5.7 Construction Planning

5.7.1 Planning Policy

The Construction Plan will be planned to optimize economical and construction schedules while taking the conditions of the erection site into consideration, based on the previously mentioned Analysis Policy-4. Initially, each selected method for comparison will be investigated on seasonal constructionability (Rainy/Dry season, river water level, typhoon, etc.), whether or not overnight construction is possible, etc. to determine the schedule for the complete Project. Probable construction safety measures will also be considered.

Local facilities, topological factors, location of Construction Yard, stock yards and the existing roads, access roads for construction (Temporary Roads), disposal sites, etc will also be investigated and individual construction plans for the Main and Approach Bridges will be explored. The Construction Plan for the Main Bridge substructure will include special attention to the selecting Steel Pipe Sheet Pile (SPSP) foundations and verify the advantages of Japanese technology. Road Construction Plans will apply soft soil related technologies with special care.

From the above, the Construction Plan will investigate the following items:

- Construction Schedule
- Temporary Road Plan
- Bridge Construction Plan (Main Bridge)
- Bridge Construction Plan (Approach Bridge)
- Road Construction Plan

5.7.2 Construction Schedule

The Comprehensive Construction Plan was explored based on the Road and Bridge Construction Plans. The Comprehensive Construction Plan is shown in Table 5.77.

The following elements are believed to affect the construction scheduling:

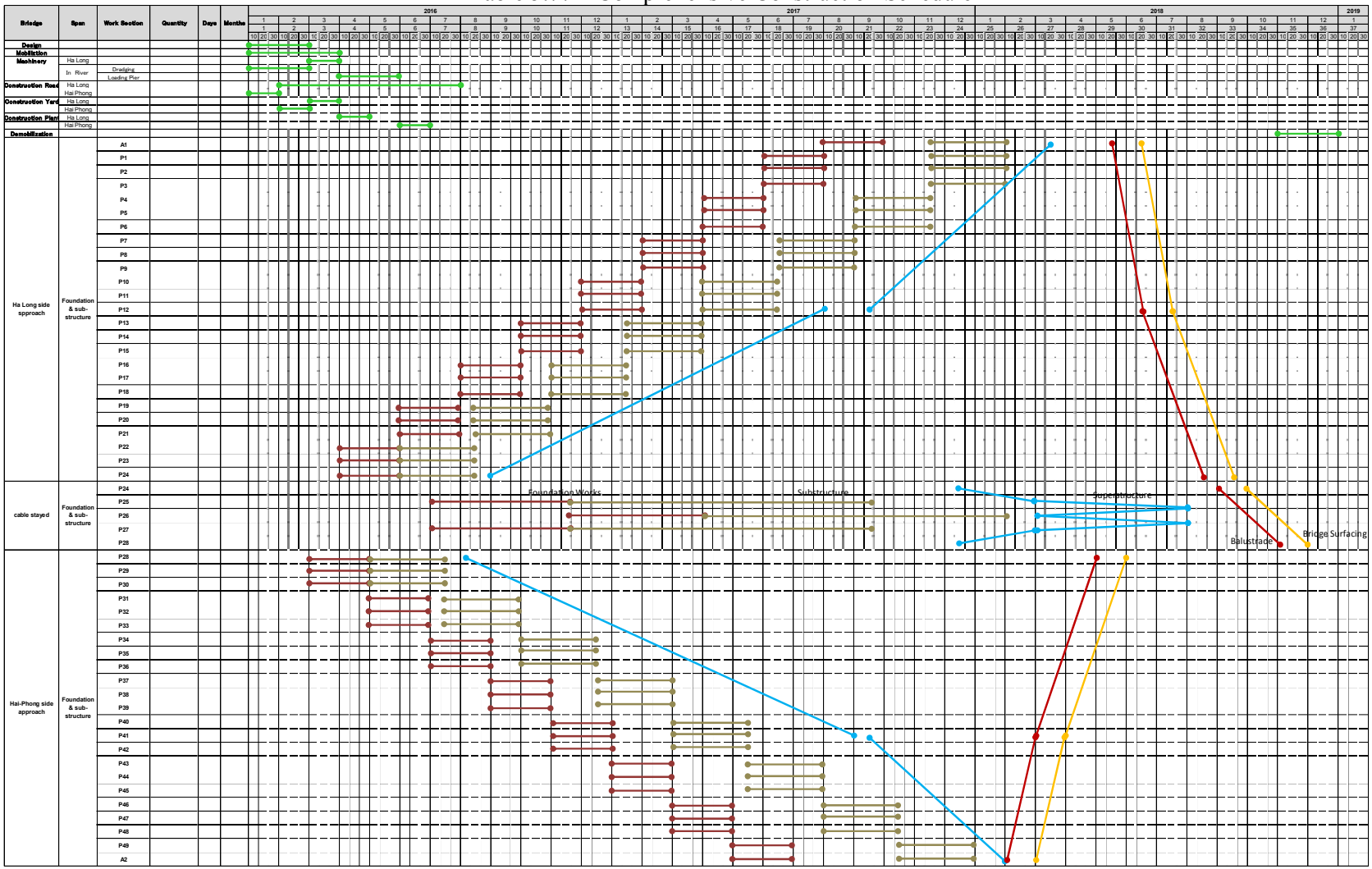
- Capacity Utilization (rainy season, dry season)
- Calendar events specific to Vietnam (Lunar New Year, etc.)
- Capacity Utilization restriction for daytime/overnight
- Others (Lead time required to procure machinery, etc.)

The effects of the indivudual elements were analyzed from previous examples by interviewing staff who had worked on Nhat Tan Bridge on how the various elements ahd affected the construction. From the interviews, it was established that although specific Vietnamese factors such as rainy season (river water levels), special events such as Lunar New Year, differences in workers' environments and the differing commercial and tax situation for machine procurement had to be taken into consideration, these conditions were normally encountered in overseas civil engineering projects in general and would not significantly impact on the Comprehensive Construction Schedule. As part of Safety Planning, the following items would recieve attention, allowing adequate time to conduct the discussions and implement the measures:

- forward negociations for height limits, navigation restrictions
- warning vessels in rivers
- prior notice for traffic restrictions
- safety Restrictions such as overnight restrictions
- labor safety and Hygene Administration (Labor Environment Management)
- labor management during hot weather, dry season

Individual items will be reviewed at the implementation stage and reflected in the schedule.

Table 5.77 Comprehensive Construction Schedule



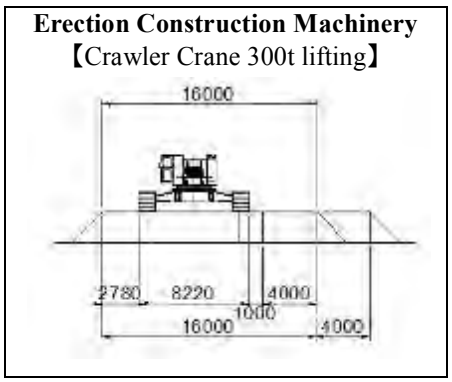
Source: JICA Study Team

5.7.3 Temporary Road Plan

The construction of a Temporary Road and Embankment were studied for the Temporary Road Plan.

(1) Width Composition

A crawler crane with a 300-ton lifting capacity will be used to erect steel girders on the Halong side. The temporary road width is set at 16.0m to allow trailers to pass.



Source: JICA Study Team

Figure 5.77 Width of Construction Yard (Superstructure Erection Crane) & Temporary (Construction) Road Width

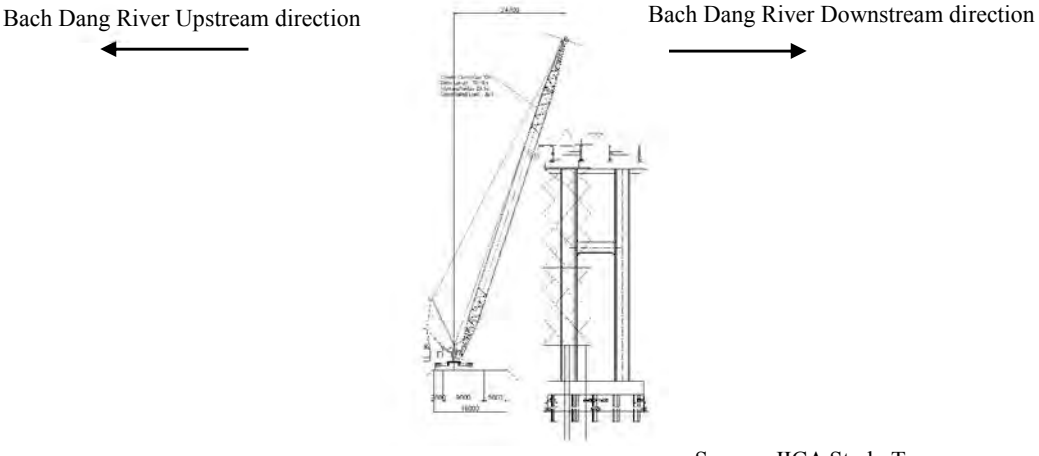
(2) Temporary Road/Embankment Plan

1) Halong side

A） General Areas

The shape of the temporary road is configured based on the 300-ton crawler crane being the maximum-sized heavy machinery to use the road during the erection work.

The road is provided on the downstream side only and all construction will be conducted from the upstream side.

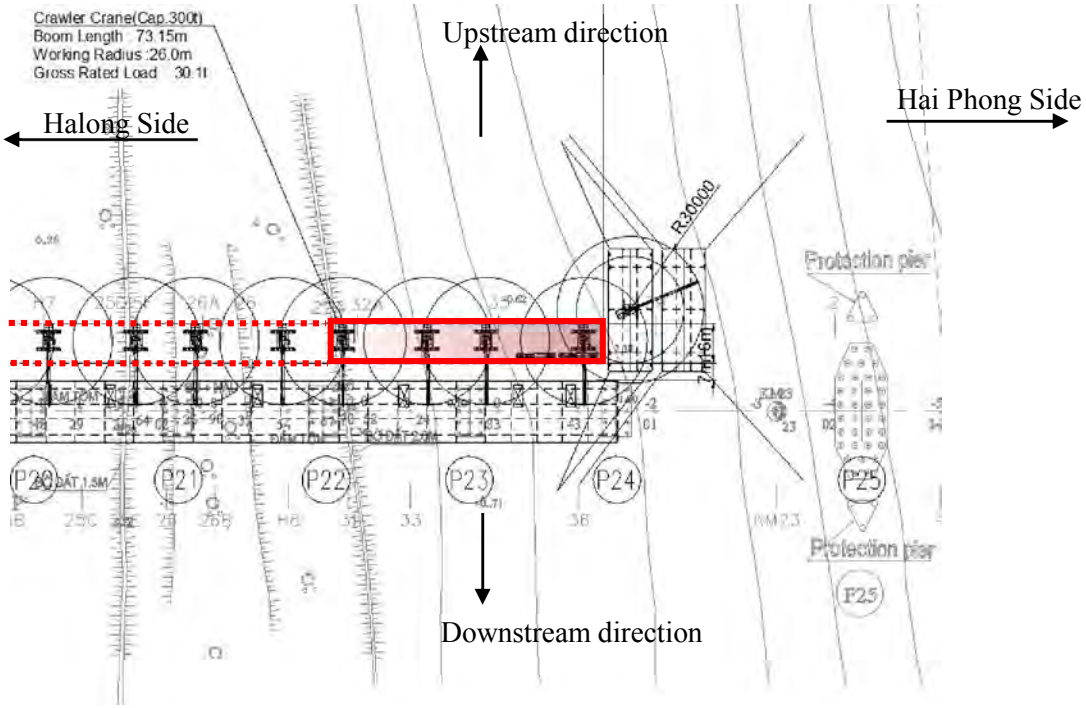


Source: JICA Study Team

Figure 5.78 Shape of Temporary Road & Embankment (Halong side /General Area)

B） In-River work

A temporary Road in-River will be constructed on the embankment to construct the Approach Bridge sections in the river. The road width will be the same as for the roads in the Dam Nha Mac area.



Source: JICA Study Team

Figure 5.79 Temporary Road (Halong side/in-River)

2) Hai Phong side

The Construction Site on the Hai Phong side can be divided into "Factories and Facilities" and "Swampland". The points requiring attention in each case are listed below.

- Factories and Facilities: A temporary road will be constructed and site entry finalized.
- Swampland: Will basically follow the Halong side planning. However, since it is not on the river side, it need not take care of HWL and levels can be set in relation to existing road levels connected to the Temporary Road.

5.7.4 Bridge Construction Plan (Main Bridge)

(1) Superstructure Erection Plan

1) Construction Conditions

The Restrictions concerning bridge erection are summarized as follows:

- Barge moorings in the river that obstruct navigation will be avoided.
  (Barge mooring for conveying material to Tower Foundation jacket will take care to avoid obstructing navigation.)
- Airspace Use will be applied during Erection Works to relax height limits.
  (During tower crane use)

At present, no detailed information regarding the depth of the river in the tower vicinity is available, but the material and equipment must be conveyed into the site to construct the tower foundations and structure and dredging will be performed to allow barges to enter.

2) Erection Procedures

The girders will be constructed using an overhang erection method as shown in Figure 5.80.

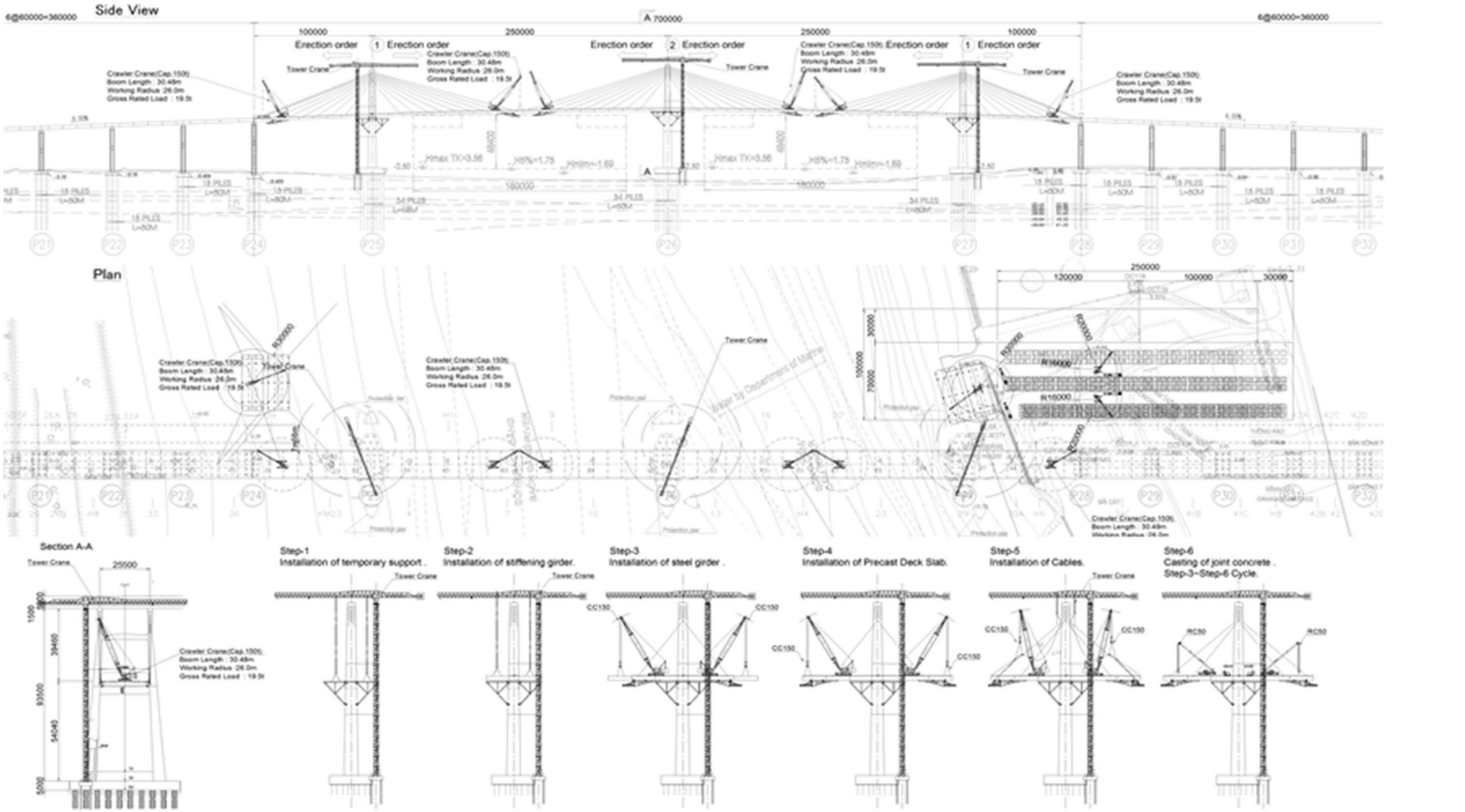
The overhang erection method is the one of the most common methods used to construct cable-stayed bridges since it does not obstruct under girder spaces and is the most appropriate erection method for the Project, which includes restrictions on using the river.

The Project Construction Plan is as follows:

- The crane used in tower construction will be deployed and inclined bents erected on the main tower.
- Girders close to the tower will be erected with the tower cranes.
- Crawler cranes will be deployed on top of the girders.
  Afterwards, an overhang erection will be repeated following the procedure cycle below.

1st STEP: girder members are taken in, conveyed and erected (members taken in close to tower, laterally moved out to the erection position and lifted into position)
2nd STEP: pre-cast deck plates are taken in (tower section), conveyed and laid.
3rd STEP: cables are strung, tensioned and camber adjusted
4th STEP: filling concrete is placed between deck plates.

The above cycle is repeated as shown in Figure 5.80 and finally, the closure block in the middle is erected, pre-cast deck plates laid and concrete placed to complete the construction.



Source: JICA Study Team

Figure 5.80 Main Bridge / Assembly Procedure Drawing (1)

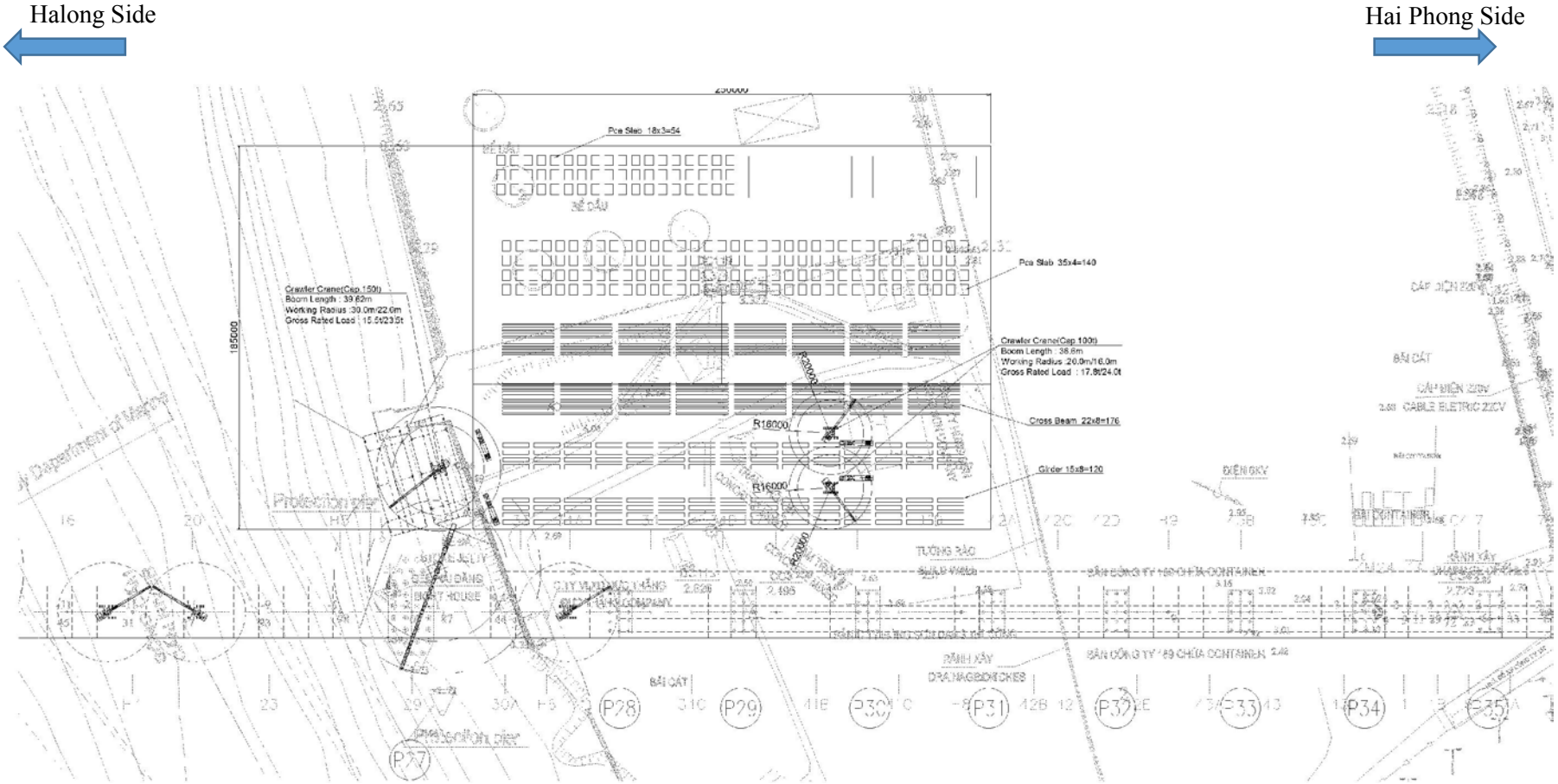
3) Construction Yard

The completed girder members and pre-cast deck plates are stocked in the Construction Yard as shown in Figure 5., while the Construction Yard is placed on a site facing the river on the Hai Phong side to allow transportation by barges. Transportation of members between the Fabrication Factory and Construction Yard will assume overland transportation.

The erection of girders will be completed in approximately 4 months net, the girder members and pre-cast deck plates will be assumed to be largely completed and in stock when erection starts for the estimation of Yard size requirements.

The load-bearing capacity of the ground in the Construction Yard is assumed to be weak and the girders will be laid out vertically in a single layer while deck plates will be laid out flat in two layers.

Lateral transportation within the Yard will use crawler cranes (100t). The loading onto barges will be via a 150t crane erected on the river quay.



Source: JICA Study Team

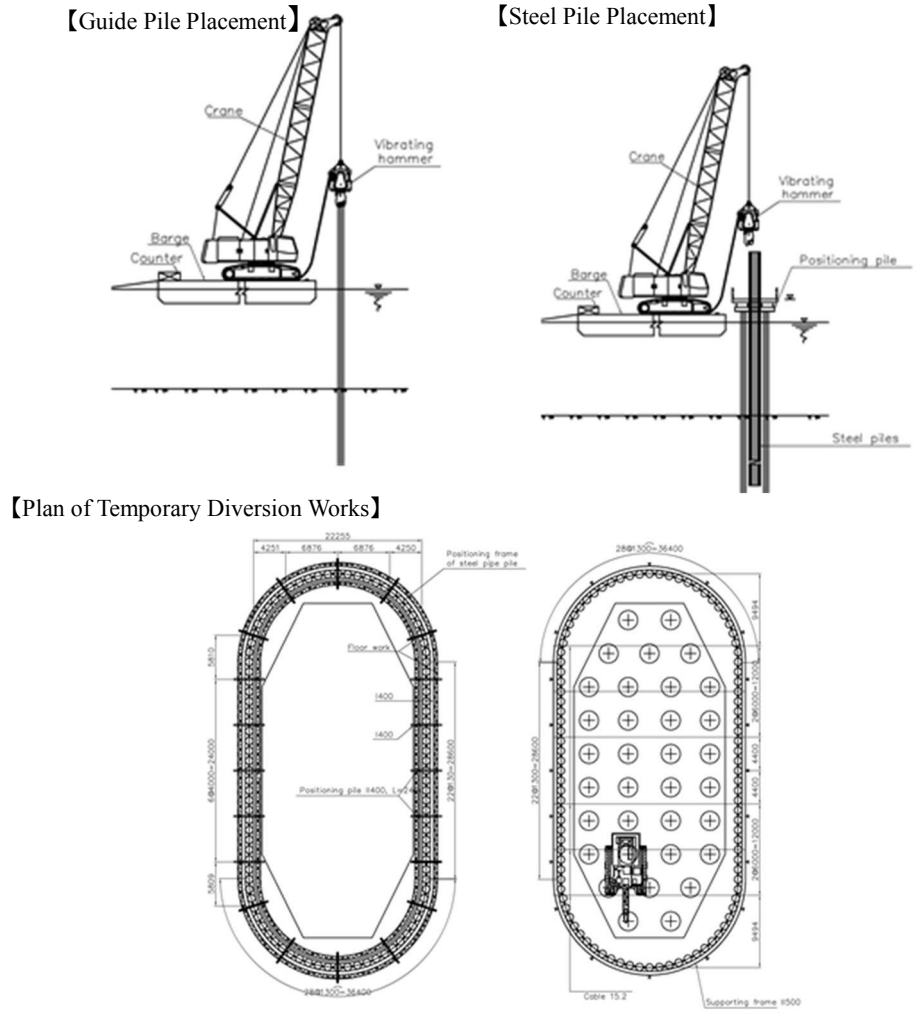
Figure 5.81 Main Bridge Construction Yard

(2) Substructure Erection Planning

The substructure of the Main Bridge comprises the piers P25, P26 and P27, all of which are constructed in the river. The construction procedures can be roughly separated in: (1) Construction of Temporary Diversion by Barges → (2) Pile Placement → (3) Construction of Foundation Slab → (4) Construction of Tower. The procedures are described below. The restricting conditions of Navigation Limit and Height Limit must be considered in the Detailed Construction Planning performed in parallel with the Detailed Design and adjusted with the related authorities.

1) Construction of Temporary Diversion by Barges

Cranes are loaded on barges and towed into position and small-bore guide piles are placed to guide the positioning of the main steel pipe sheet piles. Placement of the guide piles and steel pipe sheet piles is alternately repeated to construct an oblong-shaped temporary diversion shoring.



Source: JICA Study Team

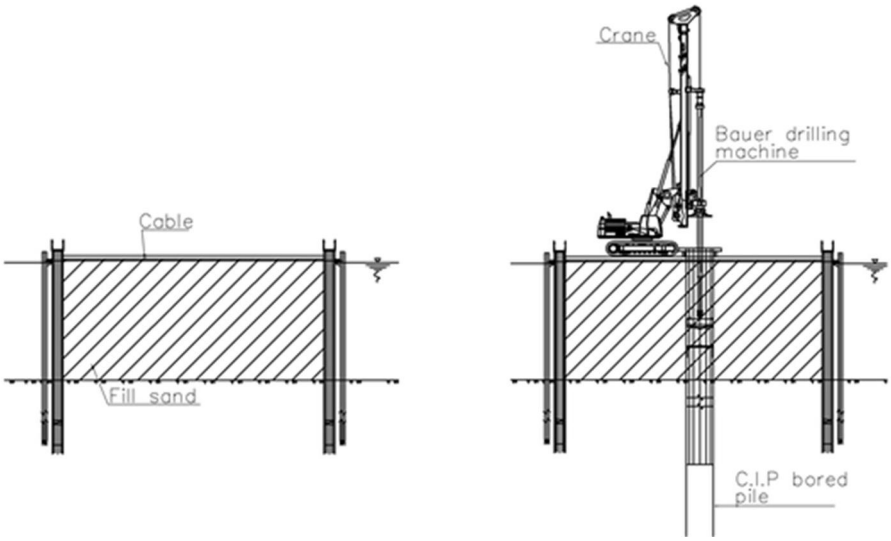
Figure 5.82 Main Bridge Substructure Construction Plan (Temporary Diversion construction)

2) Pile Driving

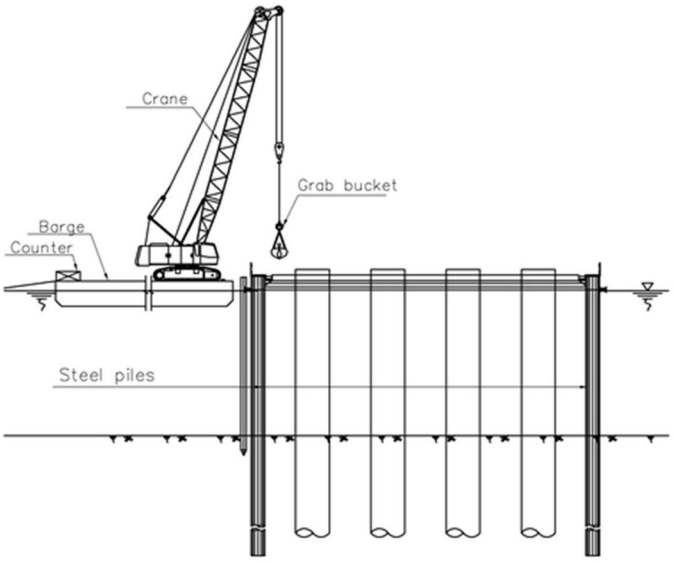
Steel Sheet Pile tops are secured with tie-rods (PC cables) and sand replacement is carried out. After sand replacement, cast-in-place piles are constructed using the sand as the base level. After completion of the pile casting, the replaced sand is removed.

Construction of construction base level for Pile casting machinery
- Secure Pile tops with Tie-rods (PC cables)
- Replace Sand inside the Temporary Diversion

Concrete Placement of Cast in Place Piles



【Removal of Replaced Sand】

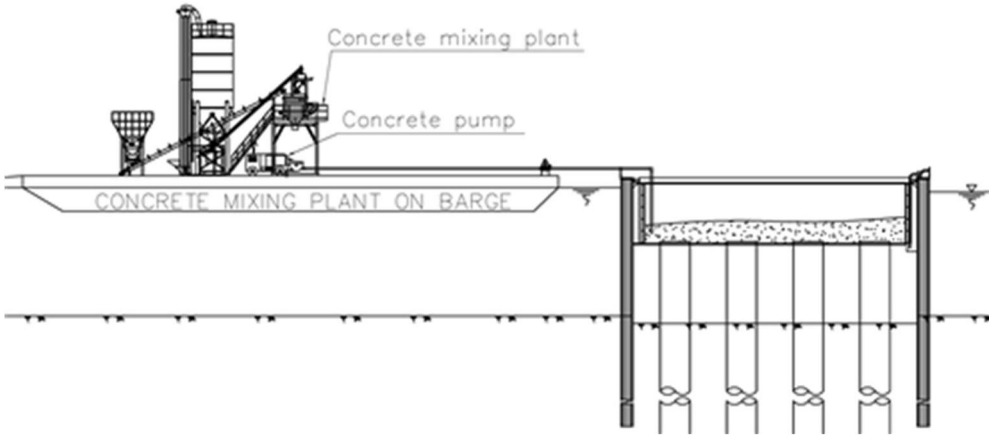


Source: JICA Study Team

Figure 5.83 Main Bridge Substructure Construction Plan (Pile Driving)

3) Construction Of Foundation Slab

Cast-in formwork (Pre-cast member) will be placed on top of piles and a foundation slab will be constructed with the concrete supplied from concrete plant set up on the barge. The steel sheet piles will be removed after construction of the foundation slab is completed.

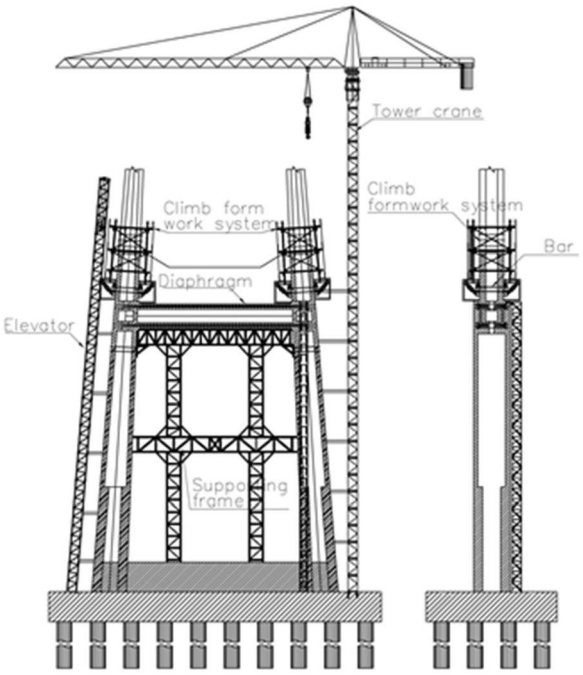


Source: JICA Study Team

Figure 5.84 Main Bridge Substructure Construction Plan (Construction of Foundation Slab)

4) Construction of Main Tower

A Tower Crane will be erected on the Foundation Slab and the Main Tower will be constructed in parallel with erection of supports and scaffolding.



Source: JICA Study Team

Figure 5.85 Main Bridge Substructure Construction Plan (Construction of Main Tower)

5.7.5 Bridge Construction Plan (Approach Bridge)

(1) Erection Plan of Superstructure

1) Steel Girder

A） Construction Conditions

The restricting condition for the erection of steel girders in the river course (between P. 21-22-23) is avoidance of barges moored for the long term in the river ship lanes. The construction plans do not take other restrictions into consideration.

B） Erection of the Steel Girder Section

a) General section

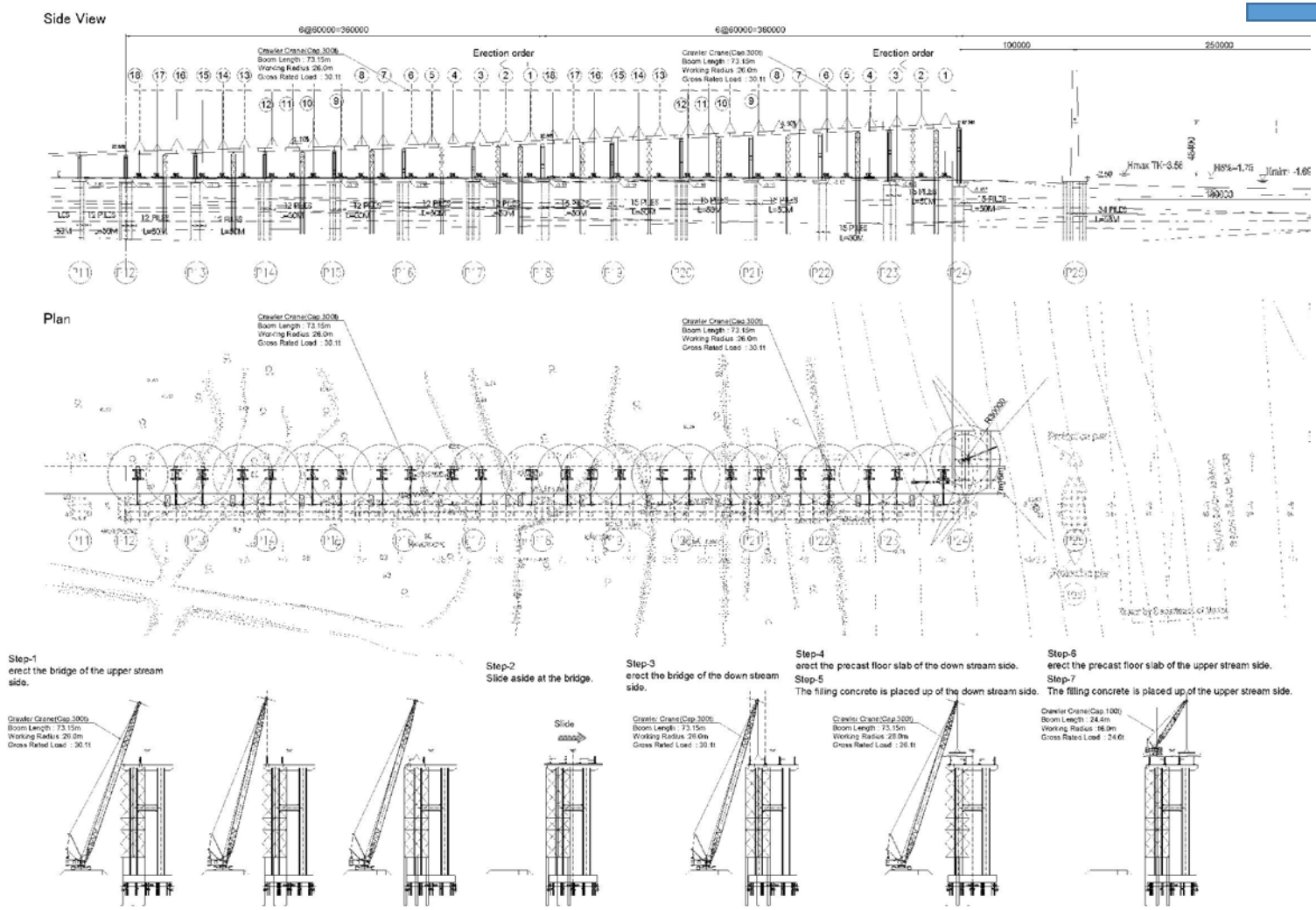
Steel girders are erected two blocks at a time on the ground and lifted into place by the Crane Bents Method as shown in Figure 5.86, 5.87 and 5.88.

Temporary construction roads are planned on the downstream side only, which restricts the position for the crane erection. Accordingly, the upstream side girders are erected and moved laterally into position, followed by the downstream girders. A summary of construction cycles is shown below:

1st STEP: Bents erection (including bents foundation)
2nd STEP: upstream side girders are erected on the ground, two blocks at a time, lifted and placed on a horizontal beam (the ground erection of girders utilizes part of the temporary road).
3rd STEP: the lifted upstream girder is moved laterally into an upstream position.
4th STEP: downstream girders are erected on the ground, two blocks at a time, lifted and placed on the horizontal beam.
5th STEP: Downstream side pre-cast RC deck plates are erected and connecting concrete is placed.
6th STEP: The crane is moved to the downstream side pre-cast RC slabs, upstream side pre-cast RC slabs are lifted into position and connecting concrete is placed.

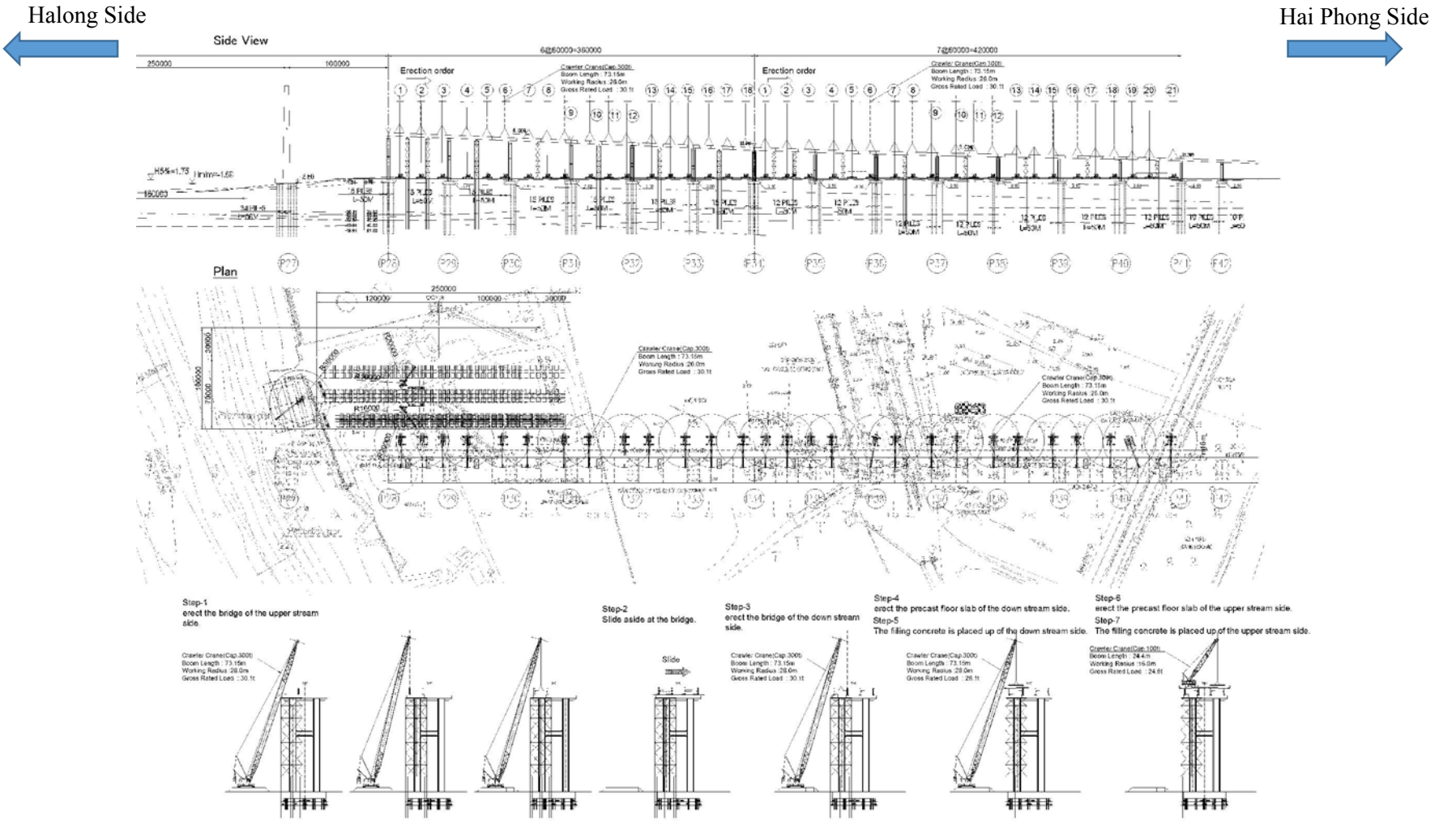
Halong Side

Hai Phong Side



Source: JICA Study Team

Figure 5.86 Approach Bridge (Steel Girder)/Assembly Procedure Drawing (1)

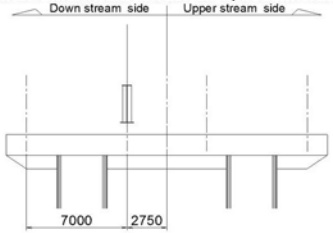


Source: JICA Study Team

Figure 5.87 Approach Bridge (Steel Girder)/Assembly Procedure Drawing (2)

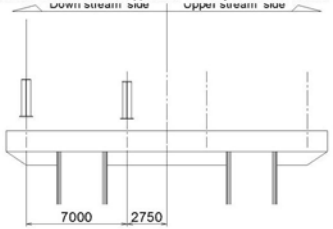
Step-1-1

Erection of Inner Main Girder on upstream side



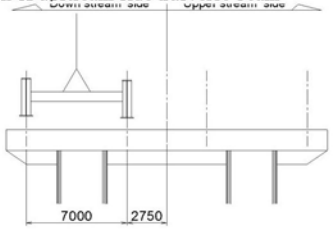
Step-1-2

Erection of outer main girder on upstream side



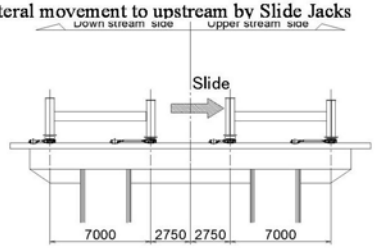
Step-1-3

Erection of upstream side trasverse beam



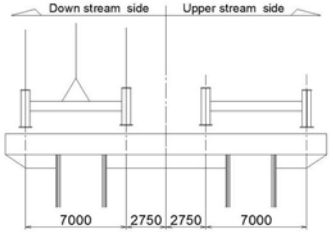
Step-2

Lateral movement to upstream by Slide Jacks



Step-2

Erection of downstream side Approach Bridge

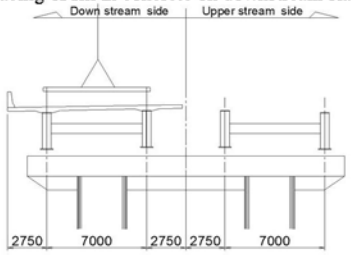


Step-4

Installation of downstream side PC Deck slab

Step-5

Placing of fill in concrete on downstream slabs

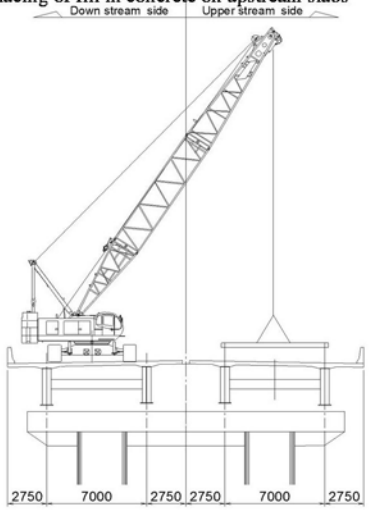


Step-6

Installation of upstream PC deck slab

Step-7

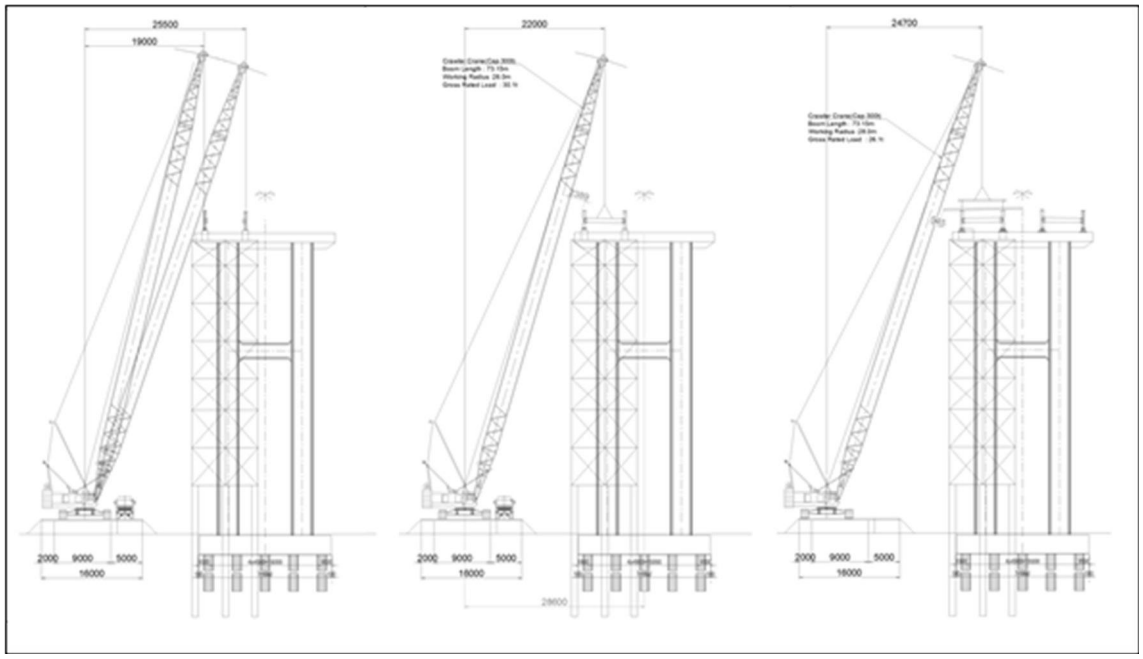
Placing of fill in concrete on upstream slabs



Source: JICA Study Team

Figure 5.88 Approach Bridge (Steel Girder)/Assembly Procedure Drawing (3)

As shown in Figure 5.89, it is possible to implement construction with two 300t crawler cranes.



Source: JICA Study Team

Figure 5.89 Approach Bridge (Steel Girder)/Crawler Crane Construction

b) Road Section

The road section (P. 35 – 36 - 3) will also be constructed using the Crane Bents Method, which involves erecting bents by restricting traffic on one or both sides of the road in the median strip and overnight by stopping all traffic in both up and down directions. Since relatively free movementt of cranes can be achieved by stopping all traffic on one side, no horizontal movement will be necessary to position the girder correctly. Traffic restrictions will be one day in the up direction and two days in the down direction.

After positioning, the bridge deck will be constructed with partial stoppage of traffic or temporary full stoppage of traffic.

Since traffic restrictions are required, comstruction implementation must involve sufficient safety measures. Furthermore, aerial obstructions (power lines, etc.) shpuld also be thoroughly reseached prior to construction.

c) In-River Construction

Temporary construction roads are extended up to outside river ship lanes area. Construction will performed with normal sections using this road. Accordingly, there will be no problems relating to permission to occupy river ship lanes.

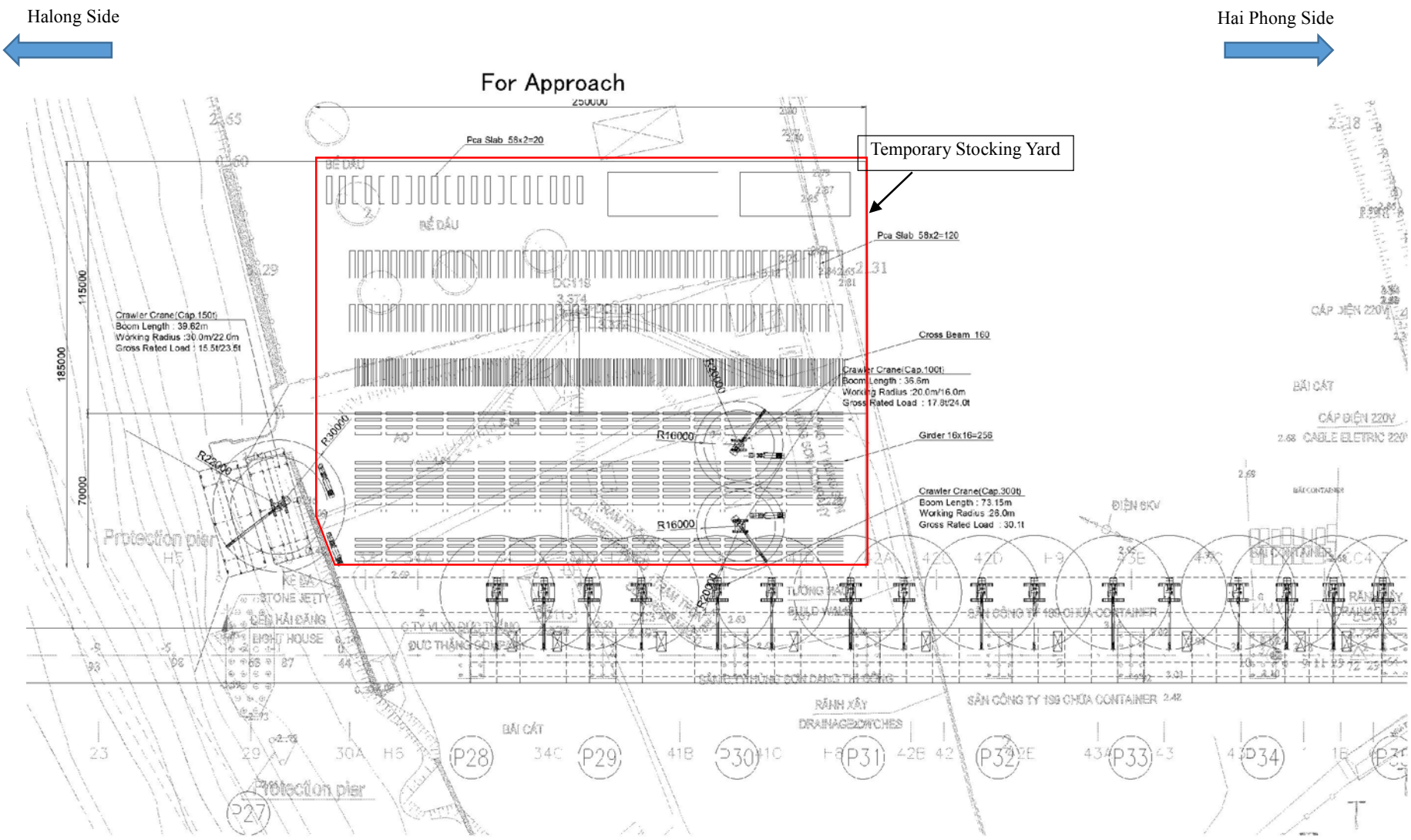
Construction will include bents foundations and bent erection in the river bed, but since all construction will be from the road, no major problems are envisaged.

C） Temporary Yard

A Temporary Yard to house the fabricated Main Girder and Pre-cast members will be required as for the Main Bridge. The Temporary Yard must be in line with the general construction schedule, but this Study assumes that all members will be in stock when erection starts.

Temporary stocked members are carried overland to the site for the main and side girders, while PC members will be fabricated in the vicinity.

The yard will be shared with the Main Bridge construction with the approach road making prior use. The present General Schedule allows the delivery of Main Bridge members after the Approach Bridge construction has proceeded and the size of the Temporary Yard is determined by Approach Bridge Needs.



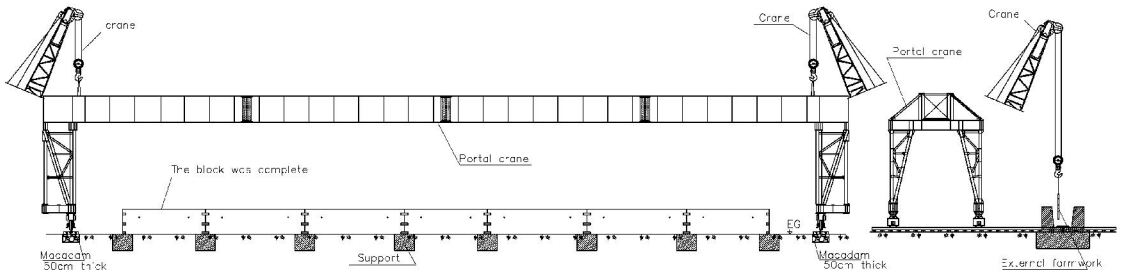
Source: JICA Study Team

Figure 5.90 Temporary Stocking Yard

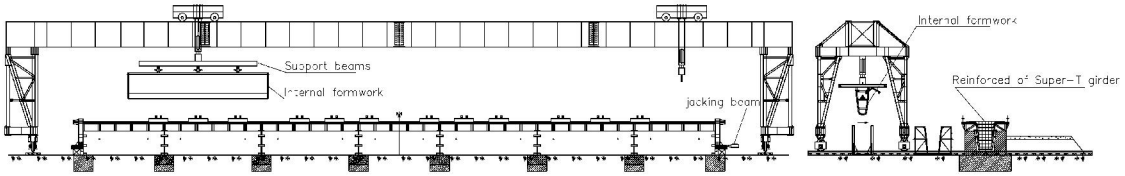
2) Super-T Girder

A Construction Yard to assemble the Super-T Girder will be prepared on site and equipped with a gantry crane to convey material such as formwork etc. After constructing the girders, the girders will be loaded on to trailers for conveyance to the prescribed position and to be evenly lifted into the final position by two crawler cranes.

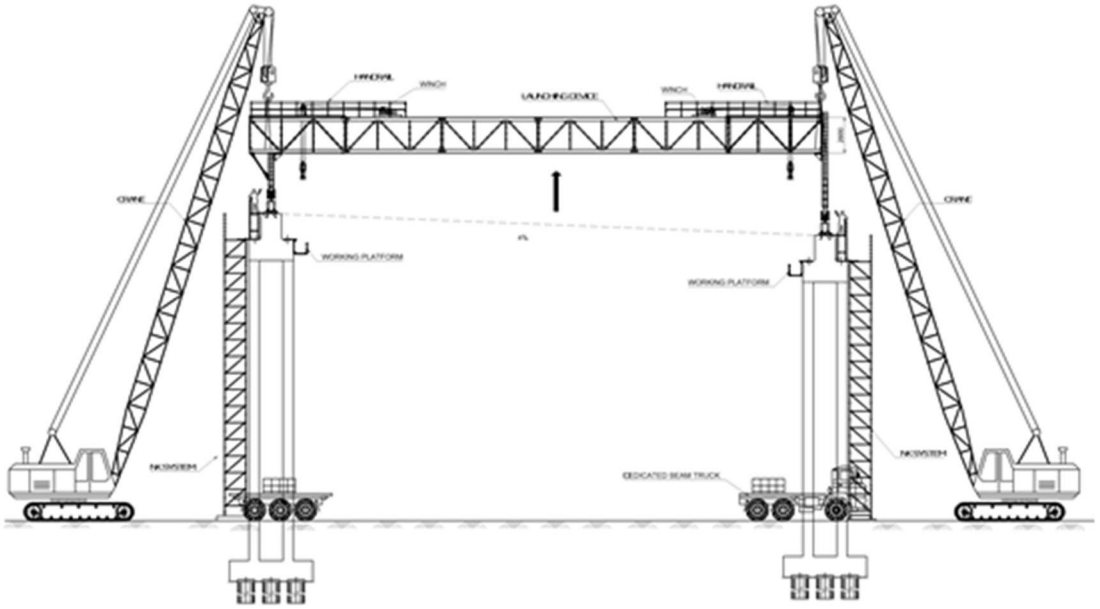
【 Preparation of Construction Yard: Assembly of the Gantry Crane】



【Girder Construction: Gantry Cranes will be used to construct PC members】



【 Girder Construction: Two Crawler Cranes will be used to lift the bridge into place.】



Source: JICA Study Team

Figure 5.91 Approach Bridge Superstructure Assembly (Super-T Girder)

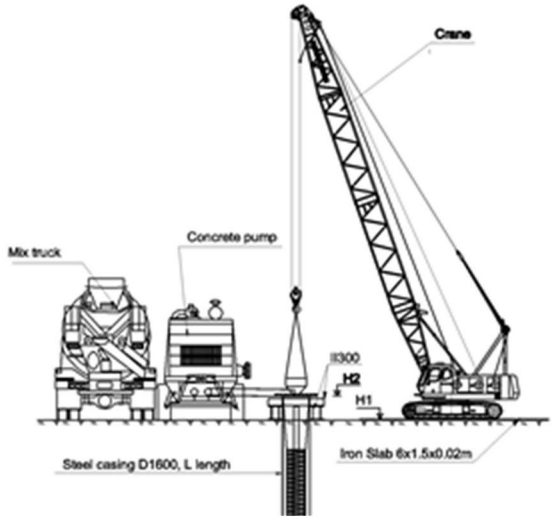
(2) Substructure Construction Plan

The substructure of the Approach Bridge will all be constructed with the same procedures. Construction procedures are roughly divided into (1) Pile Driving → (2) Construction of Temporary Diversion Shoring → (3) Construction of Foundation Slab → (4) Construction of Column and Girders. The procedures are illustrated below. The temporary diversion construction is to be executed mainly on the Ha Long side where swamps are dominated whereas open-cut method is to be applied

on the Hai Phong side.

1) Pile Driving

Cast-in-Place Piles are constructed. The Halong side will construct an embankment approximately the same height as the upper surface of the temporary road built on the top level of the substructure, which will then be used as the base construction level. The base construction level on the Hai Phong side will be the existing ground level, but some areas under swamps may require an embankment similar to the Halong side

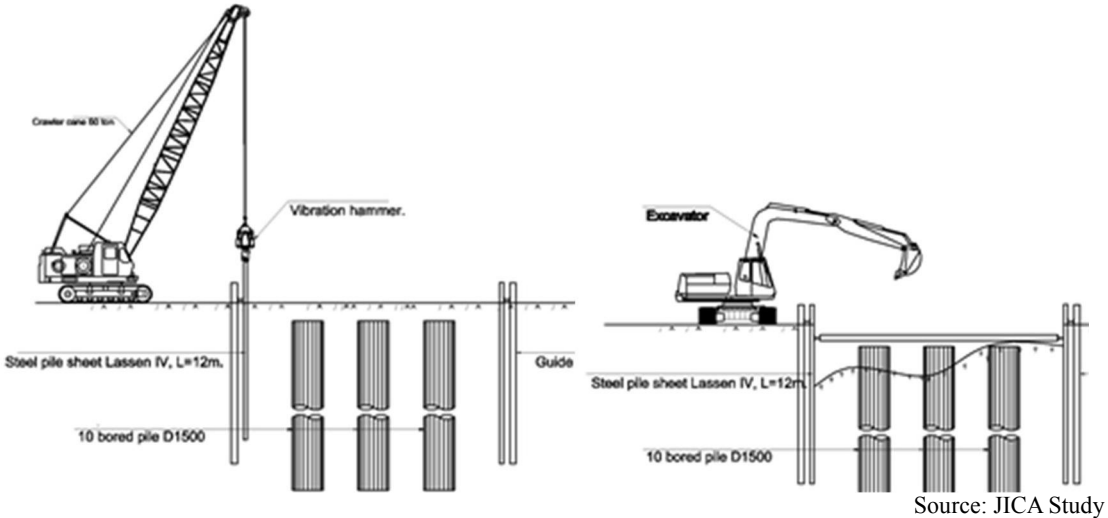


Source: JICA Study Team

Figure 5.92 Approach Bridge/Substructure/Construction Plan (Pile Driving)

2) Construction Of Temporary Diversion Shoring

Small-diameter steel pipe piles (guide piles) will be driven to establish position and diversion sheet piling will be driven in parallel. After driving the piles, struts will be attached and excavation of the sealed-off section will proceed.

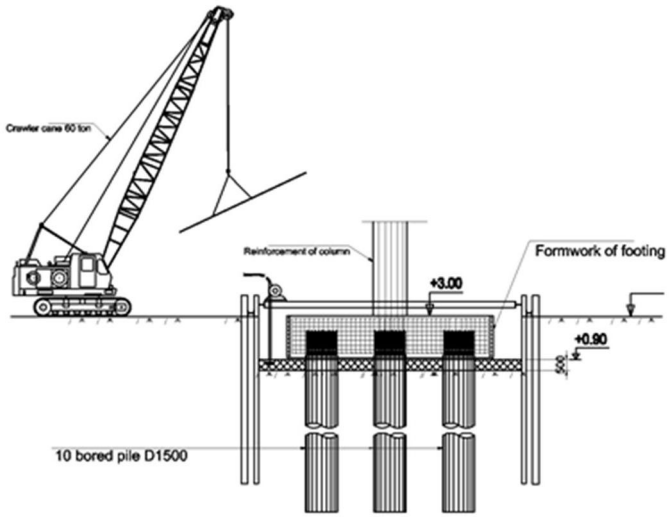


Source: JICA Study Team

Figure 5.93 Approach Bridge/Substructure/Construction Plan (Temporary Diversion Construction)

3) Construction of Foundation Slab

After excavation in the Temporary Diversion, the Foundation Slab will be constructed. After the Foundation Slab has been constructed, sheet piles and other Temporary Diversion shoring works will be removed.

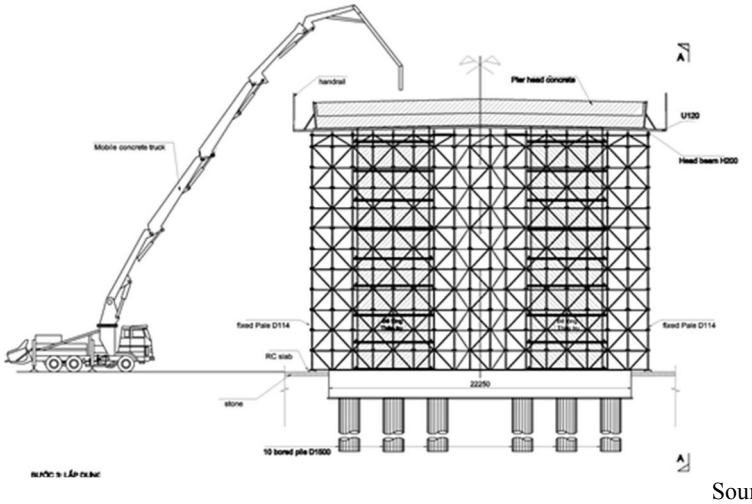


Source: JICA Study Team

Figure 5.94 Approach Bridge/Substructure/Construction Plan (Construction of the Foundation Slab)

4) Construction of Columns / Girders

Columns and Girders will be constructed employing both scaffolding works and support works.



Source: JICA Study Team

Figure 5.95 Approach Bridge/Substructure/Construction Plan (Construction of Columns/Girders)

5.8 Construction Quantities

The Construction Quantities (Estimation) of the Project facilities are shown in Table 5.78.

Table 5.78 Construction Quantities

Item			Specification	Unit	Quantities	Note
Road	Excavation			m^3	80,704	
	Embankment			m^3	521,076	
	Soil Improvement			m^3	311,567	Sand Drain Method
	Pavement (Asphalt)			m^2	110,868	
	Concrete		C30, C25	m^3	17,443	Trunk road culvert, U-shaped retaining wall, L-shaped retaining wall, cross culvert
	Steel reinforcement bars		SD390	ton	2,160	
Bridge	Super-structure	Concrete	C50, C35, C25	m^3	32,823	Main Bridge, Approach Steel Bridge, Approach Concrete Bridge
		Steel reinforcement bars	SD390	ton	5,447	Main Bridge, Approach Steel Bridge, Approach Concrete Bridge
		Steel members	SM490YB SM570	ton	12,533	Approach Steel Bridge
		Painting Area		m^2	26,769	Approach Steel Bridge
		PC Steel members		ton	292	Approach Concrete Bridge
		Stay cables		ton	585	Main Bridge
		Support (Shoe)		基	712	Main Bridge, Approach Steel Bridge, Approach Concrete Bridge
	Sub-structure	Concrete	C50, C35	m^3	78,443	Main Bridge, Approach Steel Bridge, Approach Concrete Bridge
		Steel reinforcement bars	SD390	ton	35,415	Main Bridge, Approach Steel Bridge, Approach Concrete Bridge
		In-situ Pile driving		m	35,536	Main Bridge, Approach Steel Bridge, Approach Concrete Bridge
		Excavation		m^3	43,998	Main Bridge, Approach Steel Bridge, Approach Concrete Bridge
		Steel sheet pile Shoring		m^3	8,160	Approach Steel Bridge, Approach Concrete Bridge
		Re-fill earth		m^3	28,533	Main Bridge, Approach Steel Bridge, Approach Concrete Bridge
	Bridge deck	Pavement		m^2	83,648.0	Main Bridge, Approach Steel Bridge, Approach Concrete Bridge
		Expansion Joints		m	320.0	Main Bridge, Approach Steel Bridge, Approach Concrete Bridge
		Drainage basins		Place	614.0	Main Bridge, Approach Steel Bridge, Approach Concrete Bridge
		Protective railing		m	10,760	Main Bridge, Approach Steel Bridge, Approach Concrete Bridge
		Waterproofing works		m^2	70,780	Main Bridge, Approach Steel Bridge, Approach Concrete Bridge
Other	Toll Gate			Nos.	1	
	Operation Office, Memorial Hall			Nos.	1	
	Lighting facilities			Unit	230	Arrayed at 47m intervals on one side
	Hoarding during construction, Main Bridge			Lump Sum	1	

Source: JICA Study Team

5.9 Procurement Plan

A completed example of a steel cable-stayed bridge exists in the vicinity of Bach Dang Bridge and it is deemed feasible to procure the material used in the Project from Vietnam while maintaining quality and economic advantages. However, the special machinery needed for the construction, steel plate for bridges, cable stays, large shoe supports/expansion devices and paint material are difficult to procure in Vietnam and procurement from Japan will be assumed.

In principle, it is assumed that the fabrication of steel girders and assembly will employ Vietnamese engineers. Vietnamese engineers have acquired sufficient skills through actual experience in construction works on cable-stayed bridges and technical training.

Table 5.79 Procurement of Main Materials

Material		Procurement Source			Notes
		Vietnam	Japan	Other neighboring countries	
Embankment material		◯			
Asphalt		◯			
Road fill	Crushed stone	◯			
Cement		◯			
Fine Aggregate	Sand	◯			
Coarse Aggregate	Crushed stone	◯			
Steel reinforcement bars		○			
Steel plate for Bridge			○		Fabrication in Vietnam
Stay cables			○		
Support (Shoe)		○			
Expansion Joints		○			
Paints			○		
Concrete Form Plywood		○			
Temporary Support material		○			
Scaffolding		◯			
Fuel		◯			

Source: JICA Study Team

5.10 Estimated Construction Cost and Project Cost Estimation

5.10.1 Construction Cost and Project Cost in METI F/S

The Construction Cost and Project Cost for the METI F/S dated February 2012 was estimated as 5,213.3Bil.VND (Approximately 20.0 Bil. JPY) and 7999.3 Bil. VND (Approximately 30.8Bil. JPY, including escalation), respectively, based on 1 JPY = 260VND, at the rate of the METI F/S and as shown in Table 5.80.

Table 5.80 Construction Cost & Project Cost and Breakdown in METI F/S

	Item	Amount (10trillion VND)	Note
1	Bach Dang Bridge	4,681.4	incl. Hanoi-Haiphong Highway IC, Lighting Facilities, etc.
2	Vessel Collision Protection	170.8	Pier Fender, warning vessel during construction
3	Dam Nha Mac IC, Approach Road	328.0	
4	Toll Gate	22.0	
5	Memorial Hall	11.0	
6	**Total Construction Cost**	**5,213.3**	
7	Land Acquisition	77.0	Same as for exisitng F/S
8	Project Administration Cost	26.8	0.5149% of construction cost
9	Consultant Fees	521.3	10.0% of construction cost
10	Miscellaneous	198.5	3.8075% of construction cost
11	Reserve	603.7	10.0% of Total for Items 6-10
12	Price Escalation	1,358.6	calculated for items 6 - 10 , with Duration; 3 years, CPI escalation =7% annualy
13	**Project Cost (w/o Escalation)**	**6,640.7**	
14	**Project Cost (w/ Escalation)**	**7,999.3**	

Source: METI F/S Report

5.10.2 Cost Estimate Conditions

(1) Date of Estimate

The date of the estimate is August 2014.

(2) Currencies and Conversion rates

The currencies and conversion rates applied in the estimate are shown below.

1 US$ = 20,000 VND
1 JPY = 200 VND

(3) Applicable Standards

The estimate was made using the add-on method in principle, in compliance with the Vietnam Standard Circular 04/2010/TT-BXD. However, the Main and Approach Bridges composed of steel continuous double main I-Girder bridges are rare and no cost estimate standard has yet been established in Vietnam where PC bridges proliferate. Accordingly, Japanese Standards or completed examples in Vietnam will be analyzed to derive applicable values.

■ **Vietnam Standard**

- Circular 04/2010/TT-BXD: Cost Estimation Standard
- Decree 83/2009/ND-CP: Management of construction investment project
- Decision 957/QD-BXD: Cost of project management and consultant in construction investment project

■ **Japanese Standard**

- MLIT Civil Engineering Cost Estimate Standard, 2014 Issue,
  Construction Cost Investigation Foundation
- Cost Estimate of Bridge Assembly Construction, 2014 Issue,
  Japan Construction Machinery and Construction Association
- Rental Cost Calculation Chart of Construction Machinery 2014 Issue,
  Japan Construction Machinery and Construction Association

The Vietnam Standard Circular 04/2010/TT-BXD also stipulates the labor ratio for each work item, but is used to estimate indirect costs for each work item instead of being included as a direct cost as in Japanese standards.

(4) Applicable Unit Costs

The unit rates for 2011 for the construction material, machinery and labor cost applied in the METI F/S were adjusted for the current rates for the date of the Study Estimate (August 2014) by multiplying by the price index ratio.

5.11 Estimated Construction and Project Costs

The Construction and Project Costs were estimated from the following procedures. It should be noted that the parts that were derived as percentages of the total cost must be estimated in more detail in future.

(1) Construction Costs

Construction Costs were estimated by multiplying construction quantities by the applicable unit rates.

(2) Land Acquisition Costs

The Land Acquisition Costs, including the relocation cost of displaced residents, are to be borne

and performed by Quang Ninh Province. According to the Report to Quang Ninh Province DOT (4339/SGTVT-KHTC, dated August 8, 2013), the cost is estimated at 181 Bil. VND.

In this Report, the land acquisition cost is estimated at 181 Bil. VND by Quang Ninh Province, but this figure must be reviewed in compliance with JICA Guidelines for Environmental and Social Considerations.

(3) Project Administration Costs

Project Administration Costs include F/S Implementation Fees, Contractor Selection costs and groundbreaking ceremony costs, etc. and are estimated at 0.527% of construction costs.

(4) Consultant Fee

Consultant Fees include costs for the Detailed Design and Construction Supervision and according to Decision 957/QD-BXD, can be set at approximately 1.473% of construction costs. However, if Japanese companies are the main contractors for the Project, costs are expected to increase and have been set at 5% of construction costs in this Study.

(5) Miscellaneous Costs

Miscellaneous costs include disposal of unexploded shells, construction insurance, transportation costs for construction, safety management, approval and permit procedure costs and financial auditing as noted in Circular 04/2010/TT-BXD. The Study has referred to METI F/S proportional distribution and the insurance rates for completed bridge construction projects in Vietnam as shown below reaching 4% for the estimate.

- Construction insurance: 0.5% of construction cost
- Transportation insurance: 0.4% of procurement costs from Japan
- Other insurance (overseas stay, travel insurance, etc.): 0.5% of construction cost

(6) Establishment of Project Company

The costs required to establish the Project Company to implement the Project have been estimated as shown in Table 5.80. The period assumed for Operation Office rents, staff personnel costs in the estimate are from establishment to completion of construction.

Table 5.81 Establishment Fees of Project Company

	Item	Fee	
		VND	Equivalent JPY
1.	Attorney fees for various Contracts (BOT/Project related Contracts)	46,080,000,000	230,400,000
2.	Financial Advisory Services Fees for Project Planning, Negotiations with Financial Institutions	15,400,000,000	77,000,000
3.	Rental Expenses for Offices, etc.	6,880,000,000	34,400,000
4.	Personnel Expenses	40,076,000,000	200,380,000
5.	Company Registration, Establishment Expenses	200,000,000	1,000,000
6.	Investigation Fees for Company Establishment	6,000,000,000	30,000,000
7.	Advertisement and other Preparatory Expenses for Opening	10,000,000,000	50,000,000
8.	Miscellaneous Expenses	6,231,800,000	31,159,000
	Total	130,867,800,000	654,339,000

Source: JICA Study Team

(7) Provisional Fees

Provisional Fees are set at 10% of the total for Construction Cost, Land Acquisition cost, Project

Administration Fees, Consultant Fees and miscellaneous fees, just as for METI F/S.

(8) Estimated Construction Cost and Project Cost

The Estimated Construction Cost and Total Project Cost determined by the method previously discussed are shown in Table 5.82.

Table 5.82 The Construction Cost of This Project and Total Project Cost

Work Category			I. Construction Cost (incl. Material & Equipment Cost)			
			Procurement from Vietnam	Procurement other than Vietnam		Total ('000 JPY)
				Procurement from Japan	Third Country Procurement	
			Amount (Mil. VND)	Amount ('000 JPY)	Amount (USD)	
A	Common Area					**1,319,000**
	A1	office	105,572	0	0	511,000
	A2	Construction yard, Temorary Roads, etc.	139,027	0	0	673,000
	A3	Construction Equipment	27,843	0	0	135,000
B	Road					**4,232,000**
	B1	EarthWwork	346,833	0	0	1,678,000
	B2	Culvert (Trunk Road)	177,284	0	0	858,000
	B3	U-Shape Retaining Wall	169,518	0	0	820,000
	B4	L-Shape Retaining Wall	19,182	0	0	93,000
	B5	Culvert (Dam Nha Mac area)	9,224	0	0	45,000
	B6	ON/OFF Ramps	152,492	0	0	738,000
C	Bridge					**18,382,000**
	C1	Main Bridge Superstructure (inc. Main Tower)	450,423	3,074,000		5,254,000
	C2	Main Bridge Substructure	577,678	159,000	0	2,954,000
	C3	Approach Bridge (Steel Bridge) Superstructure	341,445	2,358,000	0	4,010,000
	C4	Approach Bridge (Steel Bridge) Substructure	676,235	51,000	0	3,323,000
	C5	Approach Bridge (RC Bridge) Superstructure	218,389	84,000	0	1,141,000
	C6	Approach Bridge (RC Bridge) Substructure	346,902	21,000	0	1,700,000
D	Others					**1,144,000**
	D1	Toll Gate	23,260	0	0	113,000
	D2	Operation Office, Memorial Hall	11,630	0	0	56,000
	D3	Lighting and Electrical Facilities	20,818	0	0	101,000
	D4	Protective Facilities during Construction, Protection of Main Tower	180,614	0	0	874,000
E	Construction Cost (=A+B+C+D) (before taxes)					**25,077,000**
F	VAT 10%					**2,507,700**
G	Construction Cost (=E+F)					**27,584,700**

Source: JICA Study Team

Chapter 6 Operations and Maintenance Planning

6.1 Status of Operations and Maintenance in Vietnam

6.1.1 Vietnam Standards to be Considered

Standards to operate and maintain expressways in Vietnam are being prepared alongside work to refine advance individual projects. A comprehensive standard for expressways is now also under preparation.

According to existing expressways reports in Vietnam, laws concerning the operation and maintenance of expressways in Vietnam exist in the form of the provisional O&M Standard established under Decision 226/QD-BGTVT of February 17, 2011. Subsequently, it was formally adopted as Operation Standard under Decision 819/QD-BGTVT 2012/4/16 of April 16, 2012. In addition, Decree 32/2014/ND-CP, "Operation and maintenance of Expressways" of April 22, 2014 is an existing law forming a comprehensive operation and maintenance standard.

According to Decree 32/2014/ND-CP, even though it describes standards for the applicable scope, organization of the operation and maintenance of expressways, expressway traffic rules, traffic monitoring centers (network routes, single routes), traffic patrols, toll collection, roadway maintenance, and security, the Circular to describe the actual implementation of the Decree has not yet been issued.

6.1.2 Example Expressway Projects

MOT is the agency responsible for expressways projects in Vietnam and oversees not only construction, but also post-construction operation and maintenance.

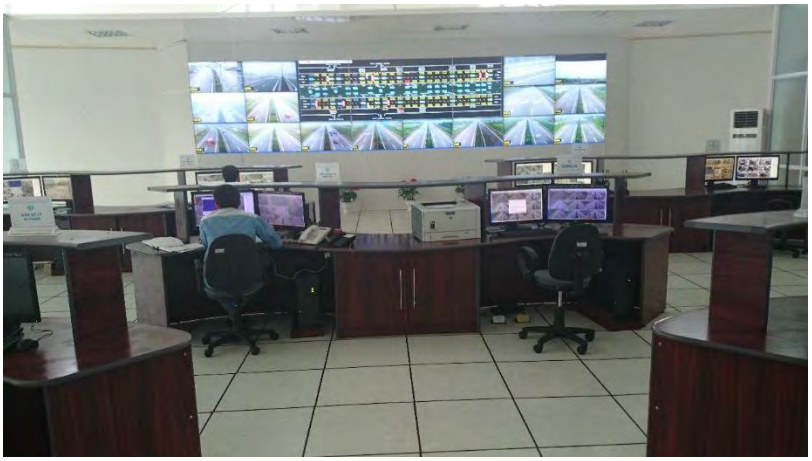
Since expressways are being constructed at a rapid pace, the actual operations and maintenance activities are often handled out by dedicated units for each construction segment. Major examples of expressway development projects sorted by development type (government funding (including ODA), private funding by BOT scheme, etc.) are shown in Table 6.1.

Table 6.1 Examples of Operation Organization of Expressway Development Projects

	Project Title	Project Length	Project Administration	Administrative Type
Government Funding	Ho Chi Minh – Trung Luong Expressway	40km	DRVN	Commission Contract
	Loop Road No. 3 Hanoi	28km	Hanoi Municipal Transport Bureau	Commission Contract
	Tan Long Boulevard	30km		Commission Contract
Private Funding	Cau Gie – Ninh Binh Expressway	50km	VEC	Commission Contract with VEC O&M Co., Ltd
	Lien Cuon - Dalat Expressway	19km	MTV 7/5 Co., Ltd	Directly implemented by investors
	Ho Chi Minh – Đảo Dài Expressway	50km	VEC	Commission Contract with VEC O&M Co., Ltd
	Noi Bai – Lao Cai Expressway	245km	VEC	

Source: JICA Study Team

VEC in particular, which was founded to promote implementation of expressway development in Vietnam under the guidance of MOT, has established VEC O&M Co., Ltd, which is a specialist operation and maintenance company. This company has undertaken the task of operating and maintaining some expressways that have already been completed, including the Cau Gie – Ninh Binh Expressway and Ho Chi Minh – Đảo Dài and Noi Bai – Lao Cal Expressways.



Source: JICA Study Team

Figure 6.1 Traffic Monitoring by VEC O&M

6.1.3 Establishment of Operation and Maintenance foundation

Until 2008, operation and maintenance costs in Vietnam were borne by national and local government budgets. However, the actual budget amounts allocated fell woefully short, covering only approximately 40% of the required sums for national roads and approximately 30% for regional roads. In response, it was deemed appropriate to levy a certain charge on road users in a concentrated and efficient manner, whereupon a proposal to establish the "Road Operation and Maintenance Foundation" was submitted to the National Assembly and approved.

The Road Operation and Maintenance Foundation is stipulated in Article 49 of National Road Law 23/2008/QH12 and the costs of operating and maintaining national roads are funded by the Road Operation and Maintenance Foundation. The management of the Foundation is stipulated in Decree 18/2012/ND-CP dated March 13, 2012 and Circular 197/2012/TT-BTC dated November 15, 2012 and others. Toll collection is obligatory for all car owners, regardless of expressway use. The collected tolls are a maximum of 150,000VND/year for motorbikes and 1,560,000VND/year for standard-size automobiles.

Consequently, tollbooths for roads constructed using national or regional government funds were abolished as a practical matter and tollbooths established with collection rights as an auxiliary enterprise of BOT schemes were bought out by MOF. However, with regard to the Ha Noi – Hai Phong Expressway Project, collection rights were allowed for tollbooths situated on National Road No. 5 running parallel to the Expressway to recover invested funds.

6.2 Basic Policy to Formulate an Operation and Maintenance Plan

6.2.1 Characteristics that should be considered when preparing an Operations and Maintenance Plans

The particular characteristics that should be considered when planning operations and maintenance of the Ha Noi – Hai Phong Expressway are listed below:

- The Hanoi – Hai Phong Expressway to be completed by the end of 2015 on the Hai Phong side will be connected to National Road No. 18 on the Ha Long side.
- The line is a single line connecting cities and does not form a loop-road network system seen in inner-city traffic.
- There are five interchanges, including start/end terminal points and intermediate points along the 25km total length.
- Planning for the connecting road in the Dam Nha Mac Area is closely related to the

development planning for the Area as a whole, but since the development plans for the Area remain pending, the area development contents and schedule are unavailable.

- Traffic demand as of commencement of operations is projected to be approximately 9,000 cars/ day and will increase annually until 2048 when it is projected to reach 60,000 cars/day. It is projected that additional traffic lanes, including an increase in width, will be required during the operation period.
- The high ratio of large buses, trailers and container trucks as a proportion of the total traffic load (commercial vehicle ratio) must be considered when planning the cycle to inspect and repair pavements and structures.
- It is expected that the frequency of traffic from over loaded vehicles will be high[40] hence the need to gage the requirement for installing weighbridge equipment and traffic control organization.

6.2.2 Scope of Operation and Maintenance Services

The scope of Operation and Maintenance Services is summarized in Table 6.2; based on the efficiency of services and discussions with Quang Ninh Province.

The Ha Long – Hai Phong Highway comprises the Project section (BOT project, 5km long) and the section by public works of Quang Ninh Province (approximately 20km long). Under the plans, this section will be directly operated and maintained by the Quang Ninh Provincial Government. However, since the two sections are not physically separated by tollbooths or similar facilities, "Road Administration Services", although a component of operation and maintenance services, is envisioned as a single unit throughout the entire length due to its nature.

The Quang Ninh Province People's Committee has approved the construction of tollbooths at every interchange to exercise the right to collect tolls from all highway users. Accordingly, tollbooths will be constructed at all interchanges of the Ha Long – Hai Phong Highway.

To provide sound service of the Project Facilities (roadway, main bridge structures, ancillary facilities) over the 30-year period of the BOT Contract, The scope of the inspection, maintenance and repairs and road preservation shall be assessed for the 5km BOT section of this Project.

Table 6.2 Scope of Operation & Maintenance Services

Category		Contents	Scope
1	Toll Collection	Toll collection, emergency traffic control	Tollbooths at each IC
2	Traffic Control	Patrol, traffic data collection, regulation of traffic violations	Entire 25km length of Ha Long – Hai Phong Highway
3	Inspection & Repair	Road Structure, daily regular inspection of facilities, repairing damage, improvements	5km length of this Project
4	Road Preservation	Cleaning, planting, traffic signage, inspection of special trucks	5km of this Project

*1: The present Study has not confirmed any information on the frequency of overloaded vehicles in the Project vicinity

Source: JICA Study Team

[40] The frequency of traffic from over loaded vehicles in the areas around the planned project site was not confirmed concretely in this survey.

6.3 Determination of Service Level

The Ha Long – Hai Phong Highway is a key transportation thoroughfare that supports not only the socioeconomic activities of the people in the immediate area, but over the entire northern region of Vietnam. Accordingly, operating and maintaining the highway facilities appropriately is crucial for the development of Vietnam.

The level of operation and maintenance services will differ according to the numbers and composition of the users of the highways who benefit from the services, or, in specific terms, the volume of traffic and the ratio of large vehicles as a proportion of total traffic demand. In this Project, traffic demand is projected to range from approximately 9,000 cars/day (at commencement of operations) to 60,000 cars/ day (at termination of contract) and the commercial vehicle ratio is projected to be approximately 40 to 60%, when large vehicles are stipulated as 2- and 3-axle trucks, trailers and vehicles with more than 25 seats. Since data summarization differs, a simple comparison with Japanese traffic census is inappropriate, but as the commercial vehicle ratio for Japanese expressways is roughly 30% (taking daytime as 12 hours), the commercial vehicle ratio for the Ha Long – Hai Phong Highway is deemed high.

Based on this study, the service level was set qualitatively as per Table 6.3.

Table 6.3 Determination of Service Level

Service Target	Contents	Service Level Criteria
Safety	· Prevention of accidents due to road surface abnormalities & obstructions · Constantly maintaining unobstructed space & visibility for pleasant travel · Maintaining soundness of traffic safety facilities · Swift elimination of congestion due to disasters & traffic accidents	· Frequency of inspections · Frequency of cleaning · Incidence of traffic accidents
Amenity	· Improving traveling pleasure · Expediting travel time to destinations	· Securing cruising speed · Incidence of congestion, delay time
Confidence	· Prevention of traffic stoppages due to structural breakage & deterioration · Reduction & elimination of hazards emanating from highway	· Countermeasures for noise & vibration · Elimination of hazardous substances such as oil

Source: JICA Study Team

6.4 Toll Collection Planning

6.4.1 Determination of Toll Structure

The structure of tolls levied for usage of the road can be divided into distance-based and uniform fare systems. Distance-based fare systems are based on the distance traveled by users while uniform systems charge the same fare, regardless of distance traveled.

The Ha Long – Hai Phong Highway differs from intra-city traffic such as that on loop roads and carries inter-regional traffic between Hai Phong and Ha Long cities. There are three interchanges planned for the highway and it is difficult to grasp which user has entered/exited from which interchange.

Feedback was obtained on the implementation organization of the operations and maintenance services for the Ha Long – Hai Phong Highway with VIDIFI, the agency responsible for implementing the Ha Long – Hai Phong Highway, who responded by stating their intention to perform the O & M activities by themselves and to base their planning on manuals of the Korea Expressway Corporation. Accordingly, as things stand, it will be difficult to apply automated toll collection for the Ha Long – Hai Phong Highway.

Based on the above, a uniform fare system was applied in this Project.

6.4.2 Vehicle Categories and Toll Structure

The Vehicle Categories are described in the Vietnamese Road Design Standard TCVN4054-2005 and Circular 159/2013/TT-BTC published by the MOF and the vehicle categories under TCVN4054-2005 will be applied for this Project. Fares are determined as shown in Table 6.4, based on the car categories set out in TCVN4054-2005 and Circular 159/2013/TT-BTC.

Table 6.4 Car Categories and Fares for this Project

Vehicle Category	Circular 159/2013/TT-BTC		Categories & Fare for this Project	
	Vehicle Type	Fare (VND/time)	Vehicle Type	• Fare (VND/time)
1	Passenger cars carrying under 12 passengers, Cargo trucks with load capacity under 2 tons, Public buses	15,000～52,000	Private car/ taxi	35,000
2	Passenger cars carrying from 12 to 30 passengers, Cargo trucks with load capacity of 2-4 tons	20,000～70,000	Truck (2-axle) Microbus (fewer than 25 seats)	53,000
3	Passenger cars carrying more than 30 passengers, Cargo trucks with load capacity of 4-10 tons	25,000～87,000	Truck (3-axle) Bus (over 25 seats)	77,000
4	Cargo trucks with load capacity of 10-18 tons, 20ft container trucks	40,000～120,000	Container	200,000
5	Cargo trucks with load capacity exceeding 18 tons, 40ft container trucks	80,000～200,000		

*: The above fares for this Project apply as of the time of commencement of operations (2018)

Source: JICA Study Team

6.4.3 Planning for Location of Tollbooths

The planned location of tollbooths must satisfy the decree that "the Bach Dang Bridge enterprise Firm has the authority to collect tolls from users over the entire 25km length of the Ha Long – Hai Phong Highway". The toll structure and location are to be closely studied based on this formula.

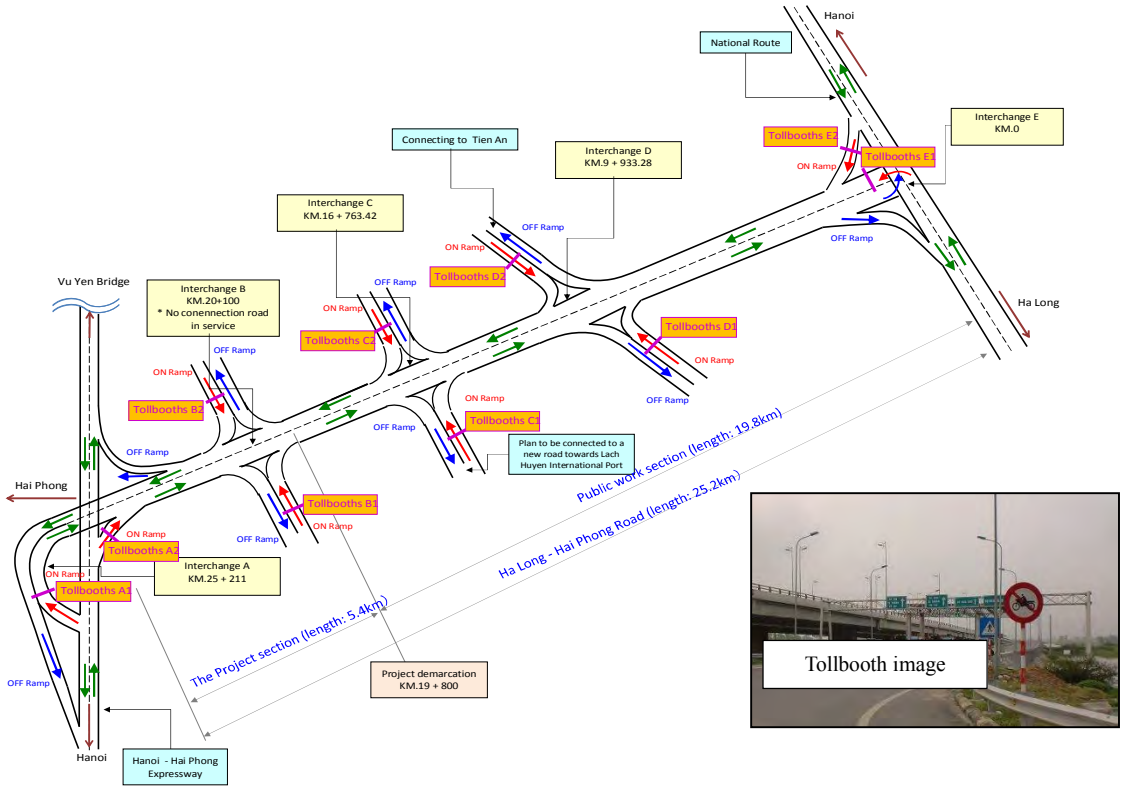
The merits and demerits of roadway booths and interchange booths for the location of the tollbooths are compared in Table 6.5.

Table 6.5 Merits & Demerits Comparison of Booth Placement types

Location	Merit	Demerit
Roadway Placement	Tollbooth placement can be concentrated and can cope with both distance-based and uniform fare systems.	Vehicles are stopped on the main roadway, causing congestion if the traffic volume is high.
Ramp Placement	A uniform fare is collected irrespective of destination (can cope with uniform system) and collection failure can be prevented.	If tolls are collected at an OFF ramp, entry IC must be verified for each vehicle and distance-based systems are difficult to implement.

Source: JICA Study Team

With the expressway situation in Vietnam and the need to streamline the toll collection system in mind, this Project will implement tollbooths on the ON ramps. The detailed locations are shown in Figure 6.2.



※ Photograph shows tollbooths for the entry ramps of the Cau Gie - Ninh Binh Expressway
Source: JICA Study Team

Figure 6.2 Location of Toll Collection Booths

6.5 Traffic Control Plan

Traffic control is a key element to maintaining safe and smooth expressway traffic. It must take into consideration the division of work between traffic control services, the executing agency and the traffic police. The traffic control tasks envisioned for this Project are summarized in Table 6.6.

Table 6.6 Traffic Control Tasks

Category	Item	Project Agency	Traffic Police
Normal Tasks	Traffic Patrol	Traffic Patrol agents perform routine patrols of assigned sections and identify damaged portions, remove fallen objects and assist broken-down vehicles. The frequency of patrols is determined by traffic volume.	Traffic patrols are the same as the left, monitoring traffic flow and apprehending traffic violations.
Emergency Tasks	Accident Response	Traffic safety is secured and traffic regulations enforced. Prepare independent accident reports and reports to regulatory government office.	Responsible for accident responses. Preparing official accident reports
	Emergency Vehicles	Assist traffic police	Issuing requests for ambulances and fire engines.
Traffic Monitoring	–	Traffic control agents are deployed on a 24/7 basis and collect traffic data. Relay information to relevant agencies and provide traffic information to users.	Issues traffic notices to relevant agencies based on information as provided from the left item.

Source: JICA Study Team

6.6 Maintenance and Repair Plans, including Inspections

Bach Dang Bridge is located approximately 5 km from the river mouth and close to the sea. It will also be constructed under conditions of high temperature and humidity. This will mean swift deterioration of structural members and render the structure prone to damage, hence the need for stable maintenance to maintain soundness. Accordingly, the Maintenance Plans for this Project should desirably be formulated to implement early repair of any minor damage before it triggers conditions requiring major repairs.

It will be important to perform routine inspections to discover damage and implement repairs based on information to stop further deterioration and achieve this goal.

6.6.1 Inspections

Inspections will be either daily, regular or emergency inspections.

■ Daily Inspections
- Period: daily and monthly inspections (once a month)
- Content: Daily Inspections: confirmation and cleaning of main road surface conditions.
  Monthly Inspections: confirmation of damage to main structural members within accessibility limits
  Emergency repairs: temporary repairs for confirmed small defects as necessary.

■ Regular Inspections
- Period: Inspections of entire bridge at decade-long intervals
  Intensive inspections of support members expected to be prone to damage midway through the decade-long period.
- Contents: Close-up visual inspection: Closely approach structural members and visually confirm damage condition.
  Records of Inspections: record of confirmed damage condition, evaluate seriousness of damage, decide on timing of repairs and prepare repair plans.

■ Emergency Inspections
- Timing: After natural disasters
- Contents: Confirm damage, if any, to structural members and signage

6.6.2 Repairs, Renewal and Reinforcement

If early repairs of damages are deemed necessary after inspections, repairs, renewals and reinforcement will be implemented to eliminate damage and restore functions

- Timing: When early repairs or reinforcements are deemed necessary after inspections.
- Contents: Repair Design: To be formulated to perform repair works for members requiring repairs to correct damage. Repair Design items will include a study of repair measures, preparation of repair drawings, estimation of repair quantities, implementation work plan and estimation of repair costs.
  Detailed Inspections: if deemed necessary when preparing repair measures studies, detailed inspections shall be carried out.
  Regular renewal: members damaged due to normal vehicular traffic, such as pavement and expansion joints, shall be renewed at pre-determined intervals.

6.7 Road Maintenance

The expected road maintenance services are summarized in Table 6.7.

Table 6.7 Expected Road Maintenance Services

Item	Content
Cleaning	Cleaning of road surface, (machine, manpower), drainage facilities
Planting	Weeding and mowing of median strip, shoulders, pruning of tree planting
Minor Repairs	Countermeasures for pothole, ground subsidence, and rut forming, embankment slope protection Emergency repairs to damaged facilities due to accidents and natural disasters
Traffic Control	Traffic control related to above service works

Source: JICA Study Team

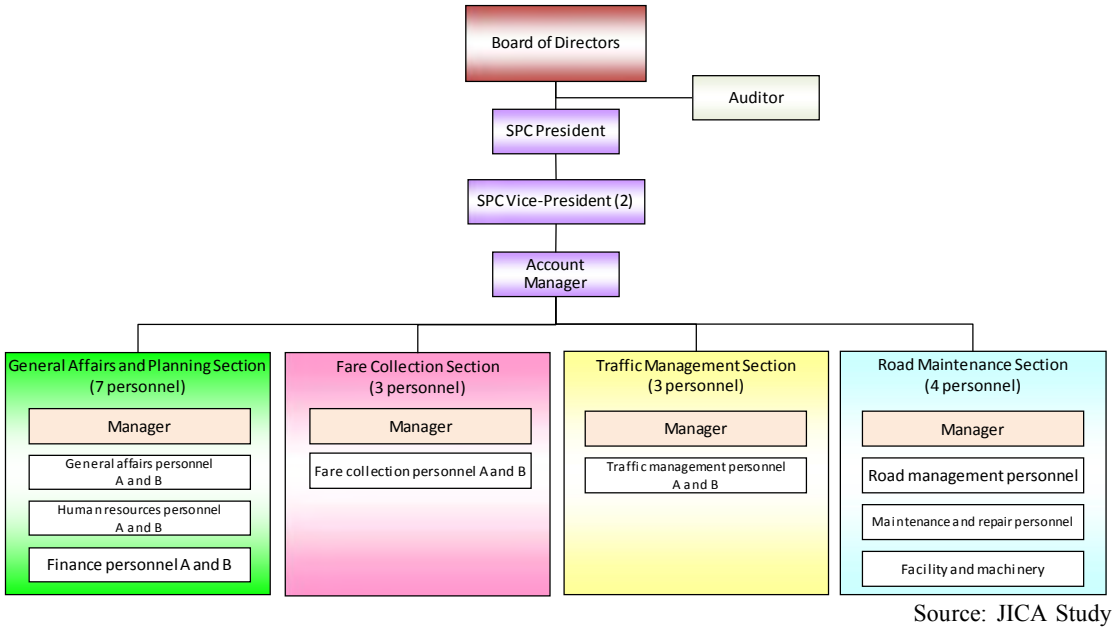
6.8 Implementation System and Organization

6.8.1 Basic Planning

It is difficult to argue in favor of creating a dedicated implementation organization within the Project Company solely to operate and maintain the project facilities, from either perspectives of project efficiency or the provision of better services. Accordingly, it was decided to commission professional service companies such as VEC O&M and the Project Company with the operation and maintenance services.

6.8.2 Organization

An Operations Office is to be set up along the path of the Ha Long – Hai Phong Highway to operate and maintain the highway, which will become the office of the Project Company. The organization of the Project Company is shown in Figure 6.3.



Source: JICA Study Team

Figure 6.3 Organization Diagram of the Project Company

The Organization comprises four Sections: General Affairs and Planning, Fare Collection, Traffic Management, and Road Maintenance Sections. The organization will be structured with each Section headed by a Manager, who, as a practical member of the management personnel, will maintain constant communications and share knowledge with the responsible manager, President and Vice President of the Project Company. Furthermore, in compliance with the Comprehensive Company

Law of Vietnam, a Chief Financial Officer will be appointed, responsible for all financial matters. The four Section managers and responsible staff of each section shall comprise a total of 17 persons. It was assumed that the General Affairs Manager and Road Maintenance Manager would be Japanese nationals while the other Managers would be local Vietnamese nationals. In addition, fare collection and traffic control must be on a 24-hour basis, requiring a three-shift system, which must be duly noted in the "Guidelines for Consignment of Services".

Table 6.8 The Division of Duties of Sections

Department	Division of Duties
General Affairs & Planning Section	Duties are General Affairs (contract, asset management, public relations), Human Resources (personnel affairs, salary, organization management), Finance (budget, accounts, settlements, long-term planning) and oversees administrative procedures, internal regulation finance and long-term planning as general management.
Fare Collection Section	Duties include collecting fares from road users and reporting monthly income to the General Affairs Planning Section.
Traffic Control Section	Duties include traffic safety, maintaining orderly traffic, implementing inspections and patrols, collecting traffic information, and responding to accidents in cooperation with local police to facilitate convenient passage. Traffic information is collected from roadside surveillance cameras at the traffic monitoring room. The accident response is defined by the Project Company in "Guidelines for Implementation of Consignment of Services" and is also implemented as a traffic regulation in consultation with police.
Road Maintenance Section	Duties include inspecting roads (daily / regular inspections), cleaning, repair of road facilities and maintaining a good road condition at all times by maintaining facilities and machinery.

Source: JICA Study Team

6.9 Required Equipment

6.9.1 Vehicles and Maintenance Equipment

Vehicles required for operation include one company-use passenger sedan and two road patrol vehicles (minivans), which are the only directly-owned vehicles. Traffic control vehicles, maintenance work vehicles (small trucks, crane-equipped trucks, mobile platform trucks for under girder maintenance works), cleaning work (brush-mounted) trucks and water-spraying trucks (water tank-mounted trucks) are to be procured by the outside company receiving the consignment contract.

6.9.2 Tollbooth Facilities

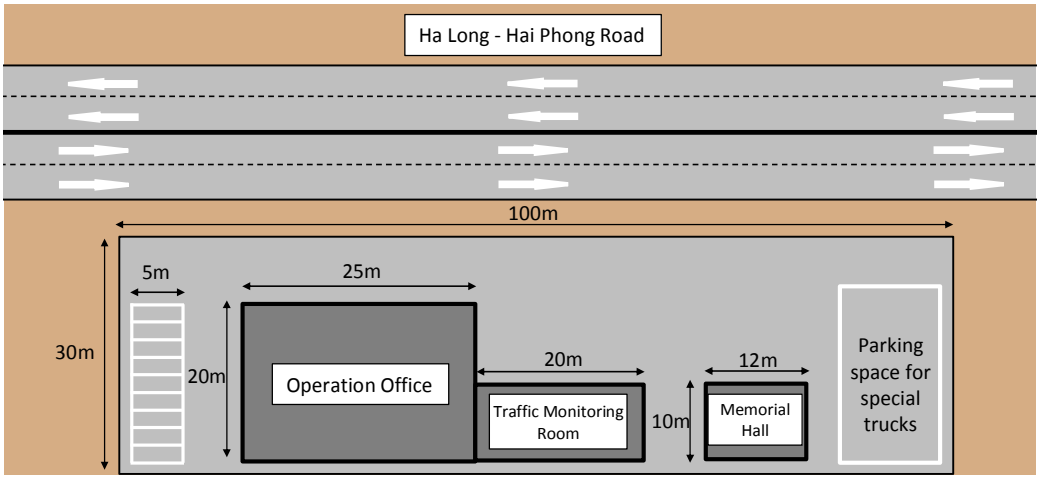
Tollbooths at toll collection facilities are to be fitted with the following equipment:

- Service telephones
- All call paging devices
- Emergency transmission devices, emergency bells, or similar
- Interphones
-

6.9.3 Operation Offices

Figure 6.4 shows the block diagram for the operations office and related facilities. The offices and related facilities represent the core base of the Project Company operations and are located along the Ha Long – Hai Phong Highway route for convenience.

In addition to operations office, the site will be shared with the Traffic Monitoring Room that collects information from surveillance cameras, the Memorial Hall that will propagate information on bridge technologies and parking spaces for the special road maintenance vehicles.



Source: JICA Study Team

Figure 6.4 Block Diagram of the Operation Office

6.10 Estimation of the Operation and Maintenance Cost

6.10.1 Initial Cost

The operation and maintenance costs were estimated on the following conditions:

- The facilities to be newly constructed are Toll collection Stations (Toll gates, booths, toll island, and others), Operations Office, Traffic Monitoring Room, Memorial Hall (memorial display, information center on bridge and operations).
- The only vehicles owned by the Project Company are one official vehicle (passenger car) and two road patrol vehicles (minivans).
- Special vehicle required for operations and road maintenance are to be procured by the outside company receiving the consignment contract.

Table 6.9 Initial Cost of Facilities and Equipment

Item	Initial Cost (Mil. VND)
Toll Collection Stations (10 locations)	40,000
Operation Office	20,000
Traffic Monitoring Room	15,000
Memorial Hall	10,000
Traffic Monitoring System with surveillance cameras	20,000
Total	105,000

Source: JICA Study Team

6.10.2 Running Cost

Running cost is estimated for Operation cost and Maintenance Cost by proportional distribution and service life assumptions of each element. The running costs estimated in this Report must be reviewed after consulting the relevant Vietnam authorities on the service life of each member and estimation methods.

(1) Operation Costs

The running costs required for operation and maintenance during the 30-year period of the Project include the operation costs of the Project Company (personnel costs, power and lighting costs, communication costs, and public relations costs), various insurance costs, maintenance costs (inspections, repairs, reinforcement, cleaning and others), and outsourcing costs. For this study,

annual running costs were assumed at 6% of annual toll revenue based on similar previous examples.

(2) Maintenance Costs

Various inspections, repairs and renewals, etc. were calculated as shown in Table 6.10. High-durability Paint Coatings (Type C-5, D-5 coatings) as described in “Steel Highway Bridge Painting and Corrosion Prevention Guideline” (December 2005) were selected for the paint coating for steel girders in the estimate and therefore only partial repainting are included at 15 years after commencement of operations of expansion joints and bearings.

Table 6.10 Operation and Maintenance Cost over 30 Year Period

Bridge Structure	Member	Unit	Repair Quantities	Unit Cost of Repair (10^3*VND)	Annual Maintenance & Operation Cost (Unit: Mil.VND)																														Total
					Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	
Approach (Halong) Super-T	Main Girder	Surface Area (m²)	2,500	680										1,700										1,700											3,400
	Slab	Surface Area (m²)	4,800	680										3,260										3,260											6,520
	Bearing	Unit	180	25,200															1,350																1,350
	Expansion Device	Length (m)	100	47,400															4,740														4,740		9,480
	Pavement	Pavement Area (m²)	11,280	340															3,840														3,840		7,680
	Protective fencing	Surface Area (m²)	320	680										220										220											440
	Drainage Facility	Lump Sum	1	858,000										860										860											1,720
	Abutment	Surface Area (m²)	70	870										60										60								60			180
	Pier	Surface Area (m²)	370	870										320										320								320			960
Approach (Halong) Steel Girder	Steel Girder	Painting Area m²	55,224	720																															0
	Steel Girder	Painting Area m²	7,363	720															5,300																5,300
	Slab	Surface Area (m²)	4,800	680										3,260										3,260											6,520
	Bearing	Unit	56	35,600															420																420
	Expansion Device	Length (m)	100	50,400															5,040														5,040		10,080
	Pavement	Pavement Area (m²)	16,920	340															5,750														5,750		11,500
	Protective fencing	Surface Area (m²)	480	680										330										330											660
	Drainage Facility	Lump Sum	1	1,508,000										1,510										1,510											3,020
	Pier	Surface Area (m²)	860	870										750										750								750			2,250
Main Steel cable-stayed	Tower	Surface Area (m²)	360	680										240										240											480
	Steel Anchor/ Main Tower	Painting Area m²	770	1,470																															0
	Steel Girder	Painting Area m²	39,000	720																															0
	Steel Girder	Painting Area m²	1,783	720															1,280																1,280
	Slab	surface(m²)	4,400	680										2,990										2,990											5,980
	Bearing	Unit	10	59,300															130																130
	Expansion Device	Length (m)	50	41,500															2,080														2,080		4,160
	Pavement	Pavement Area (m²)	16,450	340															5,590														5,590		11,180
	Protective fencing	Length (m)	1,400	6,160															8,620																8,620
	Drainage Facility	Lump Sum	1	468,000										470										470											940
	Pier	Surface Area (m²)	850	790										670										670								670			2,010
Approach (Haiphong) Steel Girder	Steel Girder	Painting Area m²	59,826	720																															0
	Steel Girder	Painting Area m²	5,983	720															4,310																4,310
	Slab	Surface Area (m²)	6,500	680										4,420										4,420											8,840
	Bearing	Unit	60	35,600															450																450
	Expansion Device	Length (m)	100	50,400															5,040														5,040		10,080
	Pavement	Pavement Area (m²)	16,920	340															5,750														5,750		11,500
	Protective fencing	Surface Area (m²)	480	680										330										330											660
	Drainage Facility	Lump Sum	1	1,508,000										1,510										1,510											3,020
	Pier	Surface Area (m²)	800	870										700										700								700			2,100
Approach (Haiphong) Super-T	Main Girder	Surface Area (m²)	1,900	680										1,290										1,290											2,580
	Slab	Surface Area (m²)	3,600	680										2,450										2,450											4,900
	Bearing	Unit	132	25,200															990																990
	Expansion Device	Length (m)	100	47,400															4,740														4,740		9,480
	Pavement	Pavement Area (m²)	9,870	340															3,360														3,360		6,720
	Protective fencing	Surface Area (m²)	320	680										220										220											440
	Drainage Facility	Lump Sum	1	858,000										860										860											1,720
	Abutment	surface(m²)	70	870										60										60								60			180
	Pier	Surface Area (m²)	340	870										300										300								300			900
Hanoi-Haiphing Interchange	Tunnel L=140m	10% over 30years	1	16,730,000										5,580										5,580								5,580			16,740
	U shape retaining Wall L=240m	10% over 30years	1	15,440,000										5,150										5,150								5,150			15,450
	L shape retaining wall L=140m	10% over 30years	1	1,773,000										590										590								590			1,770
	Culvert	10% over 30years	1	858,000										290										290								290			870
	Ramp A,B,C,D	10% over 30years	1	12,740,000															6,370														6,370		12,740
	Pavement L=641m	Pavement Area (m²)	15,100	340															5,130														5,130		10,260
	Drainage `ump	10% over 30years	1	14,300,000															7,150														7,150		14,300
	Pump Room	10% over 30years	1	486,000										160										160											480
Dam Nha Mac Area Interchange		10% over 30years	1	28,860,000															14,430														14,430		28,860
Toll Gate		10% over 30years	1	1,924,000															960														960		1,920
Lighting & Power Facilities		10% over 30years	1	1,820,000															910																910
Regular Maintenance		Lump Sum	1	per 5 years					2,740					12,900					4,030					12,900					2,740					2,740	38,050
Daily Inspection		Annually	1	1,244,000	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	1,240	37,200
					1,240	**1,240**	**1,240**	**1,240**	**3,980**	**1,240**	**1,240**	**1,240**	**1,240**	**54,690**	**1,240**	**1,240**	**1,240**	**1,240**	**109,000**	**1,240**	**1,240**	**1,240**	**1,240**	**54,690**	**1,240**	**1,240**	**1,240**	**1,240**	**3,980**	**1,240**	**1,240**	**1,240**	**95,840**	**3,980**	**354,680**

Source: JICA Study Team

Chapter 7 Environmental and Social Considerations

7.1 Basic Policy

The Project is classified as a Category A project (projects that are likely to have significant adverse impacts on the environment and society) under the "Japan Cooperation International Agency's Guidelines for Environmental and Social Considerations (announced in April 2010)" (hereinafter called the "Guidelines for Environmental and Social Considerations"). Specifically, an environmental impact assessment (EIA) report must be compiled based on the Guidelines. In the survey, Vietnamese EIA results on the entire Ha Long – Hai Phong Highway, including the project section, were reviewed, new information on survey items that were insufficient in the Vietnamese EIA and required in the Guidelines was gathered and the information reported in the Vietnamese EIA was updated to prepare an EIA report.

7.2 Vietnamese Systems and Organizations related to the Environmental and Social Considerations

7.2.1 Systems and organizations related to environmental and social considerations

(1) Environmental administrative agencies of the Central Government

The Law on Environmental Protection (2005) stipulates the roles and responsibilities related to environmental protection to be performed by central government. The roles and responsibilities of relevant ministries related to road and bridge construction projects are shown in Table 7.1 below.

*The roles and responsibilities are provided in Articles 141 and 142 in the new Law on Environmental Protection (55/2014/QH13)

Table 7.1 Ministerial Roles and Responsibilities related to the Environment

Ministry	Roles and Responsibilities
MONRE	The MONRE is responsible for the following matters in state management on environmental protection: a) Submitting issuance of legal documents on environmental protection to the Government (or issuing them). b) Submitting state policies, strategies and plans on environmental protection to the Government. c) Handling inter-branch, inter-provincial environmental issues. d) Constructing and issuing environmental standard systems. e) Constructing and managing environmental monitoring systems and direct integrated management of the monitoring data. f) Direct environmental assessments. g) Appraising and approving strategic environmental impact assessment reports and environmental impact assessment reports and managing the registration of pledges on environmental protection in an integrated manner. h) Directing, supervising, auditing and handling violations of laws and regulations on environmental protection and settling related disputes and complaints. i) Handling international cooperative activities on environmental protection with other countries and international organizations. j) Directing and supervising the implementation of laws and regulations on environmental protection to be performed by people's committees at each level.

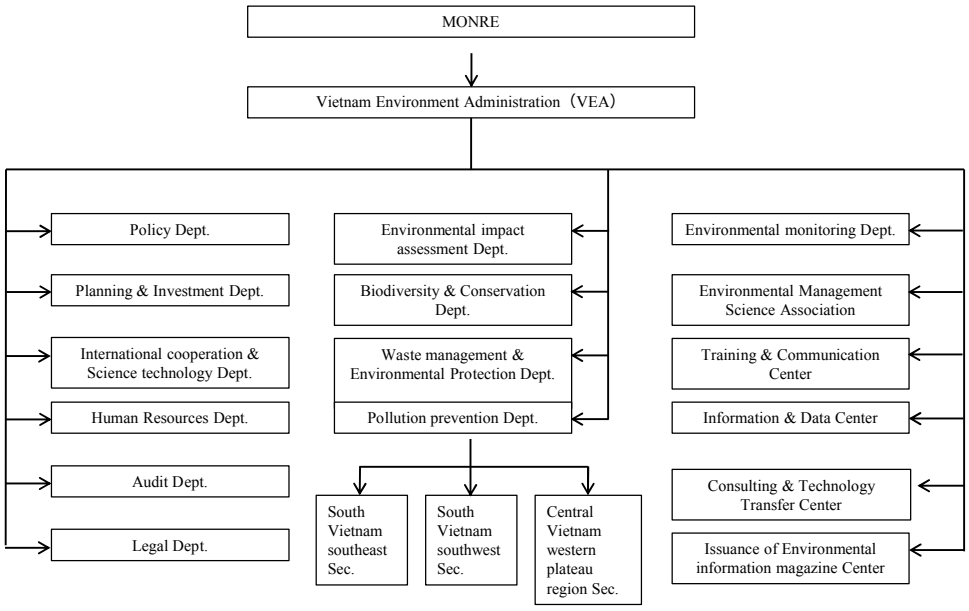
	k) Ensure environmental protection in the national land use plan, national strategy on water resources and planning of inter-provincial river valley and national master plan on basic investigations, surveys, exploitation and processing of mineral resources.
MARD	Handling management of agriculture, forestry and rural development. The Dike Management and Flood Prevention Department and the Water Resources and Hydraulic Project Management Department of the Ministry are in charge of irrigation dams, reservoirs and other agricultural water resources management. The Forestry Protection Agency and Forestry Development Agency are responsible for forest protection: regulations and managing protected forest zones for special use as well as protecting rare and endangered species of fauna and flora. The MARD formulated the Law on Forest Protection and Development (Law 29/2004/QH11), Decree on the Enforcement of the Law on Forest Protection and Development (Decree 23/2006/ND-CP) and Circular 24 that provides transplanting procedures, etc., in cutting of conserved forests for forest protection. It also supervises and directs the following in collaboration with MONRE and other concerned ministries and people's committees: ・Law on Environmental Protection and relevant environmental protection provisions; ・Provisions on the production, import and use of chemicals, pesticides, fertilizers and agricultural waste substances; ・Provisions on genetically modified plant seeds and livestock animals; ・Provisions on dikes, irrigations, conserved forest zones and water supply in rural areas.
MOF	The MOF supervises and directs the following provisions: ・Law on Environmental Protection and relevant environmental protection provisions ・Provisions on farming, harvesting and processing of fisheries products, genetically modified fisheries products and conserved oceanic zones.
MOC	The MOC is in charge of administering water and sanitary facilities. Local governments and public corporations are in charge of planning, implementing and operating specific projects. It supervises and directs the following in collaboration with MONRE and other concerned ministries and people's committees: ・Law on Environmental Protection and relevant environmental protection provisions ・Provisions on infrastructure development activities of water supply and discharge, solid waste treatment and wastewater treatment facilities in cities, combined production and service areas, trade villages and centralized rural residential areas.
MOT	The MOT supervises and directs the following in collaboration with MONRE and other concerned ministries and people's committees: ・Law on Environmental Protection and relevant environmental protection provisions ・Legal provisions on construction activities of transport infrastructure and traffic and transport activities.
Environmental Police	The environmental police detect factories and facilities that violate environmental laws and regulations.

* The above table is compiled based on information in the Development and Execution of the Vietnamese Legal System (Ministry of the Environment, 2011) and Profile related to Vietnamese Environmental and Social Considerations (JICA, 2011) with additional information from interviews in the survey.

Source: JICA Study Team

MONRE is the central government agency responsible for environmental protection policies, which was preceded by the National Environment Agency (NEA), which came into being under the Ministry of Science, Technology and the Environment (MOSTE), that was itself established in 1992. The environmental division of the MOSTE became independent due to the need to enhance policies to tackle pollution and protect the environment and was integrated with other relevant divisions to set up MONRE in 2002.

The Vietnam Environment Protection Agency (VEPA) in MONRE was responsible for formulating environmental protection policy, monitoring compliance with the Law on Environmental Protection and relevant standards and directing local environmental agencies and organizations. However, the VEPA was integrated with the environment department and EIP department in 2008 to expand its authority on environmental issues and increase manpower to be reorganized as the Vietnam Environment Administration (VEA). The VEA organizational structure is shown in Figure 7.1.



Source: compiled by study team based on VEA website

Figure 7.1 Organization of the Vietnam Environment Administration (VEA)

(2) Environmental administrative responsibilities of local governments

Provincial people's committees largely oversee local environmental protection measures. The Law on Environmental Protection (2005) provides provincial responsibilities as follows:

- Issue environmental protection rules, systems and policy plans.
- Direct and formulate environmental protection strategies and plans and implement them.
- Construct, manage and direct local monitoring systems.
- Regularly direct environmental assessments.
- Appraise and approve responsible EIA reports. (The central government approves the reports of major projects.)
- Improve understanding of environmental protection laws.

- Direct and handle violations of environmental protection laws and settle complaints and lawsuits.

Organizational reform resembling that of the central government was carried out by provincial governments and centrally controlled cities in 2002, which resulted in the reorganization of provincial Department of Science, Technology and the Environment into the Department of Natural Resources and Environment (DONRE). The DONRE is under the provincial (or centrally controlled cities') people's committee and established in all provinces. It is mainly responsible for:

- Issuing permits to factories.
- Environmental monitoring of rivers and air.
- Visiting and inspecting factories and treatment and disposal facilities.
- Detecting violations.

7.2.2 Laws and standards related to environmental and social considerations

(1) Law on Environmental Protection

The Law on Environmental Protection (LEP), comprising 55 articles, was established in 1993 and came into effect in 1994 as a law. The first revision was made in 2003 and it was expanded significantly to comprise 136 articles following the revision in November 2005 (52/2005/QH11). The revision that came into effect in 2006 will remain valid until December this year.

In addition, procedures to promulgate the revised law on environmental protection started in 2013. It was promulgated in June 2014 and scheduled to take effect as of January 1, 2015.

The LEP stipulates obligations for specific report preparation on environmental impact assessments and obligations incumbent on each actor, including organizations (business entities), households and individuals in relation to water, air and waste and other environmental media and waste management. The law covers wide-ranging environmental matters in general and, compared to Japan, is like a collective set of separately established laws, including the Environmental Basic Act, Air Pollution Control Act, Water Quality Pollution Control Act, Waste Disposal and Public Cleansing Act and Noise Regulation Act. It is also unique in that regulations by sector and air pollution and noise and vibration regulations are all sorted as one of "waste management."

(2) Laws and regulations on environmental and social issues

Table 7.2 is a list of laws and regulations on environmental and social issues particularly related to the promotion of the Bach Dang Bridge Project.

Table 7.2 Vietnamese Environmental Laws and Regulations related to the Project

Type	Relevant Laws and Regulations
Environment	Law on Environmental Protection 52/2005/QH11 dated 29/11/2005 of the Socialist Republic of Vietnam. Current Law on Environmental Protection is effective until the end of 2014.
	Law on Environmental Protection 55/2014/QH13 dated 23/06/2014 of the Socialist Republic of Vietnam The New Law on Environmental Protection is to come into effect on January 1, 2015.
	Law on Water Resources 17/2012/QH13 of the Socialist Republic of Vietnam.
	Decree 29/2011/ND-CP dated 18/4/2011 of the Government providing "Regulations on strategic environmental assessment, environmental impact assessment and environmental protection commitment".
	Decree 59/2007/ND-CP dated 9/4/2007 of the Government on solid waste management.
	Decree 201/2013/ND-CP dated 27/11/2013 of the Government stipulating the detailed implementation of some articles of the Law on Water Resources.
	Decree 179/ND-CP dated 14/11/2013 of the Government stipulating Regulations on administrative sanctions in environmental protection.
	Circular 26/2011/ND-CP dated 18/7/2011 of the Government "Detailed regulations on

Type	Relevant Laws and Regulations
	some articles of Decree 29/2011/ND-CP dated 18/04/2011 of the Government stipulating the strategic environmental assessment, environmental impact assessment and environmental protection commitment".
	Circular 12/2011/BTNMT dated 14/04/2011 of the Ministry of Natural Resources and Environment on hazardous waste management.
	Decision 22/2006/QD-BTNMT dated 18/12/2006 on the compulsory application of Environmental standards of Vietnam.
Construction	Construction Law 16/2003/QH11 dated 26/11/2003 by the XIth National Assembly of the Socialist Republic of Vietnam, 4th session.
	Law on the amending and supplementing some articles of Laws related to basic construction investment 38/2009/QH12 dated 19/6/2009 by the XIIth National Assembly of the Socialist Republic of Vietnam, 5th session.
	Decree 08/2005/ND-CP dated 24/01/2005 of the Government on Construction Planning.
	Decree 209/2004/ND-CP dated 16/12/2004 of the Government on managing construction work quality.
	Decree 49/2008/ND-CP dated 18/04/2008 of the Government on amending and supplementing some articles of Decree 209/2004/ND-CP.
	Decree 12/2009/ND-CP dated 12/02/2009 of the Government on managing a work construction investment project.
	Decree 83/2009/ND-CP dated 15/10/2009 on amending and supplementing some articles of Decree 12/2009/ND-CP.
	Decree112/2009/ND-CP dated 14/12/2009 of the Government on managing the costs of work construction investment.
Land	Law on Land 45/2013/QH13 dated 29/11/2013 by the XIIIth National Assembly of the Socialist Republic of Vietnam, 4th session.
	Decree43/2014/ND-CP dated 15/05/2014 of the Government stipulating the detailed implementation of some articles of the Law on Land.
	Decree 44/2014/ND-CP dated 15/05/2014 of the Government defining regulations on land prices.
	Decree 45/2014/ND-CP dated 15/05/2014 of the Government on land use levy collection.
	Decree 46/2014/ND-CP dated 15/05/2014 of the Government stipulating regulations on the collection of land rent and water surface rent.
	Decree 47/2014/ND-CP dated 15/05/2014 of the Government on compensation, support, resettlement when land is recovered by the State.
	Decision 3288/2012/QD-UBND dated 12/12/2012 of People's Committee of Quang Ninh Province on stipulating regulations on order, administrative procedures for investment in socioeconomic development projects using land, water surface; management of investment projects in construction and urban area business, housing development projects in Quang Ninh Province.
Tax	Law on Natural Resources Tax 45/2009/QH12 adopted on 25/11/2009 by the XIIth National Assembly of the Socialist Republic of Vietnam, 6th session.
	Decree 50/2010/ND-CP dated 14/5/2010 of the Government stipulating and guiding implementation of some articles of the Law on Natural Resources Tax.
	Circular 105/2010/TT-BTC dated 23/7/2010 of the Ministry of Finance guiding implementation of some articles of the Law on Natural Resources Tax and Decree 50/2010/ND-CP dated 14/05/2010 of the Government stipulating and guiding detailed implementation of some articles of the Law on Natural Resources Tax.
	Circular 158/2011/TT-BTC dated 16/11/2011 of the Ministry of Finance providing guidelines on the implementation of Decree 74/2011/ND-CP dated 25/8/2011 of the Government on environmental protection charges for mineral exploitation.
Cutting of mangrove and other trees	Decree 23/2006/ND-CP dated 03/03/2006 on the implementation of the Law on Forest Protection and Development.
	Circular 24/2013/TT-BNNPTNT dated 06/5/2013:
	Decision 73/2010/QD-TTg dated 16/11/2010 of the Prime Minister on promulgating the regulation of management of investment in construction of silviculture works.
	Directive 02/CT-TTg dated 24/01/2014 of the Government.

Source: JICA Study Team

(3) New Law on Environmental Protection (which came into force in January 2015)

The main articles of the new Law on Environmental Protection (55/2014/QH13) are listed below:

Article 7: Acts to Be Strictly Prohibited.
Article 19: Preparation of Environmental Impact Assessment Reports.
Article 20: Contents of Environmental Impact Assessment Reports.
Article 21: Review of Environmental Impact Assessment Reports.
Article 26: Responsibilities from Investors after getting approval for EIA.
Article 27: Responsibilities from Investors before putting the project into operation.
Article 52: River water environment protection.
Article 59: Land environment protection.
Article 60: Air environment protection.
Article 73: Environmental protection in construction activities.
Article 85: Waste management.
Article 86: Mitigation, recycle, reuse of waste.
Article 90: Hazardous Waste Management Dossiers Compilation, Registration, Licensing
Article 95: Classification of General Solid Waste.
Article 96: General Solid Waste Collection and Transport.
Article 99: Wastewater management.
Article 100: Wastewater Collection and Treatment.
Article 101: Wastewater Treatment Systems.
Article 102: Dust and Air Emission Management and Control.
Article 103; Noise, Vibration, Light and Radiation Management and Control.
Article 108: Environmental Incident Prevention.
Article 109: Environmental Incident Response.
Article 112: Building of Forces for Environmental Incident Response.

7.2.3 Overview of the Vietnamese environmental impact assessment

(1) Types of the environmental impact assessment

In Vietnam, the following three environmental impact assessment methods (procedures) are legally specified in accordance with the scale of development plans and projects:

- Strategic Environmental Assessment (SEA)
- Environmental Impact Assessment (EIA)
- Environmental Protection Commitment (EPC)

The strategic environmental assessment (SEA) is an assessment in the form of an analysis and forecast of the impacts on the environment caused by development before the development plans are approved. National development strategies and plans, land use, forest protection and development, exploitation of natural resources in inter-provincial areas and development plans of key economic regions are subject to the SEA. The development project of the Ha Long-Hai Phong Highway (approx. 25km) subject to the survey is not subject to the SEA according to the Quang Ninh Provincial Department of Natural Resource and Environment (DONRE).

Projects subject to the environmental impact assessment (EIA) are defined in Clause 2 of Article 2 of the (former) Law on Environmental Protection. The development project of the Ha Long-Hai Phong Highway (approx. 25km) falls under the following provisions[41] in the clause:

- Projects of national importance
- Projects have potentially adverse impacts on the river watershed or coastal areas
- Projects which may potentially harm the environment.

Thus, the EIA must apply for and obtain project approval from MONRE. Quang Ninh Province obtained approval for the Ha Long-Hai Phong Expressway (approx. 25km) from MONRE in Decision 2306/QD-BTNMT (confirmed with DONRE response) dated December 12, 2012, based

[41] Details are specified in APPENDIX II of Decree 29/2011/ND-CP.

on the EIA. The environmental protection commitment (EPC) is the commitment made by implementing bodies of small projects not subject to the SEA or EIA to environmental protection efforts.

(2) Contents of the environmental impact assessment

The Law on Environmental Protection (former law) specifies details of project types that must submit EIA reports, their contents and procedures. Projects that are approved based on the EIA reports must submit additional EIA report in the following cases:

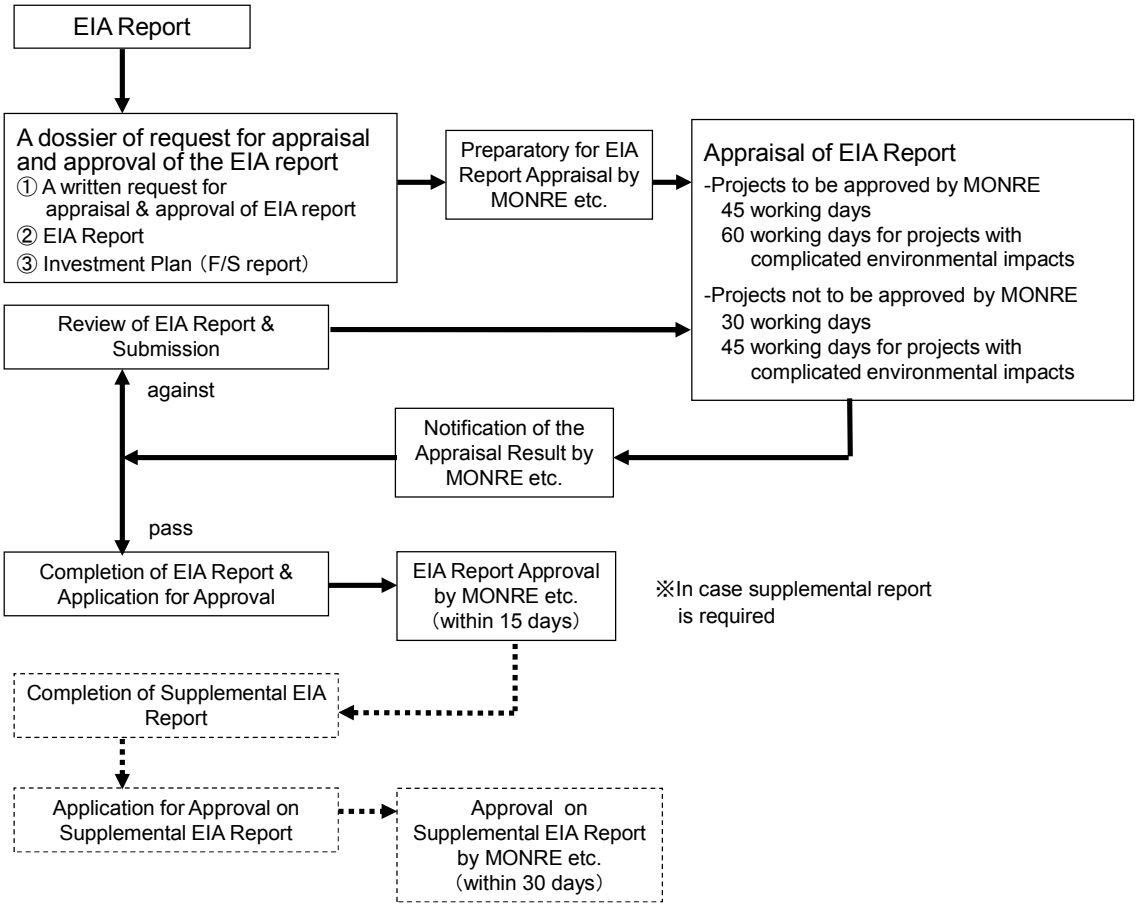
a) Project area changes.
b) The project is not launched within 36 months of construction approval based on EIA reports.
c) Changes in project scale and applied construction method are believed to increase the environmental load.

Article 20 of the (former) Law on Environmental Protection provides items to be contained in the EIA reports as shown in Table 7.3.

Table 7.3 Items of the Environmental Impact Assessment

1	A list and detailed description of the project area, time, workload and construction method applied for each of the construction components
2	Overall assessment of the environmental status at the project site and neighboring areas, the sensitivity to changes and load capacity of the environment
3	Detailed assessment of possible environmental impacts when the project is implemented, environmental components and socioeconomic elements to be affected by the project and prediction of environmental incidents possibly caused by the project
4	Specific measures to minimize, prevent and respond to bad environmental impacts
5	Commitments to taking environmental protection measures during the project construction and operation
6	List of project work types and a program to manage and supervise environmental issues during the project implementation
7	Cost estimates for environmental protection measures within the total cost estimate of the project
8	Opinions of the commune/ward or township people's committees and representatives of communities in the project venue and opinions against the project
9	Citation of sources of figures and data and assessment methods

Source: JICA Study Team



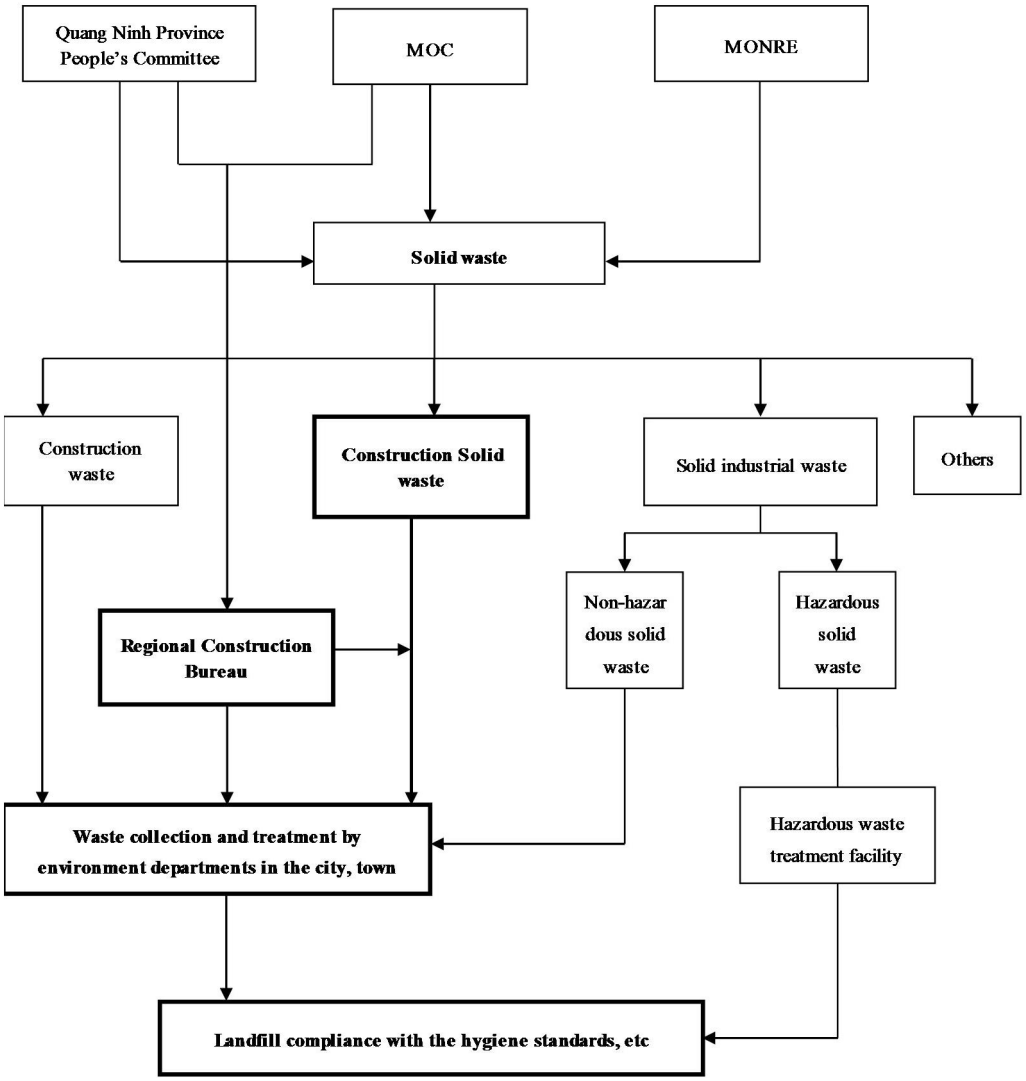
Source: Compiled by the study team based on Law 29/2011/ND-CP

Figure 7.2 Flow Chart of Application and Procedures to Appraise Environmental Impact Assessment (EIA) Report

7.2.4 Supporting laws related to waste treatment and treatment procedures

Figure 7.3 shows treatment procedures for waste (construction waste soil and materials, etc.) generated by the Project based on Vietnamese laws and regulations.

The central governmental agencies responsible for supervising and governing solid waste treatment are the Ministry of Construction (MOC) and the Ministry of Natural Resources and the Environment (MONRE). The Department of Construction (DOC) of Quang Ninh Province People's Committee is mainly responsible for supervising the implementation of the Bach Dang Bridge project.



Source: JICA Study Team

Figure 7.3 Flow of Waste Treatment Procedures and Relationship of Governing Ministries and Local Governments

Rules on solid waste treatment are provided under a 2007 Decree. Rules in main clauses of the decree are described below.

a. Decree 59/2007/ND-CP 9/4/2007 of Government on Solid Waste Treatment

Article 4: Fundamental rule on solid waste treatment

2. Waste shall be sorted for recycling, reuse, treatment and components useful for materials and power generation where it is generated.

Article 6: Prohibitions

1. Locating solid waste in non-designated places.
2. Generating dust and dropping waste during collection and transportation.

3. Mixing harmless and harmful forms of solid waste.
4. Importing or bringing in illegal solid waste to Vietnam.
5. Hindering the collection, transportation and treatment of solid waste in projects approved by relevant authorities.
6. Other legally prohibited acts.

Article 19: Sorting of solid waste at places where it is generated.

1. Harmless solid waste shall be managed and sorted at places where it is generated and kept in bags and tanks in colors designated under laws.
2. Harmful solid waste shall be managed and sorted at places where it is generated in accordance with laws. Harmless and harmful forms of solid waste shall not be mixed. When mixed, it shall be treated as harmful waste.
3. Organizations and individuals involved in projects generating solid waste shall sort it in accordance with Article 20 of the Decree.

Article 20: Sorting of harmless solid waste

1. Harmless solid waste shall be sorted into the following two groups regardless of where it is generated:
    a) Reusable and recyclable waste: electric appliances, old paper, metal and plastic, etc.,
    b) Waste that needs to be treated or buried: organic waste (trees, food, etc.), consumables containing harmful chemicals (battery, lubricant, etc.) and non-recyclable waste
2. Solid construction waste: sludge and soil and other waste generated in the process of construction and demolition work shall be sorted as follows:
    a) Excavated soil and sludge usable as fertilizers
    b) Soil and stones from bricks, concrete and other construction materials, which is recyclable and reusable as filling and construction materials
    c) Glass pieces, iron and steel, paper and other recyclable and non-recyclable waste

Article 21: Sorting of harmful solid waste

1. Relevant ministries shall instruct on storage and retention of solid waste generated in activities such as manufacturing and research conducted by the sectors they govern.
2. The Ministry of Natural Resource and Environment shall announce a list of harmful waste.

Article 22: Responsibilities and obligations to be borne by generators of harmless waste

2. Responsibilities and obligations to be borne by various agencies and commercial and

manufacturing organizations, etc.

a) Collection and sorting with sanitary equipment in accordance with instructions given by waste collection and transportation service providers

b) Conclusion of contracts with waste collection, transportation and treatment service providers and bearing all costs

Article 23: Responsibilities and obligations to be borne by generators of harmful waste

1. Responsibilities and obligations to be borne by generators of harmful waste:

a) Registration with the local governing agency in charge of environmental protection

b) Sorting, packaging, storage and labeling of harmful solid waste before it is transported to treatment facilities in accordance with the relevant laws and regulations

2. The Ministry of Natural Resources and the Environment shall instruct harmful waste generators when they register.

Article 24: Collection, storage and transportation of harmless solid waste

1. Companies and associations (hereinafter referred to as "solid waste collection and transportation service operators") shall collect, store and transport harmless solid waste in accordance with contracts.

Article 25: Collection, storage and transportation of harmful solid waste

1. Organizations with proper technologies approved by the relevant ministries shall collect, store and transport harmful solid waste.

2. Generators approved by the relevant ministries and with proper technologies, may collect, store and transport harmful solid waste. If they are not approved or lack such technology, they shall conclude contracts with authorized organizations to have them perform such work.

7.3 Resettlement and land acquisition

7.3.1 Legal framework of resettlement, its supportive measures and compensation

(1) Supporting laws at the state level

A new Land Law (No. 45/2013/QH13), hereinafter referred to as the "new Land Law") was established on November 29, 2013 and put into effect on July 1, 2014.

Local governments are responsible for all resettlement and land acquisition procedures (target properties: identification of houses and land, notice to owners of the target properties, volume calculation, compensation payment, house demolition, provision of living support for resettlers, etc.) for the Ha Long-Hai Phong Highway construction. However, because the procedures are implemented at different times between Quang Ninh Province and Hai Phong City where the highway runs and because of the timing of the enforcement of the new Land Law (2013), the procedures are taken as below:

- Highway section in Quang Ninh Province: procedures in accordance with the 2003 Land Law
- Highway section in Hai Phong City: procedures in accordance with the 2013 new Land Law

Table 7.4 Vietnamese Laws and Regulations on Land Acquisition (state level, related to the former Land Law)

Laws and Regulations	Contents
Land Law January 26, 2003	1998 Law on Complaints and Accusations
Decree 181/2004/NĐ-CP of Oct. 29, 2004	Enforcement of Land Law
Decree 197/2004/NĐ-CP of Dec. 3, 2004	Provisions on compensation, support and resettlement in relation to land acquisition by the government
Decree 17/2006/NĐ-CP of Jan. 7, 2006	Revision and supplementation of notice on enforcement of 2003 Land Law
Decree 84/2007/NĐ-CP of May. 25, 2007	Supplementation of procedures of land use right issuance, land acquisition, execution of land use right and governmental compensation for land acquisition, support and resettlement provisions and settlement of lawsuits of land issues
Decree 69/2009/NĐ-CP of Aug. 13, 2009	Supplemental clauses on land use plan, land price, land acquisition, compensation, resettlement and support

Source: JICA Study Team

Table 7.5 Vietnamese Laws and Regulations on Land Acquisition (state level, related to the new Land Law)

Laws and Regulations	Contents
New Land Law (Law 45/2013/QH13) Put into effect on July 1, 2014	New law that replaces the 2003 Land Law (Law 13/2003/QH1)
Decree 43/2014/ND-CP Put into effect on July 1, 2014	A decree that provides detailed enforcement regulations Details of the formulation of land use plans
Decree 44/2014/ND-CP Put into effect on July 1, 2014	A decree on land price setting
Decree 47/2014/ND-CP Put into effect on July 1, 2014	A decree on compensation, support and resettlement when the state government recovers land

Source: JICA Study Team

(2) Decisions by local governments

Table 7.6shows decisions and their contents made in relation to the Ha Long-Hai Phong Highway Construction Project.

Table 7.6 Laws and Regulations on Ha Long-Hai Phong Highway Construction (at local government level)

Laws and Regulations	Contents
Decision 1236/2010/QĐ-UBND of Jul. 30, 2010 (Hai Phong City)	Supplementation and revision of provisions on compensation, support and resettlement policy for governmental land acquisition in Hai Phong City
Decision 166/QĐ-UBND of Jan. 19, 2012 (Quang Ninh Province)	Approval of road investment project to connect the Ha Long and Hanoi-Hai Phong Expressways
Decision 1656/QĐ-UBND of Jul. 3, 2012 (Quang Ninh Province)	Approval of auxiliary project to develop roads and facilities to connect the Ha Long and Hanoi-Hai Phong Expressways in Build-Transfer scheme
Decision 3239/QĐ-UBND of Jul. 12, 2012 (Quang Ninh Province)	Approval of revision of auxiliary project to develop roads and facilities to connect the Ha Long and Hanoi-Hai Phong Expressways in Build-Transfer scheme
Decision 511/QĐ-UBND of Feb. 21, 2013 (Quang Ninh Province)	Approval of line shape and 1/1000 scale of land acquisition boundary of road to connect the Ha Long and Hanoi-Hai Phong Expressways (section in Ha Long City)
Decision 499/2010/QĐ-UBND of Feb. 11, 2010 (Quang Ninh Province)	Issuance of provisions on compensation, support and resettlement policy for governmental land acquisition in Quang Ninh Province
Decision 1748/2010/QĐ-UBND of Jun. 11, 2010 (Quang Ninh Province)	Revision and supplementation of Clause 2 of Article 17 of provisions on compensation, support and resettlement policy for governmental land acquisition in Quang Ninh Province
Decision 1081/2013/QĐ-UBND of Apr. 25, 2013 (Quang Ninh Province)	Approval of overall plan of compensation, support and resettlement of road construction project to connect the Ha Long and Hanoi-Hai Phong Expressways (section in Ha Long City)

Source: JICA Study Team

7.3.2 Scale of resettlement and land acquisition

The Ha Long-Hai Phong Highway Construction Project covers two local governments: Quang Ninh Province (Ha Long City and Quang Yen Town) and Hai Phong City. The responsible departments of the local governments are in charge of resettlement and land acquisition procedures required for the bridge construction.

The target of the survey is the section comprising the bridge (Bach Dang Bridge) and embankment of the approach road to the bridge in the 5km section on the Hai Phong side (ending point) of the Ha Long-Hai Phong Highway and crosses the border of Hai Phong and Quang Ninh Province.

Table 7.7 Target of Resettlement and Relocation Necessary for the Ha Long-Hai Phong Highway Construction Project (by item)

No.	Item	Unit	Under Quang Ninh Province administration		Under Hai Phong administration	Total
			Ha Long	Yen Hung	Hai An	
1	**Dwellings**					
	Roof tile house	Household/m^2	5 households/200 m^2 in total		0	27 households /1,800m^2 in total
	One-story house	Household/m^2	18 households /1,400m^2 in total		0	
	Two-story house	Household/m^2	4 households /200m^2 in total		0	
2	**Land**					
	Residential land	m^2	3,500	18,000	28,000	49,500 m^2
	Land for gardens	m^2	12,000	14,000	0	26,000 m^2
	Artificial forest	m^2	0	484.41	0	484.41 m^2
	Perennial zone	m^2	0	6,400	0	6,400 m^2
	Aquaculture zone	m^2	98,825	624,641	24,500	747,966 m^2
	Rice paddy	m^2	339,087		0	339,087 m^2
	Land for fruit growing	m^2	145,323		0	145,323 m^2
3	**Plants and trees**					
	Fruit tree	tree		35	0	35 trees
	Tree for timber	tree		20	0	20 trees
	Other trees	tree		100	0	100 trees
4	**Public facilities**					
	Relocation of electric poles for 35kV cables	pole	0	0	5	5
	Relocation of electric poles for 220V cables	pole	0	5	6	11
	Relocation of electric poles for telephone lines	pole	0	0	3	3
5	**Cemetery**					
	Grave	grave	0	20	0	20

Source: "Report of Environmental Impact Assessment, Ha Long – Hai Phong Expressway Project", EMAC 2011

Progress of the resettlement of residents and land acquisition procedures in each area, as determined during the site survey, is described below. The information is based on that provided by the Quang Ninh Province Department of Natural Resource and Environment (DONRE) as of August 11, 2014.

(1) Ha Long City (inseparable project section)

Ha Long City People's Committee formulated an overall resettlement and land acquisition plan for areas governed by the city, which the Quang Ninh Provincial joint committee screened and the provincial People's Committee approved in Decision 1081/2013/QĐ-UBND dated April 25, 2013. The total cost of resettlement and compensation was 195,759,591,000VND (approx. 980 million yen: 1yen=200 VND).

Table 7.8 Scale of Resettlement and Land Acquisition and their Progress for Section in Ha Long City

Target section	L=2.3km
Area to be acquired	50.9ha
Number of target households (target of land acquisition)	113 households (16 of which involuntarily resettled, 1 a shrimp farm, etc. and 96 owning farmland), 4 organizations and 13 graves
Support to put resettlers' life back in order provided by project owner	· 113 of 113 households targeted by the Quang Ninh Province People's Committee (16 of which in residential areas and the others on arable land.). The Ha Long City People's Committee approved compensation, support and resettlement plan for the 13 graves. Their owners received compensation and delivered land. · Resettlement measure: Targeted 16 households hoping to resettle on their own. The Ha Long City People's Committee provided money to support their resettlement and get them back on track. · The Ha Long City People's Committee supported targets who are direct farm producers in changing their occupation and stabilizing their basic needs.
Others	· Disposal of bombs (unexploded bombs from the Vietnam War), development of trenches to protect petroleum pipelines and special trenches to protect civil engineering and high-voltage current installations · Implemented public facilities: exploration, gasoline pipeline protection work, public facility protection work, high-voltage cable transfer

Source: JICA Study Team

(2) Quang Yen Town (inseparable project section)

The total cost of resettlement and land acquisition to date in areas controlled by Quang Yen Town is 135 billion VND (approx. 675 million yen: 1 yen=200VND).

Table 7.9 Scale of Resettlement and Land Acquisition and their Progress for Section in Quang Yen Town

Target section	L=17.5km
Area to be acquired	99.83ha
Number of target households (target of land acquisition)	Number of affected households, organizations and individuals: 818 households, 814 of which households and individuals and the remaining four of which, organizations. (The exact number of households subject to resettlement is unknown.)
Progress	Resettlement of 799 of 881 households is approved. 11 have not received compensation money. 788 of 799 households have received compensation and delivered the land. Compensation plans for 17 households and two organizations were screened by the compensation plan committee, whereupon the land acquisition procedures are to be completed and the plan approved.
Others	Implemented public facilities: exploration, gasoline pipeline protection work, public facility protection work, high-voltage cable transfer

Source: JICA Study Team

The Bach Dang Bridge Construction Project area in the above section:

- Resettlement targets: 4, 2 of which households and two companies. (Lien Vi 1 and Lien Vi 2)
- The target land acquisition area is 25.3 ha.; namely a fish farm and a tidal zone. The People's Committee approved the payment of compensation to four organizations and households respectively, received it and signed a document on the land handover.

Compensation and compensation target:

- Coastal wetland and tidal zone for fish farming. Cost of land cultivation and fish farm pond development
  Land assets (management building for fish farming: including facilities that also serve as residential facilities)
- Paid for remaining operation contract period of management building for fish farming, pond bank and drainage system.
- Target farm products: compensation paid for shrimp, crab and small fish, calculated based on the per unit area (m^2) of the yield.

(3) Hai Phong City

Although the study team tried to gather information on land acquisition and resettlement in Hai Phong City in three interview sessions with the city's DONRE (Department of Natural Resource and Environment) in charge of the issue and by submitting a questionnaire, it had yet to obtain quantitative information as of the end of October 2014.

The following information was obtained in the interview:

1) Interview on August 8, 2014 (comments from Hai Phong DONRE)

- Although the DONRE understands that no household is subject to resettlement in Hai Phong for the Bach Dang Bridge construction, they will confirm it as a detailed field survey may reveal that households running fish farms may be subject to resettlement.
- Land that is the target of acquisition in the current Bach Dang Bridge construction plan is owned by four companies (no Japanese company).
- As for land on the Hai Phong side, some land from the point where the interchange with Hanoi-High Phong Expressway is planned to the nearest river belongs to Nam Hai Province.

2) Interview on September 18, 2014 (comments from Hai Phong DONRE)

- Hai Phong City understands that a problem related to the coordination with the land development plan (to be carried out by VIDIFI, see Chapter 5 for details) near the intersection of Hanoi-Hai Phong Expressway and Ha Long-Hai Phong Highway came to surface and the line shape of the Bach Dang Bridge has not been finalized.
- Thus, the city confirmed that there would be no resettlement if it were in the line shape proposed by Quang Ninh Province although they cannot give a final comment at this point. Land owned by companies will be acquired.
- The schedule of stakeholders' meetings cannot be decided until the problem with the above land development plan is resolved.

As of the end of October, 2014, concrete information (details of the area to be acquired, items subject to compensation and existing facilities needing to be relocated) on land acquisition on the Hai Phong side in relation to the Bach Dang Bridge construction has not been officially obtained.

7.3.3 Resettlement and land acquisition procedures structure and specific processes

(1) Bodies executing resettlement and land acquisition procedures

People's committees of each administrative body shall oversee resettlement and land acquisition procedures based on state laws and regulations.

For the section of the Bach Dang Bridge in Quang Ninh Province, Quang Yen Town will set up a land acquisition committee and proceed to implement procedures in line with those below. The Quang Ninh Province shall finance the land acquisition and compensation. Don Hai District's People's Committee is responsible for the procedures on the Hai Phong side.

(2) Supporting laws of compensation procedures and unit price

Laws supporting land acquisition, resettlement and compensation procedures include Decrees 84/2007/ND-CP, 69/2009/ND-CP and MONRE 14 provided by the state government and Circular 499 provided by Quang Ninh Province.

There is a provincial manual related to the land acquisition compensation (resettlement) plan in Circular 499, etc., of Quang Ninh Province. In Vietnam, the state government owns land and residents and companies rent land for residency and business activities.

(3) Specific resettlement and land acquisition procedures

The compensation flow for resettlement and land acquisition and support for those who resettle provided by Quang Ninh Province is shown below as an example. Procedures of Hai Phong City are the same in principle.

Step 1: Announcement of project plan and notification of land acquisition: interview with local residents and explanation of compensation and support structures and resettlement policies to households subject to land acquisition.
Step 2: Land survey of target area and map-making
Step 3: Confirmation of assets of buildings, trees and arable land subject to compensation
Step 4: Confirmation of background of households subject to land acquisition and history of land use
Step 5: Formulation and approval of compensation, support and resettlement plan
Step 6: Compensation payment and land handover

In Step 2 above, the specific compensation amount and land area are decided after a 1/500-scale drawing is produced. Although JICA Study Team was informed that consultation and approval are included in the step, the Team had not acquired detailed information on the circumstances under which consultation is performed and approval made. The drawings are produced by consultants to be hired by Quang Ninh Province and a land acquisition committee is formed on production. Projects are approved by national or provincial governments depending on the classifications made. The amount of compensation or the number of those receiving it are approved by Quang Yen Town.

7.3.4 Mechanism of complaint handling

Complaints may be filed by those subject to resettlement and land acquisition in the procedures. State laws and regulations on complaints and lawsuits in Vietnam are introduced in Table 7.10.

Table 7.10 Laws and Regulations on Complaints and Lawsuits

Laws and Regulations	Contents
Law on Complaints and Lawsuits Law 09/1998/QH10"	1998 Law on Complaints and Lawsuits
Law 26/QH11 of Jun. 15, 2004	Revision and supplementation of the Law on Complaints and Lawsuits
Law 58/QH11 of Nov. 29, 2005	(same as above)
Decree 136/ND-CP of Nov. 14, 2006	Defines details and implementation guidelines of the Law on Complaints and Lawsuits and some clauses of its revision and supplementation
Circular 07/TTTTCP, Oct. 31, 2013	Government Inspector involved in procedures and handling complaints against administration

Source: JICA Study Team

Current Laws on complaints and lawsuits against administrative bodies specify the rights and obligations of plaintiffs and defendants and clarify the entities capable of handling complaints and procedures for filing and settling complaints.

Current laws on administrative actions and acts against complaints by prefectural agencies and provincial People's Committee are provided based on the following principles:

[Principles provided under current laws]

"When a complaint is filed against administration for the first time, it is handled by the administrative body that conducted the act triggering the complaint." This principle is regarded as an opportunity for the administrative body to review the handling and its actions and correct mistakes. However, there have been claims that it is inappropriate because very few administrative bodies can correct their wrong acts.

Plaintiffs are allowed to file the complaint twice. They first file a complaint against the administrative body that conducted wrong actions or acts. If they are dissatisfied with the first decision of arbitration, they file an administrative review with a higher-level body.

The plaintiffs may select whether to file an administrative review or file with an administrative court. If they are dissatisfied with the second arbitration decision, they may appeal to a higher court.

7.4 Alternative plans

Alternative plans were examined for the entire Ha Long-Hai Phong Highway, including the scope of the Project. The Ha Long-Hai Phong Highway is a road connecting Ha Long and Hai Phong. The south side of the highway faces the Ha Long Bay and administrative and commercial facilities and overcrowded residential areas in central Quang Yen Town lie in the northern side.

If the road plan should be along the coast of Ha Long Bay, the road would skirt the vegetation area of mangrove etc. and thus have significant impacts on the ecosystem. If the road were shifted toward the ocean to avoid it, the ratio of bridges would increase, which would not only increase the cost sharply but also go near the national park of Cat Ba Island, exerting even more impact on the ecosystem. If it were shifted to the northern side to avoid Quang Yen Town, the road distance would increase, making the project far more expensive and thus unrealistic. Because of the geographical restrictions on the south and north sides as described, the highway route is limited to the area between Ha Long Bay and Quang Yen Town.

Within the limited area, the current plan of the Ha Long-Hai Phong Highway (Route B) was compared to two alternatives: a route running north from Ha Long – Hai Phong Highway to avoid central Quang Yen Town (Route A) and a route running south of the Ha Long-Hi Phong Highway near the Ha Long Bay (Route C) with the Zero Option (no project implementation) taken into consideration.

The following issues were taken into consideration when selecting each route:

- The Project is a road construction project participated in by the private sector and alternatives are designed to be almost equidistant to the current plan (Route B); prioritizing the development effect and cost.
- It is confirmed that Korean companies have formulated a detailed plan of the Hanoi-Hai Phong Expressway (Route B) as a Build-Operate-Transfer project. The Project road is to be connected to the expressway.
- As for the Ha Long-Hi Phong Highway to be connected with the Project in the Dam Nha Mac area, Quang Ninh Province examined alternative plans for Routes A and B in EIA when it decided the route. Route C is added to compare three routes to reexamine the relevance of Route B.
- Because of mangrove forests on both banks of the river, traversed by the Ha Long-Hai Phong Highway, the impact in the line shape across the river remains the same.
- Local residents who are not subject to resettlement within the area of land acquisition may continue to reside and operate businesses in the area after the launch of the Project. Accordingly, alternative plans were compared to the households subject to resettlement who will be significantly affected by the Project as the target.
- Although Ha Long Bay is inscribed on the list of World Heritage Sites, the scope of inscribed area includes the ocean southeast of the Ha Long-Hai Phong Highway. The alternative routes run inland of Ha Long Bay and thus do not affect its overall landscape. Because the road structures of both routes are also the same and the space between them is small, landscape comparison by route is not included to be examined.

The advantages and disadvantages of each of the routes to be considered in the selection are described below.

[Route A]

- It enables power lines and other obstructions on the west bank of the Bach Dang River to be avoided. It also enables central Quang Yen Town to the north to be avoided.
- Due to overcrowded residential areas in Quang Yen Town on the northern side, the road needs to be extended to bypass them to the north, which also extends the connection section with the Hanoi-Hai Phong Expressway. This means that extending the road may increase

the construction cost undesirably.

[Route C]

- It has an advantage of involving fewer households subject to resettlement as Quang Yen Town is avoided on the south side.
- It is also disadvantageous, if it is built in the south side, because it traverses the overcrowded residential areas in Quang Yen Town and industrial parks on the Hai Phong side and extending the road length increases the project cost.

The comparison study results are shown in Table 7.11 and the ground plans for alternative routes are shown in Figure 7.4 and Figure 7.5.

Table 7.11　Overview showing a Comparison of Alternative Routes to the Ha Long-Hai Phong Highway

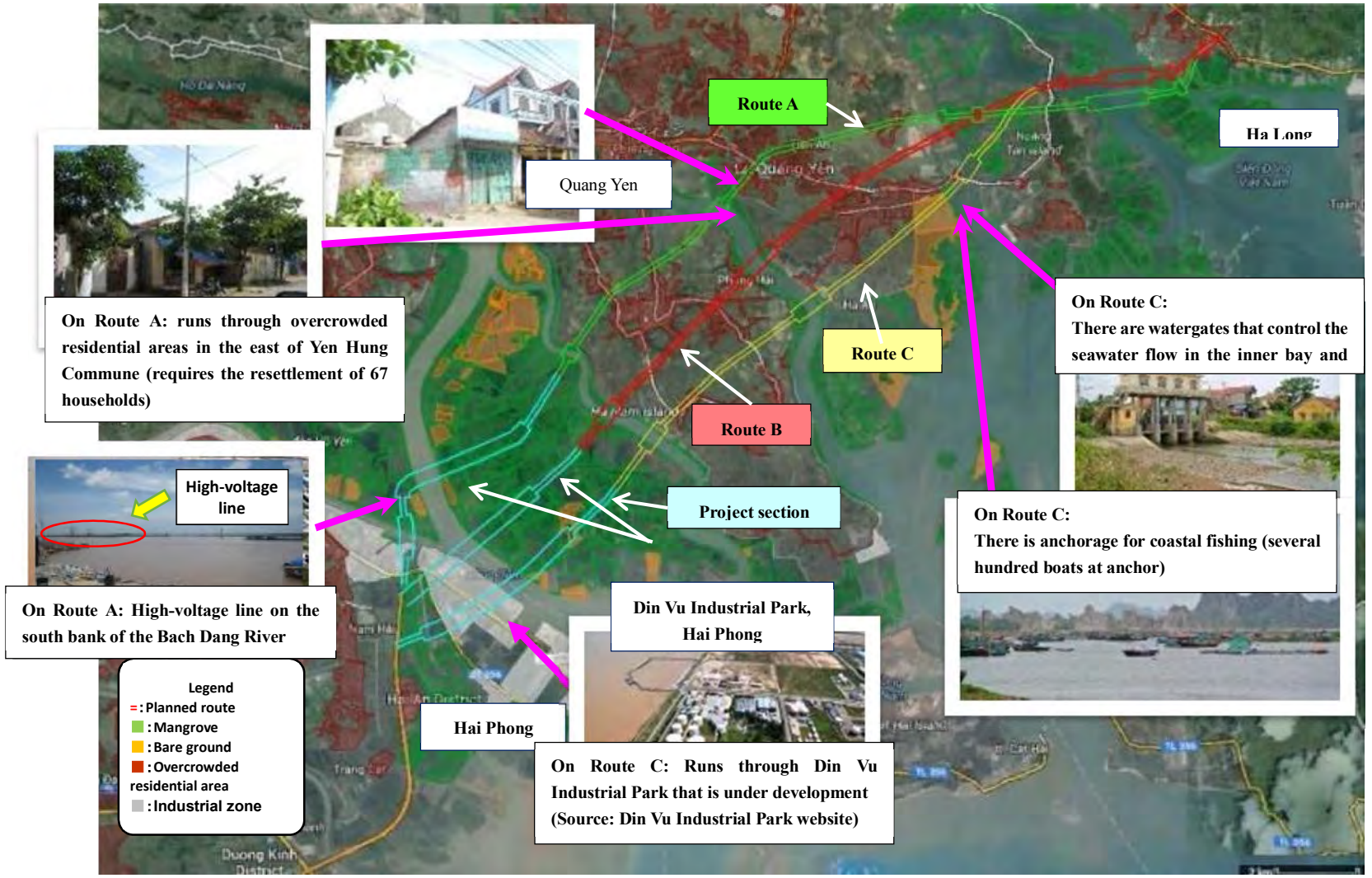
Item		Route A		Route B		Route C		Zero Option	
Overall evaluation: recommended most relevant route and grounds		+ Route A traverses the city center, the number of households subject to resettlement is up to 67 and impacts on such foundation are big, which includes resettlement of local residents' as farmland, fish ponds and port and harbor facilities. ＋The area where mangrove forests are logged is the biggest at 59ha. + Construction cost: approx. 9,300,000 million VND + Because of the reasons above, Route A is not recommended.	△	+ Because Route B is the shortest route avoiding surrounding residential areas and existing facilities, the number of households subject to resettlement is the smallest among the three routes at 27. ＋The area where mangrove forests are logged is 45ha, which is the smallest among the three plans. + Construction cost: approx. 9,000,000 million VND + For the above reasons, Route B is recommended as the most relevant plan.	◎	+ Route C traverses farmland, fish ponds, city center, anchorage and other port and harbor facilities and industrial parks. Although the number of households subject to resettlement is 60, the expressway construction involves resettlement of an industrial park. ＋The area where mangrove forests are logged is 45ha, which slightly exceeds that of Route B. + Construction cost: approx.9,600,000 million VND + For the above reasons, Route C is not recommended.	△	＋It is Zero Option, which means the Ha Long-Hai Phong Highway construction will not have any impact on the natural or social environment. ＋No household will be subject to resettlement. ＋No implementation of the Project makes it impossible to expect any contribution to economic development or reduction of greenhouse gas emissions to be made by developing a distribution network connecting Hai Phong and Ha Long. ＋For the above reasons, the Zero Option is not recommended.	×
	Starting point	+ Approx. 10 km from the intersection (Cau Trang) with National Route 18		Intersection (Cau Trang) with National Route 18		+About 4.5 km from the intersection (Cau Trang) with National Route 18 (Bin Huana)		Same as Route B	
	Ending point	+ Approx. 0.5 km to the north from the intersection (Hai An) with the Ha Long – Hai Phong Expressway and Route B		Intersection (Hai An) with the Ha Long – Hai Phong Expressway		+ About 1.0 km to the south from the intersection (Hai An) with the Ha Long – Hai Phong Expressway and Route B		Same as Route B	
	Length (km)	27.65km (road: 20.00km, bridge: 7.65 km)		25.22km (road: 17.54km, bridge: 7.67 km)		26.19 km (road: 17.93 km, bridge: 8.26 km)		Approx. 70km (extension of inland detour between the starting and ending points of the Ha Long-Hai Phong Expressway)	
	Route	+ Route A is the northernmost and longest among the three routes. + It traverses farmland, fish ponds, the center of Quang Yen Town and the northern part of the Dam Nha Mac area. It crosses multiple rivers near Hai Phong City in the ending point side to connect to the Hanoi-Hai Phong Expressway.		+ Route B will connect Ha Long and Hai Phong in a virtually straight line avoiding surrounding residential areas and existing facilities and is the shortest among the three routes. + The route traverses farmland, fish ponds and the center of Dam Nha Mac area avoiding the center of Quang Yen Town.		+ Route C diverges from a point of Route B and runs south of Dam Nha Mac area avoiding the center of Quang Yen Town. It traverses watergates, anchorage of fishing boats on the way and industrial park near the ending point.		+ It traverses the center of Hai Phong (congested area) from the ending point side of the Ha Long-Hai Phong Expressway and the ending point of the expressway via National Routes 10 and 18.	
	Number of rivers crossed	8		8		8		8	
Land use	Use of surrounding land	+ Currently, the land is used as a city center in Hai Phong City and Quang Yen Town. The other land is used as fish ponds and farmland and there are also mangrove forests.		+ Currently, the land is used as a city center in Hai Phong City and Quang Yen Town. The other land is used as fish ponds and farmland and also includes mangrove forests.		+ Currently, the land is used as Dinh Vu Industrial Zone in Hai Phong City and for the city center in Quang Yen Town. The other land is used as fish ponds and farmland and there are also mangrove forests.		+ Areas along National Route 10 from Hai Phong include city center, residential areas, farmland, factory premises and golf courses. The section from the interchange of National Routes 10 and 18 to the starting point of the Ha Long-Hai Phong	

Item		Route A		Route B		Route C		Zero Option	
								Expressway includes residential areas, farmland and quarries.	
	Consistency with direction of local development	Same as Route B	○	+ Partial revision of the expressway development plan (Prime Minister's Decision 356/QD-TTg dated Feb. 25, 2013) + Coastal road development plan (Prime Minister's Decision 129/QD-TTg dated January 18, 2010)	○	Same as Route B	○	+ It is existing national routes (10 and 18) and regarded as basic infrastructure of regional development plans as main arterial roads in the master plan in both areas of Quang Ninh Province and Hai Phong City sides.	○
	Impacts on agriculture and fish farming	+ Land acquisition of new farmland and residential areas on the route	△	+ Land acquisition of new farmland and residential areas on the route	△	+ Land acquisition of new farmland and residential areas on the route	△	+ As it is Zero Option, there is no land acquisition of farmland or fish farms. However, when there is a need to expand the road width due to increased traffic on the existing road, this will require land acquisition of farmland and residential areas.	○
Technological overview	Technological perspective	+ The longest total length among the three routes: about 28 km + The assumed number of bridges (9 bridges) and their total length (approx. 7.65km) differ little from those of other routes. + The impacts of control points (that should be avoided) including overcrowded residential areas that restrict the line shape may result in some bridge types having to change and be skewed or be difficult for them to maintain alignment.	○	+ The total length is the shortest among the three routes: about 25 km + The assumed number of bridges (9 bridges) and their total length (approx. 7.67 km) differ little from those of other routes. + There are few control points (that should be avoided) including overcrowded residential areas that restrict the line shape and it is the shortest route connecting the starting and ending points.	◎	+ The total length is the middle among the three routes: about 26 km + The assumed number of bridges (8 bridges) and their total length (approx. 8.26 km) differ little from those of other routes. + The impacts of control points (that should be avoided), including overcrowded residential areas that restrict the line shape, may result in changes of some bridge types to be skewed.	○	+ Renovation, maintenance and repair of existing national routes (10 and 18) as well as repair of existing bridges will occur when traffic demand increases in future. The bridges where National Route 10 crosses the Cua Cam River and the Bach Dang River (upper stream) are long big bridges.	○
	Scale of project cost (only of civil engineering work section)	+ Construction cost: total of 9,291,052 (million VND) (Of the above cost, project cost is 4,472,022 (million VND))	○	+ Construction cost: total of 9,008,816 (million VND) (Of the above cost, project cost is 4,054,395 (million VND))	◎	+ Construction cost: total of 9,611,132 (million VND) (Of the above cost, project cost is 4,380,716 (million VND))	△	+ Construction cost: 0 VND (Zero Option) + Renovation and maintenance cost of existing national routes (10 and 18) and renovation of existing bridges will be incurred in future.	–
Environmental and social considerations	Social environment	+ Because the route traverses the center of Hai Phong and Quang Yen Town, it affects many local residents. + Because farmland and fish ponds lie expansively, it affects the lives of many farmers.	△	+ The city center area the road traverses is the shortest among the three. + Because farmland and fish ponds lie expansively, it affects the lives of many farmers. + There are multiple ports located	○	+ Because the route traverses the center of Hai Phong and Quang Yen Town, it affects many local residents. ・Because farmland and fish ponds lie expansively, it affects the lives of many farmers. + There are watergates and anchorage	△	+ Because it is Zero Option, there are no social impacts occurring in cases of Routes A, B and C. +If the current traffic volume increases without Ha Long-Hai Phong Highway, there will be negative impacts such as increased	△

Item		Route A		Route B		Route C		Zero Option	
		+ There are multiple ports located around the Bach Dang River on the Hai Phong City side.		around the Bach Dang River on the Hai Phong City side.		in Ha Long and industrial parks in Hai Phong.		accidents involving residents along current roads.	
	Natural environment	+ Expressway construction may cause air pollution and impact on groundwater sources. + The area where mangrove forests are logged is assumed to be 59ha, making it the largest among the three plans. + Impact level: high (loss of mangrove forests)	○	+ Expressway construction may cause air pollution and impact on groundwater sources. + The area where mangrove forests are logged is assumed to be 45ha, which is the smallest among the three plans. + Impact level: high (loss of mangrove forests)	○	+ Expressway construction may cause air pollution and impact on groundwater sources. + The area where mangrove forests are logged is assumed to be 48ha, which slightly exceeds that of Route B. + Impact level: high (loss of mangrove forests)	○	+ Impacts on the natural environment of the section of the Ha Long-Hai Phong Highway construction are the same as under current circumstances. + Conversely, congestion, particularly in the center of Hai Phong, is deteriorating along the current road in accordance with the increased traffic volume. If the Project is not implemented, greenhouse gases emitted by vehicles in traffic jam will further increase emissions. + Such negative impacts on traffic conditions and air quality caused by deterioration of congestion due to the increased vehicle volume in the center of Hai Phong are likely to occur. + Deterioration of traffic environment, including traffic accidents due to the increased traffic volume along existing national routes (10 and 18) and deterioration of air quality due to increased exhaust gas emissions will intensify.	○
	Land acquisition and resettlement within the scope of project	+ Number of households subject to resettlement: 67 + In addition to local residents, farmland, fish ponds and port and harbor facilities must be relocated.	△	+ Number of households subject to resettlement: 27 (the least among three routes except the Zero Option) + In addition to local residents, farmland needs to be relocated.	○	+ Number of households subject to resettlement: 60 + In addition to local residents, farmland needs to be relocated.	△	+ Number of households subject to resettlement: 0 + If there is a need to expand the road width due to increased traffic on the existing road, it will require land acquisition of farmland and residential areas.	◎

[Legend] ◎: most relevant, ○: relevant, △: other plans must be considered, ×: irrelevant

Source: JICA Study Team



Source: JICA Study Team

Figure 7.4 Comparison Results of Alternative Plans of Ha Long Hai Phong Highway (source: Google map)

Source: JICA Study Team

Figure 7.5 Current Road in Zero Option Scenario (approx. 70km on land)

7.5 Basic environmental and social conditions

The site survey on the environmental and social conditions, which serves as the basis, was recommissioned to environmental consultants in Quang Ninh Province, who conducted a field exploration and interviewed local governments and residents to check the conditions of the local administration along the road and whether flora and fauna listed on the RED DATA BOOK and IUCN RED LIST in the ecological survey existed.

7.5.1 Overview of communes along Ha Long – Hai Phong Highway

Table 7.12 shows the socioeconomic overview of communes along the Ha Long – Hai Phong Expressway that is scheduled for construction.

Table 7.12 Socioeconomic Overview of Each Commune

Administrative Zone	Area (ha)	Population (No. of	Infrastructure		Living environment	Economy
Dai Yen Ward (Ha Long City)	4,569	Approx. 9,456 2,134 households	Transport:	A total road length of approx. 51km (9km of National Route 18, 34km of narrow roads in total, 3km of road between villages, and 5km of road in the ward)	79% of residents live in a permanent house and remaining 30% live in a semi-permanent house. There is no temporary housing or shelter.	It is situated at the entrance of Quang Ninh City, blessed with the location, natural resources and transport. Economy has developed based on the varied economic structure consisting of trade, service sector, tourism, domestic industry and forestry, etc.
			Irrigation:	18km-long irrigation canal, 5km-long irrigation waterway, and 5 reservoirs		
			Electricity:	Total capacity of 2,200KVA at 9 substations		
			Educational Fac	1 kindergarten, 1 primary school and 1 junior high school		
			Social Welfare F	Obstetrics and children's hospital opened in August 2014. There are also clinics.		
			Cultural Facility	17 radio clusters (radio stations) and 1 broadcasting station		
			Market:	1 small makeshift market		
Hoang Tan Com. (Quang Yen Town)	4,011	Approx. 4,047 1,013 households	Transport:	A total road length of approx. 23.6km (8.6km in the section, 5km between villages, 5.73km of narrow roads, and 4.27km in the commune)	All households have their own house: 60% are permanent houses and remaining 40% are semi-permanent houses. The commune is recognized as one with no temporary housing or shelter.	Main industries are agricultural production, fish farming and construction material production, etc.
			Irrigation:	The irrigation system is always upgraded to meet the agricultural production. 3 freshwater reservoirs, 2 waterways, 2 drainage canals and 2 water pump stations		
			Electricity:	The power system is invested in and developed in accordance with electricity rules. The power grid to cover all households is		
			Educational Fac	2 kindergartens and primary school and junior high school that meet national standards		
			Social Welfare F	Clinic (met national standards in 2008)		
			Cultural Facility	5 culture houses and 1 facility for entire commune is built in compliance with local standards.		
			Market:	1 makeshift market		
Tan An Com. (Quang Yen Town)	1,445	5,115	Transport:	A total road length of 25.5km (2.5km of commune section, 15km between villages, 5km of narrow road, 3km in the commune) 2km of waterway	50% of houses meet standards of the Ministry of Construction and remaining 50% are semi-permanent houses, not temporary dwelling or shelter.	The main industries are fish farming and agriculture and other industries include shipbuilding and ship repair, carpentry, fish transport, tourism and small-scale retailing. Manufacturing sector in which more than 1,000 workers are engaged has developed.
			Irrigation:	5km of irrigation waterway, 3 drainage canals work effectively for agriculture and flood prevention.		
			Electricity:	6 substations (total capacity of 1,450KVA). 100% of households use power safety permanently.		
			Educational Fac	1 day care, 1 kindergarten, 1 primary school and 1 junior high school		
			Social Welfare F	1 clinic (met national standards in 2006)		
			Cultural Facility	Culture house in all the 5 villages, 1 broadcasting station, and 1 play ground for sports and cultural activities		
			Market:	1 makeshift market that satisfies basic needs of residents		
Tien An Com. (Quang Yen Town)	1,143	Approx. 9,348人 2,438 households	Transport:	A total road length of 67km (45km of it is paved under technical standards of the Ministry of Construction)	75% of houses meet mandatory requirements of the Ministry of Construction and there is no temporary dwelling or shelter.	Main industries are agriculture (rice and vegetable production), retailing and service industries. Economy has grown fairly well.
			Irrigation:	2 dams, 53.5km of irrigation waterway in total managed by the commune. 2 drainage canals (4.2km), and 1 sewer system		
			Electricity:	8 substations (total capacity of 2,000KVA). The power grid does not meet the demand of residents and electricity sector. 98% of households use power safety permanently.		
			Educational Fac	1 kindergarten, 1 primary school and 1 junior high school		
			Social Welfare F	1 clinic that meets national standards but has become depleted recently.		
			Cultural Facility	Culture house in all the 16 villages and 8 sports grounds. No culture house or stadium for the entire commune		
			Market:	1 central market in gien sen and Roc market		

Ha An Com. (Quang Yen Town)	2,711	9,208 2,254 households	Transport:	A total road length of 48km (4.8km of commune section road, 6.2km between villages, 25.7km of narrow road, and 11.3km in the commune)	40% of houses are permanent houses and remaining 60% are semi-permanent houses. There is no temporary dwelling or shelter.	Economic structure: 79% of industrials, 15.4% of service and commerce, and 5.6% of agriculture
			Irrigation:	9km-long sea embankment for tidal prevention. The irrigation system in two areas in the east and west has a total length of 29km and includes 35 branching channels.		
			Electricity:	9 substations (total capacity of 2543KVT). 99.9% of households use electricity in their everyday life.		
			Educational Fac	3 schools that meet national standards		
			Social Welfare F	1 medical center that meets national standards		
			Cultural Facility	1 culture house, which has been depleted and cannot be used. 11 of 14 villages have public house. 1 playground for the entire commune		
			Market:	1 low-standard market		
Phong Hai Com. (Quang Yen Town)	606	8,150 2084 households	Transport:	A total length of 1.8km asphalt road, 8 bridges that do not meet mandatory requirements of the Ministry of Construction although they are being upgraded.	35% of houses are permanent houses and 55% are semi-permanent houses. There is no temporary dwelling or shelter.	Main industries are rice cultivation and fish farming.
			Irrigation:	Approx. 6.6km-long waterway and 20km-long drainage canals		
			Electricity:	The electric power system covers the entire area and meets the needs of production activities. However, it is not supplied sufficiently for everyday activities of residents and does not meet the demand of electricity sector.		
			Educational Fac	1 kindergarten and 1 primary school and 1 junior high school that meets national standards		
			Cultural Facility	4 public houses in the commune, no culture center or sports center		
			Market:	No standard market		
Phong Coc Com. (Quang Yen Town)	1,333	7,221 1,561 households	Transport:	11.7km-long road in the commune	All of the 1,561 household have a tiled house and 1,200 of them meet standards. The majority is made solid with bricks, cement and mortar and sand, etc.	The commune has 962.6ha-wide water surface including lakes and Mac yard swamp and thus it is favorable to fish farming development. Agriculture and fisheries account for 59.5% of total production value. Other industries include
			Irrigation:	26.3km-long waterway as an irrigation system		
			Electricity:	3 substations. New substations need to be constructed.		
			Educational Fac	3 schools		
			Cultural Facility	No culture center or sports center. Small culture center in 6 villages		
			Market:	Dhien cock market		
Lien Hoa Com. (Quang Yen Town)	3,019	7,961 2,132 households	Transport:	3.9km-long main road (asphalt pavement) and 4 bridges (depleted although consolidated)	60% of houses meet mandatory requirements of the Ministry of Construction. There is 1 temporary housing.	Situated in a coastal flat area with a convenient transportation system, the area is favorable to development of agriculture, fisheries and service sector. Economic structure: 61.8% of agriculture, forestry and fisheries, 25.3% of trade and service sector, 12.9% of industrials, handicrafts and construction
			Irrigation:	A total length of approx. 10.5km waterway and 20k-long drainage canal. They need to be improved .		
			Electricity:	The electric power system covers the entire area and meets the needs of production activities and residents use power safely permanently. The power grid needs to be upgraded.		
			Educational Fac	1 kindergarten, 1 primary school and 1 junior high school		
			Cultural Facility	No culture center or sports center for the entire commune. 6 of 8 villages have public house.		
			Market:	2 low-standard markets, one of which is a makeshift market		
Lien Vi Com. (Quang Yen Town)	3,002	9,674 2,065 households	Transport:	4.8km-long arterial road, 16.5km-long village road and 8km-long road in the commune	75% of all households have a permanent house that meets standards of the Ministry of Construction. There is no temporary dwelling or shelter.	There is a wide natural area and fish farming and agriculture have developed rapidly. Economic structure: 59.7% of agriculture, forestry and fisheries, 30.2%of trade and service sector, 10.1% of industrials, handicrafts and construction
			Irrigation:	A total length of approx. 66.5km waterway and 20km-long drainage canal. Irrigation works to supply water for agricultural land are underway in Lake Yen Lap and freshwater project to supply		
			Electricity:	5 substations. All household use electric power.		
			Educational Fac	2 kindergartens, 1 primary school and 1 junior high school		
			Social Welfare F	Clinic(s) that meet(s) national standards		
			Cultural Facility	1 hall in People's Committee, 6 culture houses and 2 sports centers		
			Market:	1 central market and 1 market in Vi Khe village although they need to be upgraded.		
Dong Hai 2 Ward. (Hai Phong)	3,134	8,022 1,847 households	Transport:	A total road length of approx.18.65km A total length of 13km of waterway system in upper reaches of Cam River	Ports and harbors and logistics are core of the industry. Many households are engaged in the distribution sector.	It is in Hai Phong and industrials, commerce and service sector have developed. He core business is transportation and service at the piers. Din Vu Port is situated in the ward.
			Irrigation:	98% of households use tap water.		
			Electricity:	All households use electric power.		
			Social Welfare F	1 clinic		

Source: JICA Study Team

7.5.2 Ecological survey results

The main ecosystem surrounding the Project construction site is classified into the following: mangrove (all Dam Nha Mac area), river mouth and wetland.

(1) Mangrove ecosystem

The mangrove is distributed throughout almost the entire Dam Nha Mac area (Quang Ninh Province). However, the distribution points are not the result of natural exuberance. It grows in and outside fish farms separated by man-made dams created there. The survey results show that mangrove distribution points and growth condition depend on impacts such as river flooding height, soil hardness and tides. Around the Bach Dang River mou, mangrove of 36 species in 24 families are confirmed. Eighteen species that grow around the Dam Nha Mac area include Sonneratia caseolari and Avicennia marina and mangrove that is tall and wide as an individual. Aegyceras corniculatum, Avicennia lanata, Avicennia marina, Kandelia candel, Bruguiera gymborrhiza and Derris trifoliata were observed in the tidal zone and Acanthus ilicifolius, Excoecaria agallocha, Sesuvium portulacastrum, Acrostichum aureum, Suaeda maritima, Cynodon dactylon and Cyperus stoloniferus were observed in tidal land affected at high tide. Sonneratia caseolaris was observed in the surrounding forest. This includes native mangrove and artificially grown individuals.

(2) Vegetation distribution

- Mangrove mainly comprising Avicennia marina and Rhizophora stylosa: Salt concentration and inundation height peak and they are distributed in newly formed sand zones significantly affected by waves and tides.
- Mangrove mainly comprising Rhizophora stylosa, Rhizophora stylosa +, Bruguiera gymnorhiza +, and Kandelia candel: distributed in areas with relatively high salt concentrations and average tidal height.
- Mangrove mainly comprising Sonneratia caseolaris, Aegiceras corniculatum and Lumnizera littorea: Distributed in brackish water zones at river mouths significantly affected by freshwater.
- Bruguiera gymnorhiza, Bruguiera gymnorhiza, Rhizophora stylosa and Aegiceras corniculatum and other shrub mangrove: Distributed in coastal zones with thick nutrient-rich deposits and good water circulation due to the tide.
- Mangrove grass zone mainly comprising Phragmites valltoria: It grows in areas where mangrove does not grow well or has been logged because it is photophilic.

(3) Vegetation around residential areas

- Plant formation around residential areas: perennial crops, corn and other annual highland crops and perennial trees for timber, etc.
- Mangrove shrubs on water surface of fish farms: Distributed in coastal areas and salt soil where mangrove originally grows.

When the fish ponds and other plants were compared, it emerged that the river bank zone not used as fish ponds showed considerable biodiversity and a forest coverage rate in coastal wetland, excluding shrimp farms, of 90 to 95%. Accordingly, the layered tree distribution is not clear,

which constitutes an ideal condition for the revival of nursery stock.

Trees growing in ponds are pure breed and low and the coverage rate is also low. Almost no other species but Rhizophora stylosa (approx. 95%) is observed, while the distribution of other species is observed only around the wetland area. Because it is always submerged, Kandelia candel, Bruguiera gymnorhiza and Aegiceras corniculatum cannot perform root respiration due to oxygen shortage and thus cannot survive. The main cause of weakened revival capacity of nursery stock is the relationship with the water level.

Creatures living in mangrove thrive. Six to 22 species are observed as water surface vegetation per observation point. Five to nine animal species, three to 11 mangrove species and one to three species of benthic vegetation were observed to live in water. Within the area, 14 bird species and 39 fish species are confirmed to be living.

(4) Ecosystem at the river mouth

The study team examined ecological distribution in the coastal tidal zone, riverbed and its surrounding areas of the Bach Dang River mouth. Mangrove along the coast was mainly distributed on the north bank of the Cam River (Hai Phong City) and sedimentation areas. In most of the south side of the Cam River, port and harbor buildings, plants and factories are located. Mangrove vegetation mainly comprises pure breed trees of Sonneratia caseolari and Aegyceras corniculatum, Kandelia candel and Cyperaceae are scattered at a low rate (below 5%).

The biome in the area has two opposite trends:

- Plants and animals on the water surface grow better than mangrove.
- In comparison, other biome growth is inferior to that of mangrove. There were zero to three animal species, zero to three mangrove species and almost no birds per observation point of waterbed.

(5) Ecosystem in wetland

The area was formerly used as a fish farm. The main creature in the wetland is brackish algae. Although there is much mangrove vegetation from zero to eight species, they scatter and do not form forests. Almost no birds are observed.

7.5.3 Existence of flora and fauna listed in the RED DATA BOOK and IUCN RED LIST

(1) Water surface flora

Ninety-eight species in six types of algae were observed in the planned Project area in the site survey in August 2014, most of which diatom (36 species).

No species listed in the Vietnamese RED DATA BOOK or IUCN RED LIST was observed.

(2) Water surface fauna

It is identified as an area which 36 taxa inhabit, most of which arthropod.

No species listed in the Vietnamese RED DATA BOOK or IUCN RED LIST was observed.

(3) Mangrove

Eighteen species in 14 families of mangrove plants were observed in the planned Project area .

No species listed in the Vietnamese RED DATA BOOK or IUCN RED LIST was observed.

(4) Benthic habitants

Forty species in three groups of invertebrates were observed in the planned Project area in the site survey in August 2014, of which the mollusk (16 species) dominated.

No species listed in the Vietnamese RED DATA BOOK or IUCN RED LIST was observed.

(5) Fish

Thirty-nine fish species (Actinopterygii) were observed.

The following two species are listed in the Vietnamese RED DATA BOOK 2007: Bostrichthys sinensis (endangered species IA: CR) and Channa maculata (endangered species IB: EN). It was confirmed by local residents and relevant parties involved in the Project that the two species are frequently caught in ponds in the Dam Nha Mac area.

No species listed in the IUCN RED LIST was observed.

(6) Birds

In 2002, the Institute of Ecology and Biological Resources announced 40 bird species inhabiting the Dam Nha Mac area, some of which very rare. For example, Platalea minor is categorized as EN on the IUCN RED LIST and R in the Vietnamese RED DATA BOOK, while Phalacrocorax carbo is categorized as EN in the Vietnamese RED DATA BOOK.

The team conducting the site survey within the planned Project area in August 2014 observed only 14 species, none of which was listed in the IUCN RED LIST or the Vietnamese RED DATA BOOK

(7) Animals

According to interviews with local communities, hamsters in Cricetidae were observed. Although Lutra lutra (Eurasian otter) was observed 30 years ago, no lonber was observed.

7.5.4 Summary of the ecological survey

A total of 242 species of creatures (97 water plant species, 18 mangrove plants, 34 animals inhabiting water, 40 benthis animal species, 39 fish species and 14 bird species) were observed during the observation period in the area where the Bach Dang Bridge construction is planned.

Two species (Bostrichthys sinensis: CR; Channa maculata: EN) listed in the Vietnamese RED DATA BOOK were observed. Two bird species--Platalea minor (CR in IUCN and R in the Vietnamese RED DATA BOOK) and Phalacrocorax carbo (EN in the Vietnamese RED DATA BOOK)—may be inhabiting there.

The Bach Dang River traverses three areas with different ecosystems:

- Mangrove: Its distribution is observed in areas separated by fish pond.

- River mouth area: Almost no bird species is observed due to the significant impacts of the port and harbor activities. There are few mangrove plants and Sonneratia caseolari dominates.
- Wetland: Few species are observed because of the impacts from ports and harbors and residential areas.
- Impacts on the surrounding ecosystem must be minimized during the construction and operation and there is also a need to observe and monitor biodiversity in accordance with regulations.

Table 7.13 Scenes of EIA Survey

Ph-1 Site survey
Checking the survey location

Ph-2 Site survey

Ph-3 Water channel in the Dam Nha Mac area
Flow direction changes due to tidal impacts

Ph-4 at high tide in the Dam Nha Mac area

Ph-5 Boats and fish basket used by fish farmers in the Dam Nha Mac area

Ph-6 Interview with fish farmers about their products and income in the Dam Nha Mac area

 Ph-7 Dam Nha Mac area Interview with fish farmers	 Ph-8 Dam Nha Mac area Same as the left photo
 Ph-9 Dam Nha Mac area Salt concentration is measured in the brackish water zone	 Ph-10 Dam Nha Mac area Same as the left photo
 Ph-11 Dam Nha Mac area Water for domestic use on fish pond premises	 Ph-12 Dam Nha Mac area Same as the left photo (a water reservoir tank)

Ph-13 Dam Nha Mac area
Interview with fish farmers

Ph-14 Shellfish (crab) raised in the Dam Nha Mac area

Ph-15 Connecting point with National Route 18 (in QN Province)
Noise and vibration measurement

Ph-16 Connecting point with National Route 18 (in QN Province)
Noise and vibration measurement (at night)

Ph-17 Phong Hai area
Noise and vibration measurement (12:30 A.M.)

Ph-18 Phong Hai area
Noise and vibration measurement (5:00 A.M.)

Ph-19 Dam Nha Mac area
Air quality observation

Ph-20 Dam Nha Mac area
Air quality observation near Bach Dang River

Ph-21 River near Dam Nha Mac area
Surface water in the Chanh River is sampled

Ph-22 Dam Nha Mac area
Surface water in the Dam Nha Mac area is sampled

Ph-23 Hoang Tan area
Groundwater (well water) collection and analysis

Ph-24 Tien An Area
Groundwater (well water) collection and analysis

Ph-25 River near Dam Nha Mac area
Chanh River bed sediment collection

Ph-26 Dam Nha Mac area
Inner water channel bed sediment collection

Ph-27 Bach Dang River
River bed sediment collection

Ph-28 Dam Nha Mac area
Water bed sediment collection

Ph-29 Dam Nha Mac area
Land surface soil collection

Ph-30 Dam Nha Mac area
Same as the left photo

Ph-31 Near the planned site of the Bach Dang Bridge
A set of ecosystem survey tools

Ph-32 Near the planned site of the Bach Dang Bridge
Bird observation

Ph-33 Dam Nha Mac area
Ecological survey in inner water

Ph-34 Dam Nha Mac area
Small fish and plankton are caught.

Ph35 Dam Nha Mac area
Collection of benthic creatures

Ph-36 Dam Nha Mac area
The collected creatures are checked.

Ph37 DaiYen People's Committee

Ph38 DaiYen People's Committee
Interview to obtain socioeconomic information in the district

Ph39 DaiYen People's Committee

Ph40 Dam Nha Mac area
Interview to obtain socioeconomic information in the area

Ph41 Lien Hoa People's Committee
Interview with vice chair

Ph42 Phong Hai People's Committee
Interview with vice chair

Source: JICA Study Team

7.6 Scoping and TOR of Environmental and Social Considerations Survey

7.6.1 Scoping results

Items on which scoping and environmental and social considerations survey are regarded required for the Project were examined and the study results are summarized in Table 7.14.

Table 7.14 Scoping Results (Bach Dang Bridge)

Category	Impact Item	Assessment		Reasons for Assessment Results
		Before construction During construction	During Operation	
Pollution control measures	Air pollution	B-	B-	During construction: Increase in exhaust gas emissions due to operation of construction vehicles and equipment is likely to cause air quality to deteriorate. During operation: Exhaust gases emitted by vehicles on the road will cause air quality to deteriorate.
	Water pollution	A-	B-	During construction: Temporary works, bridge construction and embankment works will generate turbid water during construction, which is likely to cause river water quality to deteriorate. During operation: Drainage water from the road after the completion will cause water quality to deteriorate. Although changes in the sedimentation environment of base materials caused by bridge piers are inevitable, details of the scope are unknown.
	Waste	B-	C	During construction: Construction waste soil and other waste generated by the works is likely to affect the surrounding environment. During operation: Waste (liquids (lipids, etc.) from passing vehicles, waste discarded from them and generated at tollgates, etc.) that affects areas around the disposal site is believed to be disposed of.
	Soil contamination	B-	D	During construction: When effluent, including lipids used for construction equipment, is generated at the construction yard, it raises concern over its impacts on soil contamination. There are plans to use muddy water and cement used for placement of bridge piers (piling). During operation: No soil contamination caused by bridges or piers after completion is likely to occur in operation.
	Noise and vibration	A-	B-	During construction: The noise and vibration level is likely to increase due to the operation of construction vehicles and equipment. During operation: Vehicles on the road are likely to raise the noise and vibration level.
	Subsidence	B-	B-	Consolidation settlement is likely to be caused by earth filling of soft foundations during construction and operation.
	Foul odor	D	D	There will be no works that will generate malodors.
	Bottom material	B-	B-	During construction: Drilling of foundations for bridge pier placement and placement work as well as placement of temporary piers is likely to affect bottom materials. During operation: Although bridge pier construction is likely to have impacts such as scouring and soil sedimentation around the piers, details of the extent of impacts are unknown.
Natural environment	Protected zone	D	D	There is no national park or protected zone in and around the Project site. Although the Cat Ba Island (approx. 10km from the Bach Dang Bridge) is designated as a national park, it is assessed that the construction will have no impact because of the direction of the current.
	Ecosystem	A-	B-	During construction: Civil engineering works are likely to impact on the ecosystem, including the mangrove forests in and around the Dam Nha Mac area and Bach Dang River. During operation: The new road will change the environment and may have some impact on the surrounding ecosystem.
	Hydrological phenomena	A-	B-	During construction: If civil engineering works cause a large volume of soil to flow outside the area, it will impact on the hydrological phenomena. During operation: Although bridge pier construction will have some impacts on the hydrological phenomena, details of the extent are unknown.

Category	Impact Item	Assessment		Reasons for Assessment Results
		Before construction During construction	During Operation	
	Topography and geology	B-	B-	During construction: Although there is some embankment section near the collecting point with the Hanoi-Hai Phong Expressway and in the Dam Nha Mac area, there will be no civil engineering work that will significantly change the current ground condition. There will be no impact on the geology. During operation: There is no plan of topographical change to be caused by revetment works, etc., in the Project. Although there will be no major topographical change, there will be some changes caused by embankment.
Social environment	Resettlement and land acquisition	A-	A-	During construction: Procedures for land acquisition and resettlement must be conducted prior to the construction. During operation: The impact of resettlement procedures will persist.
	Poverty group	B-	B-	During construction: There will be changes (including resettlement) of the living environment of the poor near the route. During operation: There will be negative impacts if tiny fishing operators or illegal occupants settle.
	Ethnic minorities and indigenous people	D	D	There are no ethnic minorities or indigenous people in and around the planned Project site.
	Employment, means of living and other local economy	B+/-	B+/-	During construction: Local residents will be hired for menial labor during the construction. Conversely, the Project affects fish farming (local economy) and includes negative impacts. During operation: Improved access to Ha Long and Hai Phong will benefit employment and the local economy. Conversely, bridge construction work will have negative impacts on fish farmers, which includes the handover of fish ponds.
	Use of land and local resources	C	B+/-	During construction: The shape of areas where entry in the construction site is prohibited due to construction work on the Hai Phong side is likely to affect local traffic. During operation: Road development in the Dam Nha Mac area will help improve the local logistic network, promote land use and the utilization of local resources. Conversely, land use efficiency may decline because of the segmentation of land caused by the bridge construction.
	Water use	B-	C-	During construction: River water use along the planned route is likely for irrigation and fish ponds. If civil engineering works cause water turbidity, this will affect local industry. During operation: Although less likely, impacts such as groundwater contamination caused by bridge construction will affect water consumers. Water supplied to residents along the road is delivered from reservoirs.
	Existing social infrastructure and services	B-	C	During construction: There will be some impacts on existing infrastructure on the Hai Phong side. They include relocation of high-voltage lines and impacts on existing roads along ports and harbors. During operation: It will contribute to logistics of the local community after completion. Impacts on water transport service operators in the neighboring areas will be studied and assessed.
	Social capital and local decision-making bodies and other social organizations	D	D	The Project will have little impact on social capital and local decision-making bodies, etc.
	Uneven distribution of damage and benefits	C	C	There are plans to build an interchange on the starting-point side of the Bach Dang Bridge, which will enable access to the expressway from the Dam Nha Mac area. Thus, it is unlikely that the Project will cause visible uneven distribution of damage and benefit. However, we will interview the implementing organization, etc. and confirm local conditions in the site survey to assess whether or not there will be any impact.
	Conflict of interest in the area	D	B+/-	During construction: As of now, there are no conflicts of interest in the area. During operation: There will be various impacts (positive and negative) on fish farmers, manufacturers, retailers and service providers (logistics), etc., along the road.
	Cultural heritage	D	D	There is no cultural heritage site in and around the Project section.

Category	Impact Item	Assessment		Reasons for Assessment Results
		Before construction During construction	During Operation	
	Landscape	B-	B-	Bridge and embankment construction will affect the surrounding landscape.
	Gender	C	C	Although the Project is unlikely to have any negative impact on gender, we will interview the implementing organization, etc. and confirm the local conditions in the site survey to assess whether or not there will be any impact.
	Children's rights	C	C	Although the Project is unlikely to have any negative impact on children's rights, we will interview the implementing organization, etc. and confirm the local conditions in the site survey to assess whether or not there will be any impact.
	HIV/AIDS and other infectious diseases	B-	D	During construction: Inflow of construction workers increases the risk of occurrences and transmission of infectious diseases. During operation: It is unlikely after the completion of construction.
	Working environment (including occupational safety)	B-	C	During construction: There will be works in and around rivers and in wetland, etc. Safety measures must be taken in accordance with the site environment. During operation: Bridge inspection and other safety measures must be taken.
Others	Accidents	B-	B-	During construction: Considerations to occurrences of accidents and disasters during construction are needed. During operation: Operation of expressway where vehicles run faster will increase the risk of traffic accidents.
	Cross-border impacts and climate change	D	D	The Project will have very little cross-border impact or impact causing climate change.

A+/-: Significant positive/negative impact is expected.
B+/-: Positive/negative impact is expected to some extent.
C+/-: Extent of positive/negative impact is unknown. (Further examination is needed and the impact could be clarified as the study progresses)
D: No impact is expected

Source: JICA Study Team

7.6.2 TOR of Environmental and Social Considerations Survey

(1) Scope of the survey

The scope of the survey is an approx. 5km-section from the starting point in Quang Yen Town in Quang Ninh Province to the ending point in Hai An and Du Hai districts in Hai Phong City.

(2) Items to be surveyed and survey method

The survey items and method concerning the impact items that were narrowed down in scoping are described inTable 7.15.

1) Collection of existing information and on-site conformation

The EIA carried out in 2011 for the Ha Long-Hai Phong Highway Construction Project (25km-section) is reviewed, gaps with the Guidelines for Social and Environmental Consideration are analyzed and local information on the social and natural environments is gathered.

Items in the Table set up based on the scoping results are surveyed. Although data obtained along the Bach Dang Bridge in Vietnamese EIA (2011) is available as baseline data (air, water, noise and vibration), environmental changes around the observation points after 2011 are checked on site and data is obtained in the survey at the points on which data is insufficient or where the environmental changes are significant.

Table 7.15 Survey TOR

Environmental Item	Item to be Surveyed	Survey Method
Consideration of alternative plans	① Comparison with alternative plans from environment (hydrological, ecological, etc.) and social (resettlement, land acquisition, interest) perspectives. ② Comparison based on location, line shape and scale (project cost). ③ Comparison based on growth of mangrove within the Project scope and surrounding areas	① Carry out site survey (interview with governing local governments and exploration) for each alternative plan, gather and sort environmental and social information and compare them. ② Compare location, line shape, etc., with alternative plans to see their implementation aspects and scale and compare the scale to see the project cost. ③ Confirm mangrove growth using satellite photos and site survey.
Air pollution	① Confirm past data near the planned route. ② Obtain new data of points for which data has not been obtained. ③ Confirm whether there are any infrastructure facilities emitting air pollutants and that were established after 2011. ④ Impact assessment after the highway is opened for operation	① Check Vietnamese EIA materials. ② Select monitoring points and obtain data. ③ Site survey and interview ④ Estimate the amount of air pollutants based on traffic volume forecast after the highway is provided for operation to assess impacts.
Water pollution	① Confirm past data near the planned route. ② Obtain new data of points for which no data has been obtained. ③ Understand river water use. ④ Impact assessment of drainage and polluted water discharged from construction yard and workers' quarters during construction ⑤ Impact assessment of water pollution in lower reaches caused by boring and piling for embankment of access road and bridge construction	① Check Vietnamese EIA materials. ② Select monitoring points and obtain data. ③ Site survey and interview ④ Assume location, flow volume and discharged volume based on formulated construction plan. ⑤ Comprehensive assessment based on confirmation of construction plan and work plan and ecological survey results around the construction site
Waste	① Select candidate sites for disposal location of construction waste soil. ② Assessment of deterioration of roadside environment caused by litter thrown by road users, etc. ③ Formulation of disposal plan for total waste volume ④ Examine and sort waste-related laws and regulations and waste disposal systems and understand waste disposal in watershed areas.	① Interview with relevant entities and site survey ② Interview with relevant entities and site survey ③ Interview with relevant entities and site survey. Interview with local governments, etc., on reality of waste-related laws and regulations and disposal methods

Environmental Item	Item to be Surveyed	Survey Method
Soil contamination	① Oil leakage from construction equipment, etc., during construction ② Use or abolition of harmful chemicals that affect the environment	① Check the contents, method, duration, location and scope of construction and types, operation and storage place of construction machinery and equipment. ② Confirmation based on construction plan
Noise and vibration	① Confirm past data near the planned route. ② Obtain new data of points for which data is not obtained. ③ Distance from the source to residential areas and facilities ④ Impact assessment during construction and operation	① Check Vietnamese EIA materials. ② Select monitoring points and obtain data. ③ Site survey ④ Check the contents, method, duration, location and scope of construction and types, operation and storage place of construction machinery and equipment.
Subsidence	① Subsidence or no subsidence under current conditions ② Selection of measurement points of consolidation settlement in the embankment section	① Site survey ② Selection of candidate sites based on-site check
Bottom material	① Understand bottom materials before construction. ② Impact assessment of construction on bottom materials	① Bottom material sampling and analysis before construction ② The bottom material survey is mainly to check whether there are any chemicals that cause water pollution. Understand chemicals used for boring and piling, take required measures and compare results by obtaining baseline data and data during construction in the Bach Dang River and Dam Nha Mac area
Protected zone	① Impact assessment for possible soil flow from the construction site into the Cat Ba Island (national park), etc.	① Acquire current data for impact assessment.
Ecosystem	Check whether there are any rare fauna and flora near the planned road site. Check mangrove growth. Impact assessment of boring and piling for embankment of access road and bridge construction and cutting of mangrove forests on ecosystem (flora and fauna including mangrove, fish and birds) in upper and lower reaches Assess short and mid-term impacts of cutting of mangrove forests (change into land areas, impacts on animals living in mangrove, illegal waste dumping, etc.).	① Site survey and interview with relevant entities ② Site survey ③ Assessment taking ecological and mangrove ecological survey results into consideration and estimated soil volume from the construction site. ④ Interview with Quang Ninh Provincial Agricultural Center and local governments
Hydrological phenomena	① Understand the conditions of the surface and bottom water before and during construction. ② Assess impacts of construction on hydrological phenomena.	① Impact assessment of construction on hydrological phenomena through sampling and analysis of surface and bottom water before and during construction ② Interview with Quang Ninh Province on past bridge construction projects including the Bai Chay bridge
Topography and geology	① Check current condition of section where embankment works are performed. ② Select candidate sites for soil collection and confirm their current condition.	① Site Survey ② Interview with relevant entities and site survey
Resettlement and land acquisition	① Confirm scale of resettlement and land acquisition. ② Make a resettlement plan (summary).	① Site check based on scope of construction ② Make a resettlement plan based on Vietnamese Land Law, JICA Guidelines for Social and Environmental Considerations and WB's Operational Policy 4.12, etc.
Poverty group	① Impact assessment of the Bach Dang Bridge construction on tiny fishing operators near the bridge and those who make a living in mangrove forests	① Interview with local government and fisheries associations, etc.

Environmental Item	Item to be Surveyed	Survey Method
Employment, means of living and other local economy	① Assessment of negative impacts (duration and scale) of the Bach Dang Bridge construction work on fish farmers	① Interview in target areas and with fisheries associations, etc.
Use of land and local resources	① Assessment of assumed changes of efficiency of land use to be made by bridge construction including the construction period (2 years)	① Site survey and interview with relevant entities
Water use	① Survey of Bach Dang River water use ② Water use survey in the Dam Nha Mac area ③ Impact assessment of bridge construction work on water use	① Interview with local residents and companies ② Site survey and interviewing ③ Ground assessment (groundwater distribution) based on past ground survey and interview with local residents and entities
Existing social infrastructure and services	① Existence or no existence of dwellings, schools and medical facilities around the project site ② Existing water transport service	① Site survey and interview with relevant entities ② Site survey
Uneven distribution of damage and benefits	① Imbalance of accessibility to expressway among locations	① Site survey and interviewing
Conflict of interest in the area	① Extract items of interest from the perspective of logistics (distribution and sales of primary products in particular) and living environment along the road during construction and operation.	① Interview with local residents, companies, etc. ② Interview with local governments
Landscape	① Assume impacts on surrounding landscape (elements, location and duration of landscape damage) during construction based on the construction plan. ② Assume impacts of structures (bridges and embankment) on surrounding landscape after completion of construction.	① Understand topographical conditions in the site survey. ② Produce drawings (perspective drawings, etc.) with which the site can be imagined during construction and operation.
Gender	① Assume gender issues that can be raised by bridge construction. They include local employment during construction.	① Interview with relevant entities
Children's rights	① Assume possible positive and negative impacts of project implementation on children's rights.	① Interview with relevant entities and local residence ② Interview with relevant entities and local residence
HIV/AIDS and other infectious diseases	① HIV/AIDS prevalence in neighboring areas of planned project site ② Organizations that conduct activities to tackle infectious diseases	① Interview with relevant entities ② Interview with relevant entities
Working environment (including occupational safety)	① Extract work items and styles with disaster risks based on construction plan. ② Extract risky work items in consideration of season, meteorological conditions and work process.	① Interview with concerned parties of similar projects (Hanoi-Hai Phong Expressway Construction Project, etc. in Vietnam ② Interview with concerned Vietnamese entities ③ Collection and analysis of information on occupational safety in similar projects
Accident	① Measures to handle accidents during construction ② Measures to prevent traffic accidents on expressways during operation	① Risk analysis based on assumed contents, method and location of construction work. ② Survey of similar projects (confirmation of expressway operation rules in Vietnam)

Source: JICA Study Team

7.6.3 Environmental and Social Considerations Survey Results

Information obtained as a result of an environmental and social considerations survey and based on the survey methods described in Table 7.15 is shown in Table 7.16.

Of the survey results, baseline data was obtained for indicators of air pollution, water pollution, soil contamination and noise and vibration in the section of the Bach Dang Bridge and the inseparable section (20km-section of the starting-point side of the Ha Long-Hai Phong Highway) in the survey. The results of the four indicators in the Table include an assessment of the results. Detailed prediction and evaluation for each survey results were not conducted. Figure 7.6 shows the location map of the baseline data survey.

Table 7.16 Environmental and Social Considerations Survey Results

<table>
<tr><td>Consideration of alternative plans</td><td>Details are described in 7.4.</td></tr>
<tr><td>Air pollution</td><td>Results of baseline data acquisition during the survey are shown below.

[TSP: 24-hour average of suspended particulate matters]
<table>
<tr><th>Measurement point</th><th>Measurement place</th><th>Measured value</th><th>Tolerance</th><th>Measurement unit</th></tr>
<tr><td>KK1</td><td>Starting point of Ha Long-Hai Phong Highway</td><td>137</td><td rowspan="4">200</td><td rowspan="4">μg/m³</td></tr>
<tr><td>KK9</td><td>Phong Hai district</td><td>41</td></tr>
<tr><td>KK14</td><td>Crossing point of Bach Dang bridge and National Route 5 in Hai Phong</td><td>221</td></tr>
<tr><td>KK15</td><td>Crossing point with Hanoi-Hai Phong Highway</td><td>100</td></tr>
<tr><td colspan="5">Vietnamese standards: QCVN 05: 2013/BTNMT</td></tr>
</table>
Although SO_2 (sulfur dioxide), PM (particulate matter) 10 were observed (24-hour average) at the above observation points, the values were far below the tolerance.

[TSP: suspended particulate 1-hour average value]
<table>
<tr><th>Measurement point</th><th>Measurement place</th><th>Measured value</th><th>Tolerance</th><th>Measurement unit</th></tr>
<tr><td>KK16</td><td>Central Dam Nha Mac area</td><td>34</td><td rowspan="2">300</td><td rowspan="2">μg/m³</td></tr>
<tr><td>KK17</td><td>Crossing point of Dam Nha Mac area and Bach Dang Bridge</td><td>51</td></tr>
<tr><td colspan="5">Vietnamese standards: QCVN 05: 2013/BTNMT</td></tr>
</table>
Although NO (nitrogen oxide) was observed (1-hour average) at the above observation points, the values were far within the tolerance at both points.

The observation result of air pollution that exceeded the Vietnamese standards was only the 24-hour average of TSP at KK14. It is along the coastal road (National Route 5). Container transport vehicles, cement transport vehicles and other large freight vehicles run the coastal road during daytime and at night and there are major impacts of dust and exhaust gases there.</td></tr>
<tr><td>Water pollution</td><td>Results of baseline data acquisition during the survey are shown below.

[Water pollution: observation points and values]</td></tr>
</table>

Item	Unit	Criteria	Measurement result			
			NN1 Resident area of Huang Tang village	NN2 Resident area of Tien An I village	NN9 Resident area of Hong Hai urban district	NN10 Hai Phong City Resident area of Dong Hai 2 villages
Water temperature	℃	-	28.3	27.6	30.2	28.6
pH	-	5.5-8.5	7.1	6.3	6.8	7.2
Turbidity	NTU	-	1.07	1.22	1.11	1.16
Conductivity	mS/cm	-	0.531	0.390	2,290	0.647
Water hardness	mg/l	500	16	15.4	51.6	44.8
COD		4	10	7.1	8.3	8.9
Suspended solid		1,500	262.7	211.3	967.7	284.5
Pb		0.01	<0,005	0.0086	0.0261	0.0246
Cd		0.005	<7.10-4	<7.10-4	<7.10-4	<7.10-4
Zn		3	0.16	0.14	0.15	0.14
Mn		0.5	0.05	0.03	0.25	0.04
Fe		5	0.18	0.08	0.10	0.05
Hg		0.001	<5.10-4	<5.10-4	<5.10-4	<5.10-4
As		0.05	0.0018	0.0022	0.0033	0.0028
Colon bacillus	MPN/ 100ml	3	0	5	3	4
QCVN 09:2008/BTNMT						

Underground well water for water for domestic use in residential areas in the village near the project area was surveyed for the water pollution survey. According to the survey results, the temperature of well water is high at all wells and coli bacteria were detected in three wells, which show big impacts from the surface. In particular, the electrical conductivity at NN9 was 2,290 mS/cm, which is approx. 4,400 times as high as other locations. Other heavy metals were less than standard values.

[TSS: suspended solids] Measurement unit: mg/l

Measurement point	Measurement place		Measured value	Tolerance	Tolerance
NM7.1	Chanh River	Bottom	64	100	mg/l
NM7.2	Chanh River	Surface water	81		
NM9.1	Bach Dang River at crossing point of Bach Dang Bridge	Bottom	186		
NM9.2	Bach Dang River at crossing point of Bach Dang Bridge	Surface water	205		
NM10.1	Central Dam Nha Mac area	Bottom	82		
NM10.2	Central Dam Nha Mac area	Surface water	95		
NM11.1	Inner water area in Dam Nha Mac area, point with water balance with the Bach dang River	Bottom	108		
NM11.2	Inner water area in Dam Nha Mac area, point with water balance with the Bach dang River	Surface water	132		
Vietnamese Standards: QCVN 08: 2008/BTNMT					

The COD (chemical oxygen demand) and BOD5 (biochemical oxygen demand) of samples from surface water collected at the above observation points were observed and the values were far below Vietnamese standards QCVN 08: 2010/BTNMT(B2) at both points.

The observation results show that water quality at the points (NM11/NT11) near the Bach Dang River where there is a significant impact of water balance at ① Bach Dang River (NM9/NT9) and ② Dam Nha Mac area exceed Vietnamese standards. (Value at ① is approx. twice as much as the standard, while the value at ② is 10% higher than standards.) The values at other points were below the standards.

Waste	The project operator is in charge of cutting trees in the site clearance area and the area that is approved based on the application submitted by the project implementation side to construct the bridge and approach road. * An inquiry to determine who is responsible for tree cutting and waste disposal is submitted to Quang Ninh Province. Materials for temporary works and waste materials and lipids from the site must be disposed of at the designated disposal site in the designated disposal method and in accordance with national regulations.
Soil contamination	Details of baseline data obtained on site during this survey are being sorted.

Item	Unit	Torelence	Measurement result			
			D2	D8	D9	D10
			Tien An I village	Phong Cong village	Dan Nha Mac district	Dan Nha Mac district
Cu	mg/kg dried	50	70.38	18.72	56.72	50.58
Pb		70	61.09	18.93	66.22	54.88
Cd		2	0.465	0.061	0.205	0.331
Zn		200	71.67	<2	41.05	36.61
Mn		-	1,017	600	124	1,105
Fe		-	24.72	9.17	28.66	25.72
Hg		-	<0,0005	<0,0005	<0,0005	<0,0005
As		12	20.38	4.85	26.31	22.84
QCVN 03:2008/BTNMT (agricultural soil)						

Measurement was carried out using criteria

Noise and vibration

The results of the baseline data acquisition during the survey are shown below.

[Noise: Measurement point and values]

Period 6:00-21:00	Measurement place			
	O1	O9	O14	R15
	Starting point of Ha Long - Hai Phong Highway	Phong Hai district	Crossing point of Bach Dang bridge and National Route 5 in Hai Phong	Dinh Vu District, Ending Point of the Project
Unit	dBA			
Torelance	70			
6:00–7:00	63,6	64,3	65,8	58,1
7:00-8:00	68,6	64,7	65,5	58,6
8:00-9:00	68,3	63,8	67,6	59,3
9:00-10:00	67,3	64,4	68,9	60,4
10:00-11:00	66,7	64,7	69,2	60,9
11:00-12:00	67,1	63,2	69,7	61,2
12:00-13:00	65,7	62,7	68,0	61,4
13:00-14:00	64,9	62,2	68,9	61,0
14:00-15:00	65,6	62,9	67,1	60,7
15:00-16:00	67,3	63,3	66,7	59,7
16:00-17:00	68,0	63,9	68,6	60,3
17:00-18:00	66,8	63,6	69,2	61,7
18:00-19:00	64,7	62,8	68,1	58,7
19:00-20:00	63,8	60,9	67,4	57,2
20:00-21:00	61,5	57,7	66,9	55,7
QCVN 26:2010/BTNMT (6h to 21h)				
Unit	dBA			
Torelance	50			
21:00-22:00	60,1	54,3	65,7	53,7
22:00-23:00	57,3	53,5	64,9	52,6
23:00-24:00	56,8	52,8	62,2	52,7
24:00-1:00	55,7	51,9	62,7	52,9
1:00-2:00	54,8	51,6	61,1	52,2
2:00-3:00	54,5	50,9	60,7	52,4
3:00-4:00	55,9	52,9	59,9	53,1
4:00-5:00	59,3	53,1	62,5	53,6
5:00-6:00	63,4	54,8	63,9	54,9
QCVN 26:2010/BTNMT (21h to 6h)				

Noise measurement results (averages) once every two hours exceeded the tolerance at night (21:00 – 6:00) at 014 (National Route 5). O14: 65-70 dBA during day and 60-66 dBA at night. This is because the tolerance (average value) at night is 55dB.A. Results at other observation points were below the tolerance.

Period 6:00-21:00	Measurement place			
	R1 Starting point of Ha Long - Hai Phong Highway	R9 Phong Hai district	R14 Crossing point of Bach Dang bridge and National Route 5 in Hai Phong	R15 Dinh Vu District, Ending Point of the Project
Unit	dBA			
Torelance	70			
6:00–7:00	43,1	43,7	46,9	41,1
7:00-8:00	44,7	43,2	46,3	43,1
8:00-9:00	44,1	42,6	45,7	42,9
9:00-10:00	43,8	42,1	45,2	42,8
10:00-11:00	42,9	41,9	44,9	42,6
11:00-12:00	43,9	41,7	45,3	42,1
12:00-13:00	43,6	41,5	44,7	42,2
13:00-14:00	43,2	41,9	43,9	42,3
14:00-15:00	44,4	42,4	44,6	42,0
15:00-16:00	44,7	43,0	45,7	42,6
16:00-17:00	45,0	43,6	46,7	42,8
17:00-18:00	44,3	43,8	46,2	43,0
18:00-19:00	44,8	42,9	45,1	43,1
19:00-20:00	43,6	42,5	45,3	42,8
20:00-21:00	43,9	41,8	45,6	42,1
QCVN 27:2010/BTNMT (6h to 21h)				
Unit	dBA			
Torelance	60			
21:00-22:00	42,5	41,0	44,7	41,6
22:00-23:00	42,3	40,8	44,4	41,4
23:00-24:00	41,5	40,7	43,9	41,8
24:00-1:00	41,3	40,2	42,1	41,5
1:00-2:00	41,3	39,5	42,0	41,2
2:00-3:00	40,9	39,4	41,9	41,6
3:00-4:00	41,4	39,2	42,3	42,0
4:00-5:00	42,4	41,2	43,7	42,7
5:00-6:00	42,9	41,7	45,2	42,6
QCVN 27:2010/BTNMT (21h to 6h)				

Vibration was measured at between 40 and 47dB for 24 hours at both points and the average value was below the tolerance level.

Subsidence

There is no major groundwater intake in the planned section of the Bach Dang Bridge and thus no factor that will cause subsidence. Subsidence needs to be monitored when ground improvement and embankment works are performed in the construction stage.

Bottom material

Item	Uinit	Criteria	Measurement place			
			TT7	TT9	TT10	TT11
			Chanh River	Bach Dang Bridge	Dam Nha Mac area Central waterway	Ending point area of Bach Dang Bridge
Cu	mg/kg dried	108	6.75	16.02	19.79	39.00
Pb		112	9.62	8.11	22.11	34.99
Cd		4.2	0.21	0.27	0.15	0.08
Zn		271	<2	<2	<2	32,461
Mn		-	694	954	1,123	1,253
Fe		-	2.99	8.02	21.10	24.92
Hg		0.7	0.45	0.33	0.27	0.08
As		41.6	2.21	1.59	15.53	25.35
QCVN 03:2008/BTNMT						

Protected zone

Following a review of current data at the planned Bach Dang Bridge site point, Cat Ba Island and near the area designated as Ha Long Bay world heritage, the construction work will have no impact as the current is moving farther from the island.

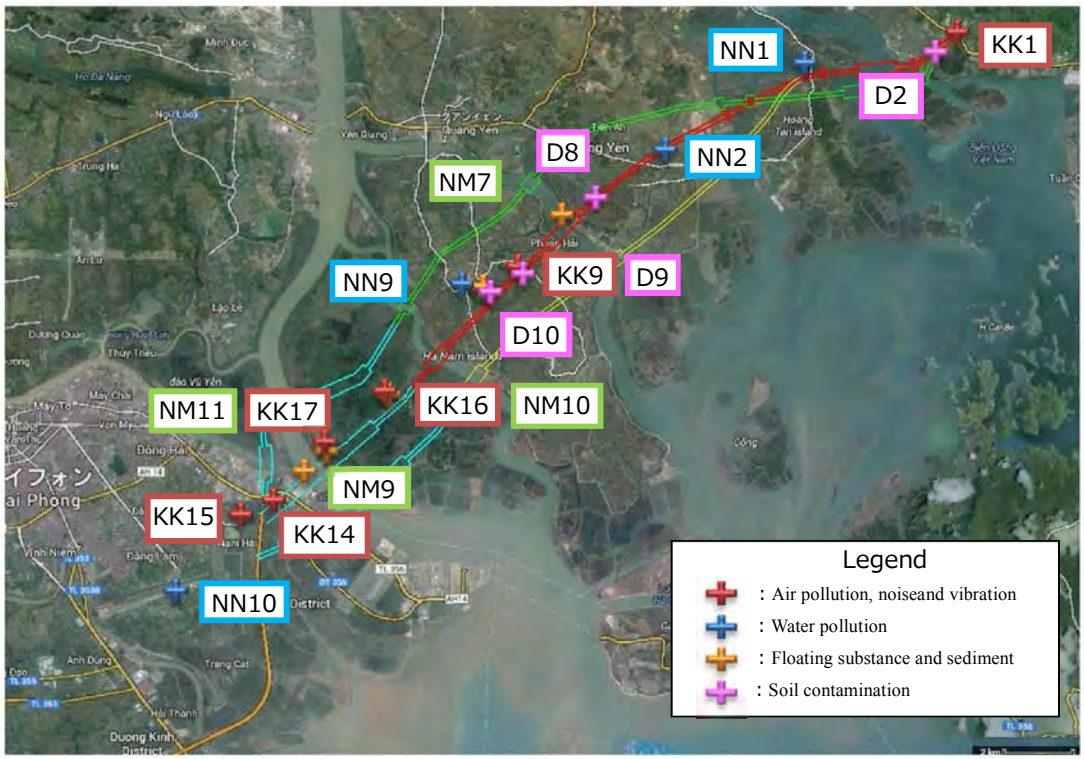
Ecosystem

* The ecosystem is based on the original survey results through employment of outsourcees.
The site survey was conducted within the scope of 250 meters from the centerline of the road on each side for the section of the Bach Dang Bridge construction (5km) to check flora and fauna and ecosystem in the area. No animal or plant species designated as rare or endangered species in IUCN or Vietnamese red BOOK was observed.
As for cutting conserved forests (mangrove), Decree 23/2006/ND-CP stipulates that the logger is obliged to choose one of the following: ① plant trees at another location equivalent to that of the area where the trees are cut down (90% of the grown trees must be checked based on the growth observation obligation for a minimum of 3 years) or ② payment of compensation for the area equivalent to that where the trees are cut

	down (specified in Decision 38). If the logged area of the conserved forest is smaller than 20ha, a provincial approval will suffice. Application for approval from central government (including Prime Minister's approval) is required when the area is bigger. Tree planting activities must be launched within 18 months of logging. The activity plan is required together with a detailed design. (The above is confirmed with the MARD.) The logger is Quang Ninh Province (confirmed in the fourth site survey.
Hydrological phenomena	The project is likely to have the following impacts on the ecosystem: water pollution and soil contamination by civil engineering work during construction and the pollution will affect the ecosystem, including mangrove forests around the Dan Nha Mac area and Bach Dang River. During operation, impacts on the surrounding ecosystem caused by environmental changes caused by new road construction may persist. Baseline data results obtained during the survey period are shown below. Underground well water for water for domestic use in residential areas in the village near the project area was surveyed for the hydrological phenomena survey. According to the survey results, the well water temperature was high at all wells and coli bacteria were detected from three wells, which showed big impacts from the surface. In particular, the electrical conductivity at NN9 was 2,290 mS/cm, which is approx. 4,400 times as high as other locations. Other heavy metals were below standard values. The Project may have impacts on the hydrological phenomena such as water turbidity if a large volume of soil flows out from the civil engineering work site as well as changes of groundwater flow due to deep dredging and the construction of underground structures during the work. Hydrological phenomena may be affected by constructing bridge piers during operation.
Topography and geology	The Dam Nha Mac area is situated at the mouth of the Bach Dang River. It is a flat area (0.5 to 1.5 meters above sea level on average) where deposits mainly comprising fine-grain fractions are washed away by the river and oceanic deposits, most of which wetland. Natural water channels and man-made channels that were excavated and developed (for shrimp, crab and small fish ponds) are in the 37-square-kilometer-wide wetland and sea water circulates in the channels constantly because of the tidal influence.) Dong Hai and 2 areas on the Hai Phong side are being developed as part of Din Vu Industrial Park. Geologically, the areas also have thick deposits (approx. 20 meters) washed away by the Bach Dang River and Cam River. The area near the planned Bach Dang Bridge site is also flat (1.8 to 2.6 meters above sea level on average), gently sloping from north to south. The road embankment is to be built on soft layers and a construction plan must be formulated based on soft ground analysis (consideration of subsidence) based on a sufficient ground survey. In the bridge section, there are plans to place bearing piles in the foundation layer.
Resettlement and land acquisition	The details are described in 7.1.
Poverty group	There is no illegal occupant or resident with no permanent address around the planned Bach Dang Bridge site, according to an interview with local government. Although there are tiny fishing operators who catch fish in the mangrove distribution area and river as an income source, they have regular work and catch fish irregularly as a side job.
Employment, means of living and other local economy	Those who must resettle due to the Bach Dang Bridge construction are limited to households engaged in fish farming in the Dam Nha Mac area (on the Quang Ninh Province side). The households subject to resettlement and land acquisition in the Site Clearance are subject to compensation for the cost of developing fish ponds and related facilities (house for living, fish ponds, floodgates, etc.) New ponds can be built in areas designated as fish farming promotion area by the local government in the future plan for ponds subject to land acquisition and can continue to operate fish farming. They are also eligible for support from local government. Although the agricultural cooperative (fish farming is governed by the fisheries section of the agricultural cooperative rather than fishery cooperatives in the area) and personal income will be affected during the resettlement and until their operation at the new place gets on track, it is not a long-term impact. Local communities expect that the Bach Dang Bridge construction will generate employment for menial labor on the construction site.
Use of land and local resources	The Dam Nha Mac area comprises fish ponds, idol land (for fish ponds) and wetland of mangrove forests and only use by fish farmers is planned. There is no land for personal use on the Hai Phong side. It is a container yard site, with land owned by companies, wetland and existing public roads. Although the land for the highway and that occupied during construction are subject to compensation, Hai Phong City needs to coordinate the existing land plan and the land plan for the bridge that will be newly constructed.
Water use	Fish farmers in the Dam Nha Mac area use rainwater in stock or drinking water delivered by its boat delivery service providers to secure drinking water (no well water available) as well as rainwater and river water for domestic use, according to the interview in the site survey. Only companies are situated along the road of the planned route on the Hai Phong side and their business does not consume much groundwater or surface water. Some ordinary households transmit water from reservoirs for tap water and depend on well and stored rainwater for domestic use on the Hai Phong side. River water is used for irrigation.
Existing social infrastructure and services	There are some impacts on existing infrastructure on the Hai Phong side. They include the relocation of high-voltage lines, impacts on existing road along the port and harbor and segmentation of container yards. Currently, there is no regular ferry service around the planned Bach Dang Bridge site to deliver people and goods to the wetland in the Dam Nha Mac area. Although there are ferry services at a place several kilometers away, they are not to or from the wetland in the Dam Nha Mac area.
Uneven distribution of damage and benefits	The Bach Dang Bridge section on the Quang Ninh Province side (Dam Nha Mac area) is untapped, making it unlikely that uneven distribution of damage and benefits will become clear, in addition to the damage in the sense that ponds of existing fish farmers will become targets of relocation. On the Hai Phong side, part of land used for companies is subject to acquisition and it (damage) is subject to compensation. Because access to city roads, etc., is not secured in the section on the Hai Phong side of the Bach Dang Bridge, there

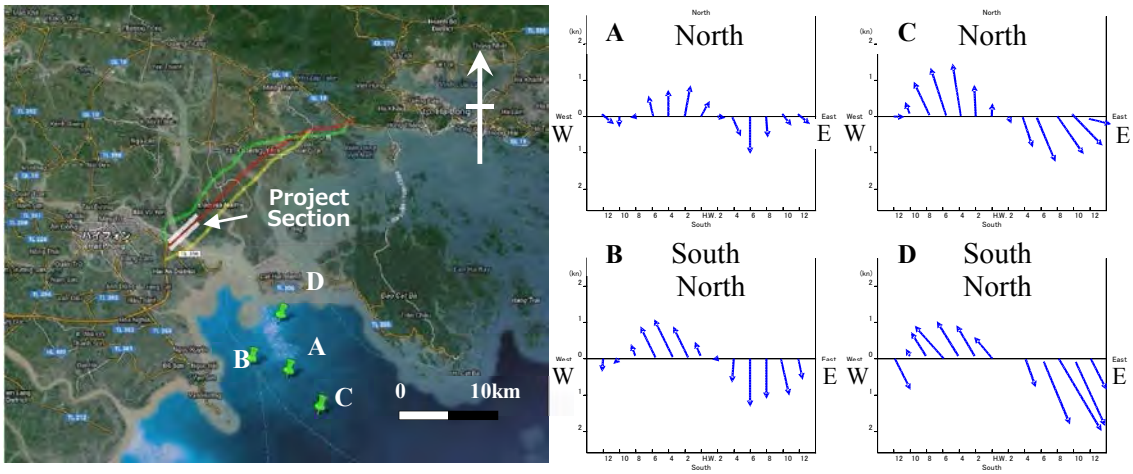
	is no factor to cause benefits.
Conflict of interest in the area	The Dam Nha Mac area is untapped and the Bach Dang Bridge construction cannot be a factor of conflict interest in the area. The absence of a land use regulation plan or drainage development plan according to the site survey results make it very unlikely that any conflict of interest will emerge. Although the land use plan on the Hai Phong side after the bridge construction has yet to be formulated, a conflict of interest may arise if the roadside development plan of the expressway, including interchange, leads to a sharp rise in land use fees when the mid- to long-term impacts are considered.
Landscape	It is approx. 10km to the neighboring national park (Cat Ba Island) designated by the government, which means no impact on the park. There is no such tourist spot as beaches in the neighboring area and there is no such locational condition whereby the structure to be constructed at the bay mouth will hinder the background natural landscape.
Gender	Local government officials responded in the interview that the Project was one of traffic infrastructure development and thus unrelated to gender issues.
Children's rights	Local government officials responded in the interview that the project was a traffic infrastructure development project and thus did not affect children's rights.
HIV/AIDS and other infectious diseases	The construction site is on the opposite bank of Hai Phong City and near Quang Yen Town on the Quang Ninh Province side. There is a need to instruct the parties involved in the construction, formulate an educational plan and ensure all are aware of the same regularly to prevent infectious diseases during construction.
Working environment (including occupational safety)	In the section of the Bach Dang Bridge construction, most of the works are above the river or on soft ground, according to the site survey and past ground survey results. There is a need to plan safety measures and ensure workers (including those locally hired) are fully aware of safety rules to prevent industrial disasters and accidents. Similarly, there is also a need to pay attention when inspections are carried out by road and bridge management bodies in the maintenance stage after completing the bridge.
Accident	Industrial disasters and accidents during the construction and traffic accidents caused by vehicles on the road and those caused when workers engaged in facility inspections and structure diagnosis collide with passing vehicles after the road is opened may occur. The project company needs to plan to avoid possible accidents and disasters in each stage of the Project in advance and have it fully known among the concerned parties.

Source: JICA Study Team



Source: JICA Study Team

Figure 7.6 Location Map of Baseline Data Survey



【Nautical Charts Online】
Cuurend direction and speed data are quated from:
http://www.nauticalchartsonline.com/chart/zoom?chart=93626

Source: JICA Study Team

Figure 7.7 Current aournd Project Area

7.7 Impact assessment (tentative)

Table 7.17 shows tentative comparison results of the environmental impact assessment based on impact items selected in scoping and later site survey results of the Bach Dang Bridge Construction Project.

Table 7.17 Impact Assessment based on Scoping and Survey Results (tentative)

Category	No.	Impact item	Impact Assessment in Scoping		Impact Assessment based on Survey Results		Reason for Assessment Results
			Before construction During construction	During operation	Before construction During construction	During operation	
Pollution control measures	1	Air pollution	B-	B-	B-	B-	Before construction: According to the Bach Dang Bridge section baseline data acquisition results, the observation point of air pollution (TSP: suspended particulate) that exceeds Vietnamese standards is only near the crossing point with National Route 5 on the Hai Phong side. During construction: Although exhaust gases and dust are emitted from construction equipment during the construction period, it is only during the construction period. During operation: There are impacts of exhaust gases from vehicles on the road.
	2	Water pollution	A-	B-	A-	B-	Before construction: According to the Bach Dang Bridge section baseline data acquisition results, observation points where water pollutants (TSS: suspended solids) exceed Vietnamese standards are the main stream of the Bach Dang River and inner water area of the Dam Nha Mac area where the Bach Dang River water flows in. The amount of soil and sand washed away usually exceeds the standards in the Bach Dang River. During construction: The possibility of sediment runoff at the embankment (main structure) works in the Dam Nha Mac and Hai Phong City when the temporary road is built (embankment) cannot be denied. During operation: There may be sediment runoff from the embankment in torrential rains.
	3	Waste	B-	C	B-	B-	During construction: What is likely to be disposed of based on the constriction plan will be handled properly, using methods in accordance with Vietnamese regulations. During operation: After operation, the impacts of litter discarded by road users on the roadside environment and drainage are also possible.
	4	Soil contamination	B-	D	B-	D	During construction: Use of lipids to operate heavy machines and asphalt emulsion in road pavement works. Although there are plans to use cement and grouting materials for pile placement, the impact of soil contamination can be mitigated if attention is paid to prevent excessive leakage or spill. During operation: There is no plan for using heavy metals or harmful substances and thus no impact provided all waste is properly disposed of.
	5	Noise and vibration	A-	B-	A-	B-	Before construction: According to the Bach Dang Bridge section baseline data acquisition results, the observation point where the noise (dBA) exceeds Vietnamese standards is only the point on National Route 5 in Hai Phong (coastal road).

Category	No.	Impact item	Impact Assessment in Scoping		Impact Assessment based on Survey Results		Reason for Assessment Results
			Before construction During construction	During operation	Before construction During construction	During operation	
							During construction: Construction machines will generate noise and vibration during construction. Measures such as eliminating the concentration of heavy machines generating large noise need to be taken in densely populated areas, including the Hai Phong side. During operation: Noise and vibration is limited to those caused by vehicles on the road.
	6	Subsidence	B-	B-	B-	B-	During construction: There is a plan for an embankment on soft ground in part of the Dam Nha Mac area and Hai Phong section (approx. 2km in the Dam Nha Mac area). Subsidence may occur unless the soil ground is sufficiently improved (consideration of subsidence time and precision of ground improvement). There is no other major intake of groundwater. During operation: If the subsidence consideration and assessment are wrong, faulty construction at ground improvement works may also have an impact in the operation stage.
	7	Foul odor	D	D	D	D	The construction work is unlikely to generate any malodor.
	8	Bottom material	B-	B-	B-	B-	A certain level of changes in the current riverbed condition is likely when the bridge piers are constructed in the Bach Dang River.
Natural environment	9	Protected zone	C	C	D	D	According to the assessment based on the acquisition of current data in the coastal area of the Bach Dang Bridge, there will be no such impact as sediment runoff from the construction site to the Cat Ba national park or Ha Long Bay world heritage site.
	10	Ecosystem	A-	B-	A-	B-	During construction: Civil engineering works will have impacts such as noise and vibration and water pollution caused by sediment runoff on mangrove forests and other ecosystem around the Dam Nha Mac area and Bach Dang River. No individual listed in the IUCN or Vietnamese RED DATA BOOK was observed in the survey area. During operation: Exhaust gases and noise from vehicles on the road may have remaining impacts on the animal habitat.
	11	Hydrological phenomena	A-	B-	A-	B-	During construction: The construction work is unlikely to have any impact on groundwater in the Bach Dang Bridge section. During operation: Compared with before construction, impacts of hydrological phenomena (flow change) will remain in the river. Monitoring will be conducted after the bridge piers are built.
	12	Topography and geology	B-	B-	B-	B-	During construction: There is some embankment section near the connecting pint with the Hanoi-Hai Phong Expressway and in the Dam Nha Mac area. There is no soil work which will change the current ground remarkably. There is no impact on geology. During operation: There will be topographical changes caused by bank protection development, etc. Although there will be no major change in the original

Category	No.	Impact item	Impact Assessment in Scoping		Impact Assessment based on Survey Results		Reason for Assessment Results
			Before construction During construction	During operation	Before construction During construction	During operation	
							topography, there will be change from before the construction caused by embankment (Approx. 2km in the Dam Nha Mac area and 0.4km in Hai Phong City section).
Social environment	13	Resettlement and land acquisition	A-	D-	A-	D	Before construction: Three households in the Dam Nha Mac area. Relocation procedures (for one household in a residential area, one household operating a fish farm and one company in Lien Vi) must be taken. The procedures will be completed by the end of August. During operation: Impacts of resettlement will remain compared to before the construction.
	14	Poverty group	B-	B-	B-	B-	During construction: Although tiny fishing operators catch fish near the Bach Dang Bridge, it is their side job in most cases and it is confirmed that the construction will have minimal impacts. There is no illegal occupant in the Bach Dang Bridge section. During operation: Same as above. Both during construction and operation, it is assessed to have negative impacts because the area of fishing activities may be forced to change. However, local governments assess that there will be no extreme impact.
	15	Ethnic minorities and indigenous people	D	D	D	D	There is no ethnic minority or indigenous people in and around the project site.
	16	Employment, means of living and other local economy	B+/-	B+/-	B+/-	B+/-	During construction: Local residents will be hired to perform menial work on site in the construction stage (positive impact). Conversely, it also has such negative impacts on fish farms (local economy) and the lives of tiny fishing operators although the impact is small. During operation: Improved access to Ha Long and Hai Phong will help the market for local products expand, which will have a positive impact on the local economy. Conversely, there are some negative impacts. For example, some fish farmers will have to hand over their farms.
	17	Use of land and local resources	C	B+/-	B-	B+/-	During construction: The Dam Nha Mac side is currently used only for fish farming. Acquisition of (7) fish ponds is a negative impact. Earthwork of linear structure will limit land use on the Hai Phong side. During operation: The road development helps improve the local logistics network and use of land and local resources in the Dam Nha Mac area. Conversely, bridge construction will lower land use efficiency because of the segmentation of land owned by companies and organizations.
	18	Water use	B-	C-	B-	B-	Currently, there is only living environment of fishermen in the Dam Nha Mac area. There is no well and fish farmers use rainwater and river water for domestic use (not for drinking). There is no household in the Hai Phong section and the business companies in operation do not require the use of groundwater, etc. During construction: If sediment runoff

Category	No.	Impact item	Impact Assessment in Scoping		Impact Assessment based on Survey Results		Reason for Assessment Results
			Before construction During construction	During operation	Before construction During construction	During operation	
							occurs due to civil engineering work at the Bach Dang Bridge pint, there will be an impact on fish farmers on the south of the Dam Nha Mac area (lower reaches of Bach Dang River) However, because there are many SS (suspended substances) regularly in the Bach Dang River, it is unlikely to cause serious impacts. The civil engineering work on the Hai Phong side will not have an impact unless the sediment runoff affects wells. During operation: Although there will no longer be a direct impact of sediment runoff from the construction site, runoff of embankment due to torrential rains, etc., will impact on the surrounding water use conditions.
	19	Existing social infrastructure and services	B-	C	A-	A-	Before (during) construction: There are some impacts on existing infrastructure on the Hai Phong side. They include relocation of high-voltage lines, impacts on the existing road along the port and harbor and segmentation of the container yard. During operation: Some impacts of relocation on existing infrastructure (high-voltage lines in Hai Phong, etc.) will persist. According to interview results, ferry services have a different service route than the Bach Dang Bridge and will be operated continuously because of the need for motorcycle transportation (motorcycles are prohibited on the bridge).
	20	Social capital and local decision-making bodies and other social organizations	D	D	D	D	In the interview with People's Committee and local consulting companies, etc., respondents said that the Project will have very little impact on social capital or local decision-making bodies.
	21	Uneven distribution of damage and benefits	C	C	B-	B-	During construction: Although fish farmers subject to resettlement are subject to compensation, this is for damage for resettlement procedures and relocation in the Dam Nha Mac area. If tiny fishing operators need to move their fishing ground, it will be assessed as negative impact. During operation: The impact described above will remain limited compared to before construction and thus it is assessed as B-.
	22	Conflict of interest in the area	D	B+/-	D	B-	During construction: As things stand, there will be no conflict of interest in the area. During operation: Because there is no land use regulation plan or drainage development plan that may cause conflict of interests on the Quang Ninh Province side (Dam Nha Mac area) after bridge construction, it is very unlikely that such conflict will emerge. Although the land use plan on the Hai Phong side after the bridge construction is yet to be formulated, there may arise conflict of interest if roadside development plan of the expressway, including interchange, leads to a sharp rise in land use fees when mid- to long-term impacts are considered.
	23	Cultural	D	D	D	D	There is no cultural heritage in the target site

Category	No.	Impact item	Impact Assessment in Scoping		Impact Assessment based on Survey Results		Reason for Assessment Results
			Before construction During construction	During operation	Before construction During construction	During operation	
		heritage					of the Project.
	24	Landscape	B-	B-	B-	D	During construction: Construction equipment, earthwork material transportation and tower crane operation, etc., during construction will affect the landscape of the construction site during the construction. During operation: Because Cat Ba national park is far from the Bach Dang Bridge section (approx. 10km), there will be no impact of landscape using the park as borrowed scenery.
	25	Gender	C	C	D	D	The Project is not subject to gender issues.
	26	Children's rights	C	C	D	D	The Project has no relevance to children's rights issues.
	27	HIV/AIDS and other infectious diseases	B-	D	B-	D	During construction: There will be an inflow of several tens of to several hundreds of workers, including those from outside during the construction and thus there is the potential for an outbreak of infectious diseases. During operation: There is no impact during operation.
	28	Working environment (including occupational safety)	B-	C	B-	B-	During construction: Most workers are forced to work under unfavorable working condition above the river or soft ground during the works and thus there is a need for thorough safety education. During operation: Because maintenance and repair work of structures is not on the flat land, negative impacts will persist in terms of occupational safety.
Others	29	Accidents	B-	B-	A-	B-	During construction: The scale of construction and its contents categorized as works requiring special attention to safety measures provided by JICA are as follows: There are risks of accidents and industrial disasters on site during construction. During operation: Although there will no longer be accident risks that involve road managers. They may have contact with moving vehicles or fall from high places during maintenance inspections and repair work of structures.
	30	Cross-border impacts and climate change	D	D	D	D	The Project has no relevance to cross-border issues or climate change.

A+/-: Significant positive/negative impact is expected.
B+/-: Positive/negative impact is expected to some extent.
C+/-: Extent of positive/negative impact is unknown. (A further examination is needed and the impact could be clarified as the study progresses)
D: No impact is expected.

Source: JICA Study Team

7.8 Measures to Ease Impacts (tentative)

An environmental management plan and measures to ease impacts were examined for items whose impact assessment results are categorized as A or B as shown in Table 7.18. Data of indicators of air pollution, water pollution, soil contamination and noise and vibration were obtained during the survey period to obtain the current data (baseline data). With regard to monitoring points of these indicators during the construction phase, comparison of observation values is proposed to be carried out based on the location where baseline data was obtained.

Current measures to ease impact was prepared as tentative measures from the information obtained by the submission of the survey interium report, and not been agreed by the project implementation body in the Vietnamese side. Formulation of the measures requires investigating actual results, etc. accumulated by relevant projects in Vietnam, and therefore, its cost remains to be calculated.

Table 7.18 Environmental Management Plan

No.	Impacts	Proposed Measures to Ease Impacts	Implementing Organization	Responsible Organization	Cost Unit: US$
Construction Stage					
1	Air pollution	When heavy machines are used for temporary road construction and embankment work, the use of construction machines emitting fewer exhaust gases is considered. Efforts will be made to ensure regular inspections and maintenance of construction vehicles are carried out regularly not to cause the properties of exhaust gases from special vehicles and equipment to decline. Water will be sprayed as needed to prevent dust from scattering during construction.	Construction company	Bach Dang Bridge project company	(Under survey)
2	Water pollution	Attention will be paid to prevent sediment runoff to be caused by digging of the river bed, digging for pile holes and pile placement and leakage and spillage of cement grout materials conducted for bridge pier building in the bridge construction section. When an embankment (including temporary road construction) is built in the bridge approach section in the Dam Nha Mac area and on the Hai Phong side, a work plan will be made to minimize sediment runoff into surrounding wetland and rivers. When workers' quarters are set up near the construction site, a site sanitation management plan will be made as part of measures to properly handle polluted water and drainage from the quarters, temporary toilets and other sanitary facilities will be properly set up on the construction site as sanitation management efforts.	Construction company	Bach Dang Bridge project company	(Under survey)
3	Waste	Waste and waste soil generated at the construction site must be disposed of properly in accordance with regulations provided by national and local governments (Quang Ninh Province and Hai Phong City). Building materials that are not reusable and trash discarded by workers will be also disposed of properly in accordance with local government rules. Efforts will be made to bring equipment that requires minimal repair work on the project site and dispose of petroleum and lipids in special containers. (Legal information on Vietnamese waste treatment and general treatment flow are currently under survey.)	Construction company	Bach Dang Bridge project company	No marginal cost
4	Soil contamination	Soil work is ordinary soil work comprising bridge construction and embankment work in which no harmful material is likely to be used. However, work management will be ensured to prevent leakage of lipids from grout materials, building and civil engineering equipment during pier placement and when asphalt emulsion and bituminous agent are sprayed in road pavement work.	Construction company	Bach Dang Bridge project company	(Under survey)
5	Noise and vibration	The use of construction machinery generating little noise and vibration will be considered as construction equipment used for earthworks. Construction vehicles will be inspected and maintained regularly to operate them in good condition at all times. Instructions will be given to operators of construction machines not to overload machines and try to reduce noise and vibration by carefully operating them. Compliance with instructions will be ensured.	Construction company	Bach Dang Bridge project company	(Under survey)
6	Subsidence	Subsidence will be measured at fixed intervals where the embankment is built. The measuring instruments and frequency will be selected and planned based on subsidence analysis.	Construction company	Bach Dang Bridge project company	(Under survey)
7	Bottom material	Sonors, etc., will be used to monitor the property of the foundation area of the main and	Professionals	Bach Dang Bridge	(Under survey)

No.	Impacts	Proposed Measures to Ease Impacts	Implementing Organization	Responsible Organization	Cost Unit: US$
		secondary piers (in the river) at the crossing point of the Bach Dang River.	(consulting agency, etc.)	project company	
8	Ecosystem	Efforts will be made to prevent runoff of fuel lipids, etc., from the construction site. Efforts will be made to minimize the impacts of drainage and polluted water from the site of excavation, hole drilling and embankment and establishment of sedimentation points in some cases on the surrounding ecosystem.	Professionals (consulting agency, etc.)	Bach Dang Bridge project company	No marginal cost
9	Hydrological phenomena	Steel sheet piles, etc., will be placed to prevent runoff of soil from earthwork on the site.	Professionals (consulting agency, etc.)	Bach Dang Bridge project company	(Under survey)
10	Topography and geology	The ground that was modified temporarily for civil engineering works will be restored to its original form in the last phase of the construction. The pits will be filled in and soil will be moved.	Construction company	Bach Dang Bridge project company	(Under survey)
11	Resettlement and land acquisition	Business activities at the new fish farming locations (Dam Nha Mac area) and company sites (Hai Phong City) that were subject to resettlement will be followed up. (by business operators)	Quang Ninh Province, Hai Phong City	Quang Ninh Province, Hai Phong City	–
12	Poverty group	Establishment of a response desk or other means to deal with claims against noise, vibration, etc., during the construction work.	Bach Dang Bridge project company	Bach Dang Bridge project company	–
13	Employment, means of living and other local economy	Local residents who are affected by resettlement and land acquisition for the construction will be assisted in their business operations and in finding jobs to ensure the living environment in the new locations. (by implementing body)	Quang Ninh Province, Hai Phong City	Quang Ninh Province, Hai Phong City	–
14	Use of land and local resources	There is a need to conduct prior coordination between local governments (Quang Ninh Province and Hai Phong City) about the land use plan after the Bach Dang Bridge construction, particularly on the Hai Phong side section.	Quang Ninh Province, Hai Phong City	Quang Ninh Province, Hai Phong City	–
15	Water use	There is a need to check whether there is any impact on water for domestic use (during construction) regularly in the Dam Nha Mac side by gathering information from fish farmers outside the construction area. Well water is surveyed near the Bach Dang Bridge construction area in the Hai Phong City side regularly to check for any water quality change compared to before construction.	Professionals (consulting agency, etc.)	Bach Dang Bridge project company	No marginal cost
16	Existing social infrastructure and services	The impacts of the Project on existing social infrastructure and services (ferry services near the Bach Dang Bridge, etc.) are monitored.	Quang Ninh Province, Hai Phong City	Quang Ninh Province, Hai Phong City	–
17	Uneven distribution of	Considreation sould be made to prevent uneven distribution of employment oppourtunities by regions (autonomous body) at the site.	Bach Dang Bridge project company	Bach Dang Bridge project company	–

No.	Impacts	Proposed Measures to Ease Impacts	Implementing Organization	Responsible Organization	Cost Unit: US$
	damage and benefits				
18	Landscape	Regular cleaning of diposed waste, etc. implemented by highway operators.	Highway opeartor	Same as above	No marginal cost
19	HIV/AIDS and other infectious diseases	The construction company will provide construction workers with health education when they first enter the site and regularly afterward during construction.	Construction company Consulting agency	Bach Dang Bridge project company	No marginal cost
20	Working environment (including occupational safety)	There are some works over the river and many occupational safety risk factors in some site areas. There is a need to formulate safety measures suitable for each site, ensure full awareness among those involved in construction beforehand and strive to raise awareness of safety management on the work site at all times through KY activities by holding safety meetings regularly (daily, weekly, monthly). Efforts are also made to improve safety by allocating traffic control workers to control traffic of passing and construction vehicles around the site and ensure on-site safety.	Construction company Consulting agency	Bach Dang Bridge project company	No marginal cost
21	Accidents	Accident-prevention measures include the following: ・ Avoiding concentration of construction vehicles by properly managing their operation. ・ Instructing operators to drive construction vehicles properly and ensuring they do. ・ The construction site is all narrow along sharp slopes and measures to prevent collision accidents involving passing and construction vehicles are taken, including allocation of traffic control workers. ・ Ensure safe driving instructions are issued to drivers because waste soil transport vehicles from the 400km- and 451km-point will frequently use the public road. ・ Make site rules on various safety measures (hazardous material management, blasting work, contact of construction equipment and workers in a confined place, anti-dust measures, etc.) on the tunnel construction site at the 400km-point and ensure workers are fully aware of them and observe them.	Construction company, consulting agency	Bach Dang Bridge project company	No marginal cost
Operation stage					
1	Air pollution	Coordinate traffic restrictions on vehicles that do not meet Vietnamese exhaust gas standards with business operators; based on monitoring results at observation points along the road.	Bach Dang Bridge project company	Bach Dang Bridge project company	–
2	Water pollution	If the monitoring results at observation points along the road exceed Vietnamese water pollution standards, identify the causes and take the required measures.	Same as above	Same as above	–
3	Waste	The road management company shall observe waste disposed of from passing vehicles on a daily basis and carry out campaign activities to prohibit such acts when necessary.	Same as above	Same as above	–
4	Noise and vibration	Take required measures based on monitoring results at observation points along the road.	Same as above	Same as above	–

No.	Impacts	Proposed Measures to Ease Impacts	Implementing Organization	Responsible Organization	Cost Unit: US$
5	Subsidence	There is a need to measure subsidence during operation to ensure it does not converge at the embankment section during construction. Measurement points and frequency are planned based on subsidence speed.	Same as above	Same as above	–
6	Bottom material	Riverbed changes will be monitored based on the flow changes caused by riverbed digging and bridge pier construction for construction. Because the Bach Dang River is highly turbid, there is a need to use sonors, etc.	Same as above	Same as above	–
7	Ecosystem	The impacts of the construction on mangrove forest growth and flora and fauna distribution will be monitored.	Same as above	Same as above	–
8	Hydrological phenomena	Decide how often hydrological surveys should be conducted, monitor the impact of bridge construction, identify causes when problems arise and take the required measures.	Same as above	Same as above	–
9	Topography and geology	* Although it is assessed B-, because the impacts of earth fill during the construction stage will remain, there is no measure to ease them during the operation stage.	Quang Ninh Province, Hai Phong City	Quang Ninh Province, Hai Phong City	–
10	Poverty group	Same as the construction stage	Bach Dang Bridge project company	Bach Dang Bridge project company	–
11	Employment, means of living and other local economy	Same as the construction stage	Same as above	Same as above	–
12	Use of land and local resources	Same as the construction stage	Same as above	Same as above	–
13	Water use	Same as the construction stage	Bach Dang Bridge project company	Bach Dang Bridge project company	–
14	Existing social infrastructure and services	Same as the construction stage	Quang Ninh Province, Hai Phong City	Quang Ninh Province, Hai Phong City	–
15	Uneven distribution of damage and benefits	Establish contact points to handle the problem of uneven distribution of damage and benefits that the operation may cause.	Bach Dang Bridge project company	Bach Dang Bridge project company	–
16	Conflict of interest in the area	Same as the construction stage	Same as above	Same as above	–

No.	Impacts	Proposed Measures to Ease Impacts	Implementing Organization	Responsible Organization	Cost Unit: US$
17	Working environment (including occupational safety)	Decide on safety operation measures for road maintenance and bridge inspections and work properly. Do not perform unreasonable tasks.	Same as above	Same as above	–
18	Accidents	There is a need to formulate and implement a safety measure plan to prevent workers from having accidents involving passing vehicles during maintenance, repair and inspections of bridges and embankment.	Same as above	Same as above	No marginal cost

Source: JICA Study Team

7.9 Opinion from stakeholders

A local briefing about the Ha Long-Hai Phong Highway Construction Project plan was held; led by Quang Ninh Province DOT on July 6, 2011 (based on Decree 29/2011/NĐ-CP and Circular 26/2011/TT – BTNMT). Views of People's Committee in local areas where the planned road passes and Fatherland Front Committee[42] were referred and the briefing was conducted based on a questionnaire survey conducted with 60 households (at random selection) from the area directly affected by the project by the province.

As for the section in Hai Phong, a briefing session on the Bach Dang Bridge Construction Project is yet to be held.

7.9.1 Target area

The area that became the target of the questionnaire survey comprises nine wards and communes along the Ha Long-Hai Phong Highway.

Target wards and communes:
Dai Yen (Ha Long), Hoang Tan, Tan An, Tien An, Ha An, Phong Coc, Phong Hai and Lien Hoa (all in Quang Ninh Province) and Dong Hai Ward 2 (in Hai Phong)

7.9.2 Project evaluation by local People's Committee and Fatherland Front Committee

Table 7.19 summarizes the comments of the People's Committee and Fatherland Front Committee on the impact assessment of the Project on the surrounding areas.

Table 7.19 Evaluation of the Ha Long-Hai Phong Highway Construction Project by People's Committee and Fatherland Front Committee

No.	Ward/Commune		Negative Impacts of the Project on the Environment	Measures to Ease Negative Impacts	Recommendations to the implementing body	Responsive Action by the implementing body
	Dai Yen	People's Committee	Dust scatters in ground leveling and material transportation on the construction site.	A material storage area is prepared remote from residential areas. Spray water on the road under construction to minimize dust scattering.	Communicate with ward's people's committee regularly to solve the problem. Pay environmental sanitation fees specified by the provincial people's committee.	Agrees on recommendation.
		Fatherland Front	Agrees on environmental impacts described in the report. Social impacts including land loss and changes of employment environment	Agrees on easing measures described in the report. Spray water 4 to 6 times a day.	Agrees on construction policy of the project.	–
2	Hoang	People's	Construction in the	There is a need to pay	Request project operator to	Agrees on

[42] ※Reference: Fatherland Front Committee
The People's Committee and Fatherland Front Committee was founded in 1977 after merging the Vietnamese ***Fatherland Front*** of North Vietnam, National Liberation Front of South Vietnam and Alliance of National, Democratic and Peace Forces of Viet Nam. It is an organization for the Communist Party of Vietnam involving non-party members in political movements. Although the communist party is its core member, groups of ordinary people, such as general confederation of labor, farmers' union, women's union and Ho Chi Minh Communist Youth Union, are also members.

No.	Ward/Commune		Negative Impacts of the Project on the Environment	Measures to Ease Negative Impacts	Recommendations to the implementing body	Responsive Action by the implementing body
	Tan	Committee	commune affects fishing boat operation, aquaculture area, farming of some households and growth of fruit tree planting and growth.	attention to secure traffic of waterways and road in the commune while traveling and reduce construction waste and ordinary garbage discarded by workers to prevent impacts on the environment. Attention needs to be paid to the aquatic condition in particular, as it affects the aquaculture of the commune.	ensure the safety of waterways and road in the commune and ensure proper employment and resettlement measures for households that are affected to avoid confusion of their living.	recommendation.
		Fatherland Front	Flow of dust, exhaust gas, construction waste, lipids and solid waste into neighboring fish farming area affects the aquaculture industry and neighboring environment.	Effective measures should be taken to ease the adverse impacts described earlier to protect the environment of fish farming area.	The implementing body should pay full attention to problems that arise from the construction to handle complaints from local residents promptly.	Agrees on recommendation.
3	Tan An	People's Committee	Hinders household effluent and production activities of residents. Reduces productivity and hinders traffic. Dust and smoke from ground leveling work have adverse impacts on health and environment of residents and hinder social activities during construction.	Implement drainage measures for water for domestic use and floods in agricultural area, traffic measures and measures minimize dust. Shorten construction period to secure stable traffic and production of residents and secure safety and public order.	Request the implementing body to implement measures to reduce environmental pollution and proper compensation and resettlement measures for land acquisition and create employment to reduce economic losses of residents who lose their land.	Agrees on recommendation.
		Fatherland Front	Agrees on negative impacts described in the EIA report.	Agrees on easing measures described in the EIA report.	Make sure of items described in the EIA report.	Agrees on recommendation.
4	Tien An	People's Committee	The project has no negative impact on the natural or social environment. It has good impacts on local economy.	Pay attention to the construction schedule and material collection site not to hinder residents' production activities.	Ensure close coordination with local authorities and other organizations for efficient land acquisition and perform their duties smoothly.	Agrees on recommendation.
		Fatherland Front	Ha Long-Hai Phong Highway construction has no impact on residents in the commune.			

No.	Ward/Commune		Negative Impacts of the Project on the Environment	Measures to Ease Negative Impacts	Recommendations to the implementing body	Responsive Action by the implementing body
			Opening of the highway contributes to socioeconomic development and improvement of visibility of the area.			
5	Ha An		The road project that passes farmland and shipbuilding site does not have a major impact on residents' living.	Project plan formulation: Attention needs to be paid to comprehensive local development plan and protection of ecosystem.	The implementing body formulates a convenient connection plan to roads in the area and pays attention to compensation measures for land users who lose it.	Agrees on recommendation.
6	Phong Coc			Agrees on mentioned measures to ease adverse effects of the project.	Observe promised measures. Pay attention to agricultural drainage and irrigation system in project implementation.	Agrees on recommendation.
			Agrees on the construction plan for national and local socioeconomic development.	Best measures not to cause adverse impact on natural environment in line with local socioeconomic development should be taken during construction.	Environmental sanitation needs to be managed during construction not to affect residents' production activities.	Agrees on recommendation.
7	Lien Hoa		Agricultural land is reduced because of land acquisition in the project process and this affects food safety and local employment.	Measures to maintain public order and safety as well as collaboration among local community, the implementing body and contractors are needed when the project is implemented.	The project should be implemented swiftly for provincial and local socioeconomic development. Compensation for land acquisition needs to be given rationally based on state rules. Support of occupational training and employment needs to be considered for households whose land is taken over 100%.	Agrees on recommendation.
			Agrees on the comments described in the report.		Request the implementing body to observe promised matters.	Agrees on recommendation.
8	Phong Hai			Construction material storage needs to be arranged in a way to protect the environment during construction. Measures to prevent hindrance of wastewater flow and prevent dust from scattering during material delivery must be taken.	Close cooperation with local communities is needed to minimize environmental impact.	Agrees on recommendation.

No.	Ward/Commune		Negative Impacts of the Project on the Environment	Measures to Ease Negative Impacts	Recommendations to the implementing body	Responsive Action by the implementing body
		–	Agrees on the comment on negative impacts on natural and social environments. Requests to assess impacts of land acquisition and occupational environmental changes to be caused by land loss.	Agrees on measures to ease negative impacts on natural environment and social economy in local communities.	Observe project timetable. Solve environmental problems in close collaboration with local authorities when construction work is performed in Phong Hai Commune.	Agrees on recommendation.
9	Dong Hai 2	People's Committee	Project implementation affects households engaged in fish farming and related public works projects and environment.	The project manager should provide proper compensation for households engaged in fish farming to secure their living. A safe and sanitary environment needs to be secured during construction.	Recommends to observe matters described in the EIA report for project management.	Agrees on recommendation.
		Fatherland Front	–	–	Observe matters described in the EIA report for project management.	Agrees on recommendation.

Source: JICA Study Team

7.9.3 Project evaluation by household that will be affected by the Project

A total of 60 households whose house, land or part of farmland they own are situated on the construction site were selected randomly from among those with land use rights along the planned Ha Long-Hai Phong Highway to interview them. Table 7.20 to 7.23 show an overview of the households subject to the interview.

Table 7.20 Overview of Households subject to Interview (60)

Number of Target Residents (of 60 households)	Average Residents per Household	Number of Working Population (aged 18-60)	Number of Population in Education (aged 0-18)	Number of Population aged 60 or over
282	4.7	163	72	47

Source: JICA Study Team

Table 7.21 Occupation of Target households

Agriculture	For-Profit Business	Local Government	Other Occupation
31 households	7 households	5 households	17 households
51,67%	11,67%	8,33%	28,33%

Source: JICA Study Team

Table 7.22 Type of Dwelling of Target households

Temporary Dwelling	1-story House (roof tile)	1-story House (flat roof)	2-story or higher House
1 household	12 households	31 households	16 households
1,67 %	20 %	51,67 %	26,66 %

Source: JICA Study Team

Table 7.23 Recognition of or For or Against the Project Plan

Recognition of Project Plan		Pro- or Against the Project		
Yes	No	Pro	Against	No Response
55 households	5 households	60 households	0	0
91,7 %	8.3 %	100 %	0 %	0 %

Source: JICA Study Team

Main comments from the interviewees are listed below.

- Will cooperate fully in the Project connecting Ha Long and Hanoi-Hai Phong Expressway
- Payment of compensation required for resettlement and land acquisition
- Impacts on irrigation system in the construction phase
- Implementation of proper measures to prevent dust from scattering out of concern over the impacts of noise and dust scattering on the living environment to be caused in civil engineering works and soil transportation
- Concern over deterioration of the living environment to be caused in vehicles that transport soil
- Avoidance of damage to irrigation systems (pipelines, gutter gates and gutter pipes) to be caused by the outflow of materials from the site in wet (flood) season
- Avoidance of damage to community road surface to be caused by (heavy) construction vehicles

7.10 Items that Need to be Surveyed

Survey items on which information is yet to be gathered or sorted at the present stage (interim report) are listed below.

(1) Preparation of a draft environment impact assessment report

To prepare a draft environment impact assessment report, items on the EIA report (Decision 2306/QD-BTNMT document dated December 12, 2011) that was prepared by Vietnam for the Ha Long-Hai Phong Highway Project approved by the Ministry of Natural Resource and Environment (MONRE) and items required under the JICA Guidelines for Environmental and Social Considerations (April 2010) must be checked and information that is insufficient in the past EIA report needs to be gathered and sorted or examined if necessary.

Items on which the information is insufficient or that must be examined for preparing the report at the current stage are listed below:

- Gather and sort information to compare the JICA Guidelines for Environmental and Social Considerations (April 2010) and Vietnamese legal system
- Prepare an environment management plan (EMP) and formulate a monitoring plan (implementation scheme, method and cost, etc.).
- Clarify the budget and financial sources
- Support holding of stakeholders' meetings

(2) Preparation of a simple resettlement plan

The information below, which is required for preparing a simple resettlement plan, is yet to be obtained at the current stage. Items on which information needs to be gathered and sorted and that must be examined to prepare the plan are listed below. Although various information on census survey results, property and land survey results, items subject to compensation and compensation procedures has already obtained for the Quang Ninh Province section together with the inseparable project section, the information listed below for the Hai Phong section is yet to be obtained from the People's Committee.

According to the Hai Phong People's Committee, procedures to acquire land owned by organizations (around 4) and to compensate for the same will be necessary (oral feedback), although the Bach Dang Bridge project does not involve any resettlement of residents in the section.

- Results of census survey and property and land survey subject to all occupants on the planned road
- Specific compensation and support measures (plans of compensation for losses and measures to put resettlers' life back in order) are formulated and shown in the entitlement matrix. The land of the new locations must be prepared (if necessary).
- Procedures of compensation for lost properties based on the cost for reacquisition based on the reacquisition price survey
- Schedule of physical resettlement after the completion of compensation payment for lost properties
- Establishment of a monitoring system and preparation of monitoring form by the implementing body
- Project briefing for those subject to land acquisition (stakeholders' meetings), etc.

(3) Resettlement and land acquisition

Detailed information on property and family income of survey results of all households (2 households and two companies) subject to resettlement in the Bach Dang Bridge section (Quang

Ninh Province) and information on resettlement procedures and compensation policy of the implementing body (Quang Yen Town)

* Information on one of the four households above is obtained.

(4) Preparation of an environmental checklist

Preparation of a list of road and bridge sections based on the Environmental Checklist attached to the JICA Guidelines for Environmental and Social Considerations (April 2010)

(5) Formulation of a monitoring plan

Monitoring plans, including items to be monitored, frequency, location, responsible entity and result reporting system for both during construction and operation are formulated. In addition, a draft monitoring form that the implementing body will use in reporting the monitoring results to JICA will be prepared.

(6) Support for organizing environmental and social considerations advice committee in the DF/R stage

(7) Holding stakeholders' meetings

Chapter 8 Project Scope and Scheme

8.1 Project Scope

This Project is a BOT project covering Bach Dang Bridge and its Approach Road and a section of approximately 5km on the Haiphong side of the Halong-Haiphong Highway of approximately 25km which will be constructed. Sponsors will establish and finance a special purpose company (SPC) implementing the Project. The SPC will raise the funds required for the Project through contributions from sponsors and loans from financing institutions; constructing Bach Dang Bridge and other facilities; collecting toll fees from road users during the O&M period of 30 years; and repaying the financial institutions and distributing dividends to the sponsors. Table 8.1 summarizes the expected Project scope of the SPC in accordance with the results of a series of surveys made to date.

Table 8.1 Project Scope

Item		Target/contents
Operation (management) of the SPC		・ Using an Operation Office and other facilities as activity bases to procure required management resources and performing construction/operation/transfer under the Project within relevant contract terms ・ Reporting on the Project to the People's Committee of Quang Ninh Province and other relevant organizations of Vietnam (monthly and annually) and making procedures for approvals ・ Repaying loans to financing institutions and distributing dividends to sponsors
Build	Designing	・ Performing a detailed design of KM.19+800～KM.25+211 of the Halong-Haiphong Highway, selecting a contractor and creating the documents required for land acquisition and other tasks ・ Confirming the final design for execution created by a contractor (shop drawings) ・ Concluding procedures required for approvals
	Construction	・ Procuring workers, materials, equipment and other items required to construct KM.19+800～KM.25+211 of the Halong-Haiphong Highway and constructing the section which comprises an interchange on the Haiphong side, Bach Dang Bridge, Approach Road on the Halong side and an interchange in Dam Nha Mac area ・ Constructing the required facilities (toll gates, Operation Office, traffic control room, etc.) ・ Concluding procedures required for approvals
	Supervision	・ Supervising the construction of KM.19+800～KM.25+211 to see if it is performed in line with the design and plans from the perspectives of quality control and safety management ・ Concluding procedures required for approvals
Operate	Toll collection	・ Collecting tolls from road users at each interchange (on-ramp) on the Halong-Haiphong Highway (KM.0～KM.25+211)
	Traffic management	・ Patrolling the Halong-Haiphong Highway (KM.0～KM.25+211), gathering traffic information, controlling traffic violations in cooperation with the police and handling road accidents
	Inspection, maintenance and repair	・ Conducting routine, regular and emergency inspections, as well as required repair, upgrading and reinforcement to keep the facilities safe and sound on KM.19+800～KM.25+211
	Road maintenance	・ Performing cleaning, planting and minor repairs on KM.19+800～KM.25+211
Transfer		・ Transferring the business rights related to the Project to the People's Committee of Quang Ninh Province ・ Transferring the facilities[43] to the People's Committee of Quang

[43] Fixings, materials, equipment and other items may be included depending on the provisions of the BOT contract or agreements.

Item	Target/contents
	Ninh Province while maintaining their quality as stipulated in the BOT contract or agreements

Source: JICA Study Team

8.2 Form of the Special Purpose Company SPC

8.2.1 Procedures to establish the SPC

In Vietnam, a party wishing to establish a corporate body with foreign capital must obtain an investment license from the MPI. The investment license application is examined by relevant ministries and, if accepted, the license is issued, which also serves as a business registration certificate.

Prior to submitting the investment license application, a party must determine the capital amount, total investment amount, proportional contributions of individual investors, investment schedule and other factors. Even after the party has an investment license issued, it must apply and obtain approval from the MPI for any change in the investment license such as the capital amount and proportions of individual investors' contributions.

The establishment of the SPC for the Project must refer to Vietnam's laws and regulations such as the Law on Enterprise, Law on Investment and Decree 108.[44]

8.2.2 Major forms of business enterprises

There are various forms of business enterprises in Vietnam, including single-owner limited liability companies (hereinafter referred to as a "single-owner LLC"), multiple-owner limited liability company (hereinafter referred to as a "multiple-owner LLC") and shareholding company[45].

(1) Limited liability company (LLC)

A company owned by a single capital contributor (organization (corporate body) or individual) is called a single-owner LLC and a company owned by multiple capital contributors is called a multiple-owner LLC.

The former is owned by one single organization (corporate body) or an individual, who is liable for all debts and other obligations within the limit of capital stipulated in the articles of incorporation (the ownership of contributors depends on the proportions of capitals to which they contribute).

The latter takes a management structure of employees, an organization (corporate body) or individuals, who are liable for debts and other obligations within the limit of their capital contributions.

LLC is the commonest corporate form in Vietnam, which applies to 80% or more of companies established and registered with the participation of Japanese investors.

(2) Shareholding company (SC)

An SC is a business enterprise whose capital stipulated in the articles of incorporation is divided into shares (the ownership depends on the number of shares held by shareholders). Corporate bodies and individuals can hold shares to become shareholders. Each SC must have at least three

[44] Circulars 166/2011/TT-BTC, 03/2011/TT-BKHDT and other regulations may have to be referred to, other than the Law on Enterprise (and its supplementary ordinance, Decree 102/2010/ND-CP) and the Law on Investment (and its supplementary ordinance, Decree 102/2010/ND-CP) for the timing and schedule of capital injections in a BOT project.

[45] Other than these, there are "partnership" and "private enterprises".

shareholders, but there is no upper limit on the number of shareholders. Their liability for debts and other obligations is limited to their capital contribution.

8.2.3 Form of SPC for the Project

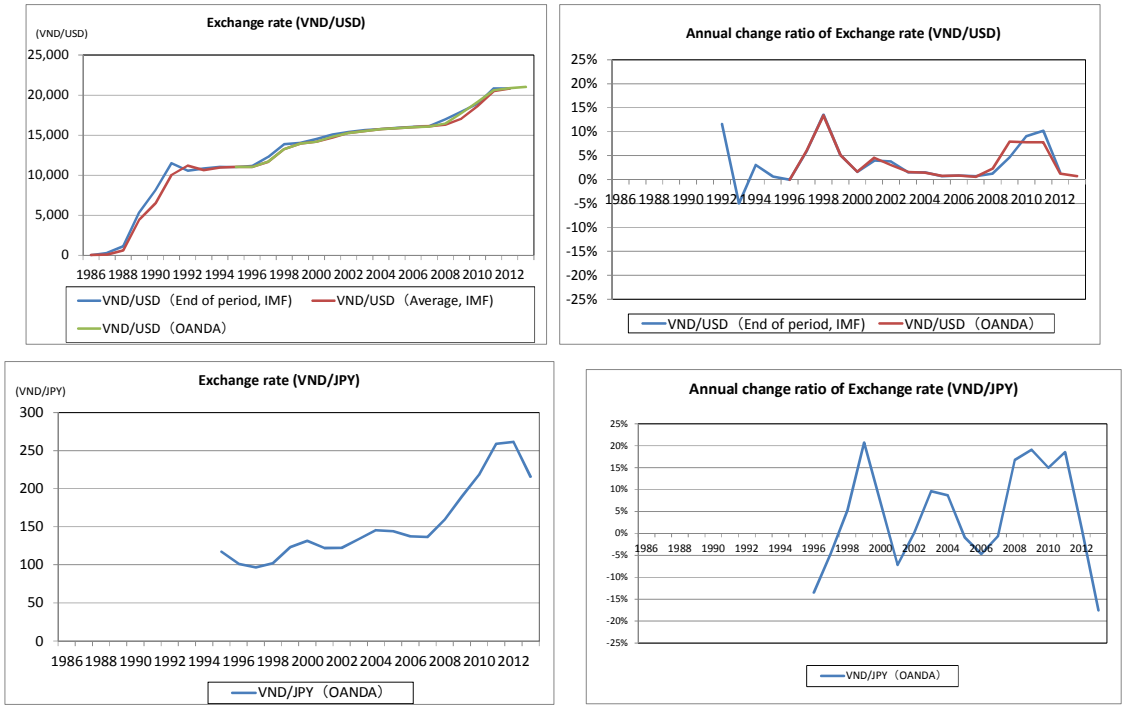
To establish an SC, each investor must actually invest capital in the company within 90 days after the issuance of an investment certificate in compliance with Article 6.4 of the Law on Investment and the relevant provisions of the Law on Enterprise. Investors must make said contributions within a certain period and make various other preparations before focusing on construction. To avoid this, it appears appropriate to establish the SPC as a multiple-owner LLC.

8.3 Trends in Economic Indicators

8.3.1 Trends in foreign exchange rates

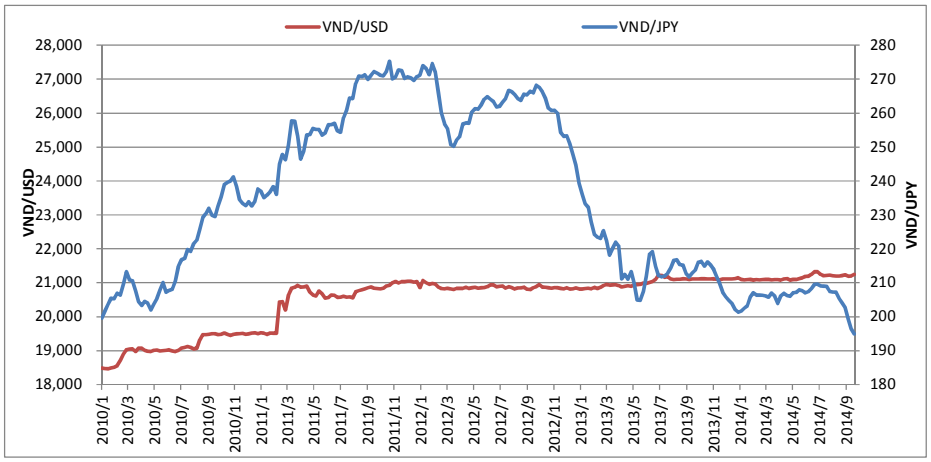
(1) Vietnam

The following figures present foreign exchange rates trends of the VND. The annual average changes during 2000-2013 included a devaluation of approximately 1.7% against the USD and a devaluation of approximately 1.4% against the JPY. (For VND/USD, the period between 2009 and 2011 is excluded when the VND was substantially devalued against the USD. For VND/JPY, the period between 2008 and 2011 is excluded when the VND fell more than 10% against the JPY.)



Source: International Financial Statistics Yearbook (2002 and 2013), OANDA HP

Figure 8.1 Exchange Rate Trends of VND



* Weekly average middle point

Source: OANDA

Figure 8.2 Recent Exchange Rate Trends

(2) Other Major Countries in Southeast Asia

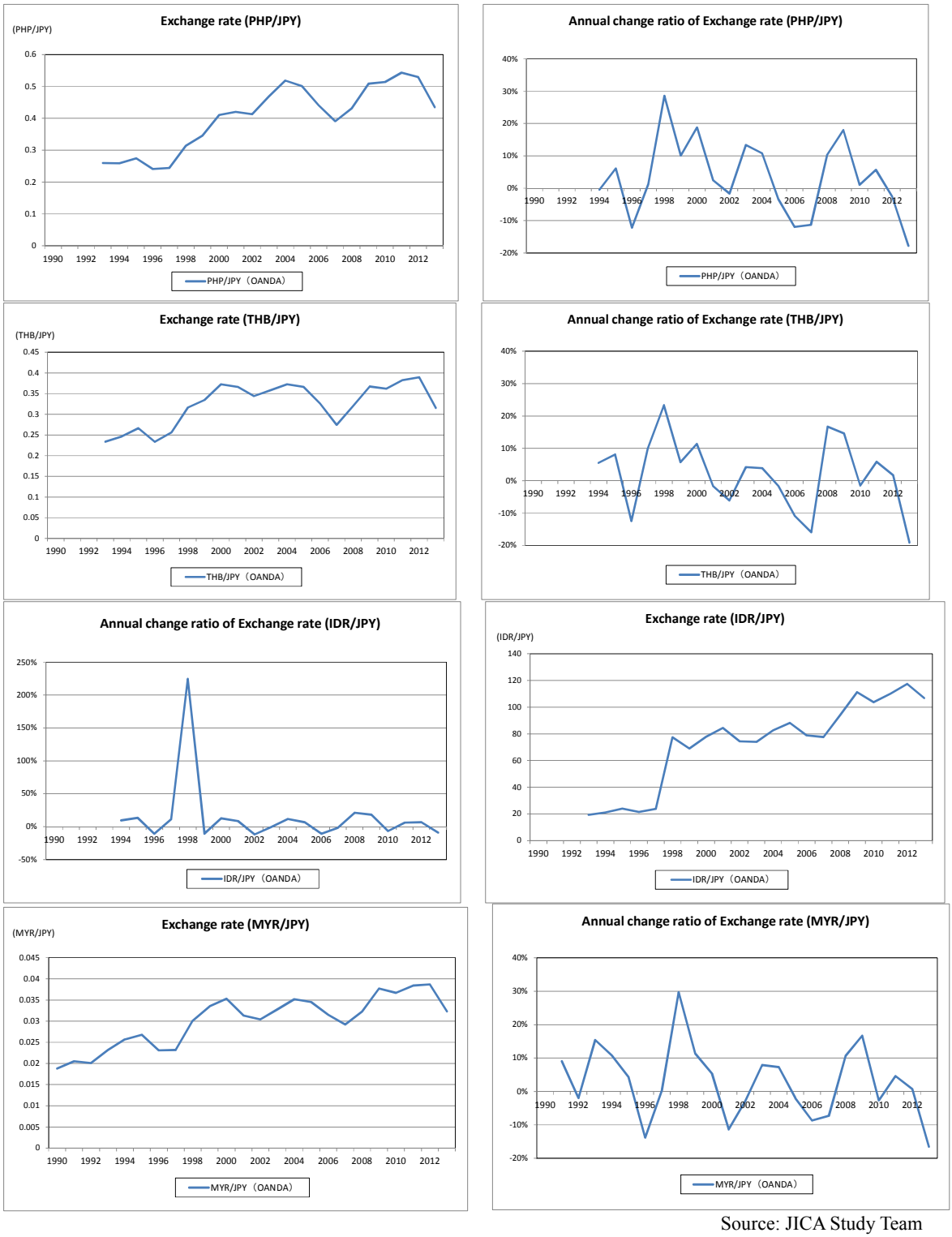
Following Asia's currency crisis in 1998, the currencies of selective countries in Southeast Asia (the Philippines, Thailand, Indonesia and Malaysia) were substantially devalued. In general, however, the annual average changes in and after 2000 were somewhat stable, ranging between -2 and 2% against the USD and -1 and 2% against the JPY. Accordingly, the Study Team assumes a basic scenario in which the exchange rate of VND will fluctuate little during the project term, hovering at around 20,000VND/USD and 200VND/JPY.

Table 8.2 Annual Average Changes in Exchange Rates of Major Southeast Asian Currencies (2000-2013)

Currency	Against USD	Against JPY
PHP	Increase by 0.3%	Decrease of 0.5%
THB	Increase by 2.0%	Increase of 1.3
IDR	Decrease by 1.7%	Decrease of 2.5%
MYR	Increase by 1.4%	Increase of 0.7%

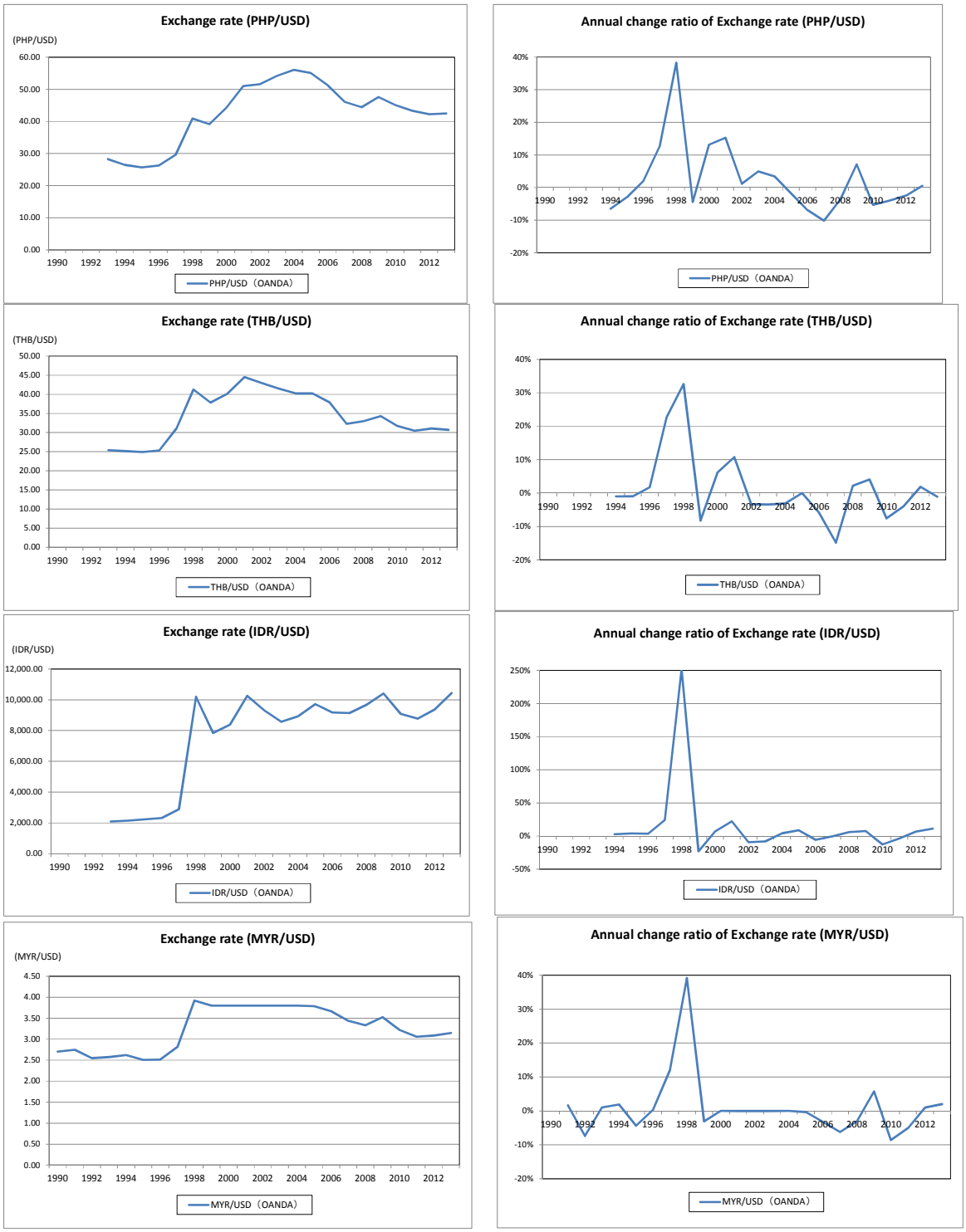
Note: Annual average middle point (annual average rate for THB)

Source: OANDA



Source: JICA Study Team

Figure 8.3　Trends and Annual Growth of Exchange Rates of Asian Currencies (against the JPY)



Source: JICA Study Team

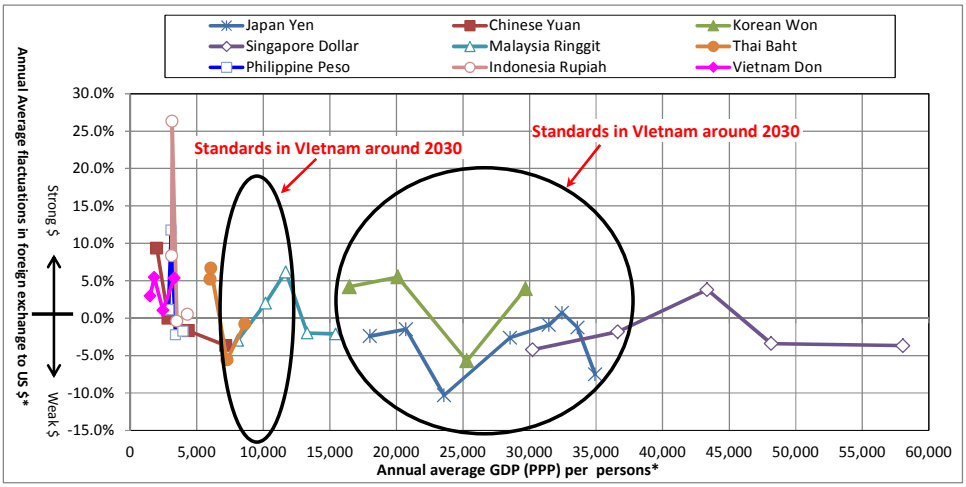
Figure 8.4 Trends and Annual Growth of Exchange Rates of Asian Currencies (against the USD)

(3) Relation between GDP per capita and exchange rates against the USD

As for the relation between GDP per capita of the Asian countries and their exchange rates against the USD, the exchange rates of some countries with GDP per capita of 10,000USD or lower fell by 5% or more per year, but those of countries with GDP per capita exceeding

10,000USD hovered at around -5 and 5% against the USD.

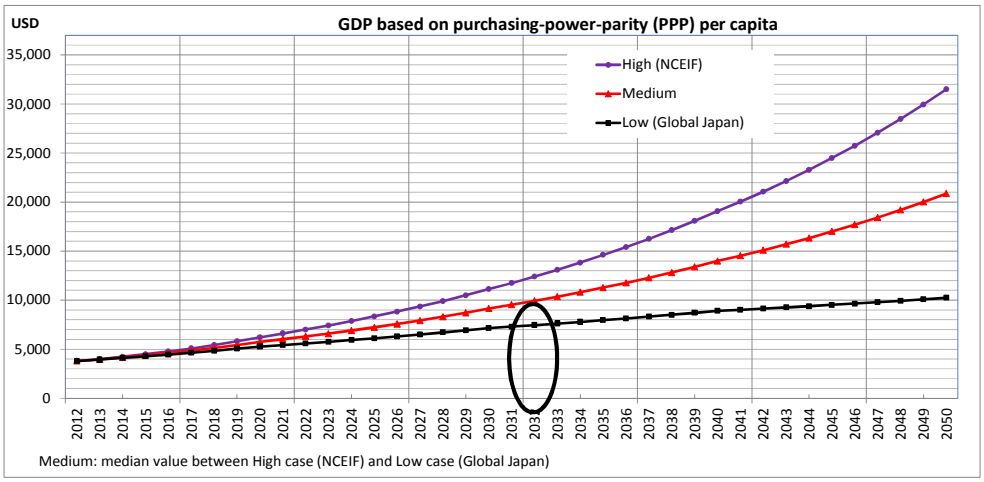
Accordingly, the Study Team assumes that VND may continue to fall while GDP remains low but will stabilize as GDP grows in future. Accordingly, the team assumes a scenario of weakened VND, in which the currency will continue to fall by 2% per year until 2030 when GDP per capita is expected to exceed 10,000USD but then stabilize.



* In principle, the five-year average values are plotted.

Source: JICA Study Team

Figure 8.5 GDP per capita and Exchange Rates against the USD of Selective Asian Countries



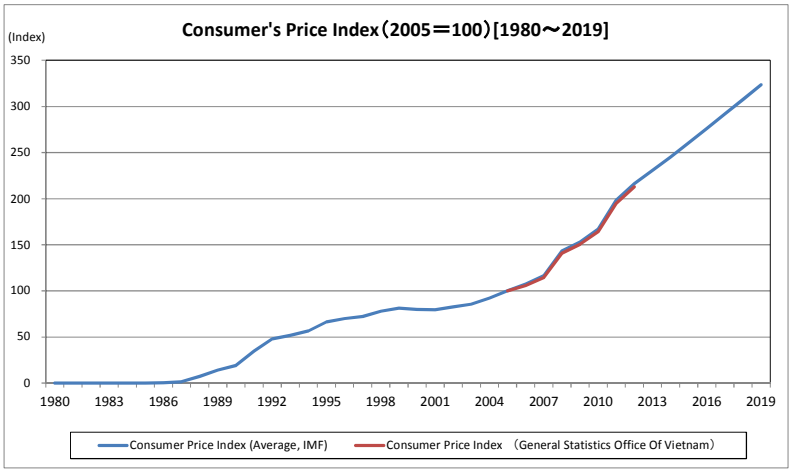
Source: JICA Study Team

Figure 8.6 Estimated GDP (based on PPP) per Capita

8.3.2 Trends in price indices

(1) Consumer price index in Vietnam

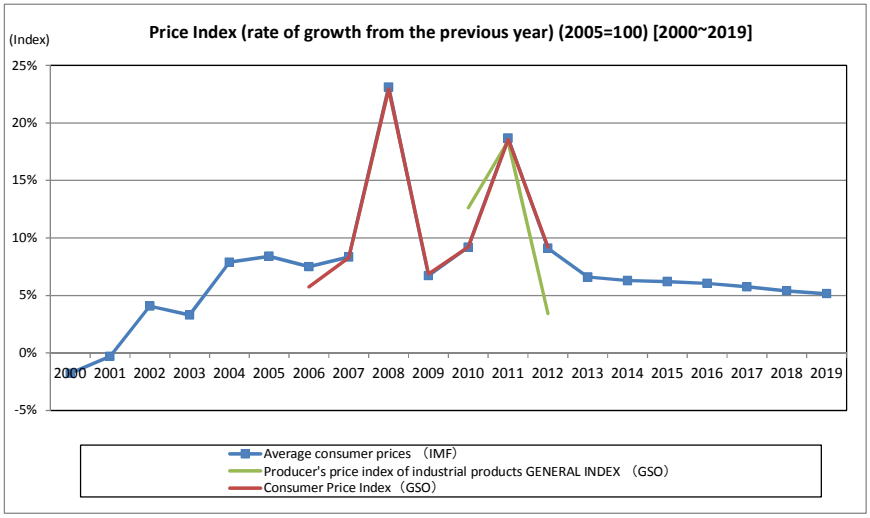
The following figures show the consumer price index (CPI) in Vietnam. As stated in Section 2.2.1-(4) "CPI growth rate", the year-on-year CPI growth rate hovered around 8% after 2005 except in 2008 and 2011 when hyperinflation was observed and has been falling since February 2011 when the government adopted Resolution No. 11, which aimed to curb inflation and stabilize the macroeconomy.



* 2005 = 100
* Source: IMF data, which is from the General Statistics Office of Vietnam
* The figures for 2014 and afterwards are IMF estimates.

Source: JICA Study Team

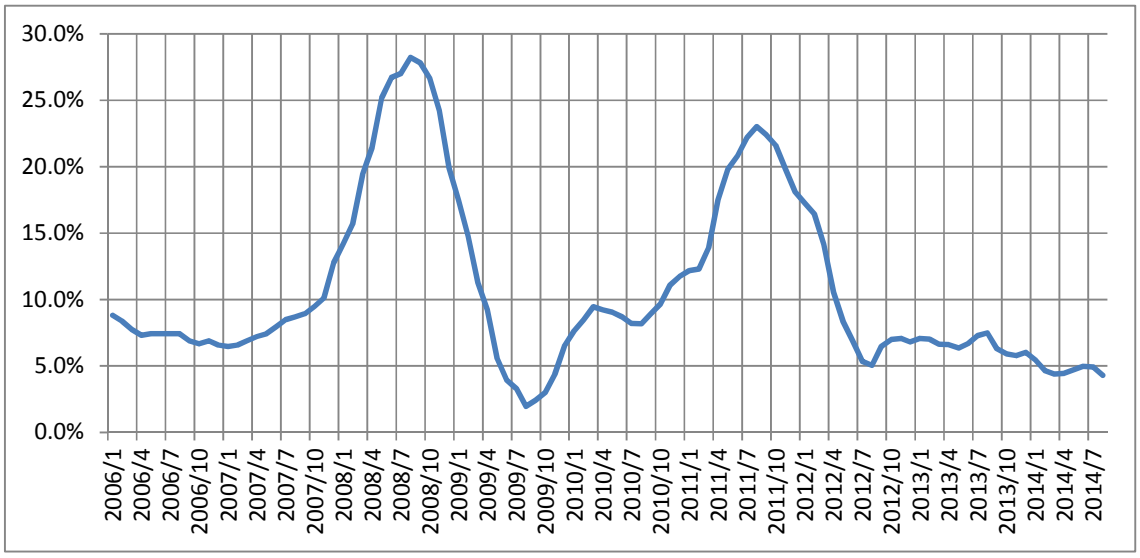
Figure 8.7 Trends in the Consumer Price Index in Vietnam



* Source: IMF data, which is from the General Statistics Office of Vietnam
* The figures for 2014 and afterwards are IMF estimates.

Source: JICA Study Team

Figure 8.8 Trends in the Consumer Price Index (year-on-year growth rate)



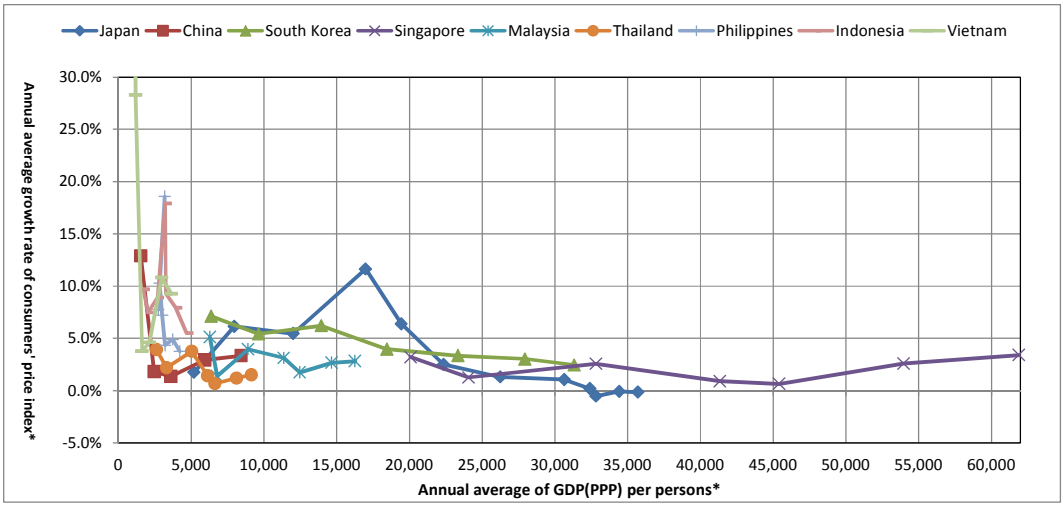
* 2005 = 100
* Source: IMF data, which is from the General Statistics Office of Vietnam
* The figures for 2014 and afterwards are IMF estimates.

Source: JICA Study Team

Figure 8.9 Year-on-Year Quarterly Trends in the Consumer Price Index (since 2006)

(2) Trends in other indices elsewhere in Asia

As for GDP per capita and CPI growth rates in selective countries in Asia (Japan, China, ROK, Singapore, Malaysia, Thailand, the Philippines, Indonesia and Vietnam), some countries with GDP per capita of 5,000USD or lower experienced a CPI annual growth rate of 10% or higher, while countries with a higher GDP per capita tended to have a stable CPI growth rate of 0-5%.



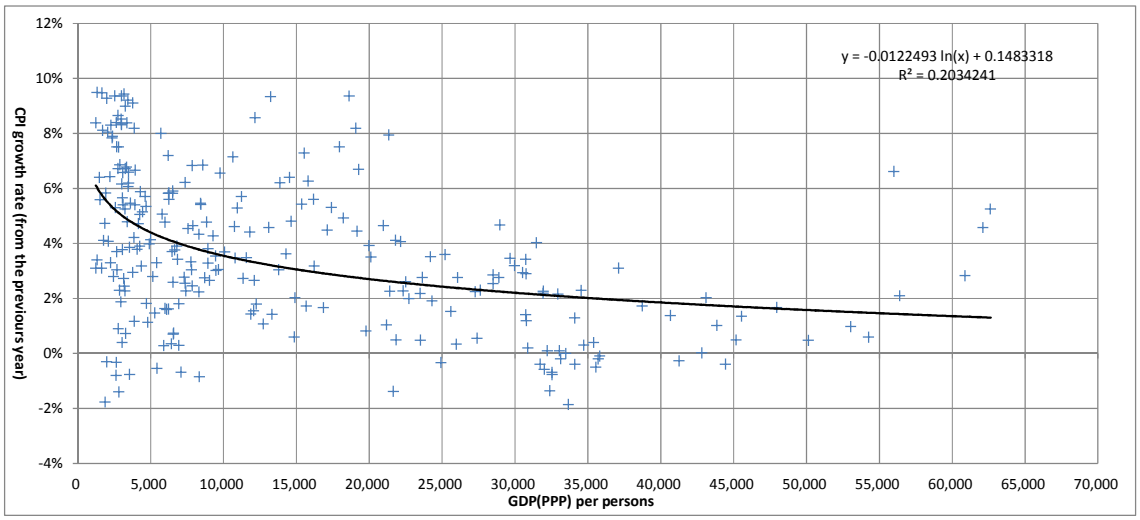
Source: JICA Study Team

Figure 8.10 GDP per Capita and CPI Growth Rates in Major Countries in Asia

(3) CPI forecasts

A simple linear regression was performed about the relationship between GDP per capita and CPI growth rates in selective countries in Asia and coefficients of determination, R2, were plotted to draw a logarithmic curve. This suggests that the CPI for countries with GDP per capita of 4,000 – 20,000USD stood at 2.7%, which was approximately 0.6 times lower than that of countries with

GDP per capita of 4,000USD.



* CPI growth rates exceeding 10% were considered abnormal values and excluded from the analysis.

Source: JICA Study Team

Figure 8.11 Correlation between GDP per Capita and CPI Growth Rates in Major Countries in Asia

Based on the logarithmic curve, this survey has set the CPI growth rate at the time of GDP per capital of 4,000USD at 8%, or 100 and forecast CPI growth rates in future as in Table 8.3 .

Table 8.3 Forecasts of Decreases in CPI Growth Rates

GDP per capita (USD)		CPI growth rate in the estimation model		Forecast CPI growth rate (assuming that the rate is 8% when GDP per capita is 4,000USD)
	Level in Vietnam		Index	
4,000	Level in 2013 - 2015	4.7%	100.0	8.0%
5,000	Level in 2016 - 2020	4.4%	94.2	7.5%
6,500	2021～2025	4.1%	87.3	7.0%
8,000	2026～2030	3.8%	81.8	6.5%
10,000	2031～2035	3.6%	76.0	6.1%
13,000	2036～2040	3.2%	69.1	5.5%
16,000	2041～2045	3.0%	63.7	5.1%
20,000	2046～2050	2.7%	57.8	4.6%

Source: JICA Study Team

8.4 Risk Analysis

8.4.1 Basic perspectives of risk analysis

Business risks involved in the Project will be analyzed from the following perspectives:

(1) Identification: Various risks involved will be clarified and classified in terms of project stage: (i) the period prior to commencement of construction (chiefly detailed designing); (ii) the construction period; and (iii) the operation and maintenance period.

(2) Assessment: (i) Loss in the Project and (ii) increased cost that could be incurred if such a risk became evident have been estimated, where:
- Loss in the Project = [additional costs exceeding the project cost initially expected by the SPC] + [lost profits due to loss of opportunity project earnings initially expected]
- Increased cost: additional cost to be borne by the government, or insurance.

Risk mitigation measures: possible risk mitigation measures are classified in terms of risk sharing.

8.4.2 Risk sharing and avoidance methods

Table 8.4 summarizes the risks to be taken by the related parties and mitigation measures:

Table 8.4 Parties Related to Risk Sharing, Major Risks and Mitigation Measures

Related party	Risks to be borne	Avoidance methods
Quang Ninh Province	Delay in delivery of land Unexpected amendments to relevant laws and regulations Delay in issuance of official approvals and licenses Revenue shortfall	Revisions to toll rates or approval to extend the O&M period Same as above Same as above Government-backed guarantee
Government of Vietnam (MOF)	Non-performance of the contract by Quang Ninh Province	Government-backed guarantee
Contributors	Inability of the project implementing body to repay	Additional capital injection (limited recourse)
Insurance company	Occurrence of any risk insured	Insurance coverage
SPC	Design defect Force Majeure causing natural disasters Third-party liability Revenue shortfall	Insurance coverage Insurance coverage Insurance coverage Grant of 50% of the amount of revenues unachieved from Quang Ninh Province
Contractor	Construction risk	Lump-sum contract or the SPC

Source: JICA Study Team

8.4.3 Insurance to mitigate risk

Insurance is a major tool for the SPC, the project implementing body, to mitigate various risks. Table 8.5 summarizes general insurance policies and their coverages.

Table 8.5 Major Insurance Policies

Stage	Title	Coverage
After conclusion of the project contract and before commencement of construction (during the detailed designing period)	Professional Indemnity Insurance	Compensation for loss or damage due to any accidents (collapse of facilities due to insufficient design load bearing capacity, damage to any third party due to such collapse, etc.) during construction, resulting from design defects The insurance period is several years after commencement of the construction
Construction period	Contractor's All Risk Insurance (CAR)	The insurance comprises the following three sections: Section-1 "Material Damage": insurance covering damage to materials and structures Section-2 "Third-Party Liability": third-party liability insurance Section-3 "Advance Loss of Profits": Compensation insurance covering loss of profits and cost incurred due to delay in schedule or discontinuation of construction
	Marine Cargo Insurance	Compensation insurance covering damage to cargo in transport and related loss of profits Insurance covers both marine and air transport
	Start-Up Delay Insurance	Insurance covering additional expenses and advance loss of profit due to start-up delay due to delay in arrival of construction materials resulting from disasters and other event. This insurance does not cover delayed commencement resulting from any delay in delivery of land or other similar reasons
	Worker's Compensation Insurance/Employer's Liability Insurance	Insurance covering damage to workers during the construction period
O&M period	All Risk Insurance (CAR)	Compensation insurance covering damage to and collapse of facilities due to natural disasters (insurance against fire, earthquake, etc.) Compensation insurance covering damage to facilities resulting from maintenance work
	Third-Party Liability	Compensation insurance covering damage to and collapse of third-parties' assets resulting from maintenance work
	Worker's Compensation Insurance/Employer's Liability Insurance	Insurance covering damage to workers during the operation and maintenance period

Source: JICA Study Team

In line with Table 8.5, Table 8.6 presents a specific risk matrix.

Table 8.6 List of Conceivable Risks

Risk Identification			Impacts such as a fall in revenues and an increase in costs	Risk allocation		Risk Assessment	Mitigation Measure
Risk category		Contents		Quang Ninh Province	SPC		
Risk after conclusion of the project contract and before commencement of construction							
	Risk related to securing of investment in capital	Inability to secure investment in capital by the time it is needed	Delay in establishing the SPC ⇒ delay in the Project as a whole		◎		Shareholders agreement
	ROW Handover Delay Risk	Delay in handover of ROW due to delay in acquisition by Quang Ninh Province, etc.	An increase in expenses due to delayed commencement of construction (such as labor costs while workers are kept waiting) Delayed commencement of construction ⇒ delayed commencement of service provision ⇒ decline in toll revenue due to the shortened O&M period	◎		The loss comprises (i) expenses incurred while awaiting commencement of construction and (ii) delayed commencement of construction ⇒ delayed commencement of service provision ⇒ decline in toll revenue due to the shortened O&M period Increase in the project cost is offset by increased toll fees (passed on to users) and an extension of the project term (O&M period)	The additional cost will be recovered and the fall in toll revenue will be offset by increased toll fees during the O&M period. An extension of the project term If it is difficult to implement these measures, an arrangement will be made to require Quang Ninh Province and the Government of Vietnam to compensate for the loss/fall in revenue in the project agreement and the government guarantee undertaking (GGU).
	Start-up Delay Risk	Delay in procedures for issuance of licenses and permits	Delay in procedures ⇒ delayed commencement of construction ⇒ delayed commencement of service provision ⇒ an increase in expenses in idle time and decline in toll revenue due to the shortened O&M period	◎		Same as above	Same as above
	Design Error Risk	Defects undetected in the detailed design	Serious accidents, damage to facilities and compensation for damage to third parties due to defects in the detailed design		◎	The loss may occur as a result of, for example, defects in design, collapse of facilities and damage to third parties.	Risk coverage by insurance (Professional Indemnity Insurance)
Risk after conclusion of the project contract and before commencement of construction (Cont'd)							
	Fund Procurement Risk (Sponsor risk, lender risk etc.)	Risk of failure to procure sufficient funds	The risk leads to a default.		◎	Shortages of borrowings from banks and grants from the Government of Vietnam	Risk coverage by insurance An increase in compensation from the government

Risk Identification		Impacts such as a fall in revenues and an increase in costs	Risk allocation		Risk Assessment	Mitigation Measure
Risk category	Contents		Quang Ninh Province	SPC		
						An increase in capital
Business Interruption	Cancelation of construction for reasons attributable to Quang Ninh Province	Damage due to failure to recover expenses (detailed designing and other expenses) incurred by the time of the cancelation	◎		The loss comprises (i) all expenses incurred after conclusion of the project agreement and until the cancelation and (ii) all expenses paid to lenders. An increase in the project cost is equal to the total compensation by Quang Ninh Province in Mitigation Measure.	Quang Ninh Province will bear the detailed designing and other expenses, other expenses for preparation for the Project and debts. This will be stated in the default clause of the project agreement, requiring Quang Ninh Province to assume responsibility.
	Cancelation of construction due to Force Majeure	Damage due to failure to recover expenses (detailed designing and other expenses) incurred by the time of the cancelation		◎	Same as above	Risk coverage by insurance (All Risks Insurance)
Risk during the construction period						
Marine Shipping Risk	Accidents during marine transport of construction materials	Damage to and loss of construction materials due to accidents during marine transport of construction materials by ship		◎	The loss is equivalent to the total market value of materials on the commissioned marine transport (replacement cost). An increase in the project cost is equivalent to the insurance premiums.	Risk coverage by insurance (Marine Cargo Insurance)
Technical risk (construction)	Delay, interruption or inability to perform construction due to insufficient skills of the contractor	Failure to complete construction Extension of the construction period ⇒ a fall in revenue due to the shortened O&M period Penalty for delay in construction		◎	The loss is offset by the contractor. Avoidance of any constructor with low capacity	Subscription to an insurance by the contractor Subscription to an insurance covering secondary damage compensation by the SPC Commissioning Japanese constructors with difficult parts of superstructure work Commissioning Vietnamese constructors with rich experience and high capacity for substructure work

Risk Identification		Impacts such as a fall in revenues and an increase in costs	Risk allocation		Risk Assessment	Mitigation Measure
Risk category	Contents		Quang Ninh Province	SPC		
Risk of construction cost over-run	Difficulty to complete the construction with the budget stipulated in the initial agreement	An increase in the project cost		◎	The Vietnamese contractor turns out to be a constructor that can implement construction within a lump-sum, fixed budget. The risk of cost over-run can be managed more easily in general by the SPC, rather than the contractor.	More accurate estimated cost Incorporation of contingency funds of 10% or so of the project cost in the SPC project plan
Risk during the construction period (Cont'd)						
Price fluctuation risk (at the construction stage)	An increase in prices during construction (construction cost)	An increase in the project cost		◎	A high inflation rate of 7.5% is expected in advance for the construction period in accordance with previous price fluctuations.	Incorporation of contingency funds of 10% or so of the project cost in the SPC project plan The project agreement will include provisions concerning measures against abrupt price rises. The increased cost will be passed on to users.
Natural Force Majeure	Accidents due to disasters and other forms of Force Majeure	Damage to and loss of construction materials or buildings due to disasters (earthquakes and other natural disasters and fire, explosion and other human-made disasters)		◎	The loss is equivalent to the total market value of materials and facilities damaged (replacement cost). An increase in the project cost is equivalent to the insurance premiums.	Risk coverage by insurance (All Risks Insurance)
Business Interruption	Cancelation of construction for reasons attributable to Quang Ninh Province (legal amendment, etc.)	Damage due to loss of opportunities to generate project revenues and gain the means of repaying debts, which are expected during the O&M period due to inability to recover the expenses (expenses of procuring construction materials) during the construction period	◎		The loss comprises (i) expenses incurred after commencement of construction and until the interruption, (ii) debts from borrowings, etc. and (iii) project revenues expected during the O&M period. An increase in the project cost comprises loss compensation by Quang Ninh Province to the SPC and the total payments made by the province to lenders.	Quang Ninh Province will bear all expenses required for commencement of construction, the remaining value of facilities completed, debts from borrowings, etc. The project agreement will include provisions concerning these matters as the default clause that requires the province to assume responsibility.
Risk during the construction period (Cont'd)						

Risk Identification		Impacts such as a fall in revenues and an increase in costs	Risk allocation		Risk Assessment	Mitigation Measure
Risk category	Contents		Quang Ninh Province	SPC		
Business Interruption (Cont'd)	Interruption of construction due to Force Majeure	Same as above		◎	The loss comprises (i) expenses incurred after commencement of construction and until the interruption, (ii) debts from borrowings, etc. and (iii) project revenues expected during the O&M period. An increase in the project cost is equivalent to the insurance premiums.	Risk coverage by insurance (All Risks Insurance)
Risk of accidents during construction	Damage to facilities or workers due to accidents during construction	An increase in the project cost			The loss is be offset by the contractor.	The contractor will take out insurance for construction work.
Third-Party Liability	Damage to assets or third party injuries due to the construction work	Compensation for damage to assets or third party injuries as a result of construction work incidents		◎	The loss is the total market value of assets and injuries that the third parties concerned have lost. An increase in the project cost is equivalent to the insurance premiums.	Risk coverage by insurance (Third-Party Liability Insurance)
Risk during the construction period (Cont'd)						
Risk of delay in completion	Delay in completion of construction due to delay in procedures for issuance of a certificate of completion, etc.	An increase in expenses during the extended construction period (such as interests incurred during the period) Delay in completion of construction due to delay in procedures ⇒ a fall in revenues due to the shortened O&M period	◎		The loss is an increase in expenses due to the extended construction period and a fall in revenue due to the shortened O&M period, resulting from delay in completion due to delay in procedures An increase in the project cost is offset by a rise in toll fees (passed on to users) to offset the loss above and an extension of the project term.	The increased expenses and fall in revenue will be offset by a rise in toll fees during the O&M period. Extension of the project period
	Delay in completion due to response to	Additional expenses incurred due to revisions to	◎		Same as above	

Risk Identification			Impacts such as a fall in revenues and an increase in costs	Risk allocation		Risk Assessment	Mitigation Measure
Risk category		Contents		Quang Ninh Province	SPC		
		unexpected amendments to laws and regulations, etc.	designs and an extension of the construction period in response to amendments to relevant laws and regulations during the construction period An extension of completion ⇒ a fall in revenue due to the shortened O&M period				
Risk during the construction period (Cont'd)							
	Risk of delay in completion (continued)	Delay in completion due to delay in removal of underground or overhead utilities (where a third-party operator is responsible for the removal work)	Additional expenses incurred due to an extension of the construction period An extension of completion ⇒ a fall in revenue due to the shortened O&M period	◎	◎	The loss is an increase in expenses due to the extended construction period and decline in toll revenue due to the shortened O&M period, resulting from delay in completion. An increase in the project cost is equivalent to the insurance premiums if compensated by the SPC. It is offset by an increase in toll fees and an extension of the project term if compensated by Quang Ninh Province.	The increased expenses or a rise in toll fees /extension of the project period
		Delay in completion due to any disasters or accidents	Additional expenses incurred due to an extension of the construction period as a result of damage to construction materials or facilities An extension in completion ⇒ a fall in revenue due to the shortened O&M period		◎	The loss is an increase in expenses due to the extended construction period and decline in toll revenue due to the shortened O&M period, resulting from completion delayed by disasters or accidents. An increase in the project cost is equivalent to the insurance premiums.	Risk coverage by insurance (All Risks Insurance) Lump-sum contract with an EPC operator.
	Related infrastructure risk	Delay in completion of the Hanoi-Haiphong	Failure in completion of the Hanoi-Haiphong Highway	◎		The road network cannot be completed solely with this	The project agreement will include provisions concerning

Risk Identification		Impacts such as a fall in revenues and an increase in costs	Risk allocation		Risk Assessment	Mitigation Measure
Risk category	Contents		Quang Ninh Province	SPC		
	Highway or the section of 20km	although its construction precedes this Project but will not complete by the time when the construction under this Project commences. Or failure in completion of the section of 20km of Ha Long-Haiphong Highway that will be carried out as a public work directly by Quang Ninh Province			Project. Even if the Project is completed and the service starts, no traffic can be expected.	compensation for relevant damage. The Government of Vietnam will take responsibility for stipulating certain provisions on compensation in the GGU.
Risk during the O&M period						
Risk of project revenue	Risk that toll revenue falls below the expected revenue	Shortage of toll revenue because of actual traffic volume below the estimate	○	○	The loss is the difference between the actual toll revenue and the revenue set forth in advance in the project agreement (estimated traffic volume x toll fees).	Quang Ninh Province will pay half the shortage of revenue to the SPC. The SPC will pay half the amount exceeding the estimated revenue to Quang Ninh Province.
* Secondary risk Risk that Quang Ninh Province lacks financial resources to compensate for a shortage of project revenue	Failure of Quang Ninh Province to have sufficient financial resources to compensate for the shortage of project revenue	Failure to compensate for the shortage of project revenue, which results in a fall in revenue	◎		Any measures to secure the project agreement even if Quang Ninh Province fails to compensate for the shortage	The Government of Vietnam (such as MOF) will make guarantee against default of Quang Ninh Province on the payment.
Risk of revisions to toll fees	Approval cannot be granted for a 20% increase in toll fees every three years.	Shortage of toll revenue	◎		An approval of the MOF needs to be obtained for a rise in toll fees exceeding the scope set forth in Circular 159.	The project agreement will include provisions for rises in toll fees. For this arrangement, approval of the MOF will be obtained as GGU.
Technical risk (O&M)	Poor O&M due to insufficient technical capabilities of maintenance administrators	Inability to appropriately operate or maintain the facilities		◎	Avoidance of constructors with low O&M capability	Commissioning Vietnamese constructors with rich experience and high technical capabilities Technical assistance from Japanese companies for O&M

Risk Identification		Impacts such as a fall in revenues and an increase in costs	Risk allocation		Risk Assessment	Mitigation Measure
Risk category	Contents		Quang Ninh Province	SPC		
Risk during the O&M period (Cont'd)						
Risk of O&M cost over-run	Difficulty in performing O&M within the budget initially estimated	An increase in the project cost		◎	Risk of cost over-run can be managed more easily in general by the SPC, rather than by the contractor.	An improvement in the accuracy of the estimated cost
Price fluctuation risk (at the O&M stage)	An increase in prices during the O&M period (O&M cost)	An increase in the project cost		◎	A high inflation rate is expected in advance throughout the project period in accordance with previous price fluctuations. Period / Predict value 2013~2015 8.0% 2016~2020 7.5% 2021~2025 7.0% 2026~2030 6.5% 2031~2035 6.0% 2036~2040 5.5% 2041~2045 5.0% 2046~2050 4.5%	The project agreement will include provisions concerning measures against abrupt price rises. The increased cost will be passed on to users.
Business Interruption	Cancelation of construction for reasons attributable to Quang Ninh Province (legal amendment, etc.)	Damage due to loss of opportunities to generate project revenues and gain the means of repaying debts, which are expected during the O&M period	◎		The loss comprises (i) debts from borrowings, etc. and (ii) project revenues expected during the O&M period. An increase in the project cost comprises loss compensation by Quang Ninh Province to the SPC and the total payments made by the province to lenders.	Quang Ninh Province will shoulder all outstanding debts of the SPC and compensate for all toll revenue that is expected after the time when the business is interrupted. The project agreement will include provisions concerning these matters as the default clause that requires the province to assume responsibility.
Risk during the O&M period (Cont'd)						
Business Interruption (Cont'd)	Cancelation of construction for reasons attributable to SPC (bankruptcy, etc.)	Same as above		◎	The loss comprises (i) debts from borrowings, etc. and (ii) project revenues expected during the O&M period.	n/a
	Interruption of construction due to	Same as above		◎	The loss comprises (i) debts from borrowings, etc. and (ii) project	Risk coverage by insurance (All Risks Insurance)

Risk Identification			Impacts such as a fall in revenues and an increase in costs	Risk allocation		Risk Assessment	Mitigation Measure
Risk category		Contents		Quang Ninh Province	SPC		
		Force Majeure				revenues expected during the O&M period. An increase in the project cost is equivalent to the insurance premiums. (* It is assumed that the insurance will cover all possible damage.)	
	Risk of repayment of borrowings	Risk of an increase in the burden of interest	An increase in cost due to an increase in the burden of interest resulting from an unexpected rise in the interest rate		◎	The loss is the amount of the increased burden of interest.	
	Risk of foreign exchange	Inability to gain approval for exchanging the currency from VND that is used for toll collection to JPY or other foreign currencies	Unless the authority allows exchanges from VND to JPY, USD or other international currencies, debts cannot be repaid, nor can dividends be distributed.	◎		The BOT Law allows exchanges of currencies.	The project agreement will include provisions concerning exchanges of currencies. The Government of Vietnam will take responsibility for stipulating provisions on this matter in the GGU.
	Risk of remittance	Remittance from Vietnam to abroad is not permitted.	Unless remittance is permitted, debts cannot be repaid, nor can dividends be distributed	◎		The BOT Law allows overseas remittance.	The project agreement will include provisions concerning exchanges of currencies. The Government of Vietnam will take responsibility for stipulating provisions on this matter in the GGU.
Risk during the O&M period (Cont'd)							
	Risk of disasters and accidents	Disasters and other forms of Force Majeure and accidents	An increase in expenses of repair and maintenance buildings damaged by disasters (earthquakes, thunderstorms, tornados and other natural disasters and fire, explosion and other human-made disasters)		◎	The loss is equivalent to the total market value of buildings and facilities damaged (replacement cost). An increase in the project cost is equivalent to the insurance premiums. (* It is assumed that the insurance will cover all possible damage.)	Risk coverage by insurance (All Risks Insurance)
	Third-Party Liability	Damage to assets or	Compensation for damage to		◎	The loss is the total market value	Risk coverage by insurance

Risk Identification		Impacts such as a fall in revenues and an increase in costs	Risk allocation		Risk Assessment	Mitigation Measure
Risk category	Contents		Quang Ninh Province	SPC		
	third-party injuries during the maintenance work	assets or third-party injuries as a result of incidents of the maintenance work			of assets and injuries that the third parties concerned have lost. An increase in the project cost is equivalent to the insurance premiums. (* It is assumed that the insurance will cover all possible damage.)	(Third-Party Liability Insurance)
Worker's Liability	Compensation for damage to staff members during the O&M period	Compensation for damage to staff members during the maintenance or other work		◎	The loss is the cost of injuries of staff members, etc., injuries and values of human lives. An increase in the project cost is equivalent to the insurance premiums. (* It is assumed that the insurance will cover all possible damage.)	Risk coverage by insurance (Worker's Compensation Insurance /Employer's Liability Insurance)
Risk during the O&M period (Cont'd)						
Automobile Breaking Down	Compensation for damage to maintenance vehicles	Repair cost of maintenance vehicles damaged		◎	The loss is the total market value of vehicles damaged. An increase in the project cost is equivalent to the insurance premiums. (* It is assumed that the insurance will cover all possible damage.)	Risk coverage by insurance (Automobile Insurance)
Risk throughout the project period						
Risk of non-performance of the agreement by Quang Ninh Province	Failure of Quang Ninh Province to comply with provisions of the project agreement, etc.	It depends on incidents.	◎		The loss depends on incidents.	The Government of Vietnam will stipulate in the GGU that it will require Quang Ninh Province to comply with the agreement. The Government of Vietnam will take responsibility if Quang Ninh Province fails to comply. The project agreement and GGU will include provisions that Quang Ninh Province will compensate for any damage incurred to the SPC because of its non-performance of the agreement and

Risk Identification		Impacts such as a fall in revenues and an increase in costs	Risk allocation		Risk Assessment	Mitigation Measure
Risk category	Contents		Quang Ninh Province	SPC		
						that the Government of Vietnam will give assurance.
Nationalization and condemnation of assets	Assets, etc. of the SPC are nationalized or condemned.	Investment cannot be recovered.	◎		The loss depends on incidents.	The project agreement and GGU will include provisions that neither Quang Ninh Province nor the Government of Vietnam will nationalize or condemn any assets of the SPC.
Risk throughout the project period (Cont'd)						
Amendments to the legal framework	It becomes difficult for the SPC to continue the business because of amendments to the relevant legal framework. Such amendments require additional expenses for remodeling of facilities.	Investment cannot be recovered. Burden of expenses of remodeling facilities	◎		The loss depends on the circumstances, consisting of the remodeling expenses and interest.	The project agreement and GGU will include provisions that Quang Ninh Province and the Government of Vietnam will purchase the facilities. The project agreement will also include provisions on revised toll fees or an extension of the O&M period.
Revisions to the tax system	An increase in tax payments due to revisions to the tax system	A fall in dividends	◎	○	The loss depends on revised tax rates and amount. The SPC is affected by revisions to the corporate tax and other tax systems related to operating companies.	The project agreement will include provisions on revised toll fees or an extension of the O&M period. If such revisions to the project conditions are difficult, the project agreement and GGU will include provisions that Quang Ninh Province and the Government of Vietnam will make relevant compensations.
Governing law and language	Setting laws and languages in Vietnam and Vietnamese as the Project's governing law and language is unfavorable to the SPC if any dispute arises.	An increase in loss if any dispute arises	○	○	The loss depends on incidents.	The project agreement and GGU will include provisions that general provisions will comply with laws in Vietnam and that special matters such as matters related to BOT will comply with international laws recognized as international standards.

Risk Identification			Impacts such as a fall in revenues and an increase in costs	Risk allocation		Risk Assessment	Mitigation Measure
Risk category		Contents		Quang Ninh Province	SPC		
							The project agreement and all other official documents will be created in English.
	Court and arbitration body	Setting Vietnamese courts and arbitration body as the Project's official court and arbitration body is unfavorable to the SPC if any dispute arises.	An increase in loss if any dispute arises	○	○	The loss depends on incidents.	The project agreement and GGU will include provisions that any dispute will be brought in an arbitration body in Singapore or other third-party country.

Source: JICA Study Team

8.5 Financial Plan

8.5.1 Basic policy

This Project will be financed by contributions from sponsors and loans from financial institutions. Loans from financial institutions will be provided as project finance to the SPC, which is established by the sponsors. A project finance is a loan provided to a company solely for project implementation (special purpose company (SPC)) with the funds to be used only for the project and the cash flow generated from the same to be used for repayment. The sponsors, in principle, have no obligation to make debt guarantee or any repayment. However, in light of recent trends in project financing, there is a chance that limited recourse finance will be adopted, which imposes limited obligations on sponsors.

8.5.2 JICA Private Sector Investment Finance

The JICA Private Sector Investment Finance is designed for projects implemented by private companies and other entities, which have great impacts on the development of developing countries such as Vietnam, but are financially unfeasible solely with funds from general financial institutions. It finances private companies and other entities via investment or loans to promote the socioeconomic development of developing countries.

Table 8.7 summarizes the system based on publicly available sources.

Table 8.7 Summary of the JICA Private Sector Investment Finance

Loan	Ratio of loan	The upper limit of a loan under the system will, in principle, comprise 70% of the total project cost, but can be 80% if it is particularly necessary. (The need to raise the upper limit is determined on a case-by-case basis depending on the project characteristics.)
	Redemption period	Within 20 years in principle (a maximum of 25 years), including a grace period of up to 5 years in principle (a maximum of 10 years)
	Interest-rate structure	The interest rate is set in accordance with the loan rates of the Fiscal Loan Fund, creditworthiness of borrowers and other factors. It will also satisfy a requirement of ODA projects, where the grant element accounts for 25% or higher, including the redemption period.
	Currency	Yen- or local currency-denominated (IDR, PHP, etc.). A possibility of adopting USD-denominated loans is under consideration.
Investment	Method	Direct investment in local companies and other entities in principle. The investment ratio will be 25% or less and shall not exceed the share of the largest shareholder.
	Investment period and exit policy	An exit policy will be set forth for each case prior to actual investment, depending on the project characteristics and consent will be obtained from the core companies and investing companies. The investment period shall be stipulated within the exit policy of each investment case.

* The JICA Private Sector Investment Finance is designed for direct assistance to individual projects and project funds.

Source: JICA website

8.5.3 Loan conditions of local banks in Vietnam

Loans for projects in Vietnam need to be yen-based under the JICA Private Sector Investment Finance, so to seek the possibility of obtaining a VND-denominated loan, hearings and specific examinations have been conducted on the loan conditions of local banks to the SPC when the two-step loan scheme is applied to the Project with finance of JICA via local banks in Vietnam.

(1) Summary of major local banks

Table 8.8 summarizes the major local banks. Various types of financial institutions exist in Vietnam, which are chiefly classified into state-owned commercial banks and private commercial banks. In general, the former exceeds the latter in terms of total assets and capital.

Table 8.8 Summary of Major Local Banks

	Form	Total asset	Capital	Workforce	Main shareholder
Vietcombank	State-owned commercial bank	414 trillion VND (approx. 2.1 trillion JPY)	23 trillion VND (approx. 120 billion JPY)	13,637	State Bank of Vietnam (77.11%), Mizuho Corporate Bank (15%), etc.
Vietinbank	State-owned commercial bank	576 trillion VND (approx. 2.9 trillion JPY)	37 trillion VND (approx. 190 billion JPY)	19,886	Government of Vietnam (80.3%), domestic private shareholders (9.7%) and overseas shareholders (IFC) (10%)
BIDV	State-owned commercial bank	366 trillion VND (approx. 1.8 trillion JPY)	145 trillion VND (approx. 730 billion JPY)	16,475	Unknown
ACB	Private commercial bank	205 trillion VND (approx. 1.0 trillion JPY)	9.4 trillion VND (approx. 47 billion JPY)	7,255	Domestic shareholders: 70.13% (individuals: 54.4% and corporate bodies: 15.7%) and foreign shareholders: 29.87%
Military bank	Private commercial bank	180 trillion VND (approx. 0.9 trillion JPY)	10.0 trillion VND (approx. 50 billion JPY)	6,128	Vietcombank (9.59%), Viettel Corporation (15%) and Flight Service Corporation of Vietnam
Techcombank	Private commercial bank	150 trillion VND (approx. 0.8 trillion JPY)	6.9 trillion VND (approx. 35 billion JPY)	7,481	Individuals (33.3%), HSBC (19.6%), Masan Group Corporation (19.7%), etc.

Sources: Created by the JICA Study Team based on "the Banking Sector in Vietnam", Kinzai Institute for Financial Affairs, Inc. and the websites of the banks listed above

(2) The results of hearings with local banks

To examine the possibility of obtaining a two-step loan, the Study Team has conducted hearings with several local banks about the conditions for a two-step loan (interest rate, risk, credit line, etc.). Table 8.9 shows the major results of the hearings.

Table 8.9 Results of Hearings with Local Banks

Hearing item	Results
Foreign exchange risk	・ Different banks responded differently to the question about whether local banks would bear foreign exchange risk. ・ The maturity of foreign exchange swap is 6-12 months for JPY/VND and about 10 years for USD/VND. ・ The interest rate of foreign exchange swap for the maturity of 10 years will presumably be at least 7%.
Interest rate	・ No long-term interest rate is available and a floating rate will presumably be applied with revisions every six months. ・ The current base rate is about 11% and the rate will presumably be at least 12-15% even in the case the JICA Private Sector Investment Finance is applied to a two-step loan. ・ However, it may be possible to lower the rate if a guarantee from central government is obtained.
Business risk	・ For local banks to bear the business risk of the Project, there is a need to obtain a government guarantee, or furnish security or joint guarantee of sponsors for debt repayments. ・ Local banks may bear business risk provided finance of JICA is secured.
Credit line	・ Regulations of the State Bank of Vietnam set forth the maximum credit line for each company. Specifically, the credit line is 15% of the shareholders' equity of the bank. ・ In principle, the State Bank of Vietnam sets forth a 15% rule, but the credit line may be raised if an application is made. ・ It is impossible to obtain a loan from a single bank for the Project. A syndicate loan is likely to be applied.

Source: JICA Study Team

(3) Issues clarified in the hearings with local banks

Table 8.10 summarizes the issues of the two-step loan scheme, which have been clarified in the hearings with local banks.

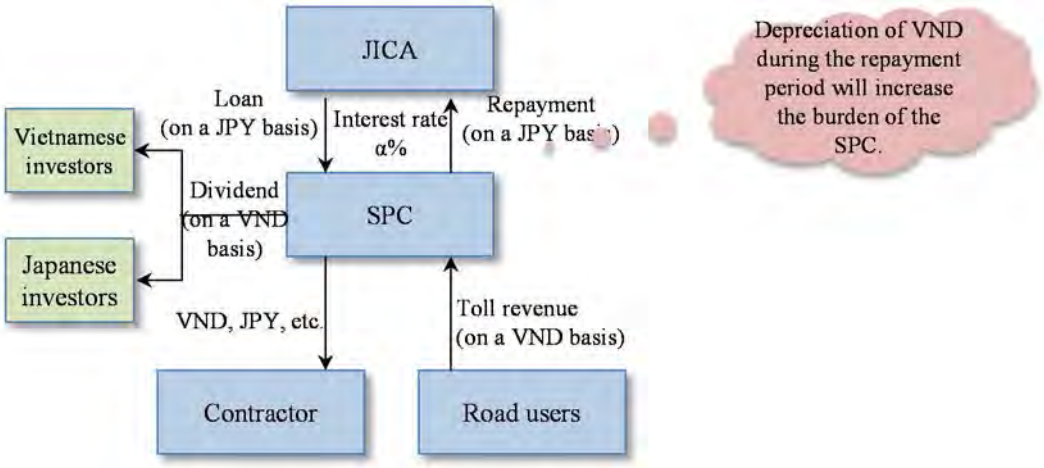
Table 8.10 Issues Clarified in Hearing Results

Hearing item	Challenge
Foreign exchange risk	・ Most foreign exchange swaps are up to 10 years and the cost is likely to increase because local banks have low credit capabilities, which means a considerable margin will be added to the interest rate.
Interest rate	・ No long-term interest rate is available and short-term rates alone are available in Vietnam, so business operations are exposed to interest-rate risk. ・ General interest rates are fairly high (annual rate of 9%).
Business risk	・ It is difficult for local banks to bear business risk without government guarantees for debt repayment. ・ Further negotiations are inevitable with central and regional governments because of the considerable impact on interest rates.
Others	・ The State Bank of Vietnam regulates the credit line of loans from one single bank to each borrower. Realistically, a syndicate loan is likely to be applied.

Source: JICA Study Team

8.5.4 Course of financial plan of the Project

At the time when this study was prepared, a VND-denominated loan was unavailable under the JICA Private Sector Investment Finance and loans for projects in Vietnam need to be yen-based. In this Project, where toll revenue that forms the project revenue is on a VND basis, the application of the JICA system will result in the SPC bearing the VND-JPY exchange risk for 20 years after commencement of the operation when principal repayment is completed, unless the foreign exchange risk is hedged through currency swaps or other means.

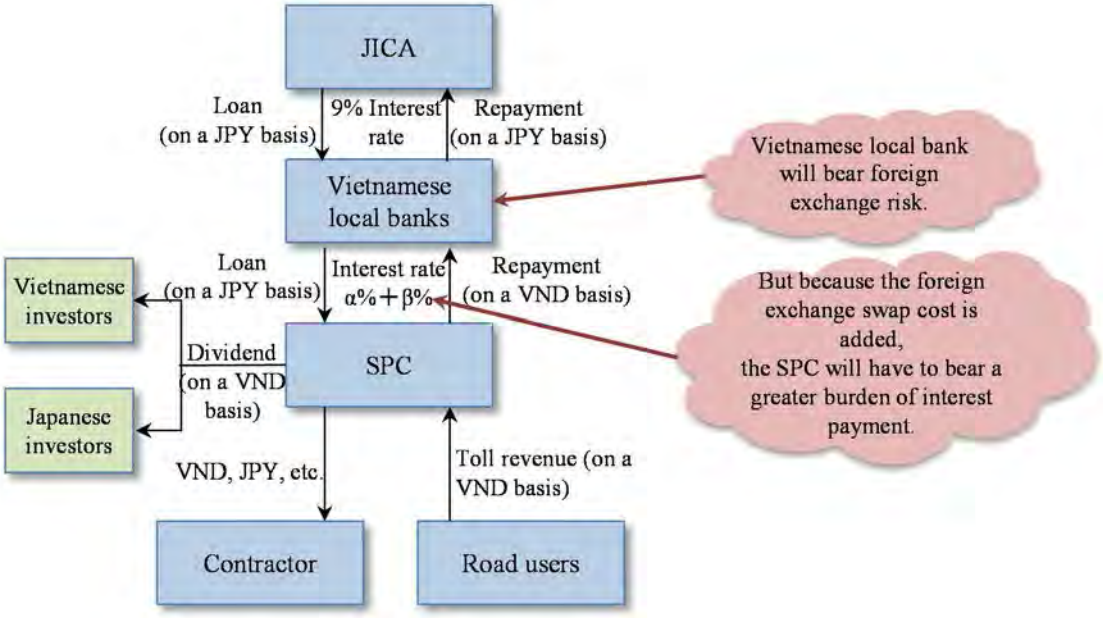


Source: JICA Study Team

Figure 8.12 Image of Direct Loan

A two-step loan involving local banks is an option to avoid such risk and make the loan VND-based.

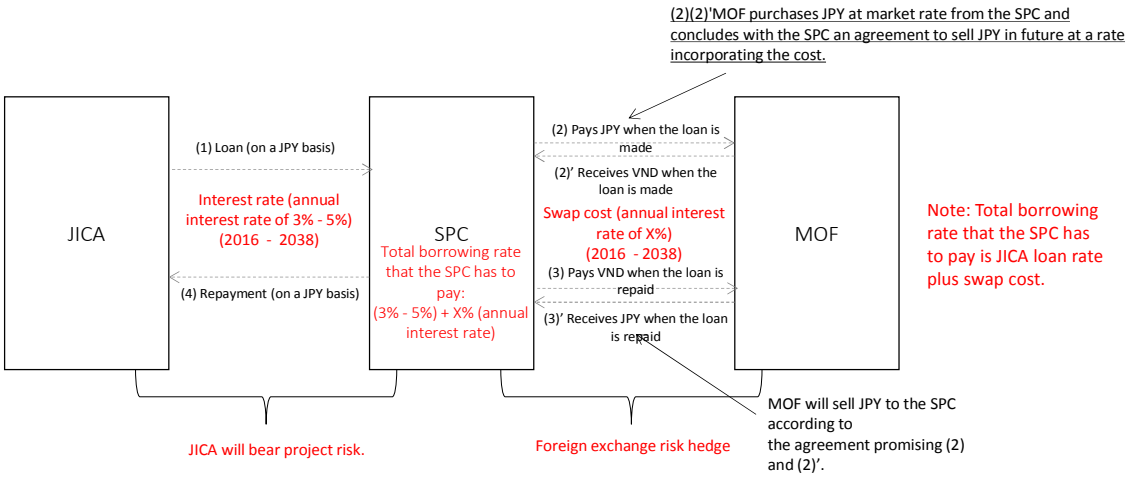
However, no foreign exchange swap market involving the Vietnamese currency exists at the moment with a maturity of 10 years or more. Even if local banks bear the foreign exchange risk, a considerable gap in interest rates of JPY and VND is likely to require the SPC to accept a considerable swap cost as part of the interest rate.



Source: JICA Study Team

Figure 8.13 Image of Two-Step Loan

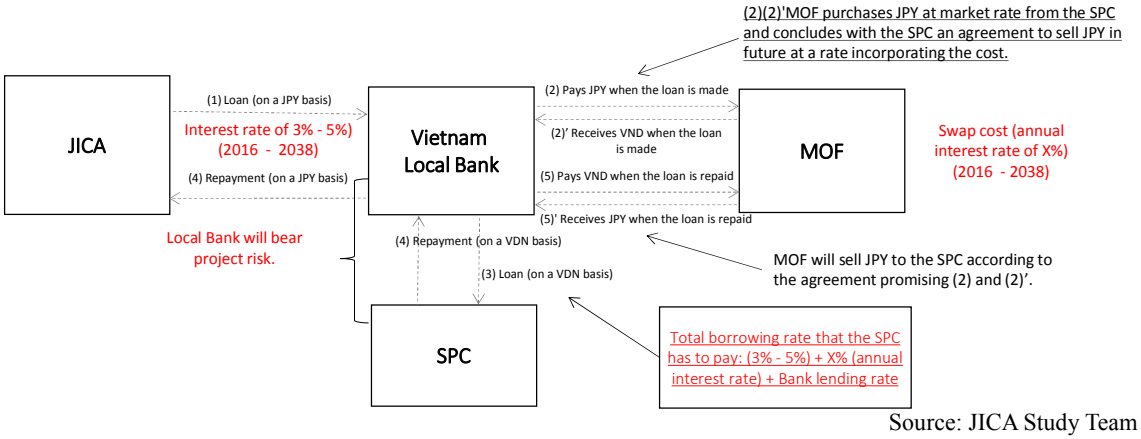
To realize the financial plan, it is essential to obtain the involvement and guarantee of the State Bank of Vietnam in comprehensive consideration of foreign exchange, interest rates and business risks. Based on this belief, the Study Team has also examined a scheme where the MOF bears long-term foreign exchange risk. Proposal 1 in Figure 8.15 is a scheme, where Vietnam's MOF forms a foreign exchange swap with the SPC as its counterpart, which the Study Team considers optimal for the Project.



Source: JICA Study Team

Figure 8.14 Proposal 1: Image of Foreign Exchange Swap by the MOF in Direct Loan

Proposal 2 in Figure 8.16 is a scheme which Vietnam's MOF forms with local banks in Vietnam, an alternative in case MOF shows a reluctance to form of a foreign exchange swap with a foreign company.



Source: JICA Study Team

Figure 8.15 Proposal 2: Image of Foreign Exchange Swap by the MOF in Two-Step Loan

Dividends to Japan's investors are not subject to the foreign exchange swap because it is believed that foreign exchange risk should be managed on their own responsibility as with other forms of investment.

8.6 Tax System

8.6.1 Corporate income tax

It has been assumed that the preferential tax treatment currently available will be applied to the SPC, so the corporate tax rate has been assumed as in Table 8.11.

Table 8.11 Corporate Tax Rate Applied to the SPC

Fiscal year		2014	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	2036 ~
iv) Applied Tax Rate	Case A						0%	0%	0%	0%	5%	5%	5%	5%	5%	5%	5%	5%	5%	10%	10%	20%	20%	20%
	Case B									0%	0%	0%	0%	5%	5%	5%	5%	5%	5%	5%	5%	10%	20%	20%

Source: JICA Study Team

The corporate tax rate has been calculated based on the following formula, where taxable revenue is assumed to be toll revenue after applying the distribution scheme of Quang Ninh Province. It has also been assumed that tax loss can be carried forward for a maximum of 5 years during the tax exemption period.

Corporate tax = (Taxable revenue – deductible expense – tax loss carried forward) x corporate tax rate
Taxable revenue = toll revenue ± income guarantee of 50% from Quang Ninh Province

8.6.2 Value-added tax (VAT)

It has been assumed that the SPC will bear the difference between sales VAT and purchase VAT in accordance with the offset method.

Taxable VAT = sales VAT – purchase VAT

It has been assumed that only toll revenue is subject to sales VAT: namely, revenue compensation from Quang Ninh Province is assumed to be exempt from sales tax. Conversely, purchase VAT is expected to be imposed on all goods and services which the SPC purchases for the toll road project and will thus be imposed on the costs of construction, consultancy and others at the construction stage. It has also been assumed that goods and services procured both within and from outside Vietnam are subject to purchase VAT.

8.6.3 Import tax

It has been assumed that the SPC will be exempt from import tax related to materials and equipment used at the construction stage in accordance with Decree 87/2010/ND-CP on the enforcement of the Import and Export Tax Law.

8.6.4 Non-agricultural land use tax

Non-agricultural land use tax is imposed annually on land used for non-agricultural purposes and it has been assumed here that it will be included in the operating cost.

Table 8.12 Amount of Non-Agricultural Land Use Tax (estimated tax amount)

Item	Condition	Unit	Remarks
Road width	80	m	It is assumed that the project land will cover an area of 40m on both sides from the road centerline.
Road length	5.411	km	Starting point: km19+800, Ending point: km²5+211
Total project area	432,880	m²	Road width x length. It is assumed that the area include rivers, over which the road passes.
Land price	10,000,000	VND/m²	The non-agricultural land price in Quang Ninh Province in 2014 ranges between VND210,000VND/m² and 20,400,000VND/m², according to Decision 3566/2013/QD-UBND issued on December 26, 2013.
Tax rate	0.03%		The rate of tax imposed on non-agricultural land for facilities manufactured or constructed under the Project, according to paragraph 2, Article 7 of Circular153/2011/TT-BTC (circular concerning non-agricultural land use tax).
(estimated) Annual tax amount	1,299	Mil VND	
	6,493,200	JPY	

Source: JICA Study Team

8.6.5 Land rental

It has been assumed that the SPC will be exempt from land rental in accordance with paragraph 3, Article 38 of Decree 108/2009/ND-CP (decree on BOT).

8.6.6 Others

(1) Business Registration Tax (BRT)

The SPC will be required to pay business registration tax (BRT) of 3,000,000VND each year. It has been assumed here that, like non-agricultural land use tax, BRT will be included in the operating cost.

Table 8.13 Business Registration Tax (BRT)

Level	Investment (VND)	Annual BRT
Level 1	Over 10 billion	3,000,000
Level 2	5 – 10 billion	2,000,000
Level 3	2 – 5 billion	1,500,000
Level 4	2 billion or less	1,000,000

Source: JICA Study Team

Sources: “Basic Summary about Systems in Vietnam for Business Expansion”, the website of JETRO; and a KPMG survey

(2) Registration fees for land use right, buildings, etc.

The SPC will be required to pay registration fees for land use rights, buildings and others at the time when the Project commences. (Estimated fees are presented in Table 8.14.) It has been assumed that these fees will be included in contingency funds.

Table 8.14 (Estimated) Registration Fees

Item		Condition	Unit	Remarks
Land use right	Total project area	432,880	m²	See calculation conditions of the amount of non-agricultural land use tax.
	Land price	10,000,000	VND/m²	
	Fee rate	0.50%		
	(Estimated) registration fee	21,644	Mil VND	
		108,220,000	JPY	
Buildings	Building and asset value	58,000	Mil VND	
	Fee rate	0.50%		
	(Estimated) registration fee	290	Mil VND	
		1,450,000	JPY	
Total		21,934	Mil VND	
		109,670,000	JPY	

* The vehicle registration fee is included in the cost of SPC establishment and thus not cited here.

Source: JICA Study Team

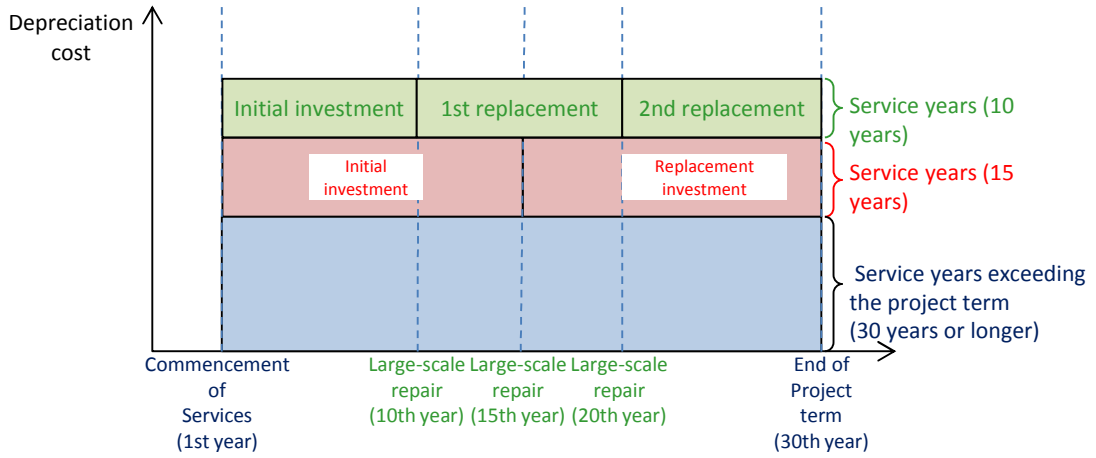
(3) Other taxes

Other than the taxes and duties cited above, the environmental protection tax and special consumption will be imposed on the SPC. It has been assumed that these taxes will be included in the commission fee that the SPC pays to the contractor and other parties, so the financial analyses here will not separately calculate them.

8.6.7 Depreciation

Decree 108/2009/ND-CP (decree on BOT) stipulates that depreciation will be completed within the O&M period, so that facilities and materials whose lifetime exceeds the project period of 30 years must be depreciated within the project period. In actual accounting, facilities and materials, such as electrical equipment, whose lifetime is longer than 30 years, must be depreciated in accordance with their lifetime. In this financial analysis, however, it has been assumed that the working lifetime of all facilities and materials for the Project will be 30 years and that they will be depreciated in 30 years. For facilities and equipment, where the O&M period (30 years) is not equal to any integral multiple of the lifetime, the approach to final depreciation must be considered.

Figure 8.17 illustrates an image of desirable depreciation (where the rental periods of facilities and materials are 10, 15 and 30 years respectively).



Source: JICA Study Team

Figure 8.16 Image of Depreciation

8.7 Dividend Policy

Vietnam imposes no particular rules or regulations that should be taken into account when a dividend policy is formulated. Priority is given to maintaining the sound financial standing of the SPC, whereupon the SPC dividend policy has been designed as follows:

Dividend: 80% of "cash before dividend except debt service reserve accounts" or earnings available for dividends (retained earnings in the previous fiscal term plus net earnings in the current fiscal term), whichever is smaller, where

"Cash before dividend except debt service reserve accounts" is defined as: 50% of "cash before dividend" less "repayment of interest and principal in the subsequent fiscal term".

8.8 Insurance

8.8.1 Types of insurance

Of various risks faced by the Project, the risk of failure to complete the construction work and the operational risk arising from damage due to natural disasters can be covered by private insurance policies and will be borne by the SPC.

Table 8.15 summarizes the insurance policies available at the construction and O&M stages.

Table 8.15 Insurance Policies Available to the Project

Construction stage	Professional Indemnity Insurance, Contractor's All Risk Insurance, Operation Delay Compensation, Marine Cargo Insurance and Marine Cargo Delay Compensation
O&M stage	All Risk Insurance, Project Discontinuation Insurance, Third-Party Liability Insurance and Worker's Compensation Insurance/Employer's Liability Insurance

Source: JICA Study Team

Three Japanese insurance companies doing business in Vietnam and state-run insurance companies - PetroVietnam Insurance Joint Stock Co. (PVI), Bao Viet Vietnam Insurance Co. (Bao Viet) and BaoMinh Insurance Co. (Bao Minh) – are potential insurance providers for the Project. Other than these, insurance brokers are available, which engage in inventing insurance packages and arranging reinsurance policies from the perspective of investors.

Hearings with the three Japanese insurance companies and insurance brokers advise the Study

Team to select private insurance companies purely for the benefit of the Project under the BOT scheme and leave no room for any Vietnamese governmental agencies to intervene. They say that many projects have got into trouble with insurance companies designated by Vietnamese governmental agencies: they lacked sufficient financial solvency and, when the project operators requested insurance payments, demanded an enormous volume of documents and were reluctant to pay insurance benefits.

8.8.2 Insurance for the construction stage

Professional Indemnity Insurance, Contractor's All Risk Insurance, Operation Delay Compensation, Marine Cargo Insurance and Marine Cargo Delay Compensation are available for the construction stage. Contractor's All Risk Insurance and Marine Cargo Insurance can cover lost profits arising from delays in construction or marine transport, respectively. Table 8.16 summarizes their standard insurance rates, indemnities and other conditions in accordance with the results of hearings with insurance brokers.

Table 8.16 Standard Rates, Indemnities and Other Conditions of Insurance for Construction Stage

Stage	Title	Abstract	(Annual) insurance rate	Ceiling on benefit	Coverage, etc.	Statutory obligation
After conclusion of the project contract and before commencement of construction	Professional Indemnity Insurance (PI)	Compensation for loss or damage due to any accidents during construction, resulting from design defects	3%	Design cost / ceiling is 10 million USD	The insurance period of five years after commencement of the construction. Exemption from obligation is 100,000 USD – 250,000 USD	Yes
Construction period	Contractor's All Risk Insurance (CAR)	Insurance covering damage to materials and structures; third-party liability insurance; and compensation insurance covering loss of profits and cost incurred due to delay in schedule or discontinuation of construction	0.7%	Construction cost / ceiling of the third-party liability insurance is 50,000 USD	The insurance period of five years after commencement of the construction. Exemption from obligation is 250,000 USD – 500,000 USD (20,000 USD for the third-party liability insurance)	Yes
	Operation Delay Compensation (covering up to 12 months)	Insurance covering lost profits due to delayed commencement of the operation	1.0%	Construction cost	An option of CRA. Exemption from obligation is 90 days.	No
	Marine Cargo Insurance	Compensation insurance covering damage to cargo in transport	0.15%	Cargo value	Exemption from obligation is 25,000 USD	No
	Marine Cargo Insurance (covering up to 12 months)	Insurance covering lost profits due to delay in marine transportation	0.5%	Cargo value	An option of Marine Cargo Insurance. Exemption from obligation is 30-45 days.	No

Note: VAT will also be charged on the insurance premiums.

Source: JICA Study Team

Lost profits of the SPC resulting from any delayed commencement of the operation would be enormous, so the SPC will subscribe to Operation Delay Compensation, Marine Cargo and Marine Cargo Delay Compensation Insurances, other than statutory obligatory Professional Indemnity Insurance and Contractor's All Risk Insurance. Accordingly, it has been assumed that the insurance cost will be 1.7% of the construction cost, 3% of the design cost and 0.65% of the marine transport cargo.

8.8.3 Insurance for the O&M stage

All Risk Insurance, Project Discontinuation Insurance, Third-Party Liability Insurance and Worker's Compensation Insurance/Employer's Liability Insurance are available for the O&M stage. Table 8.17 summarizes their standard insurance rates, indemnities and other conditions in accordance with the results of hearings with insurance brokers.

Table 8.17 Standard Rates, Indemnities and Other Conditions of Insurance for the O&M Stage

Stage	Title	Abstract	(Annual) insurance rate	Ceiling on benefit	Coverage, etc.	Statutory obligation
O&M period	All Risk Insurance	Compensation insurance against fire, earthquake and damage to facilities	0.1%	Construction cost	Exemption from obligation is 100,000 USD (250,000 USD with natural disasters)	No
	Business Interruption Insurance	Insurance covering indirect damage such as lost profits and current expenses	0.1%	Estimated revenues of the SPC	Covering up to 12 months, exemption from obligation is 30 days	No
	Third-Party Liability Insurance	Compensation insurance covering damage to and collapse of third-parties' assets	10,000 USD (fixed amount)	5 million USD	Exemption from obligation is 20,000 USD	No
	Worker's Compensation Insurance/Employer's Liability Insurance	Insurance covering damage to workers	0.3%	Monthly salary of 30 months for each worker concerned	No exemption from obligation	No[46]

Note: VAT will also be charged on the insurance premiums.

Source: JICA Study Team

8.8.4 Country Risk Insurance

Among various risks faced by the Project, sovereign risk cannot be insured by private insurance policies and needs public insurance for hedging. Sovereign risk includes suspension of foreign exchange due to institutional or policy changes in Vietnam, prohibition of remittances to Japan, contractual default by Quang Ninh Province or other governmental authorities, acquisition by the government or other parties, wars and civil commotion.

Conversely, political risk insurance policies can hedge such sovereign risks as prohibition of remittance, suspension of foreign exchange, contractual default, acquisition of the Project, wars and civil commotion. Among public insurance policies currently available, the insurance for loans for overseas projects provided by NEXI of Japan and the Political Risk Insurance provided by the Multilateral Investment Guarantee Agency (MIGA), a member of the World Bank Group, are possible insurance policies for the Project, but it has been assumed here that the latter will be used

[46] This is not a compulsory insurance according to the Insurance Business Law but is normally subscribed on the grounds that the Labor Law stipulates that employers are responsible for subscribing to the insurance.

because the Project will be financed by JICA Private Sector Investment Finance.

The Project will be implemented by a local municipality, Quang Ninh Province and thus it is fairly difficult to determine the present financial standing of the implementing agency, compared to that of central government. While the province has the Ha Long Bay World Heritage that can serve as a tourism resource and abundant underground resources, its financial standing appears weaker than that of central government. Quang Ninh Province offers an income guarantee of 50% and interest-free subordinated loan to the SPC and their solvency and determination to fulfill the Project agreement will directly affect the operation of the SPC. Accordingly, although the Project has ensured the guarantee from central government that Quang Ninh Province will fulfill the project contract, it is still crucial to prepare for risks arising from the financial standing of Quang Ninh Province (risk of contractual default) and other forms of sovereign risk.

Table 8.18 lists the insurance premiums in accordance with the present assumptions made based on the hearings with MIGA.

Table 8.18 Insurance Premiums

Risk to be insured	Insurance premium	Insurance amount
Remittance and foreign exchange risks and contractual default	100 - 120 bps	90% of the investment amount / 95% of the loan amount
Remittance and foreign exchange risks, contractual default and land acquisition	120 - 140 bps	
Remittance and foreign exchange risks, contractual default, land acquisition and wars and civil commotion	130 - 150 bps	

Note: These insurance agreements will be concluded outside Vietnam and thus are not subject to VAT.
Sources: Created by JICA Study Team based on information from MIGA

Table 8.19 shows the insurance premiums for the risk coverages.

Table 8.19 Insurance Premiums for Various Risk Coverage (annual)

	Insurance amount	Annual premium for (i)	Annual premium for (ii)	Annual premium for (iii)
Insuring capital funds only	9.72 billion yen	0107 billion yen	0.126 billion yen	0.136 billion yen
Insuring both capital funds and loan	33.66 billion yen	0.37billion yen	0.438 billion yen	0.471 billion yen

Note: The amounts of capital funds and loan are assumed to be 10.8 billion yen and 25.2 billion yen, respectively.
Sources: Created by JICA Study Team based on information from MIGA

This analysis has not tackled the question of whether or not the loan will be insured because it will be determined by JICA (and if insured, the insurance premium will be included in interest on the loan. The analysis has not tackled the question of whether or not the capital funds will be insured, either, on the grounds that investors should normally bear the risk involved, even for sovereign risk and that investors may not insure the risks involved in remittance and foreign exchange because they may want to use their funds to invest in other projects in Vietnam and thus do not remit or exchange the capital in VND.

8.9 Financial assistance from the Government of Vietnam

8.9.1 Summary

Vietnam will provide the Project with financial assistance via an income guarantee of 50% and interest-free subordinated loan of 1,000 billion VND, which the SPC will receive during the O&M period following the construction period. The Quang Ninh Province People's Committee resolved the assistance at a meeting on May 10, 2013.

8.9.2 Interest-free subordinated loan

The Quang Ninh Province People's Committee will provide the SPC with an interest-free subordinated loan, apart from the project cost. The loan amount totals 1,000 billion VND (approx. 5 billion yen) and will be given in the first to fifth year of the O&M period. The aim is to make the Project financially feasible by alleviating the financial burden of the SPC for the O&M cost and repayment of interest and principal in the early O&M period when toll revenues are expected to remain low. The SPC will repay the interest-free loan to the Quang Ninh Province People's Committee between the 11th and 15th years of the O&M period.

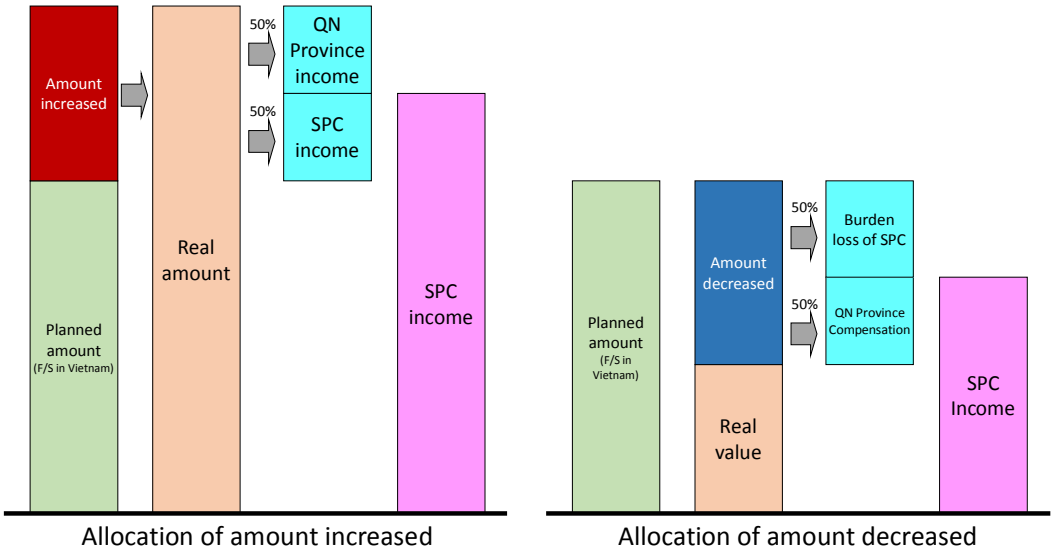
In Quang Ninh Province, the People's Committee resolved to issue local government bonds, which will be approved by the MOF and undertaken by VietinBank and BIDV.

Prior to commencement of this study, the parties concerned had agreed on the maximum amount of the loan at 1,000 billion VND and had not determined the specific amount. During this study, the Study Team basically agreed with DOT of Quang Ninh Province that the term "maximum" would be deleted. However, the agreement still needs to be subject to the resolution of the Quang Ninh Province People's Committee.

8.9.3 50% income guarantee

The income guarantee of 50% is an agreement, whereby if annual toll revenue falls below the expected revenue determined in accordance with the F/S in Vietnam and stated in the project contract, the Quang Ninh Province People's Committee will offset 50% of the shortage to the SPC and if annual toll revenue exceeds the expected revenue, the SPC will provide the committee with 50% of the surplus. Table 8.17 illustrates the conceptual schemes of the 50% income guarantee agreement.

In a hearing about how it intends to earmark the budget of the income guarantee, DOT of Quang Ninh Province has stated that they will not be able to clarify the amount of income guarantee and thus are planning to secure the maximum amount of payment that Quang Ninh Province must make if there is no toll revenue at all.



Source: JICA Study Team

Figure 8.17 Conceptual Diagrams of 50% Income Guarantee

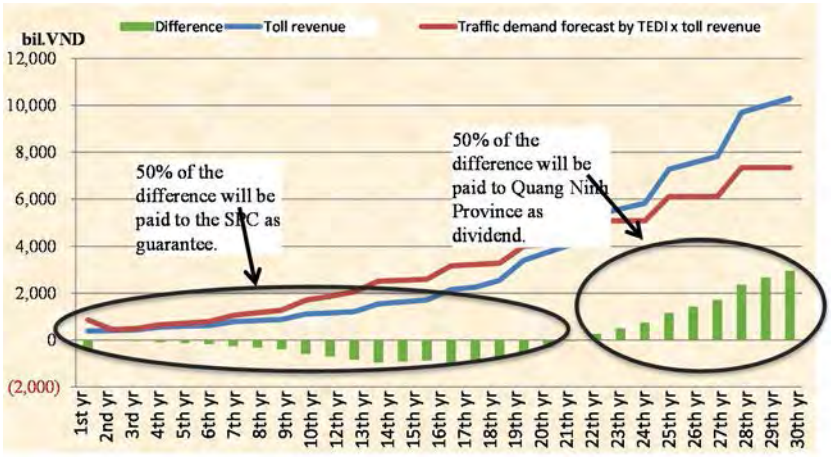


Figure 8.18 Forecast of the Amount of Income Guarantee

8.10 Project Scheme

8.10.1 Stakeholders and their roles

Table 8.20 summarizes the stakeholders of the Project and their roles.

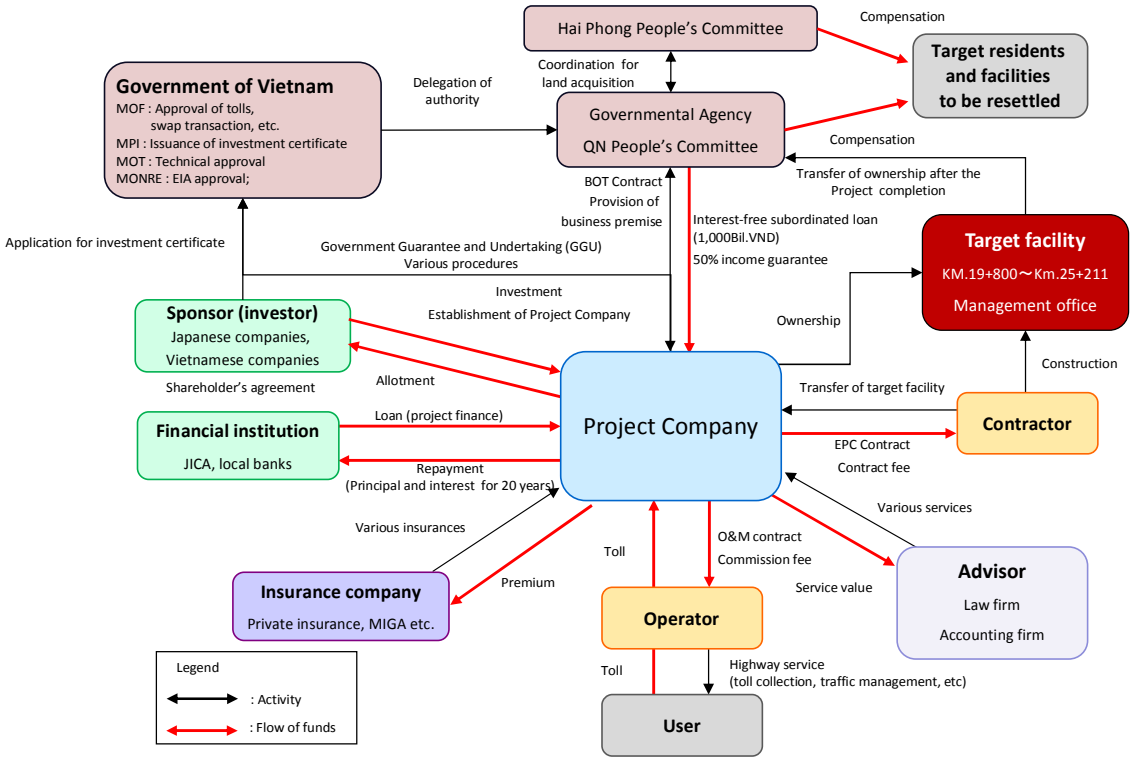
Table 8.20 Stakeholders and Their Roles

Stakeholder	Roles
Sponsors	・ Comprising Japanese and Vietnamese companies and are also called investors. ・ They establish and invest in a special purpose company (SPC). ・ They receive dividends from the SPC.
Governmental agency	・ Quang Ninh Province People's Committee ・ The governmental agency concludes a BOT contract with the SPC and provides it with the required assistance.
The Government of Vietnam	・ MOF, MPI, MOT and other ministries and agencies ・ They perform administrative work for which the Quang Ninh Province People's Committee is not responsible, such as issuing investment permits, revising toll fees and approving EIA.
Contractor	・ The contractor concludes an EPC contract with the SPC; creates shop drawings for construction; procures materials and equipment; and builds the target facilities.
Operator	・ The operator concludes an O&M contract with the SPC; collects tolls, administers traffic and provides road users with required services.
Hai Phong City People's Committee	・ The Committee acquires the land required for the Project (on the Hai Phong side).
Financial institutions	・ The Project involves JICA and local banks (if the two-step loan is adopted). ・ They conclude loan agreements with the SPC and provide loans.
Insurance companies	・ Private insurance companies and MIGA and other governmental insurance organizations ・ They deal with various insurance policies and Country Risk Insurance at the construction and O&M stages.
Law firm	・ Prepares shareholders' agreements, BOT contracts, loan agreements, GGU and other contracts related to the Project and provides relevant assistance.
Accounting firm	・ Performs audits of the SPC.
Road users	・ Pay tolls and use the roads.
Neighboring project implementing body	・ VIDIFI, the implementing body of the Hanoi-Hai Phong Highway Project ・ Discussions and coordination will be needed with VIDIFI in respect of traffic continuity, the scope of construction of interchanges and other matters.
Households and facilities that need resettlement	・ Households and facilities that need to be involuntarily resettled due to land acquisition for the Project ・ They will receive resettlement compensation from the Quang Ninh Province People's Committee and Hai Phong City People's Committee.

Source: JICA Study Team

8.10.2 Project scheme

Figure 8.19 illustrates a project scheme.



Source: JICA Study Team

Figure 8.19 Project Scheme

Chapter 9 Security Package

9.1 Risk Hedging Measures(Foreign exchange (conversion) risk)

9.2 (Proposed) Term Sheets for the BOT Contract and GGU

Note: Chapter 9 in this report is not disclosed, because they contain relevant information such as confidential on the commercial and contract.

Chapter 10 Economic Analysis of the Entire Project and Private Sector

10.1 Basic Policy

The economic analysis presented in this chapter comprises economic and financial analyses.

The economic analysis evaluates the validity of the project implementation from socioeconomic perspectives and covers the entire Ha Long-Hai Phong Highway, including the section to be constructed under the Project and the remaining section of approx. 20km to be constructed under a public work project. The financial analysis, conversely, evaluates the validity of the project implementation from perspectives of cash flow, investment and other financial aspects on the premise that the Project will exploit funds from the private sector and be implemented as a PPP/BOT project.

10.2 Basic Conditions

Prior to these analyses, Table 10.1 outlines the basic conditions of the Project and the public works project of the remaining section of approx. 20km.

Table 10.1 Basic Conditions

	The Project	The remaining section of 20km	Remarks
Total length	KM19+800～KM25+211 (about 5.4km)	KM0+000～KM19+800 (About 19.8km)	
Project method	BOT project	Public work	
Scope	Construction and O&M of the section of approx. 5.4km and toll fee collection of the section of approx. 25.2km	Construction and O&M of the section of approx. 19.8km	
Project cost	7,252,887 Mil.VND (about 36.26 bil. Yen)	6,416,034 Mil.VND (about 32.08 bil. Yen)	The land acquisition cost for the Project shall be borne by Quang Ninh Province
Project schedule	Construction: 2016 – 2018 O&M: 2019 – 2048	Construction: 2014 – 2016 (24 months after the commencement)	
Fund-raising	Investment by sponsors and loans from JICA and local banks	Financial resources of the QNPPC	

Source: JICA Study Team

10.3 Indicators to Evaluate Feasibility

The economic and financial analyses shall evaluate the Project in accordance with the indicators listed in Table 10.2.

Table 10.2 Indicators

	Subject	Indicator	Abstract
Economic analysis	Ha Long – Hai Phong Highway Development Project (about 25.2km in total)	EcIRR	Social discount rate or higher
		NPV	0 or more
		B/C	1.0 or more
Financial analysis	Bach Dang Bridge Development Project (about 5.4km)	PIRR	Interest rate of 10-year government bonds of Vietnam or higher
		EqIRR	The level that enables investment decision or higher
		DSCR	1.1 or more

Source: JICA Study Team

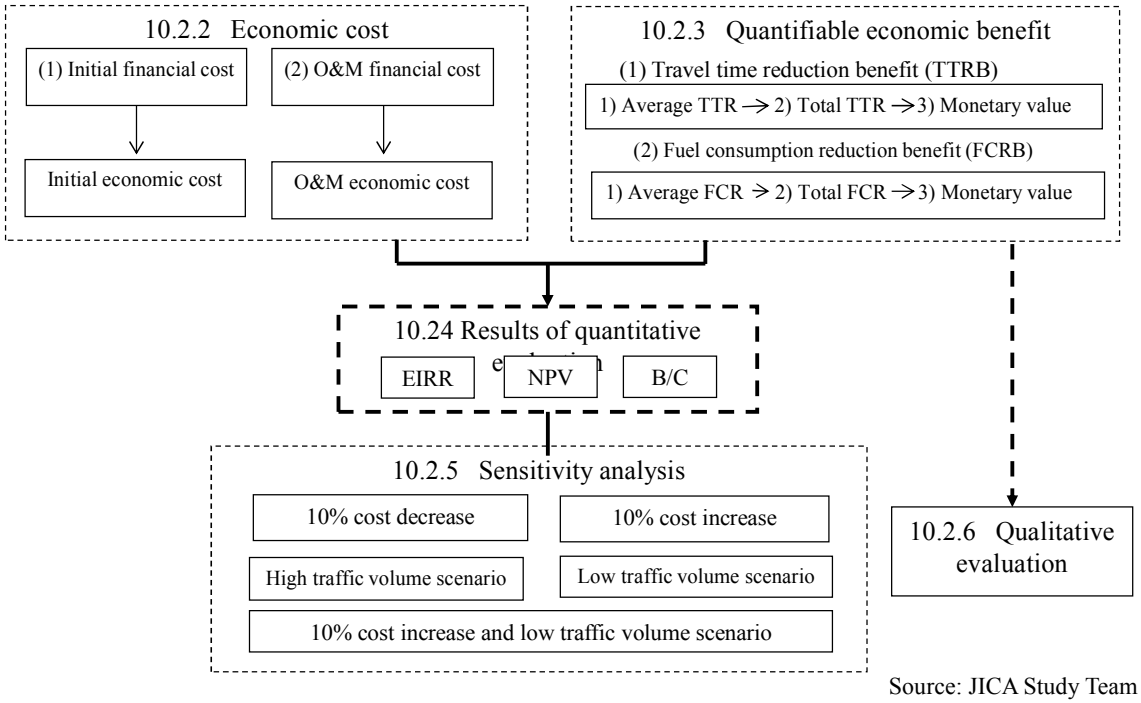
10.4 Economic Analysis

The economic analysis evaluates the Project from socioeconomic perspectives. To make the project economically efficient, the section to be constructed under the Project and the remaining section of approximately 20km to be constructed under a public works projects need to be jointed to make the entire Ha Long – Hai Phong Highway, so it is impossible to isolate the economic impact of the section of the Project. Accordingly, the economic analysis has been conducted to cover the entire highway.

10.4.1 Methodology of the economic analysis

(1) Framework and workflow of the economic analysis

Figure 10.1 illustrates the framework and workflow of the economic analysis on the construction projects of the Ha Long – Hai Phong Highway, including the section to be constructed under the Project.



Source: JICA Study Team

Figure 10.1 Framework and workflow of the economic analysis

(2) Assumptions and basic concepts as prerequisites for the economic analysis

1) Application of quantitative and qualitative approaches to the economic analysis

Prior to the economic analysis, the economic cost and benefit need to be calculated first. Among factors contributing to the economic benefit, while some can be quantitatively evaluated, others are fairly difficult or hardly quantifiable. Accordingly, the qualitative approach shall be applied to the latter.

Table 10.3 summarizes the evaluation approaches applied to individual components of the economic benefit. In passing, the economic analysis does not take price inflation into account.

Table 10.3 Application of economic evaluation approach

Item			Quantitative approach	Qualitative approach
10.2.2 Economic cost		(1) Initial cost	✔	
		(2) O&M cost	✔	
Economic benefit	10.2.3 Quantitative	(1) Benefit of reduced travel time	✔	
		(2) Benefit of reduced fuel consumption	✔	
	10.2.6 Qualitative	(1) Reduction in traffic accidents		✔
		(2) Promotion of tourism		✔
		(3) Promotion of FDI		✔
		(4) Promotion of international trade		✔
		(5) Expansion in regional economic exchanges		✔

Source: JICA Study Team

2) Shadow price applied to Vietnam

The economic evaluation uses economic prices or, as a more general term, shadow prices. The term "shadow price" refers to the calculation price to calculate the cost and benefit when the market price does not correctly reflect its opportunity cost. It is a monetary value of cost, assuming that the optimal resource allocation in competitive market is realized in a planned economy or under circumstances where no competition exists. Accordingly, the standard conversion factor (SCF) is needed to convert the market value to the economic price that correctly reflects the opportunity cost. The national economic accounting, as well as the value of the SCF, varies depending on production factors and the supply and demand of goods in each country. In the case of Vietnam, the current SCF value of 0.85 is widely used and thus shall be retained in this economic evaluation.

(3) Indicators for economic evaluation

The three indicators listed in Table 10.4 shall be used when the economic feasibility of the Project is evaluated.

Table 10.4 Descriptions of Indicators for Economic Evaluation

Indicator	Description	Formula
NPV	Indicator to forecast the future cash flow of the Project and evaluate the feasibility of investment in the Project.	$NPV=\sum_{n=0}^{n}\left\{\frac{B_n}{(1+r)^n}\right\}-\sum_{n=0}^{n}\left\{\frac{C_n}{(1+r)^n}\right\}$, where n = years elapsed, B_n = benefit in the n-th year, C_n = cost in the n-th year and r is discount rate.
EcIRR	IRR is a discount rate, where NPV is equal to zero. EcIRR is expected to exceed the social discount rate (SDR) of the country where the proposed project is implemented.	$NPV=\sum_{n=0}^{n}\left\{\frac{B_n}{(1+r)^n}\right\}-\sum_{n=0}^{n}\left\{\frac{C_n}{(1+r)^n}\right\}=0$, where r = IRR.
B/C	Another indicator to evaluate the feasibility of investment in a project. The value of the indicator needs to be 1 or greater – namely, B/C $\geqq$1 – to conclude that investing in the project is feasible.	$B/C=\sum_{n=0}^{n}\left\{\frac{B_n}{(1+r)^n}\right\}/\sum_{n=0}^{n}\left\{\frac{C_n}{(1+r)^n}\right\}$

Source: JICA Study Team

(4) Other basic assumptions

(i) Social discount rate (SDR)

The SDR is a discount rate that reflects the actual opportunity cost of a capital and is used to calculate the present costs and benefits of a project. It is also regarded as a hurdle rate to allow the EcIRR to take a satisfactory value. The rate for Vietnam is normally 12%, which shall be used for this economic evaluation.

(ii) Evaluation period

The evaluation shall cover the period from 2014 to 2048 for the following reasons:

- The construction of the remaining section of approximately 20km started in 2014, when costs were also first incurred.
- The construction work of the Bach Dang Bridge is scheduled during the period of 2016-18 and the service is scheduled for launch in 2019. Accordingly, the project life is assumed to be 30 years starting in 2019.

(iii) Foreign exchange rate

The exchange rate of the Japanese yen against the VND for the economic evaluation shall be 1 JPY = 200 VND.

10.4.2 Economic cost

(1) Initial financial cost

1) Conversion of initial financial cost to initial economic cost

The initial cost of the Project includes the costs of both the Bach Dang Bridge and the section of approximately 20km. The initial economic cost was calculated by subtracting VAT (10%) from the value of each component of the initial financial cost and then multiplying the portion in the local currency by SCF (0.85). Table 10.5 shows the values of the components of the initial financial cost that were used as bases, together with the calculated value of the initial economic cost.

Table 10.5 Comparison of Initial Financial Cost and Initial Economic Cost

(Unit: 1 million yen)

Target project	Item	Financial initial cost	Econoimc economic cost
Project for Construction of the Bach Dang Bridge	Construction cost	Remaining section	23,243
	Project administration cost	138	106
	Consultancy fee	1,312	1,003
	Other expenses	1,049	803
	Land acquisition cost	905	692
	Cost of establishing SPC	654	501
	Reserve fund (including escalation)	3,029	2,317
	Sub-total	35,943	26,348
Public works for the remaining section of approx. 20km	Construction cost	20,698	15,834
	Project administration cost	120	92
	Consultancy fee	1,076	823
	Other expenses	1,288	985
	Land acquisition cost	2,833	2,167
	Reserve fund (including escalation)	2,601	1,990
	Sub-total	28,616	21,892
Total		57,233	48,240

Source: JICA Study Team and materials of the Quang Ninh Province

(2) Schedule of injection of initial economic cost

Table 10.6 shows the schedule of injection of the initial economic cost, as calculated in the previous section, in terms of the two construction packages.

Table 10.6 Schedule of Injection of Initial Economic Cost

Item		Total	2014	2015	2016	2017	2018
Project for Construction of the Bach Dang Bridge	Construction cost	23,243			7,748	7,748	7,748
	Project administration cost	106			35	35	35
	Consultancy fee	1,003			334	334	334
	Other expenses	803			268	268	268
	Land acquisition cost	692		692			
	Cost of establishing SPC	501			167	167	167
	Reserve fund (including escalation)	2,317			772	772	772
Public works for the remaining section of approx. 20km	Construction cost	15,834	5,278	5,278	5,278		
	Project administration cost	92	31	31	31		
	Consultancy fee	823	274	274	274		
	Other expenses	985	328	328	328		
	Land acquisition cost	2,167	2,167				
	Reserve fund (including escalation)	1,990	663	663	663		
Total		50,557	8,742	7,267	15,899	9,324	9,324

Source: JICA Study Team

2) Operation and management (O&M) financial cost

(1) Conversion of O&M financial cost to O&M economic cost

The O&M cost includes the cost of operating the entire road, the O&M cost of the section to be constructed under the Project and the O&M cost of the section of approx. 20km. The O&M economic cost was calculated by subtracting VAT (10%) from the value of each component of the O&M financial cost and then multiplying the portion in the local currency by SCF.

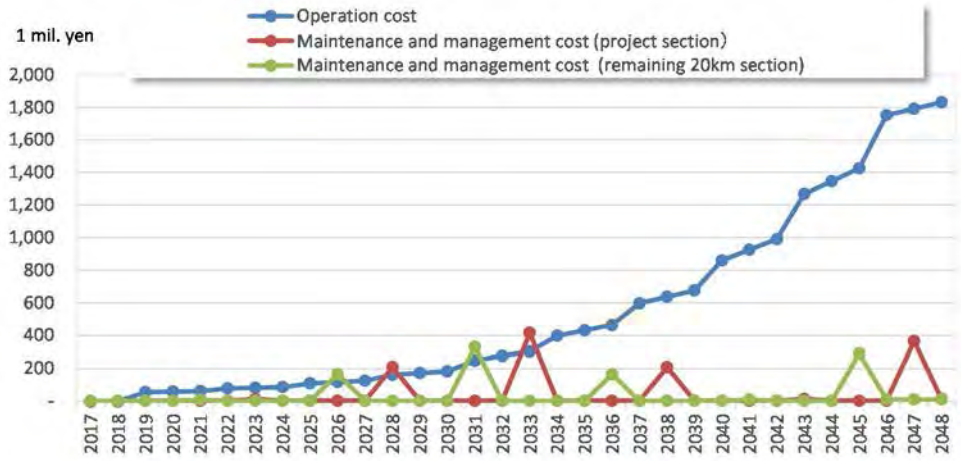
Table 10.7 Financial O&M Cost and Economic O&M Cost (Unit: 1 million yen)

Year	Financial cost				Economic cost			
	Operating cost	O&M cost		Total O&M cost	Operating cost	O&M cost		Total O&M cost
		Section subject to the Project	Remaining section of approx. 20km			Section subject to the Project	Remaining section of approx. 20km	
2017	-	-	5	5	-	-	4	4
2018	-	-	5	5	-	-	4	4
2019	74	6	5	85	57	5	4	65
2020	79	6	5	90	60	5	4	69
2021	83	6	16	105	63	5	12	80
2022	104	6	5	116	80	5	4	88
2023	110	20	5	134	84	15	4	103
2024	115	6	5	126	88	5	4	96
2025	145	6	5	156	111	5	4	119
2026	156	6	218	379	119	5	167	290
2027	166	6	5	177	127	5	4	136
2028	214	273	5	492	164	209	4	376
2029	227	6	5	238	173	5	4	182
2030	240	6	5	251	183	5	4	192
2031	325	6	434	766	249	5	332	586
2032	362	6	5	373	277	5	4	285
2033	398	545	5	948	305	417	4	725
2034	521	6	5	532	399	5	4	407
2035	565	6	5	576	432	5	4	441
2036	608	6	218	832	465	5	167	636
2037	781	6	5	792	597	5	4	606
2038	832	273	5	1,111	637	209	4	850
2039	884	6	5	895	676	5	4	685
2040	1,124	6	5	1,135	860	5	4	869
2041	1,210	6	16	1,232	925	5	12	942
2042	1,295	6	5	1,306	991	5	4	999
2043	1,657	20	5	1,682	1,268	15	4	1,287
2044	1,760	6	5	1,771	1,346	5	4	1,355
2045	1,862	6	382	2,250	1,425	5	292	1,721
2046	2,292	6	16	2,314	1,753	5	12	1,770
2047	2,344	479	16	2,839	1,793	367	12	2,172
2048	2,396	20	16	2,431	1,833	15	12	1,860

Source: JICA Study Team

(2) Schedule of injection of O&M economic cost

Figure 10.2 shows the O&M economic cost throughout the entire project life.



Source: JICA Study Team

Figure 10.2 Schedule of Injection of O&M Economic Cost

10.4.3 Quantifiable economic benefit

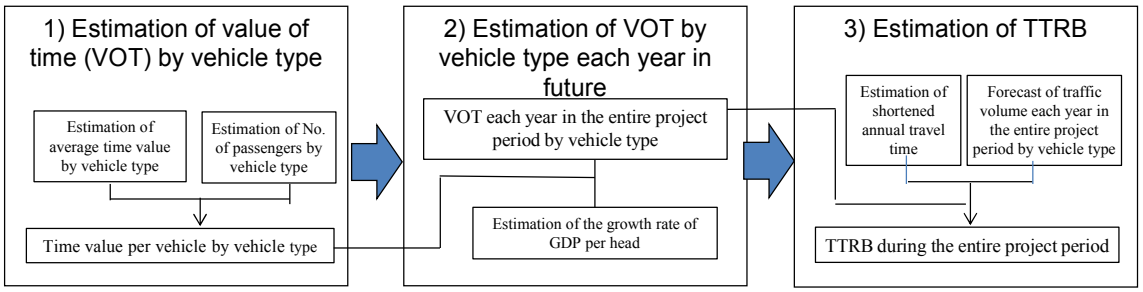
There are two quantifiable components of the economic benefit of the Project, namely "travel time reduction benefit (TTRB)" and "fuel consumption reduction benefit (FCRB)". These benefits were calculated by subtracting the cost of traveling the entire routes in the case the new roads are not constructed (With) from the cost of traveling the entire route in the case the new roads are not constructed (Without). The target beneficiaries shall be possible users of the Ha Long-Hai Phong Highway who currently use the existing route, as assumed from the results of forecast traffic demand in Chapter 4.

Source: JICA Study Team

Figure 10.3 Routes with and without the roads to be constructed under the Project

10.4.4 Travel Time Reduction Benefit (TTRB)

TTRB has been estimated in accordance with the three steps illustrated in Figure 10.4.



Source: JICA Study Team

Figure 10.4 Process of TTRB estimation

(1) Estimation of value of time (VOT) by vehicle type

"Value of Time" (VOT) is a parameter representing the monetary value of time when the traveling time of a vehicle is shortened by one minute thanks to a certain economic policy or project. Ideally, the calculation of VAT uses three elements of VOT – namely, person, vehicle and cargo. The estimation here uses VOT for persons only.

Various methods are used to calculate VOT for persons, such as "estimations based on wages" and "estimations based on data on toll road users" and this study has used the former in reference data on wages in "ADB Express Network Development Plan Project 2008" published by ADB. The study has also assumed that differences in VOT among persons depend solely on the types of their vehicles.

(2) Estimation of VOT by vehicle type each year in future

The VOT for each vehicle type each year throughout the project period was calculated by reflecting the average growth rate of GDP per capita in VOT for each vehicle time in 2012, as obtained in Step 1 above. Because this requires an estimated average growth rate of GDP per capital in Vietnam in future, this study has used estimates presented in Chapter 4.

(3) Estimation of TTRB

TTRB has been calculated in consideration of the reduced value of the travel time thanks to the Project and estimated traffic volumes by vehicle time. Table 10.8 shows that the project implementation is expected to reduce the travel time between Ha Long and Hai Phong by two hours.

Table 10.8 Travel Time Reduced Thanks to the Project Implementation

Item	Before project	After project	Difference
Route (Ha Long - Hai Phong)	via NH 5, NH 10, NH 18	via Ha Long - Hai Phong Highway	
Distance	70 km	25 km	45 km
Average driving speed	30 km/h	75 km/h	Difference in fuel consumption
Driving time	140 min.	20 min.	120 min,. (2 hours)

Source: JICA Study Team

The results of forecasts presented in Chapter 4 have been used to forecast traffic demand for the Ha Long-Hai Phong Highway.

Table 10.9 Forecasts of Traffic Demand for the Ha Long-Hai Phong Highway (unit: vehicles/day)

Year	Passenger cars and taxis	Truck (2-axes)	Truck (3-axes)	Container and trailor	Bus (25 or less passengers)	Bus (25 or more passengers)	Total
2019	3,266	16,401	3,653	25,794	1,162	11,295	61,571
2020	3,708	17,523	3,805	26,630	1,269	11,882	64,818
2021	4,151	18,644	3,957	27,465	1,377	12,470	68,065
2022	4,593	19,766	4,110	28,301	1,484	13,058	71,311
2023	5,035	20,887	4,262	29,137	1,591	13,646	74,558
2024	5,478	22,009	4,414	29,972	1,698	14,234	77,805
2025	5,921	23,118	4,579	30,835	1,806	14,833	81,092
2026	6,584	26,676	5,695	31,863	2,140	15,150	88,108
2027	7,248	30,233	6,811	32,890	2,475	15,466	95,124
2028	7,911	33,791	7,927	33,917	2,809	15,783	102,139
2029	8,575	37,349	9,044	34,945	3,144	16,100	109,155
2030	9,236	40,918	10,160	35,958	3,482	16,405	116,160
2031	10,650	44,223	12,253	40,232	3,594	18,689	129,640
2032	12,064	47,527	14,345	44,506	3,705	20,972	143,120
2033	13,478	50,831	16,438	48,780	3,817	23,256	156,601
2034	14,892	54,136	18,531	53,054	3,928	25,540	170,081
2035	16,304	57,440	20,636	57,355	4,049	27,801	183,585
2036	17,657	66,147	22,057	59,849	4,623	30,051	200,384
2037	19,011	74,854	23,478	62,342	5,198	32,301	217,183
2038	20,365	83,561	24,898	64,835	5,773	34,551	233,982
2039	21,718	92,268	26,319	67,328	6,347	36,801	250,781
2040	23,073	100,987	27,714	69,821	6,931	39,028	267,553
2041	24,275	102,784	28,082	80,122	7,432	39,831	282,526
2042	25,478	104,581	28,450	90,423	7,934	40,633	297,499
2043	26,680	106,378	28,817	100,725	8,436	41,436	312,472
2044	27,883	108,175	29,185	111,026	8,938	42,239	327,445
2045	29,084	109,959	29,553	121,313	9,444	43,030	342,384
2046	30,005	114,325	30,060	122,382	9,933	44,873	351,578
2047	30,926	118,691	30,568	123,450	10,422	46,716	360,772
2048	31,847	123,056	31,075	124,519	10,911	48,559	369,967

Source: JICA Study Team

Accordingly, TTRB each year throughout the project period has been estimated as in Table 10.10.

Table 10.10 TTRB Estimated Value of the Project (Unit: 1 million yen)

Year	Passenger cars and taxis	Truck (2-axes)	Truck (3-axes)	Container and trailor	Bus (25 or less passengers)	Bus (25 or more passengers)	TTRB Total
2019	746	98	579	212	84	965	2,684
2020	896	113	644	239	92	1,053	3,038
2021	1,052	129	709	267	101	1,139	3,397
2022	1,218	146	777	296	109	1,227	3,773
2023	1,397	163	850	327	119	1,322	4,178
2024	1,591	183	928	361	129	1,425	4,616
2025	1,802	203	1,013	397	140	1,535	5,091
2026	2,098	252	1,083	480	182	1,661	5,757
2027	2,419	306	1,159	570	228	1,796	6,478
2028	2,768	364	1,239	668	278	1,941	7,258
2029	3,145	427	1,325	774	333	2,097	8,100
2030	3,553	496	1,416	889	392	2,263	9,010
2031	4,269	533	1,681	1,001	493	2,639	10,617
2032	5,042	573	1,967	1,122	602	3,044	12,350
2033	5,876	616	2,275	1,252	720	3,480	14,218
2034	6,776	661	2,608	1,391	847	3,950	16,233
2035	7,746	712	2,964	1,542	984	4,458	18,405
2036	8,750	848	3,342	1,852	1,098	4,852	20,740
2037	9,830	995	3,748	2,186	1,219	5,274	23,252
2038	10,993	1,153	4,185	2,548	1,350	5,726	25,956
2039	12,245	1,324	4,656	2,939	1,490	6,211	28,866
2040	13,594	1,511	5,160	3,361	1,640	6,731	31,997
2041	14,854	1,683	5,469	3,553	1,725	8,021	35,306
2042	16,200	1,867	5,798	3,756	1,816	9,407	38,844
2043	17,638	2,064	6,147	3,973	1,913	10,895	42,629
2044	19,176	2,275	6,519	4,203	2,016	12,493	46,681
2045	20,820	2,502	6,913	4,447	2,124	14,209	51,015
2046	22,355	2,738	7,502	4,812	2,249	14,918	54,574
2047	23,993	2,992	8,133	5,202	2,381	15,670	58,370
2048	25,741	3,263	8,808	5,619	2,522	16,467	62,420

Source: JICA Study Team

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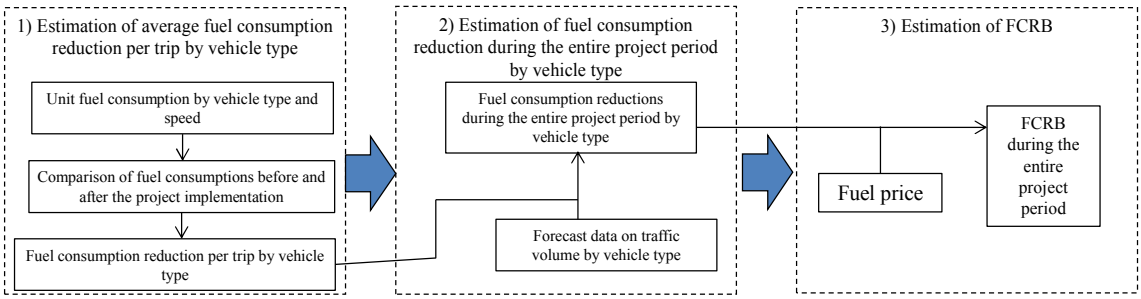
10.4.5 Fuel Consumption Reduction Benefit (FCRB)

FCRB has been estimated in accordance with the three steps illustrated in Figure 10.5:



Source: JICA Study Team

Figure 10.5 Process of FCRB estimation

(1) Estimation of average fuel consumption reduction per trip by vehicle type

To estimate the average fuel consumption reduction per trip for each vehicle type, the unit fuel consumption for each vehicle type and speed has been calculated as a unit driving cost. Subsequently, the difference between the fuel consumption for each vehicle type before and after

the project implementation has been regarded as the fuel consumption per trip for each vehicle type. The method of estimating the unit driving cost and relevant prerequisites are as in Section 4.5.2 of Chapter 4.

Table 10.11 shows the fuel consumption reduction per trip for each vehicle type between Ha Long and Hai Phong before and after the project implementation, which have been estimated according to the procedures described above.

Table 10.11 Fuel Consumption Reduction per Trip by Vehicle Type in the Ha Long-Hai Phong Section

Vehicle type targeted in the survey	Unit fuel consumption (g/km or g/km/t)		Fuel consumption per trip between Ha Long-Hai Phong (g)		Fuel consumption reduction per trip by vehicle type (g)
	Before the Project (30km/h)	After the Project (75km/h)	Before the Project (30km/h)	After the Project (75km/h)	
Passenger car and taxi	54	43	3,780	1,075	- 2,705
Truck (2-axes)	672	560	47,040	14,000	- 33,040
Truck (3 or more axes)	675	500	47,250	12,500	- 34,750
Bus (25 or less passengers	225	160	15,750	4,000	- 11,750
Bus (25 or more passenger	630	525	44,100	13,125	- 30,975
Container and trailor	729	540	51,030	13,500	- 37,530

Source: JICA Study Team

(2) Estimation of fuel consumption reduction for the entire project period by vehicle type

Forecasts of traffic demand for the Ha Long – Hai Phong Highway have been incorporated in the above estimates to obtain the fuel consumption reduction for the entire project period for each vehicle type, which is presented in Table 10.12.

Table 10.12 Fuel Consumption Reductions for the Entire Project Period, by Vehicle Type (unit: t)

Year	Passenger car and	Truck (2-axes)	Truck (3 or more axes)	Container and trailor	Bus (25 or less passengers)	Bus (25 or more passengers)	Total
2019	3,266	16,401	3,653	25,794	1,162	11,295	61,571
2020	3,708	17,523	3,805	26,630	1,269	11,882	64,818
2021	4,151	18,644	3,957	27,465	1,377	12,470	68,065
2022	4,593	19,766	4,110	28,301	1,484	13,058	71,311
2023	5,035	20,887	4,262	29,137	1,591	13,646	74,558
2024	5,478	22,009	4,414	29,972	1,698	14,234	77,805
2025	5,921	23,118	4,579	30,835	1,806	14,833	81,092
2026	6,584	26,676	5,695	31,863	2,140	15,150	88,108
2027	7,248	30,233	6,811	32,890	2,475	15,466	95,124
2028	7,911	33,791	7,927	33,917	2,809	15,783	102,139
2029	8,575	37,349	9,044	34,945	3,144	16,100	109,155
2030	9,236	40,918	10,160	35,958	3,482	16,405	116,160
2031	10,650	44,223	12,253	40,232	3,594	18,689	129,640
2032	12,064	47,527	14,345	44,506	3,705	20,972	143,120
2033	13,478	50,831	16,438	48,780	3,817	23,256	156,601
2034	14,892	54,136	18,531	53,054	3,928	25,540	170,081
2035	16,304	57,440	20,636	57,355	4,049	27,801	183,585
2036	17,657	66,147	22,057	59,849	4,623	30,051	200,384
2037	19,011	74,854	23,478	62,342	5,198	32,301	217,183
2038	20,365	83,561	24,898	64,835	5,773	34,551	233,982
2039	21,718	92,268	26,319	67,328	6,347	36,801	250,781
2040	23,073	100,987	27,714	69,821	6,931	39,028	267,553
2041	24,275	102,784	28,082	80,122	7,432	39,831	282,526
2042	25,478	104,581	28,450	90,423	7,934	40,633	297,499
2043	26,680	106,378	28,817	100,725	8,436	41,436	312,472
2044	27,883	108,175	29,185	111,026	8,938	42,239	327,445
2045	29,084	109,959	29,553	121,313	9,444	43,030	342,384
2046	30,005	114,325	30,060	122,382	9,933	44,873	351,578
2047	30,926	118,691	30,568	123,450	10,422	46,716	360,772
2048	31,847	123,056	31,075	124,519	10,911	48,559	369,967

Source: JICA Study Team

(3) Fuel Price

It has been assumed that gasoline and light oil shall be used to fuel vehicles and their prices

have been set as follows:

Gasoline: 171.9 yen/kg (density: 1.34L/kg)
Light oil: 136.4 yen/kg (density: 1.34L/kg)

(4) Estimation of fuel consumption reduction benefit (FCRB)

The FCRB throughout the project period has been estimated by multiplying the fuel consumption reduction by the gasoline or light oil price as presented in Table 10.13. It has been assumed that passenger cars and taxis use gasoline and vehicles of other types use light oil.

Table 10.13 FCRB Estimation Results (Unit: 1 million yen)

Year	Passenger car and	Truck (2-axes)	Truck (3 or more axes)	Container and trailor	Bus (25 or less passengers)	Bus (25 or more passengers)	Total
2019	561	2,236	498	3,517	158	1,540	8,512
2020	638	2,389	519	3,631	173	1,620	8,970
2021	714	2,542	540	3,745	188	1,700	9,428
2022	790	2,695	560	3,859	202	1,781	9,887
2023	866	2,848	581	3,973	217	1,861	10,345
2024	942	3,001	602	4,087	232	1,941	10,804
2025	1,018	3,152	624	4,204	246	2,023	11,268
2026	1,132	3,637	777	4,345	292	2,066	12,248
2027	1,246	4,122	929	4,485	337	2,109	13,228
2028	1,360	4,608	1,081	4,625	383	2,152	14,208
2029	1,474	5,093	1,233	4,765	429	2,195	15,189
2030	1,588	5,579	1,385	4,903	475	2,237	16,167
2031	1,831	6,030	1,671	5,486	490	2,548	18,056
2032	2,074	6,480	1,956	6,069	505	2,860	19,944
2033	2,317	6,931	2,241	6,651	520	3,171	21,832
2034	2,560	7,382	2,527	7,234	536	3,482	23,721
2035	2,803	7,832	2,814	7,821	552	3,791	25,612
2036	3,035	9,019	3,008	8,161	630	4,098	27,951
2037	3,268	10,207	3,201	8,501	709	4,404	30,290
2038	3,501	11,394	3,395	8,840	787	4,711	32,628
2039	3,734	12,581	3,589	9,180	865	5,018	34,967
2040	3,966	13,770	3,779	9,520	945	5,322	37,302
2041	4,173	14,015	3,829	10,925	1,013	5,431	39,387
2042	4,380	14,260	3,879	12,330	1,082	5,541	41,471
2043	4,587	14,505	3,929	13,734	1,150	5,650	43,555
2044	4,793	14,750	3,980	15,139	1,219	5,759	45,640
2045	5,000	14,993	4,030	16,542	1,288	5,867	47,719
2046	5,158	15,589	4,099	16,687	1,354	6,119	49,006
2047	5,317	16,184	4,168	16,833	1,421	6,370	50,292
2048	5,475	16,779	4,237	16,979	1,488	6,621	51,579

Source: JICA Study Team

10.4.6 Results of quantitative evaluation

Based on the economic cost and quantifiable economic benefits, the Project has been quantitatively evaluated. Table 10.14 summarizes the major results and Table 10.15 presents detailed evaluation results.

Table 10.14 Major Results of Quantitative Evaluation for Economic Analysis of the Project

EcIRR (%)	NPV (1 million yen)	B/C
22.08	73,715	3.0

Source: JICA Study Team

The evaluation to date has used quantifiable benefits only, so if components of benefit that cannot be quantified are also taken into account, the impact of the Project will exceed the figures in Table 10.14. Without taking those components into account, the value of EcIRR far exceeds that of SDR(12%), whereupon it can be concluded that the project implementation shall have

extremely great economic effects.

Table 10.15 Results of Cost-Benefit and Quantitative Evaluation for Economic Analysis

(Unit: 1 million yen)

Year	Cost								Benefit			Net economic benefit
	Initial cost				O&M Cost			Total cost	TTRB	FCRB	Total benefit	
	Bach Dang Bridge		Remaining 20 km section		Operation cost	Maintenance cost						
	Project cost	Land acquisition cost	Project cost	Land acquisition cost		Bach Dang Bridge	Remaining 20 km section					
2014	-	-	6,575	2,167	-	-	-	8,742	-	-	-	-8,742
2015	-	692	6,575	-	-	-	-	7,267	-	-	-	-7,267
2016	9,324	-	6,575	-	-	-	-	15,899	-	-	-	-15,899
2017	9,324	-	-	-	-	-	4	9,328	-	-	-	-9,328
2018	9,324	-	-	-	-	-	4	9,328	-	-	-	-9,328
2019	-	-	-	-	57	5	4	65	2,684	8,512	11,196	11,130
2020	-	-	-	-	60	5	4	69	3,038	8,970	12,008	11,939
2021	-	-	-	-	63	5	12	80	3,397	9,428	12,825	12,745
2022	-	-	-	-	80	5	4	88	3,773	9,887	13,660	13,571
2023	-	-	-	-	84	15	4	103	4,178	10,345	14,524	14,421
2024	-	-	-	-	88	5	4	96	4,616	10,804	15,420	15,324
2025	-	-	-	-	111	5	4	119	5,091	11,268	16,359	16,239
2026	-	-	-	-	119	5	167	290	5,757	12,248	18,005	17,715
2027	-	-	-	-	127	5	4	136	6,478	13,228	19,706	19,571
2028	-	-	-	-	164	209	4	376	7,258	14,208	21,466	21,090
2029	-	-	-	-	173	5	4	182	8,100	15,189	23,289	23,107
2030	-	-	-	-	183	5	4	192	9,010	16,167	25,177	24,985
2031	-	-	-	-	249	5	332	586	10,617	18,056	28,673	28,087
2032	-	-	-	-	277	5	4	285	12,350	19,944	32,294	32,009
2033	-	-	-	-	305	417	4	725	14,218	21,832	36,051	35,326
2034	-	-	-	-	399	5	4	407	16,233	23,721	39,953	39,546
2035	-	-	-	-	432	5	4	441	18,405	25,612	44,018	43,577
2036	-	-	-	-	465	5	167	636	20,740	27,951	48,691	48,055
2037	-	-	-	-	597	5	4	606	23,252	30,290	53,542	52,936
2038	-	-	-	-	637	209	4	850	25,956	32,628	58,584	57,735
2039	-	-	-	-	676	5	4	685	28,866	34,967	63,833	63,148
2040	-	-	-	-	860	5	4	869	31,997	37,302	69,299	68,431
2041	-	-	-	-	925	5	12	942	35,306	39,387	74,692	73,750
2042	-	-	-	-	991	5	4	999	38,844	41,471	80,315	79,316
2043	-	-	-	-	1,268	15	4	1,287	42,629	43,555	86,185	84,898
2044	-	-	-	-	1,346	5	4	1,355	46,681	45,640	92,321	90,966
2045	-	-	-	-	1,425	5	292	1,721	51,015	47,719	98,735	97,013
2046	-	-	-	-	1,753	5	12	1,770	54,574	49,006	103,580	101,810
2047	-	-	-	-	1,793	367	12	2,172	58,370	50,292	108,662	106,491
2048	-	-	-	-	1,833	15	12	1,860	62,420	51,579	113,999	112,139

EcIRR=	22.08%
NPV(million Yen)=	73,715
Present value of cost=	37,378
Present value of benefit=	111,093
B/C=	3.0

Source: JICA Study Team

10.4.7 Qualitative evaluation

Benefits that cannot be quantified may include the following components:

(1) Reduction in traffic accidents

The Project shall help improve driving speed and road conditions, which will alleviate traffic congestion and improve the driving environment. All this will reduce the number of traffic accidents.

(2) Promotion of tourism

As pointed out in Section 2.2.2 of Chapter 2, although Quang Ninh Province has excellent tourism resources, including the world heritage Ha Long Bay, sales in the hotel industry are lower than in Hai Phong City and tourism remains underdeveloped. This is because the province lacks tourist attractions, facilities and services which attract tourists and also due to poor access to the province from Hanoi City, or convenience. The Project shall improve the accessibility and convenience of Quang Ninh Province from Hanoi and Hai Phong Cities and other neighboring regions and may also generate a synergetic effect if tourist attractions, facilities and services are improved.

(3) Promotion of foreign direct investment

The project implementation shall improve the road infrastructure and shorten the practical distance between Quang Ninh Province and Hai Phong City or other surrounding regions. This shall improve the investment environment of the entire region and its appeal for foreign companies and ultimately promote foreign direct investment.

(4) Promotion of international trade

As pointed out in Section 2.2.2, both Quang Ninh Province and Hai Phong City suffer trade deficits and chronicle shortages in foreign currencies. Although there is a call that they must promote manufacturing and other industries for exports, they – in particular, Quang Ninh Province – must improve the road infrastructure as a prerequisite. The project completion shall certainly help the province have the prerequisite.

(5) Expansion in regional economic exchanges

The project completion is expected to help expand economic exchanges, not just between Quang Ninh Province and Hai Phong City, but also between the province and the surrounding regions. As pointed out in Section 3.5.2 of Chapter 2, other than the projects for the Ha Long – Hai Phong Highway, many projects currently remain in the planning phase, which links Ha Long with the surrounding regions via highways, general roads, railways, airports and harbors and ports. Together with other important infrastructure projects for the Lach Huyen Port in Hai Phong City, these projects give a clear picture of the vision for an enormous infrastructure network in the region. In other words, this Project is expected to play an important role in this enormous infrastructure network.

10.5 Financial Analysis

Note: Section 10.5 in this report is not disclosed, because they contain relevant information such as confidential on the commercial.