VII. Management and Operation Scheme

A. Administration, Management and Operation of Ports

(1) Planning, investment and operation of major ports

146. Four major ports of Hanoi, Khuyen Luong, New North and New East should be managed and operated as "Landlord Port" (see **Table VII-1**). Namely, MOT should plan and invest in these 4 major ports and port operation companies should operate them. Management of Ports/Berths should be conducted by VIWA.

147. Improvement of Chem Berths in terms of safe and environmental aspects will be needed and should be undertaken by port operation companies. In this case, support system for the companies such as low interest loan or tax incentive should be studied.

Table VII-1 Type of Port Management and Operation

Type	Service Port	Landlord Port		Government Initiative Company Port	Company Port
	A	B	C	D	E
Port Planning	○	○	○	○	●
Construction					
Infrastructure (berthing facilities, yard, etc.)	○	○	○	●	●
Superstructure (crane, warehouse, etc.)	○	○	●	●	●
Ownership					
Land	○	○	○	○	○
Infrastructure	○	○	○	●	●
Superstructure	○	○	●	●	●
Port Operation	○	●	●	●	●

Notes) ○:Government ●:Company

Source) JICA Study Team

(2) Proper port management

148. VIWA must grasp the situation of ports in its jurisdiction properly by

establishing an adequate financial and personnel framework. Technical standards for port facilities should be established for appropriate construction, improvement and maintenance of port and Berth.

149. In the Hanoi segment, more than 70% of the total cargo will be handled at 5 major ports. Therefore, although these 5 major ports will be rivals, they should cooperate with each other to form an efficient distribution network as well as to secure safe and smooth navigation. Hence, the Study Team proposes to establish a council meeting consisting of MOT (VIWA) and 5 major port operators.

(3) Restriction of new Berth construction

150. New Berth construction or extension of existing Berths other than 5 major ports and satellite passenger berths should be prohibited. Temporary cargo Berths located between Thang Long Bridge and Thanh Tri Bridge shall be removed and transferred to the outside by 2010 in principle (Transferred Berth won't be regarded as a new Berth).

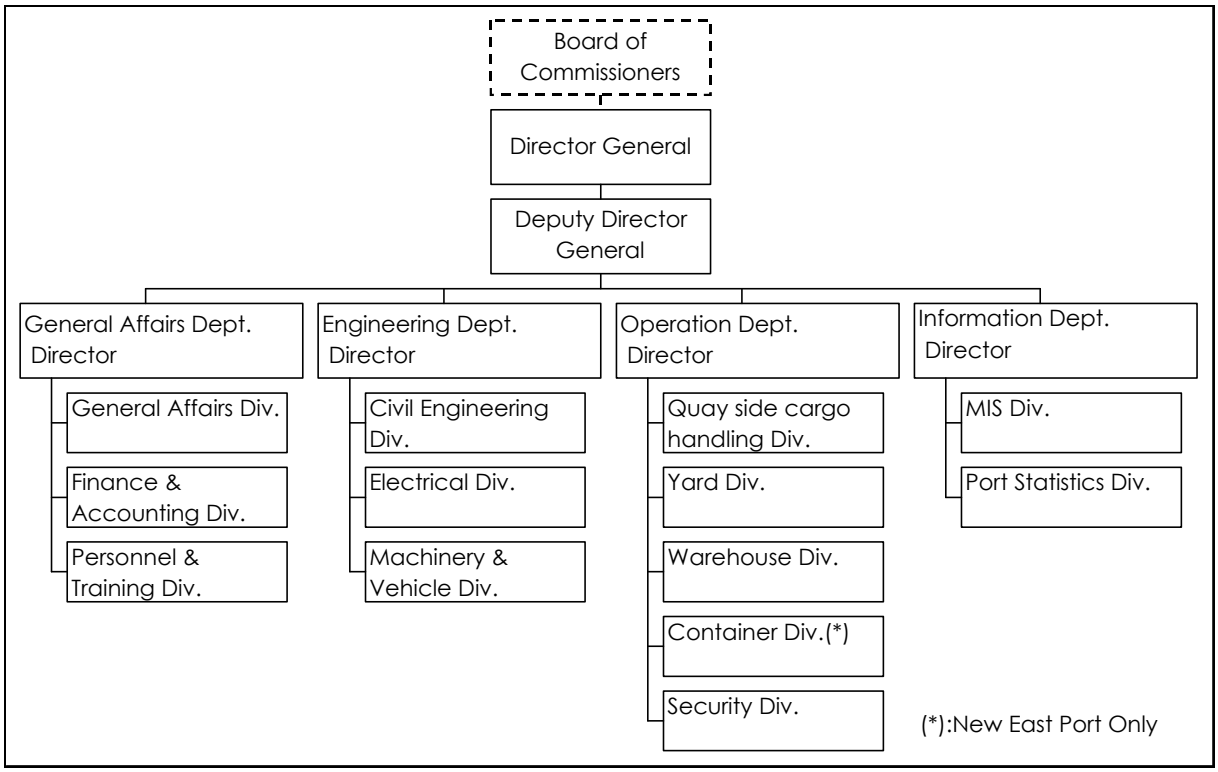
(4) Setting appropriate port dues/charges

151. In general, it is desirable to set port dues/charges as low as possible in order for the IWT to compete with other modes of transport. However, a moderate raising of tonnage dues should be considered according to the need for proper channel maintenance. A moderate raising of cargo handling charge should also be considered when new equipment is introduced to secure efficient and safe handling.

(5) Providing efficient and competitive port services

152. Round-the-clock operation should be realized and idle time including time for formalities/procedures should be reduced in order to provide efficient and competitive port services. In this context, it is recommended that VIWA (IWPA) and port operators assign personnel properly and make use of MIS (Management Information System). Reliable statistics on port activities should be kept properly.

153. The Study Team proposes appropriate organization structures and scales of 4 major port operators for reference as shown in **Figure VII-1** and **Table VII-2**.



Source) JICA Study Team

Figure VII-1 Organization Chart of 4 Major Port Operators

Table VII-2 Required Number of Staff for 4 Major Port Operators

Port		Hanoi	Khuyen Luong	New North	New East
Number of staff	year 2010	277	303	242	468
	year 2020	585	912	617	881

Source) JICA Study Team

(6) Introduction of support system for private sector

154. It is proposed to study support system for private sector such as low interest loan and tax incentive for improving port facilities in terms of safe and environmental aspects and building vessel fleet.

B. Administration and Management of Waterways

(1) Planning, investment and management of waterways

155. Waterways in the Hanoi segment should be planned, invested and managed by MOT as it is major IW. **Table VII-3** shows proposed competent authorities by IW classification.

Table VII-3 Competent Authorities by IW classification

Classification of IW	Competent Authorities		
	Planning	Investment	Management
Major IW	MOT	MOT (PMU-W)	MOT (VIWA)
Other IW	Province(1)	Province(2)	Province(2)

Note) (1)Under approval of MOT

(2)Subsidy from MOT should be considered

Source) JICA Study Team

(2) Introduction of appropriate management equipment

156. To manage waterways efficiently and safely, it is indispensable to introduce appropriate management equipment as well as to place personnel properly. **Table VII-4** shows management equipment required in the Hanoi segment. Introduction of MIS should also be considered.

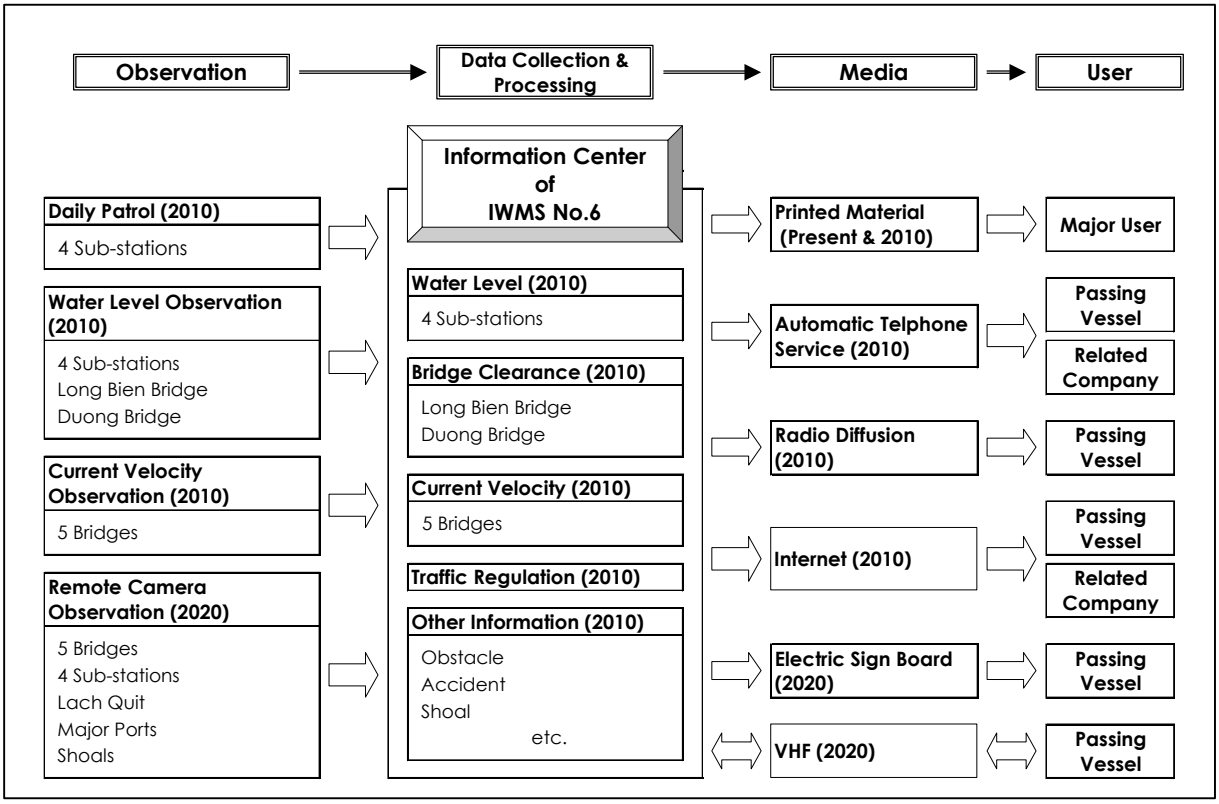
Table VII-4 Management Equipment Required in Hanoi Segment

Item	Spec	Unit	Required number	
			in total	to be introduced in 2010
Dredging fleet		unit	1	1
Dredger	150m3/h	vessel	1	1
Barge	400DWT	vessel	2	2
Tugboat	150CV	vessel	1	1
Buoy lifting vessel	150CV, crane-5ton	vessel	5	2
First Aid vessel	600CV	vessel	1	1
High speed boat	50CV	vessel	5	1
Depth sounder		Unit	5	5
GPS		Unit	5	5
Computer system		unit	3	3

Source) JICA Study Team

(3) Information Service System

157. Condition of waterways is changing day by day and season by season. Therefore it is indispensable to know the latest information about waterways for safe and efficient navigation. Hence, the Study Team proposes an Information Service System as shown in **Figure VII-2.**



Source) JICA Study Team

Figure VII-2 Structure of Information Service System in Hanoi Segment

(4) Revision of IW cargo transport tariff

158. Current IW cargo transport tariff, which is calculated by converted transport distance depending upon IW class, should be revised since the current drastic conversion of distance would hinder an effective use of the IW network.

(5) Strict control for illegal sand exploitation

159. It is strongly recommended for VIWA to strictly control illegal sand exploitation through close cooperation with relevant authorities.

(6) Enactment of legal framework to regulate bridge clearances

160. It is very important for IWT to secure necessary vertical and horizontal clearances when a bridge is newly constructed. It is strongly recommended to enact legal framework to regulate bridge clearances.

VIII. Engineering Studies

A. Preliminary Structural Design

161. From functional point of view, there are two kinds of structures for the project, one is channel stabilization facilities and the other is port related facilities. The following facilities in the Red River Hanoi segment are preliminarily designed (see **Figure VIII-1**):

- Groins, training walls and bank protections for channel stabilization, and
- Quay walls and pontoons in the existing and newly planned ports for berthing of planned calling ships.

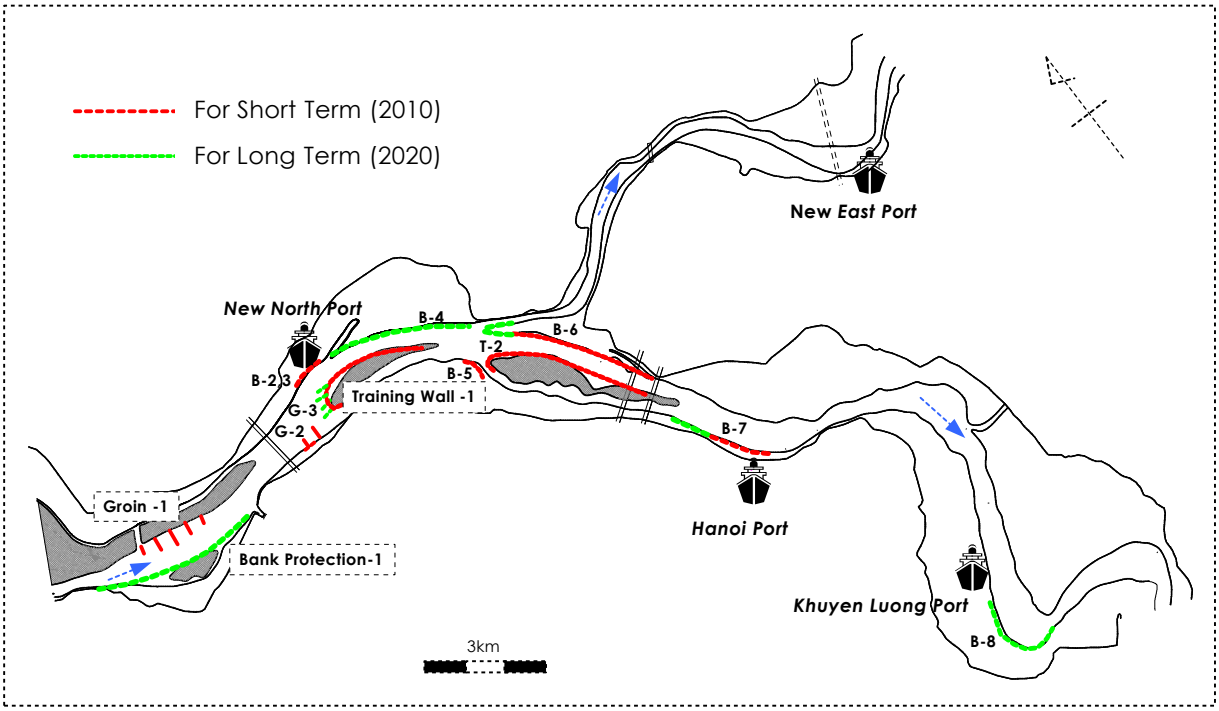


Figure VIII-1 Locations of Designed Structures

162. Their locations and scales (lengths, crown height, etc.) are planned and decided based on the functional requirements, which were derived from the demands for the port activity and utilization, the numerical analysis on channel stabilization, and information on the historical river characteristics.

163. In the preliminary design of the structures, critical design conditions to be considered are the seasonal change in water level (variation reaches about 9m between the dry and rainy seasons) as well as capricious riverbed behavior (erosion and accumulation of riverbed materials) as described in the above **Chapter V**. In addition, the basic natural conditions of sub-soil and river water

current are taken into account on the structural design.

164. Soil investigations including boring and laboratory tests have been carried out mainly in the existing ports and possible new port construction sites. According to the result of the investigations, the soil conditions can be understood as follows:

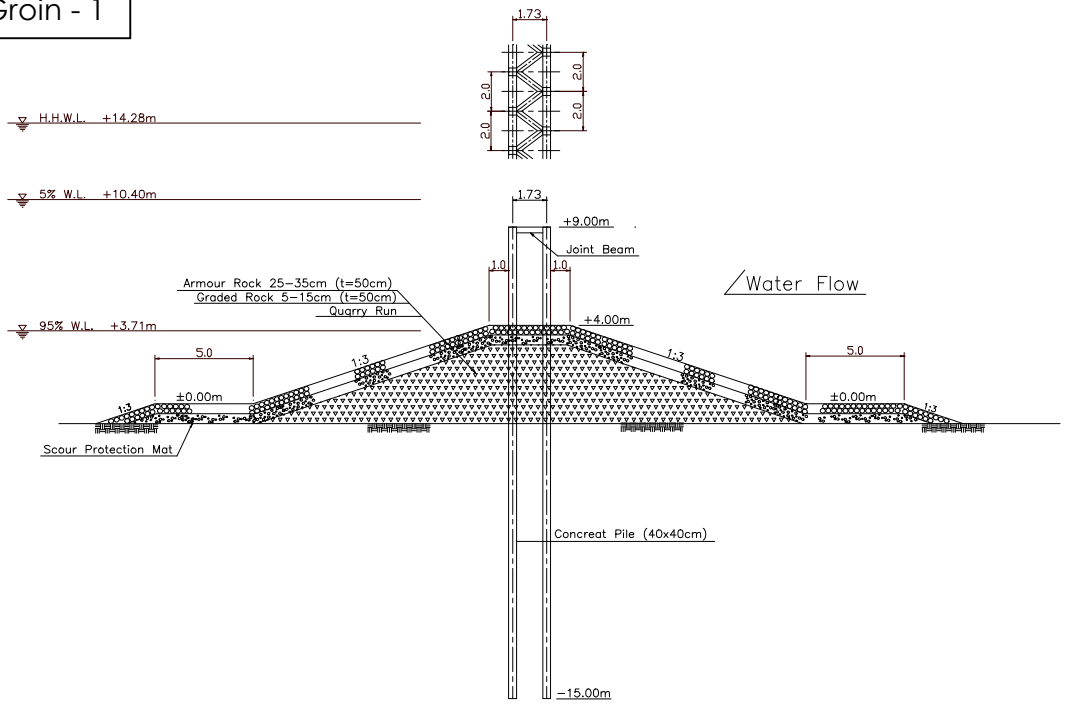
- Judging from distribution of particle size of soils, two-layer stratum (Clay and Sand) is prevailing throughout the study area.
- Clay layer can be considered that it has been normally consolidated, having more than 5 in N-value.
- The bearing stratum for pile structure, which shall keep more than 30 in N-value, lies on the level of about LSD –20 to –30m.

165. Structures, which are planned to construct in or along the river, must be strong enough against attacks of water current. Special attention is paid to rock and concrete block materials, which are placed in expectation of protective role from erosion. Referring to the result of numerical hydraulic simulations carried out by the Study Team**,** a possibility of the maximum current speed of 3.0m/sec (water level = LSD +12.5m) is considered in stability analysis of the above materials.

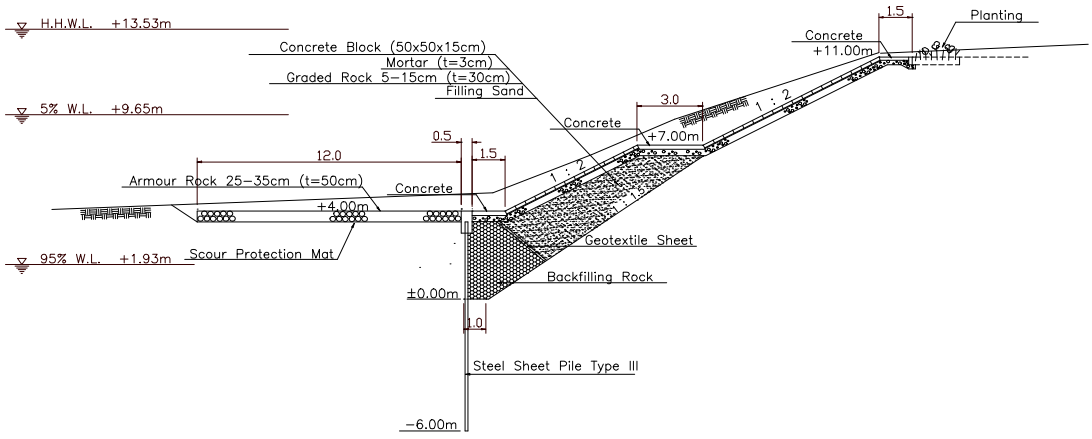
166. In order to construct the new ports in harmony with the effective channel stabilization works, any structural types of berth, which may interrupt trained river water flow, are not considered suitable as sound alternatives. Therefore, the Study Team recommends permeable pier structures for the berths.

167. As a result, typical cross sections of designed structures are presented in **Figure VIII-2 (1)**, **(2)** and **Figure VIII-3**.

Groin - 1

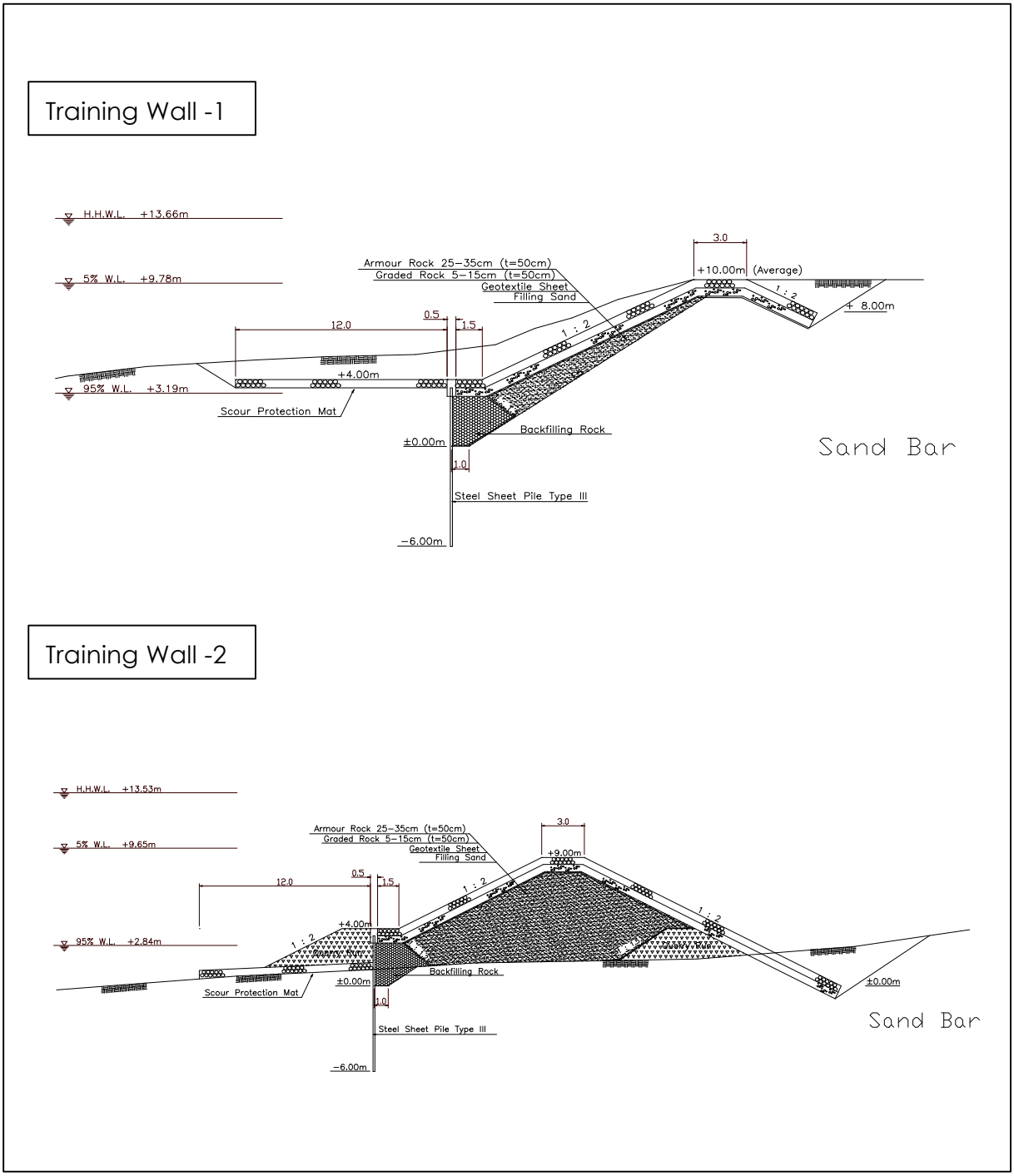


Bank Protection - 7



Source) JICA Study Team

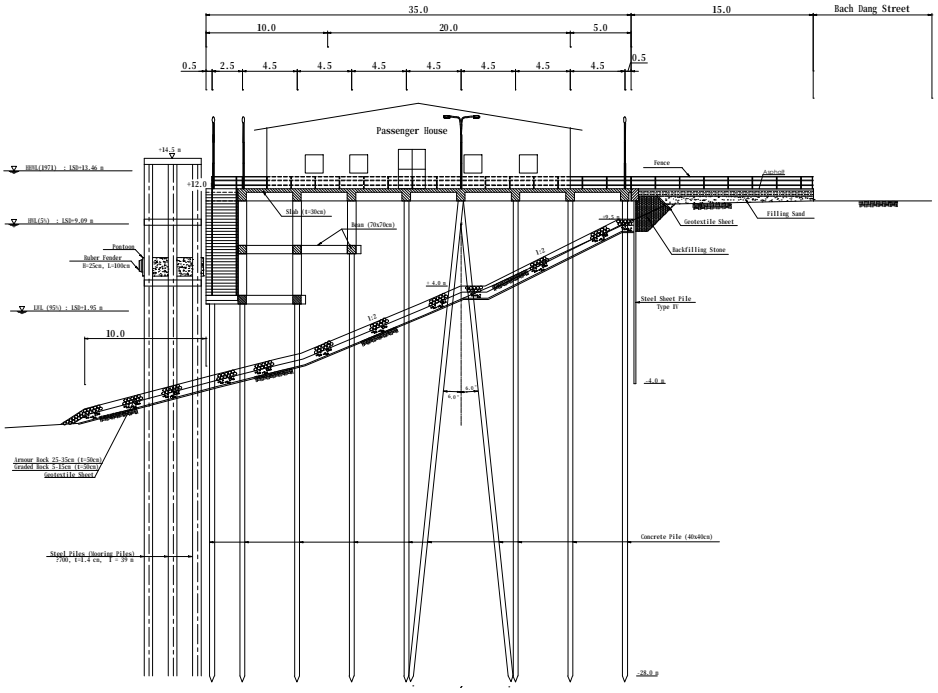
Figure VIII-2 (1) Typical Cross Sections of Channel Stabilization Structures



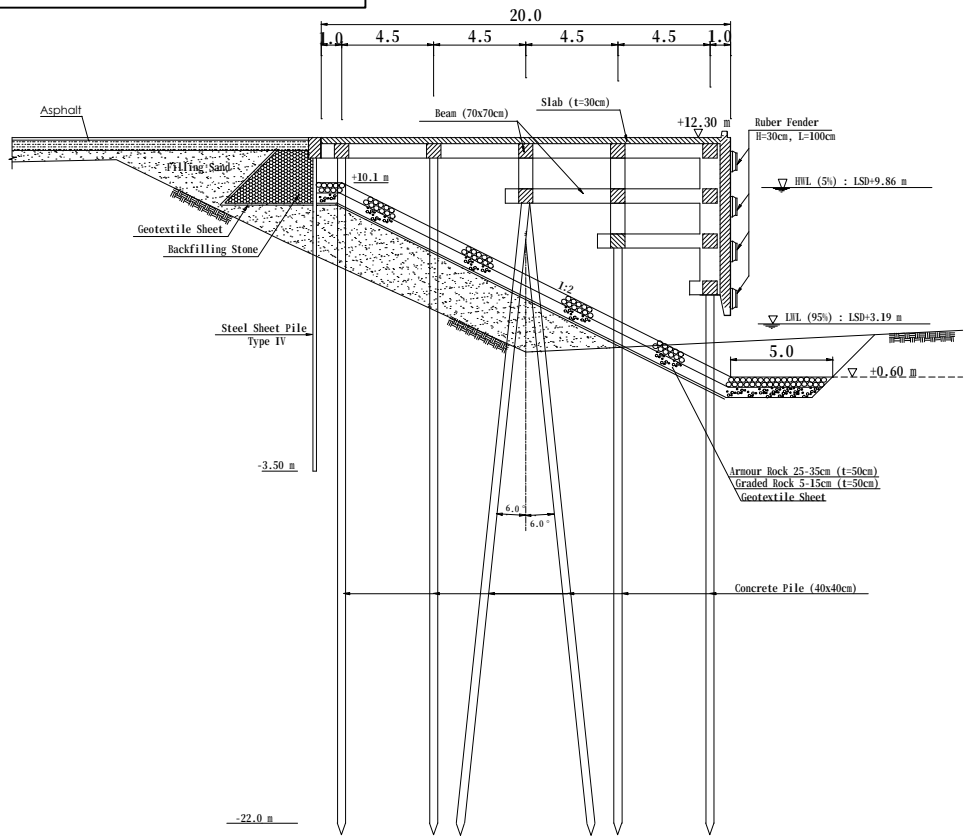
Source) JICA Study Team

Figure VIII-2 (2) Typical Cross Sections of Channel Stabilization Structures

Hanoi Port Passenger Berth



New North Port Cargo Berth



Source) JICA Study Team

Figure VIII-3 Typical Cross Sections of Quay Walls

B. Implementation Program

168. Aiming at commencement of the port operation at the planned ports in early 2010, an implementation schedule is presented as shown in **Figure VIII-4**. As indicated in the figure, the regular flood season in the study area (from July to September) is regarded not to be suitable for construction works.

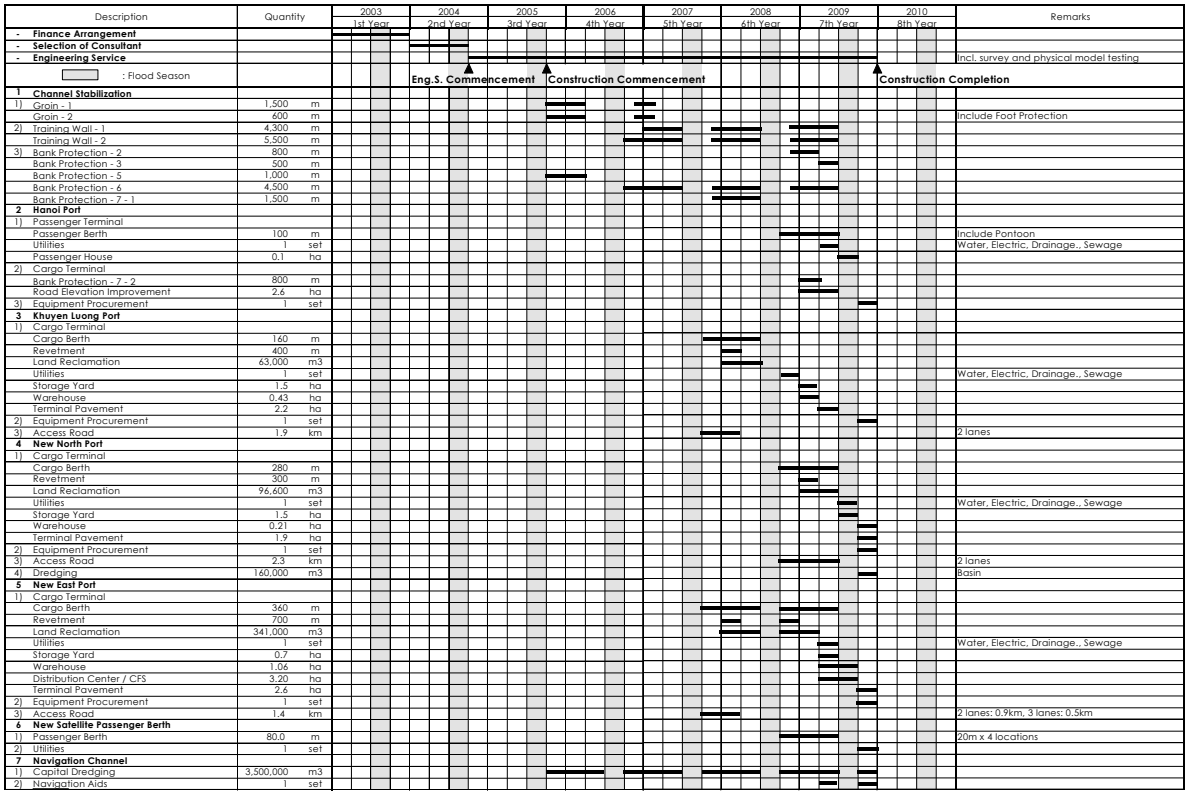


Figure VIII-4 Planed Implementation Schedule for Short Term Project (2010)

169. The surveys and analysis are necessary during the implementation of the Project include bathymetric, topographic, hydrographic, and geographical surveys. At the early stage, in-depth numerical simulations and hydrographic model tests are prerequisite with movable bed.

C. Cost Estimation

170. The project costs are estimated based on the Unit Rate Method and the result is summarized in **Table VIII-1**. Based on the above construction schedule, required project cost by currency in each year are summarized in **Table VIII-2**. As shown in the table, the foreign currency portion (including latent foreign currency cost) shares 66% of the total project cost in this project.

Table VIII-1 Estimated Cost for Projects

Item	2010		2020	
	Million US$	Share	Million US$	Share
A. Port	**46.8**	**39%**	**108.4**	**45%**
1. Hanoi Port	8.0	7%	13.4	6%
2. Khuyen Luong Port	8.9	7%	30.2	13%
3. New North Port	10.8	9%	26.7	11%
4. New East Port	19.1	16%	38.1	16%
B. Channel Stabilization	**63.3**	**53%**	**101.5**	**42%**
C. Navigation Channel	**9.8**	**8%**	**13.8**	**6%**
D. Duong Bridge Improvement	**0.0**	**0%**	**17.7**	**7%**
Direct Cost (A+B+C+D)	119.9	100%	241.4	100%
Contingency (10% of Direct Cost)	12.0		24.1	
Engineering Service (7% of Direct Cost)	8.4		16.9	
Survey and Analysis	1.5		2.0	
VAT (5% of D.C+Cont.+Eng.+S.&A.)	7.1		14.2	
Ground Total	**148.9**		**298.6**	

Note) Excluding operation & maintenance costs.

Source) JICA Study Team

Table VIII-2 Investment Schedule by Currency

Unit: Local - Billion VND, Foreign – Million USD

Currency	2004 2nd Year	2005 3rd Year	2006 4th Year	2007 5th Year	2008 6th Year	2009 7th Year	**Total**
Local	5.0	31.6	88.7	158.8	198.8	284.7	**767.6 (34%)**
Foreign	1.3	3.6	8.6	16.0	23.4	44.6	**97.5 (66%)**

Source) JICA Study Team

D. Recommendations

171. The engineering studies in this Study are conducted based on the available data, both existing and investigated ones by the Study Team, at the moment. However, considering flow condition in the river as well as economic circumstances in Vietnam, which change from time to time, following conditions should be reviewed in the Detailed Design Stage of the Project.

- Topography and bathymetry around the structures should be surveyed to scrutinize design condition of flood plane, riverbank, and riverbed. Tendency of their changes should be evaluated carefully, especially in the construction sites which were pointed out that erosion and accumulation

are likely to occur in the channel stabilization analysis. The changes of the profiles will greatly affect on the alignment of facilities, type of structures, quantities of materials, and construction costs.

- Soil conditions around the structures, especially of channel stabilization facilities, should be surveyed more in detail. The driving depth of piles of structures should be adjusted to the actual undulation of bearing stratum or probable depth of erosion.
- Considering recent tendency of deviation of mainstream, construction of channel stabilization structures, especially Groins-1 and -2, should be started as soon as possible in order to avoid additional construction periods and costs.
- Basically, construction of the proposed channel stabilizing facilities will induce changes in river flow character considerably. Therefore, in order to avoid adverse effects of the channel stabilization facilities to the other facilities, construction works of port-related structures should be planned to start after that of channel stabilization structures and realization of the stable riverbed.
- Due to high water level during the flood season, the construction schedule is planned in limited workable days excluding the flood season. Under this condition, the proposed construction schedule should be understood to be quite tight, specifically that of pier structure in New North port and training walls. In case of the training walls, stable provision of large amount of quarry is indispensable.
- The project costs estimated in the Study should be reviewed, reflecting the latest conditions, including costs of materials, manpower, equipment, etc.

IX. Economic and Financial Analysis

A. Method of Analysis

172. The methodology applied for the economic analysis of the Project is as discussed in **Chapter 30** of the Main Report. The hurdle rates established to judge the economic viability of subject project are as follows:

Internal Rate of Return (IRR):	More than 10% (discount rate for computation)
Net Present Value (NPV):	More than zero (0)
Benefit Cost Ratio (BCR):	More than one (1)

173. The methodology applied for the financial analysis of the Project is similar to those applied for the economic analysis. However, NPV and BCR are not used. It is assumed that the project will be funded totally by loan. The loan conditions assumed for the project and the hurdle rate applied to judge the financial viability of subject project are as follows:

	Loan Period	Grace Period	Interest Rate
80% of total investment amount	30 Years	10 Years	1.8%
20% of total investment amount	15 Years	none	10.0%
Weighted average interest rate			3.4%

Internal Rate of Return (IRR):	More than 3.4%

174. The investment amount for the Project of which target year is set at 2010 is estimated in market price and in economic price as shown in **Table IX-1**. The cost in market price is converted to the economic cost using the Standard Conversion Factor (SCF) determined at 0.85, which includes the Shadow Wage Rate (SWR).

175. Annual maintenance cost is assumed to be one percent (1%) for the civil engineering portion and three percent (3%) for the machinery portion. Annual operation cost used for financial analysis is estimated in accordance with the operation and management plan discussed in **Chapter 41** of the Main Report.

Table IX-1 Initial Capital Investment Amount (2010)

(Unit: US$ million)

Project	Hanoi Port*3	Khuyen Luong Port	New North Port	New East Port	4 Ports Total	Channel*4	4 Ports and Channel
In Market Price*1	9.88	10.93	12.02	23.50	56.33	92.67	149.00
In Market Price*2	9.88	10.93	12.02	15.56	48.39	92.67	141.06
In Economic Price	8.40	9.29	10.22	13.23	41.14	78.77	119.90

Note) 1. Estimated cost in market price include net cost, VAT, physical and price contingencies.
2. Estimated cost of New East Port in market price does not include the cost for the construction of the Distribution Center (DC) and the Container Freight Station (CFS).
3. Estimated cost of Hanoi Port includes the cost of satellite passenger berths.
4. The channel project includes channel stabilization works, channel dredging, provision of navigation aids, etc.

Source) JICA Study Team

B. Economic Analysis

176. The economic benefit of the Project is quantified based on the saved transport cost due to the change of fleet mix and the change of transport mode from IWT to truck (see **Figure III-1**). The economic benefit derived from the passenger transport is analyzed in same method applied for that from the cargo transport by replacing vessel and truck with passenger boat and bus.

177. The results of the economic analysis for the target year 2010 are tabulated in **Table IX-2**. As shown in the table, the economic viability indicators of all projects in 2010 clear the predetermined hurdle rates; therefore, the Project is considered as viable from the national economic point of view.

Table IX-2 Result of Economic Analysis (Short-term Plan)

Target Year / Project	EIRR	NPV (US$ million)	BCR
Hanoi Port	13.6% (11.1%)	3.14	1.32
Khuyen Luong Port	16.3% (13.6%)	6.70	1.61
New North Port	15.6% (13.0%)	6.51	1.54
New East Port	22.1% (18.7%)	19.21	2.21
4 Ports Total	16.3% (12.8%)	26.34	1.54
All Ports plus Channel	12.8% (10.3%)	34.56	1.24

Note) EIRR in parentheses shows the result of sensitivity analysis (investment:+10%, benefit:-10%)

Source) JICA Study Team

C. Financial Analysis

178. The source of revenue of each port is assumed solely from the cargo handling operation and passenger terminal operation (for Hanoi Port). Cargo handling charge is assumed to be unchanged. Container handling charge is determined as an all-inclusive amount (US$4.33/ton) based on the current tariff applied in Hai Phong Port. The passenger terminal charge (e.g. US$ 2 per foreign tourist) is assumed to be newly introduced.

179. Two types of the financial analysis are carried out by source of revenue i.e. cargo handling charge and lease amount. The type of port operation in the former case is referred to as the Service Port Case for the sake of convenience. The latter case is referred to as the Landlord Port Case.

180. The result of this financial analysis is summarized in **Table IX-3**. The FIRRs of each port and 4 ports combined are more than the predetermined hurdle rate, thus the port project is considered financially feasible.

Table IX-3 Results of Financial Analysis (Short-term Plan)

Port	Service Port	Landlord Port					
		Case-A			Case-B		
	FIRR	Lease	FIRR	Margin	Lease	FIRR	Margin
Hanoi Port	7.2% (4.9%)	1.03	7.2%	0	0.87	3.4%	11.9%
Khuyen Luong Port	6.2% (3.9%)	0.96	6.2%	0	0.71	3.4%	18.2%
New North Port	8.1% (7.8%)	1.34	8.1%	0	0.79	3.4%	33.4%
New East Port	7.8% (5.6%)	2.40	7.8%	0	1.52	3.4%	29.2%
4 Ports Total	7.5% (5.3%)	5.73	7.5%	0	3.71	3.4%	8.9%

Note) 1) Lease amount is annual lease amount in US$ million
2) Margin means the profit margin of terminal operator and the difference between operation cost and revenue derived from cargo handling operation.
3) FIRR in bracket shows the result of sensitivity analysis (investment:+10%, revenue:-10%)
Source) JICA Study Team

181. As to the channel project, the revenue to be collected from all IWT vessels using the all ports/Berths in the Hanoi segment should be at VND 5,700/DWT or US$0.38/DWT as minimum if such revenue is collected solely from IWT vessels. However, VND 5,700/DWT is equivalent to about 19 times of current tonnage dues of VND 300/DWT or 25% of current average cargo handling charge per ton and such additional charge is considered to have an adverse effect on the promotion of IWT. Therefore, the other means to cover the investment cost, which may not

limit but include the following measures, should be studied with all concerned parties relating to the project.

1) Initial capital investment cost borrowed through loan will be repaid from the general account of either the National Treasury or Hanoi City.
2) A part of every possible revenues relating to the land created or value added as by-product of the project will be allocated for the repayment.
3) Acceptable charges to IWT operator as the tonnage dues will be collected in order to cover the maintenance cost.

X. Environmental Impact Assessment and Social Consideration

A. Present Environmental and Social Profile

(1) Present status of natural environment

182. The natural environment of the Study area, comprising the total area of the Red River Delta and Hanoi segment, is deteriorated, being affected by the urbanization and industrialization. For example, the water quality of the Red River is so worsened that the SS has reached more than five times as much as the value allowed by the environmental standard. Despite such worsening of water quality, the benthos is comparatively abundant. But, those subjected to the laws or regulations of protection were not found. The air quality is likewise so deteriorated that the SPM value has exceeded the environmental standard.

183. It is also noted that sudden water level increase can occur at the time of floods, thereby threatening the lives of the citizens residing along the river and between the dikes.

(2) Present status of social environment

184. The population in the inner Hanoi City has increased five (5) times during the past 45 years, which is concentrated in the city center occupying only 9.1% of total metropolitan area. The rapid population growth is causing negative impacts upon the social environments, such as: poor infrastructure; flood in the rainy season shortage in water supply in winter; and air pollution, traffic jams and accidents; uncontrolled solid waste disposal; etc.

185. There are many people who live on the river bank inside the dikes of the Red River, which is estimated to be about 79,000 in the riverine districts of Hanoi City. Among 9,114 ha land inside the Red River Hanoi segment, 37% is used for farming, followed by 15% for residence, 2% for ponds, 5% for sand bars, 1% for ports, and the rest for river basins.

(3) Environmental standards in the Socialist Republic of Vietnam

186. The following environmental standards shall be taken into consideration in the course of environmental impact assessment for the present study: Vietnam

Environmental Protection Law, and Guidelines of JBIC with regard to the conservation of natural environment. It is noted that there is no environmental standards on the sediments in the Vietnamese standards.

(4) Nature and characteristics of the present project

187. This Project contemplates development and construction of channel stabilizing facilities as one part, and river port facilities as the other. Among them the development activities which affect the Red River surroundings are construction of channel stabilization facilities (such as: groins, training walls, bank protection, etc.) and dredging. While these activities for development will improve the stability of navigation channels by the reinforcement of riverbanks and sand bars, they have possibilities to bring about local turbidity, change in the river water flow, increase of water level in case of floods, and others.

B. Initial Environmental Examination (IEE)

188. The purposes of IEE are to analyze and assess the impacts of Master Plan for the IWT System in the Red River segment through Hanoi on the natural and socio-economic conditions, and then to pick up major items to be scrutinized in EIA. Items examined here include the following natural environmental items:

Sediments:	Pesticide, N-hexan, Cadmium, Lead, Chromium, Arsenic, Mercury, Ignition Loss
Water quality:	Temperature, Salinity, pH, SS, DO, BOD, Nitrogen, Phosphorus, Coliform, N-hexan, Cadmium, Lead, Chromium, Arsenic, Mercury
Air Quality:	SPM, SO_2, CO, NO_2, VOC
Benthos	

189. The results of examination can be summarized as follows:

(1) Sediments Quality

- Ignition loss in the sediments ranged from 1.11% to 4.99%. The concentrations of chemical characteristics in the sediments range from 0.02 to 2.69 μg/kg for pesticides and from 3.4 to 10.4 mg/kg for N-Hexan.
- The level of heavy metal in sediments ranged from 10.73 to 52.86 mg/kg for Pb, from 6.4 to 12.8 mg/kg for Cr, less than 0.1 mg/kg for As, and less than 0.01 mg/kg for Cd and Hg.

(2) Water Quality

- pH value of the Red River water meets the standards.
- Concentration of BOD of the Red River water is lower than the standard, but that of SS is higher than the standard by 5 to 8 times.
- Oil and grease concentration of all the samples is higher than the standard.
- Total Coliform value of samples collected at some points exceeds the standard.
- All parameters of chemical tests on health items meet the Vietnamese Standard.

(3) Benthos in Riverbed

190. Some benthos species (i.e. Corbicula, Littorina, Spirontocaris, Marciomia, Tarebia, Tagelus, Campeloma, Notonecta) are identified in the riverbed. Among those species, Spirontocaris sp. are the most abundant. However, there are no benthos species which are subjected to the laws or regulations to protect or preserve.

(4) Air Quality

191. Concentrations of NO_2, SO_2, CO, VOC at 4 sampling points are lower than the ambient air quality standards (TCVN 5937-1995). The concentrations of SPM at some sampling points are higher than the standard by 1.1 to 1.4 times.

C. Environmental Impact Assessment (EIA)

192. Environmental impacts of Short-term Plan are assessed in terms of natural and socio-economic conditions. The measures for pollution control and mitigation of negative impacts are proposed to cope with the requirements of the relevant guidelines of Vietnam government and JBIC.

193. The EIA is conducted with respect to the present status of the study area on the same items as those for IEE, and social impacts in more detailed and concrete manner. It is divided into each stage of development plan in terms of preparatory stage for construction, construction stage, and operation stage of the proposed Project.

194. There will not be remarkable factors that may impact on the environment during the preparatory stage for construction, since the SS value of the present water is extremely high, and benthos subjected to the laws or regulations of protection are not found.

195. Requirement for resettlement of residents due to the project is almost nothing. However, reasonable indemnity must be paid for purchasing the land for port development as well as construction of access roads during this stage of the project.

196. During the construction stage, the principal factors that may cause impacts on the environments are the air contamination by exhaust gas and dusts due to construction machinery and vehicles, generation of noise and vibration due to land construction works, and erosion on the river banks and sand bars by variation of riverbed.

197. In the course of operational stage, the important factors are air contamination by exhaust gas from the transport equipment introduced for the port operations, and erosion of the riverbanks, and excavation and disposal of soils by maintenance dredging.

198. For each stage the following mitigation measures are required to be taken:

(1) Construction Stage

- Periodical maintenance of construction machinery and vehicles (air quality)
- Implementation of speed control on transporting equipment (air quality)
- Water Sprinkling on sunny days (air quality)
- Reduction of construction works during nights and holidays (noise and vibration)
- Installation of channel stabilization facilities, and at the planning stage of them, execution of riverbed variation simulation for the assessment and verification of the relation between the riverbed variation (such as remarkable increase of flow speed at certain spots) and its influence (such as bank erosion)

(2) Operational Stage

- Implementation of speed control on transporting vehicles (air quality)

(3) Positive Environmental Effect of the Project

199. A certain degree of modal shift is expected from the land transport of port cargoes to the IWT after the completion of the Project, which will reduce the quantity of CO_2 discharge as shown in the **Table X-1**.

Table X-1 Effect of Investment to IWT System on CO_2 Discharge Reduction

(2020, unit: 1000 tons)

	Investment to IWT System		Reduction
	Without	With	
Northern region by IWT (overflow: Truck)	821	410	411
Share to whole country by all sectors	0.31%	0.15%	0.15%
Share to Red River Delta by transport sector	6.84%	3.41%	3.43%
Hanoi segment by IWT (overflow: Truck)	263	152	111
Share to whole country by all sectors	0.10%	0.06%	0.04%
Share to Red River Delta by transport sector	2.19%	1.26%	0.93%

Note) CO2 Discharge (million tons) estimated by JICA Study Team
Whole Vietnam by all sectors: 266
Red River Delta by transport sector: 12
Source) JICA Study Team

200. Furthermore, it is considered desirable to maintain environment-friendly dual channel system, minimizing man-made structures as much as possible for channel development. This will preserve the biodiversity and also prevent disruption in the lives of the people living in some 100 boats along the shore. This subject needs to be considered not only from natural environmental aspect but also from social aspect.

D. Conclusions and Recommendations

- The environmental impact on the Red River and Hanoi metropolitan area by the implementation of this development project is considered to be comparatively little, and main impacts can be mitigated by way of appropriate measures.
- After the completion of development, improvement of air quality and reduction of CO_2 in the area can be expected owing to the modal shift.
- After the completion of development, consequential economic effects besides direct business effects will be generated on the outside business

area, which will contribute to a great extent to the economic development and social stability of riverside Hanoi metropolitan area.

- The resettlement of inhabitants with the development of river ports and access roads will be minimal, but reasonable indemnity will have to be considered for acquiring the land under cultivation.
- During the construction stage, measures need to be taken to avoid traffic accidents due to transportation vehicles, and noises and vibrations generated by construction machinery and equipment.
- It is desirable to effect plantation of small trees on the riverbank to enhance the scenery of the riverside in Hanoi metropolitan area.

XI. Recommendations

A. Importance and Urgency of the Project

(1) Development of ports and waterways in Hanoi segment

201. The IWT system in the Red River Delta plays an important role in carrying construction materials, cement, coal, etc., as well as bettering the lives of people living there. One of the most active areas in terms of IWT is the Hanoi segment where the IWT system supports the development and activities of the capital Hanoi.

202. In Hanoi, west suburban area development is under way. Urban and industrial development projects of east and north suburban areas are also planned and some portions have commenced. This would involve a large volume of construction materials. It is also anticipated that other cargoes will increase together with the industrial and urban development.

203. At present, about six million tons of cargo are handled at ports and the temporary cargo Berths in the Hanoi segment. This cargo volume is equivalent to about two thousand 8-ton trucks per day. According to the demand forecast in this Study, cargo throughput in the Hanoi segment will increase about threefold in 2020. Development of new ports as well as increasing the capacity of existing ports is urgently needed to meet the rapid increase of the IWT.

204. Temporary cargo Berths have been increasing randomly here and there along the Red River in order mainly to handle increasing construction materials. If this situation is allowed to continue, many disorderly heaps of sand and gravel will be seen along the Red River and this will have an adverse effect on the city planning.

205. Therefore, it is vital to restrict the increase of these temporary cargo Berths and instead to concentrate the investment into major ports. Improvement in terms of safe and environmental aspects should only be allowed for existing temporary cargo Berths. In addition, temporary cargo Berths located between Thang Long Bridge and Thanh Tri Bridge should be removed and transferred to the outside by 2010 in principle.

206. It is also important that dirty cargo such as coal and construction materials should be handled at the suburban ports, while Hanoi Port located near city center should be changed to a clean cargo port as well as a passenger port.

207. As a result, the Study Team proposes to construct 2.4km (0.9km) of berth, 4 satellite passenger berths and related port facilities such as handling equipment, storage facilities, Inland Container/Clearance Depot with distribution center, passenger terminal and access roads at 4 major ports of Hanoi, Khuyen Luong, New North and New East in addition to navigation channel plan in the Hanoi segment by 2020 (2010) after formulating the Long-term Strategy for the IWT System in the Red River Delta.

208. In Vietnam, traffic condition has been worsening and the number of traffic accidents have been increasing. If the cargo which is expected to be transported by the IWT in the future were to be transported by road, traffic congestion would be more serious and traffic accidents would also increase.

209. Hence, it is clear that economic and social development in Hanoi will be restricted and road transportation will have to undertake a big burden if the IWT system is not developed. It is necessary to develop the IWT system as proposed in this Study as early as possible.

210. On the other hand, the IWT is a environment-friendly transport mode in terms of energy consumption and CO_2 discharge. This project must be materialized urgently from the viewpoint of not only increasing the capacity of IWT system but also improving the environment.

(2) Channel stabilization in Hanoi segment

211. The IWT channels in the Red River Delta, specifically in the Hanoi segment, have had problems of instability of the routes, variable shallow depth, etc., causing troubles of stranded ships and other hindrances. Construction of countermeasure facilities for stabilization and development of the channel in the Hanoi segment has been the most basic potential demands in the Red River Delta.

212. During the execution of this Study, several new facts are revealed including hydraulic characteristics in the river, dynamic mechanism of the sedimentation/ erosion and effects of proposed channel stabilization facilities. Very recently, after several years of maintaining the same flow route, the main stream showed a tendency to change the direction at Thang Long Bridge, which may cause drastic changes in the alignment of the channels. This is to be re-trained urgently to retrieve the original alignment so as not to affect the present infrastructure.

213. Under the above circumstances, the proposed Project could be considered essential and urgent for the development of not only the IWT but also

other socio-economic activities in the Hanoi segment.

214. Besides, the channel stabilization could affect the formation of other related projects of different purposes proposed by HNPC and MARD. These projects have already been proposed to the government and now under review of the State Appraisal Committee, MPI. Urgent formation of the channel stabilization could help incorporate with those projects to be affected by the channel stabilization, which is the common understanding and basic policy in the government.

215. In this context, this channel stabilization can be considered as the kernel measure to motivate and enhance the development of the river environment and the capital city.

B. Project Risks and Recommendations

(1) Channel stabilization

216. The discussions and analysis on channel stabilization made in this Study are mostly based on survey results from 1999 to 2002. It is observed, however, that, after the flood season in 2002, there is a trend where **change of the main channel** into the secondary channel is going to occur, which shall be avoided, stopped, and trained to flow to the planned direction. Hence, the proposed channel stabilization measures should be undertaken as soon as possible.

217. Detailed analysis should be carried out by means of **numerical and physical hydraulic models** on the behavior of movable bed in the Detailed Design Stage.

218. The proposed facilities for channel stabilization should be constructed step by step with careful monitoring on the effects of the facilities by **follow-up surveys**, at least twice a year in the dry and the flood seasons, including bathymetric, topographic, hydraulic, and geotechnical surveys, and review of the plan taking account of the expected and realized effects, priority, timing, and scale of the facilities.

219. In addition to construction of hard facilities, flexible and mobile operations of **dredging** should be incorporated in the execution of the Project. An amount of capital dredging with an order of 3 million m^3 and a certain amount of annual maintenance dredging should be taken into consideration.

220. Construction of Son La Dam and other **reservoirs** in the near future will further ameliorate the flood conditions in the Hanoi Segment. The effects of the proposed channel facilities on the water level and discharge during floods are assessed to be minimal and not unfavorable. Therefore, the proposed channel stabilization measures should be positively promoted even in consideration of flood control.

(2) Development of Ports and waterways

221. It is recommended to keep reliable statistics on ports and waterways as well as to continuously monitor the availability of premises used for planning in this Study. It is also crucial to confirm how the urban and industrial development in the hinterland is progressing when deciding the investment, especially for the project which will be implemented at later stage.

222. It is vital to restrict the increase of these temporary cargo Berths and instead to concentrate the investment into major ports. Improvement in terms of safe and environmental aspects should only be allowed for existing temporary cargo Berths. In addition, temporary cargo Berths located between Thang Long and Thanh Tri Bridges should be removed and transferred to the outside by 2010 in principle.

223. As to passenger transport, it is indispensable to provide a service almost the same as that of bus in terms of transit time and fare. Before starting operation of passenger boat service, promotion activity of a large scale in order to make passengers shift from bus transport to IWT is recommended. It is also important to promote the river cruse for international and domestic tourists. In promoting the river cruise, discovering tourist attractions in and around the Hanoi segment as well as providing various types of cruise service are recommended.

224. Linking the coastal transport to the IWT is considered to be economically important to Vietnam. The Coasters, however, have always been difficult to approach to the ports in Ninh Binh and Hanoi due to draught limitations. Formulating a master plan of waterways for Coasters/SRVs with careful feasibility study is recommended as early as possible.

(3) Other issues

225. Recommendations on management and operation scheme as well as environmental and social consideration are mentioned in each chapters.

Explanation of Cover Design

Future images of the Inland Waterway Transport System in the Red River Delta, the projects on channel stabilization and the major ports in the segment through Hanoi in particular, are drawn in this Study. This project is expected to contribute to the 1000 year anniversary of Thang Long - Hanoi - in 2010. In the cover page of this final report, pink band and light blue band express the Red River and the blue sky above Hanoi respectively. Both Dao (peach flowers) and Quat (a kind of citrus fruits) in the colored bands are cultivated along the river bank and adorned at the entrance of each house to celebrate Tet (a new year) in Hanoi. The JICA Study Team and relevant organizations of Vietnam hope the project will be carried out as early as possible.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MOT (PMU-Waterways)
JICA Study Team (OCDI & JPC)
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