1+0.5×2=9.5
Shoulder	2.0×2=4.0
Protection shoulder	0.5×2=1.0
Total roadbed width	29.5

Source: Study Team

Table 2.2-3 Cross Section Elements of Road (2), 2nd Stage Construction (6-lane)

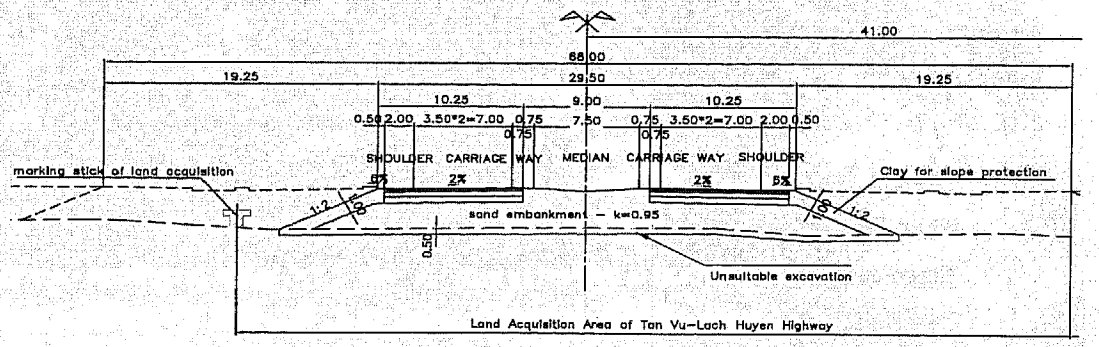
Component	Width (m)
Carriageway	3@3.75×2=22.5
Median strip	1.0+0.5×2=2.0
Shoulder	2.0×2=4.0
Protection shoulder	0.5×2=1.0
Total roadbed width	29.5

Source: Study Team

Right-of-way (ROW) shall be 20 m from the foot of embankment in accordance with Decree of the Government No. 172/1999/ND. Thus, the width of the land strip for Tan Vu-Lach Huyen Highway (6-lane) is about 90 m.

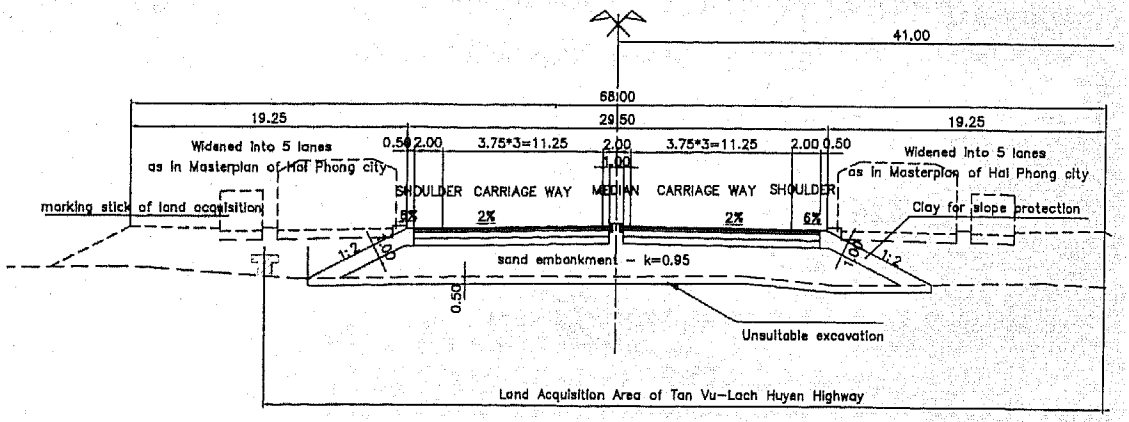
Figures 2.2-2 and 2.2.3 show the typical cross sections for the first stage and second stage, respectively. Details for the application of the stage construction are described in Section 2.4.3.

In accordance with the updated traffic demand forecast, the second stage construction should be completed before 2027.



Source: Study Team

Figure 2.2-2 Typical Cross Section (1), First Stage



Source: Study Team

Figure 2.2-3 Typical Cross Section (2), Second Stage

2) Stage Construction of Bridge Works

As with the road works, stage construction method was adopted for the bridge works in order to reduce the initial investment cost.

3) Bridge Structure Type

Width of the bridge is updated in Appendix-10.

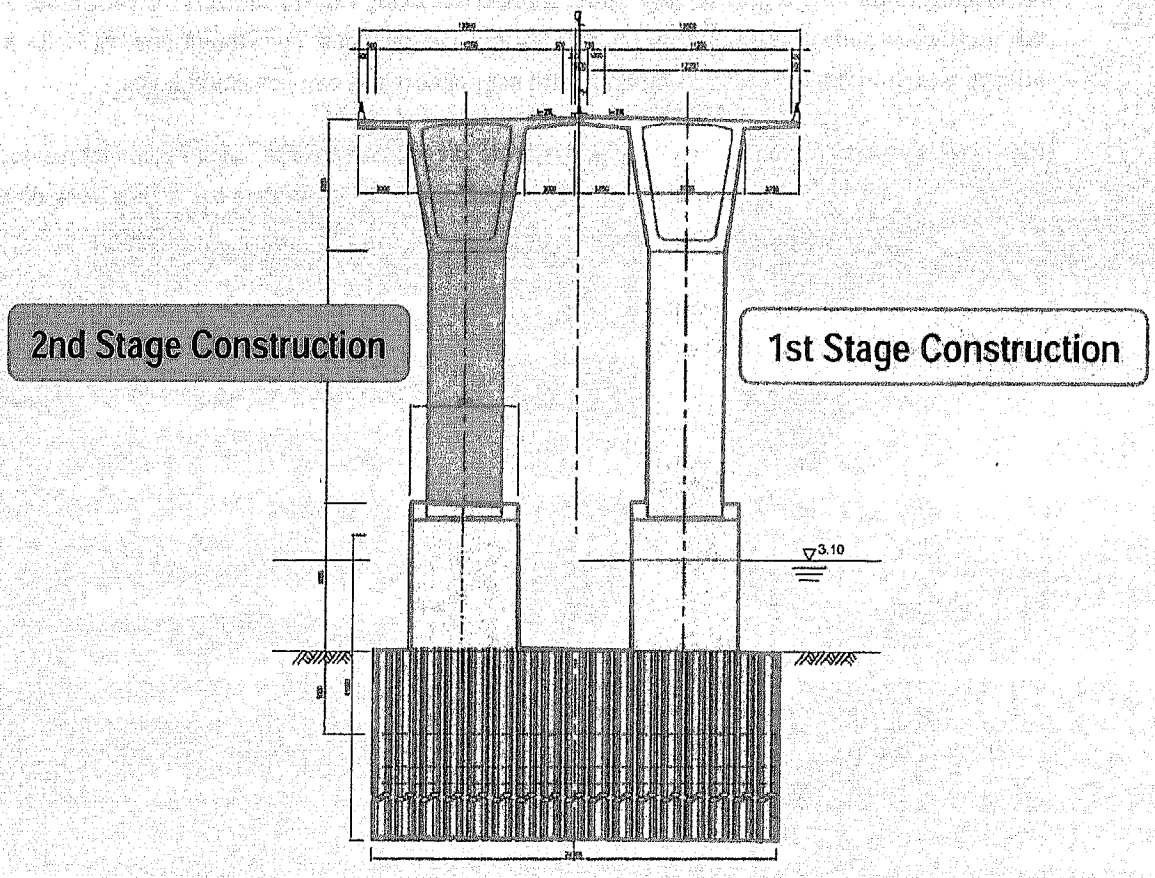
Considering the stage construction, including the future extension works, the following structure types were selected for the bridge works:

Structure type of the main bridge is PC-box girder with V-shaped pier and steel pipe well foundation.

Structure type of the approach bridge, including flyover section, is PC-box girder with double wall pillar and steel pipe foundation or bored pile foundation.

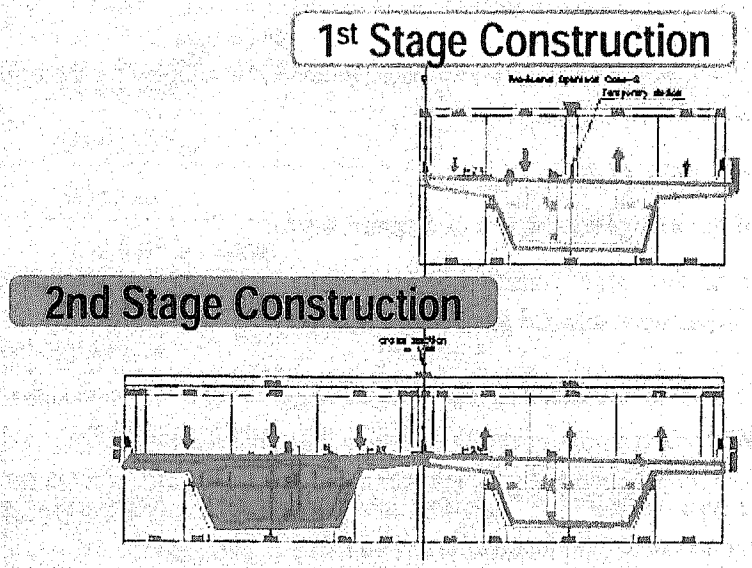
Figures 2.2-4 and 2.2-5 show the typical cross sections for stage construction of the bridges, which are described in Section 2.4.3.

For the main bridge, **the foundation and pile-cap structure in the sub-structure will be built in the initial stage** in order to ease the construction work during the second stage.



Source: Study Team

Figure 2.2-4 Typical Cross Section of Main Bridge (Stage Construction)



Source: Study Team

Figure 2.2-5 Typical Cross Section of Approach Bridges (Stage Construction)

(5) Tentative Total Investment Cost

According to the F/S report in July 2009, transferred from VIDIFI to MOT in December 2009, the total construction cost is VND 5,789 billion and the total investment cost is VND 8,729 billion, which includes the construction, land acquisition and compensation costs.

However, these costs do not properly cover some preparation works, recent price increases, and increments in land acquisition costs and compensation fees, which are subject to be updated in this Study.

The above cost was updated during the discussion between JICA and MOT in accordance with optimization of the scope and schedule of works. Updated cost is summarized in Appendix-10.

2.3. Traffic Demand Forecast

2.3.1. Review of Existing Traffic Demand Forecast

(1) ***Traffic Forecast Target Year***

Target year of traffic forecast was changed to 2035 during the discussion between JICA and MOT as shown in Appendix-10.

Target years of the traffic analysis in the F/S were 2015-2020 and 2030 which were shown in MOT Decision No. 501/QD-BGTVT dated February 29, 2008. Furthermore, consistency with traffic volume in 2022-2032 after the Hanoi - Hai Phong Expressway is open to the public and connected to the project road was taken into consideration.

In accordance with the terms of reference (TOR) of this Study, 2020 was set as the target year after the Lach Huyen Port is assumed to be open in 2015, and traffic demand in the following two durations were forecasted:

- 2015 to 2020: The first target fiscal year (Lach Huyen Port 2 berth operation stage)
- 2020 to 2030: The second target fiscal year (forward planning stage of Lach Huyen Port)

(2) ***Traffic Forecast Method***

1) Traffic Network

Same as that used in the F/S.

2) Input data

The following input data were updated:

- Basic Socio-economic Data
- Development of Industrial Zones (IZ)
- Updated Socio-economic Data of Cat Hai Island
- Updated Socio-economic Data of Cat Ba Island

Basic Socio-economic Data

In the F/S, Statistic Book in 2006 was used for the socio-economic data. In this Study, that in 2008 is used.

Development of Industrial Zones

In the F/S, Master Plan of Hai Phong City in 2007 was used. In this Study, updated and latest individual development programs were referred to.

Development of Dinh Vu Industrial Zone

The development project of Dinh Vu area covers two zones, namely, Dinh Vu Industrial Zone and Nam Dinh Vu Industrial Zone. The amount of investment by new and additional foreign direct investment (FDI), invited by Hai Phong City, became maximum in 2009 with USD 1,300

million, which is five times that of 2008.

As for Dinh Vu Industrial Zone in the north side, the first term construction is progressing. The first term construction invited investment from 17 entities amounting to USD 368 million. Moreover, 91.5% of lease was already contracted.

Meanwhile, the Nam Dinh Vu Industrial Zone in the south is divided into east and west sides, with each side managed by a different investment management company. The west side is by Hapaco Joint Stock Company (JSC) and the east side is by Southern Dinh Vu Investment JSC. This area is now calling for international investors.

After the previous F/S was conducted, Hai Phong People Committee announced two decisions, namely, No. 644/QD-UBND dated April 16, 2009 and No. 795/QD-UBND dated May 29, 2009. Supported by these decisions, the construction of shore protection works has progressed well and will be completed by 2013. Reclamation works using the dredged soil will be carried out after the slope protection works and will be completed by 2025.

Table 2.3-1 summarizes the updated land use plan on the basis of the above two decisions

Table 2.3-1 Future Land Use on in Dinh Vu Peninsula

DINH VU PENINSULA						
No.	**Item**		**Revised value of forecast**			**Preparatory Survey**
			2015	**2020**	**2030**	**Verification method**
I	Dinh Vu IZ JSC (100 m²)		(32,750) 16,375	(65,500) 32,750	(78,600) 39,300	The area of the industrial area is revised from the latest master plan of Hai Phong. **Conversion ratio:50%**
	Hapaco JSC (100m²)		(0) 0	(0) 0	(44,700) 35,760	The area of the industrial area is revised from the latest master plan of Hai Phong. Decision No.644/QD-UBND dated April 16, 2009, **The operation in 2030 assumes that it is 50%.** **Conversion ratio:80%**
	Southern Dinh Vu Investment JSC (100m²)	Non-tax zone	(0) 0	(0) 0	(9,775) 7,820	The area of the industrial area is revised from the latest master plan of Hai Phong. Decision No. 795/QD-UBND dated May 29, 2009 **The operation in 2030 assumes that it is 50%.** **Conversion ratio:80%**
		Industrial zone	(0) 0	(0) 0	(18,500) 14,800	
	Total		(32,750) 16,375	(65,500) 32,750	(151,575) 97,680	
II	Dinh Vu Port (tons/yr)		4,500,000	6,000,000	10,000,000	The area of the industrial area is revised from the latest master plan of Hai Phong.
III	Apartment block for rent (m²)		162,500	325,000	650,000	The area of the industrial area is revised from the latest master plan of Hai Phong.

Source: Study Team

Updated Socio-economic Data of Cat Hai Island

According to MOT Decision No. 501/QD-BGTVT dated February 29, 2008, for the Lach

Huyen Port Development Project, it is shown in the attachment that the whole region in Cat Hai Island could be developed as industrial zone. However, the development plan is still at the conception level. Therefore, land use of the Cat Hai Island was predicted to remain as "undeveloped" similar to the forecast in the F/S. Socio-economic data of Cat Hai Island was updated from the F/S as shown in Table 2.3-2.

Table 2.3-2 Future Land Use in Cat Hai Island

CAT HAI ISLAND					
No.	Item	Revised value of forecast			Preparatory Survey
		2015	2020	2030	Verification method
I	Population (persons)	19,000	19,300	20,100	Transition of population is revised using Statistical Yearbook 2008 of Hai Phong.
II	Port Area (tons/yr)	5,394,000	29,525,000	78,300,000	The forecast result of the Study Team of Lach Huyen Port Middle Growth Case
III	Tourists (persons/yr)	500,000	1,600,000	2,600,000	Transition of population is revised using Statistical Yearbook 2008 of Hai Phong and traffic count result

Source: Study Team

Updated Socio-economic Data of Cat Ba Island

Socio-economic data of Cat Ba Island was updated from the F/S as shown in Table 2.3-3.

Table 2.3-3 Future Land Use on Cat Ba Island

CAT BA ISLAND					
No.	Item	Revised value of forecast			Preparatory Survey
		2015	2020	2030	Verification method
I	Population (persons)	12,000	13,000	14,600	Transition of population is revised using Statistical Yearbook 2008 of Hai Phong.
II	Tourists (persons/yr)	500,000	1,600,000	2,600,000	Transition of population is revised using Statistical Yearbook 2008 of Hai Phong and traffic counts result

Source: Study Team

3) Trip Generation Model for Peak Hour Traffic

In the F/S, a Chinese traffic generation model was used because economic development in both China and Vietnam is similar.

In this Study, the same model is used to estimate the trip generation.

Table 2.3-4 Applied Traffic Generation Model

Trip Generation Rates					
Land Use	Unit	AM		PM	
		Generation	Attraction	Generation	Attraction
Apartment	pcu/hr/unit	0.250	0.080	0.080	0.250
Industrial	pcu/hr/100 m^2	0.110	0.150	0.060	0.040
Tourist	pcu/hr/person	0.400	0.400	0.400	0.400
Port	pcu/hr/ton*	0.082	0.082	0.082	0.082

* Average load per container truck is approx. 30 tons.

Source: Study Team

4) Traffic Diversion Rate Using the New Bridge to Cat Ba Island

The number of passengers to Cat Ba Island consists of i) via Cat Hai Island, ii) from Hai Phong City by high-speed boat, and iii) from Bai Chay by high-speed boat. In case the project road is developed, it was assumed that 76% of all travelers to the island would use this route.

5) Possibility of Railway (Freight) Development

Railway alignment is indicated in the F/S in accordance with the master plan of Hai Phong City.

In this Study, during the target years of the traffic demand, it was assumed that there is no railway freight traffic in 2020. However, it was assumed that 30% of freight would be carried by railways in 2030.

6) Share of Traffic Mode

In the application of the above traffic generation model, the generated values should be adjusted in accordance with the share of the traffic mode.

In this Study, the same share of traffic mode was applied in each area, as follows:

Dinh Vu Area

- Traffic generating area of an industrial area: Zones whose 30% of whole surface products and others are landscape, road network, utilities, warehouse, etc.
- Dinh Vu Port: The rate of peak of cargo volume is 5% per hour.
- Apartment block for rent: Apartment footprint is 50% of total residential block with a plot ratio of 5. Each unit occupied 1,000 m^2.
- Generating percentage of traffic: as shown in the table below.

Table 2.3-5 Applied Traffic Share in Dinh Vu Area

Item	2015	2020	2030
Rail service	Without rail service	Without rail service	With rail service
Motorcycle	70%	50%	30%
Car	30%	30%	50%
(Public transport)	-----	(20%)	(20%)

Source: Study Team

Cat Hai Island

- Four average family members =>1 unit
- Lach Huyen Port: The rate of peak of cargo volume is 5% per hour.
- Tourist: 20% of public transportation facility use, 70% of other transportation use
- Generating percentage of traffic

Table 2.3-6 Applied Traffic Share in Cat Hai Island

Item	2015	2020	2030
Rail service	Without rail service	Without rail service	With rail service
Motorcycle	50%	30%	20%
Car	50%	70%	60%
(Public transport)	-----	-----	(20%)

Source: Study Team

Cat Ba Island

- Four average family members =>1 unit
- Generating percentage of traffic

Table 2.3-7 Applied Traffic Share in Cat Ba Island

Item	2015	2020	2030
Rail service	Without rail service	Without rail service	With rail service
Motorcycle	50%	30%	20%
Car	50%	70%	60%
(Public transport)	-----	-----	(20%)

Source: Study Team

7) Daily Traffic Forecasting

In the F/S, daily traffic was calculated backwards from the peak hour traffic. In this Study, same calculation method is used. The peak ratio to be used for calculation of daily traffic is 7% for large-size car and bus and 5% for passenger car.