Chapter 39 Environmental Impact Assessment (EIA) and Social Consideration

39.1 Introduction

The environmental study covers the entire Red River Delta for the Long-term Strategy and the 40km river segment through Hanoi for the Master Plan and the Short-term Development Plant.

The scope of the environmental study includes the following items:
- Review and analysis of the present environmental situation (See Chapter 15).
- Initial environmental examination (IEE) for a Master Plan for the Inland Waterway Transport (IWT) System in the Red River Segment through Hanoi (See Chapter 31)
- Environmental Impact Assessment (EIA) for a Short-term Development Plan for the IWT System in the Red River Segment through Hanoi (See Chapter 39).
- Comprehensive environmental evaluation for the feasibility study on the priority projects (See Chapter 42) including identification of project risk and recommendation of mitigation measures

This Chapter will presents the Environmental Impact Assessment (EIA) for a Short-term Development Plan for the IWT System in the Red River Segment through Hanoi.

The EIA report will analyze, assess the impacts of a Short-term Development Plan for the IWT System in the Red River Segment through Hanoi on the natural and social-economic conditions and propose the measures for pollution control and mitigation of negative impacts to cope with the requirement of Vietnam Environmental Protection Law and guideline of Japan Bank for International Cooperation (JBIC) (JBIC Environmental Guideline for ODA Loans, October, 1999, JBIC) with regard to conservation of natural environment.

39.2 Current state of the environment at the proposed project area

39.2.1 Natural conditions

The natural conditions are described in detail in Chapter 31, which can be briefly summarized as follows.

(1) Topographical conditions

The Red River segment through Hanoi City has the length of approximately 40 km. This river section flows pass administration localities as Tu Liem, Tay Ho, Hoan Kiem, Hai Ba Trung and Thanh Tri districts in the right bank and Dong Anh, Gia Lam districts in the left bank. The Survey area can be divided into three small stretches due to the topographical characteristics.

Dong Anh district is a prolongation of the Tam Dao mountains mass in the Middle Region of the North stretching towards the Delta. So the land level of Dong Anh district is 7 – 10 m. The other areas comprising Gia Lam, Tu Liem, Thanh Tri districts and seven urban districts (i.e. Ba Dinh, Ho Tay, Hoan Kiem, Hai Ba Trung, Dong Da, Thanh Xuan, Cau Giay) belong to the Delta with the average height of 4 – 5 m.

(2) Meteorological conditions

The meteorological data observed from July 1956 to 2000 at the National Meteorological Station (Lang Station) are summarized as follows :

- There are two prevailing wind directions, i.e. NE and SE in annual wind rose. NE wind direction occurs from November to January with frequency of 15.1 to 21.8%, and SE direction occurs from February to October with frequency of 12.2 to 35.7% .Monthly average wind speed and average of monthly maximum wind speeds are 1.9 and 11.8 m/s, respectively.

- Number of the typhoons and tropical depressions passed in the North Vietnam region of latitude 19 – 22^0 North (Hanoi City N 21^0) in the past 26 years (1954 – 1980) was counted as 64 times.

- The rainfall in the Survey area is clearly characterized by two monsoon seasons, i.e. the dry and rainy seasons. The rainy season prevails from May to October with monthly average rainfall of 182 – 282 mm/month. The dry season prevails from November to April with monthly average rainfall of 21 – 97 mm/month

- Monthly average air temperature and average of monthly maximum air temperature are 18.1 and 27.5^0C respectively.
- Monthly average relative air humidity varies from 78% in December to 86% in April.

- Monthly average sunshine varies from 48.9 hours in February to 192.6 hours in July.

(3) Hydrological conditions

- The hydrological data recorded at Hanoi gauging station for the past 16 years show that The maximum water level occurred from June to September. The minimum water level occurred from December to April, mostly in February. This water level is 1.86 m higher than water levels referred to Chart Datum Level (zero m = lowest water level).

- Water flow speed is measured for consecutive 25 hours in the time when tidal fluctuation was remarkable i.e. during days of the spring tide on January 15 and 16, 2002. Measuring points consist of 7 main points (to obtain input data for implementation of simulation of navigational channel stabilization) and 13 supplemental points (to obtain data for checking numerical values computed from simulation).
The results of measurements of river water flow are presented in Chapter 31.

- The volume of water and sediment discharges as well as suspended solids are shown in Chapter 31.

- Riverbed materials are measured at 28 points consisting of the same 20 points as those in measurements of water flow and 8 points at sand bars. These samples were taken from two depths comprising the surface of riverbed and 0.50 to 0.55 m below the ground. Specific gravity, grain size distribution (d25, d50, d75) are indispensably needed for analysis of navigation channel stabilization. These sizes (d50) at surface of riverbed varies from 0.133 to 0.283 mm.

- The high volume of water flows, the monsoon climate, and frequent TDs make the Red River Basin vulnerable to severe flooding. The high bank of the riverside land in the Red River in Hanoi has elevations of Land Survey Datum + 10.0 m to 13.0 m water levels over this elevation cause flooding for the houses on the right bank. In the Red River, the warning water levels are 9.5 m, 10.5 m, and 11.5 m for class I, II, and III, respectively. At Hanoi Segment of the Red River, to protect this area from flooding, they had constructed dikes at both sides of the Red River and the Duong River, groynes at some banks, and protected slopes at the riverbanks.

(4) Geological and seismic conditions

The Study Team carried out geotechnical investigation at the 3 alternative sites proposed for new port construction including Thuong Cat port, Van Kiep port and Khuyen Luong port. Total 6 holes of under-water boring with a total boring length of about 210 m was carried out.
There are 2 main purposes in this geotechnical investigation, as follows:
- To confirm elevation and strength of bearing layer for file foundation structure related to the project facilities including wharf, revetment and others.
- To confirm and establish design soil construction of soil stratum at the Survey area.

1) Confirmation of bearing layer

It is estimated that bearing layer (sand stratum) exists below 20 m depth from ground surface in the Survey area. It is quite important to confirm the exact elevation of this bearing layer for the determination of design conditions. Therefore, at least one boring hole shall reach this bearing layer, then the depth of other one boring hole shall be adjusted within a total the length of 210 m.

Standard penetration test (SPT) to measure N- value and to obtain samples of disturbed soil were carried out at every one meter interval. And in case cohesive soil layer was found, sampling of 4 undisturbed soil per hole were taken (Chapter 31).

It shows that elevation of bearing layer exceeding N- value 50 varies from about – 24 m to – 40 m.

2) Laboratory test

All samples to be used for laboratory test were obtained and testing data are presented in the Interim Report.

39.2.2 Environmental conditions

(1) Monitoring in dry season (February 2002)

The monitoring data in dry season are described in Chapter 31, which can summarized as follows:

1) Evaluation of results of measurement of sediment materials quality

Analyzing results given Chapter 31 show that the Ignition of lose 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, from 3.4 to 10.4 mg/kg for N-Hexan. The range of heavy metals found in the Red river sediments. The table shows that the level of heavy metals 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, less than 0.01 mg/kg for Cd and Hg.

2) Evaluation of results of measurement of water quality

Comparing the analyzed results with the surface water quality standard (TCVN 5942-1995) (category A) shows that:

- pH value of the Red river's water meets the standard .
- Concentration of BOD of the Red river's water is lower than the standard, but concentration of SS is higher than the standard from 5 to 8 times.
- Oil and grease concentration of all 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) Evaluation of results of measurement of benthos in riverbed

Some benthos species *(i.e. Corbicula, Littorina, Spirontocaris, Marcromia, Tarebia, Tagelus, Campeloma, Notonecta)* were identified in the riverbed, among those *Spirontocaris sp.* are the most abundant.

However, there were not the benthos species subjected to the laws or regulations of protection.

4) Evaluation of results of measurement of air quality

Comparing the analyzed results with the ambient air quality standards (TCVN 5937-1995) shows that concentrations of NO_2, SO_2, CO, VOC at 4 sampling points are lower than the ambient air quality standards (TCVN 5937-1995), while concentrations of SPM at some sampling points (i.e. A1-1, A1-2, A1-3, A2-1, A2-2, A2-3, A3-1, A3-2) are higher than the standard from 1.1 to 1.4 times (See Chapter 31).

(2) Monitoring in flooding season (August 2002)

1) Location of the work sites with location map and coordinates (August, 2002)

- The sites for monitoring of sediment material quality will be described in **Table 39A.1.1**, in Appendix 39A.1.
- The sites for water sampling and in situ measurement will be described in **Table 39A.1.2** in Appendix 39A.1.
- The sites for monitoring of benthos in riverbed are described in **Table 39A.1.3** in Appendix 39A.1.
- The sites for air sampling are described in **Table 39A.1.4** in Appendix 39A.1.
- The map of the monitoring sites is attached in Appendix 39A.2.

2) Results of the measurements/surveys and activities performed

- The sedimentation monitoring results are described in **Table 39A.1.5** in Appendix 39A.1.
- The water quality monitoring results are described in **Table 39A.1.6** in Appendix 39A.1. Distribution of particle size of suspended solid are described in **Table 39A.1.7** in Appendix 39A.1.
- The benthos measurement data are described in **Table 39A.1.8** in Appendix 39A.1.
- The air quality monitoring results are described in **Tables 39A.1.9** and **39A.1.10** in Appendix 39A.1.

3) Evaluation of results of the measurements/surveys and activities performed

(a) Evaluation of results of measurement of sediment materials quality

Analyzing results given at **Table 39A.1.1** show that the Ignition of lose in the sediments ranged from 2.1% to 7.7%. The concentrations of chemical characteristics in the sediments range from 0.11 to 0.97 µg/kg for pesticides, from 1.05 to 3.82 mg/kg for N-Hexan.

Table 39A.1.1 shows the range of heavy metals found in the Red river sediments. The table shows that the level of heavy metals in sediments ranged from 23.1 to 98.3 mg/kg for Pb, from 22.8 to 42.3 mg/kg for Cr, less than 0.5 mg/kg for As, less than 0.5 mg/kg to 8.1 mg/kg for Hg.

(b) Evaluation of results of measurement of water quality

Comparing the analyzed results with the surface water quality standard (TCVN 5942-1995) (category A) shows that:

- pH value of the Red river's water meets the standard .
- Concentration of BOD of the Red river's water is lower than the standard, but concentration of SS is higher than the standard from 20.4 to 34.0 times.
- Oil and grease concentration of all 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.

(c) Evaluation of results of measurement of benthos in riverbed

Some benthos species *(i.e. Spirontocaris, Marcrine, Corbicula, Corbiculidae family, Tarebia, Thiaeidae family)* were identified in the riverbed, among those *Spirontocaris sp.* are the most abundant.

However, there were not the benthos species subjected to the laws or regulations of protection.

(d) Evaluation of results of measurement of air quality

Comparing the analyzed results with the ambient air quality standards (TCVN 5937-1995) shows that concentrations of SPM, NO_2, SO_2, CO, VOC at 6 sampling points are lower than the ambient air quality standards (TCVN 5937-1995).

39.2.3 Present land use behind short-term ports development area and social consideration

(1) Hanoi port

According to the Plan discussed in the **Chapter 36**, a new passenger berth is planned within the area of the existing wall at the east end of Hanoi Port. It means that no relocation of houses or any compensation will occur when a new passenger berth will be constructed.

On the other hand in case of Master Plan, rather wide and very dense populated areas behind of new passenger berth over the road to the Dyke are planed as development areas for mostly passenger port facilities. These areas are so crowed with houses so that it seems to encounter the difficulties when clearing houses and compensating inhabitants in master plan phase.

Photo 39.3.1 shows the present situation of the place where a passenger new berth is planned. These areas are now utilized for handling equipment pools of Hanoi Port. Therefore no relocation of living houses or no compensation is needed.

Photo 39.3.1 The area where a new passenger berth will be constructed.

Port developments and activities it selves seem to give some negative and positive affections to the surrounding inhabitants. However, the most serious one is that by constructing port facilities inhabitants are compelled to move other places. In this sense the short-term plan might not give serious impact to the peoples. However, there will gather many passengers so that managing land traffic for safety, mitigating noise and vibration, cleaning garbage and beatification of environment are important subject for social consideration.

(2) Khuyen Luong port

Khuyen Luong Port has quite wide land areas with approximately 40 ha, behind the existing berths where there is no living house. **Photo 39.3.3** shows the present situation of the areas behind new planned berths.

Photo 39.3.2 Upstream Scenery and Downstream End of Existing Facilities

Photo 39.3.3 Future Port Expanding Area along the Shore & Wide behind Area

Khuyen Luong Port is very suitable area to develop new port because of having wide unutilized area where no houses and few farming areas by view point of land use. There seems to happen no social problem except the traffic safety at the entrance point where the access road from the port meets the existing dike

road. It is necessary to widen and make moderate curvature or in future to make interchange according to increasing traffic volume.

(3) New North port

Figure 39.3.1 is a drawing by overlapping an aerial photograph taken in 1998, topographic map surveyed by TEDI-port in January 2002 and JICA study Plan introduced in **Figure 27.4.3.**
New North Port will be located in the front area of Hai Boi Commune. The access road can be available from descending approach road of Than Long Bridge to Noi Bai Airport to the dyke road about 1,000 m paralleling along the the Red River. From the dyke road we have to construct the short access road vertically to the dyke road.

The ground elevation of turning point on the dyke is 13.7m. The short access road down to port area about 3m should across the narrow populated area. However, if we choose the route of this short access road carefully there might be no house then any need to relocate the people.

The area should be spared for this short access road with 12m wide including adjacent pond then we have to compensate land. Right now there is no detail survey map so that fixing the content of compensation for the planned port area further investigation will be necessary.

Present situation of North Port developing areas can be seen by **Photo 39.3.4**～**Photo 39.3.7**. Port areas will be realized at the shore land of no use as the scenery of **Photo 39.3.7**. The short access road will pass through the area between the existing the two houses seen in **Photo 39.3.5.**

After New North Port will start to handle the cargo workers for the Port or trucks loading cargos or tractors and chassis carrying container will increase traffic volume.

The most important subject on social consideration of this development is surely how to keep traffic safety, because of the short access road will across the living
road along the shore line passing through longitudinally center line of Hai Boi commune. It might be needed to educate and lead the living peoples keeping the traffic regulation for traffic safety.

Figure 39.3.1 New North Port Plan


Photo 39.3.4 Entrance into Hai Boi Commune and New Norh Port from the Dyke


Photo 39.3.5 The Location of the future Access Road from the Dyke and Hai Boi


Photo 39.3.6 The Exisiting Access Road to the Shore Bank of the near New North


Photo 39.3.7 The Areas where New North Port will be Constructed.

(4) New East port

Figure 39.3.2 is a drawing by overlapping an aerial photograph taken in 1998, a topographic map surveyed by TEDI-port in January 2002 and JICA study Plan introduced in **Figure 27.5.1.**

New West Port will be located inside the area of the Duong River in Nong Vu Trung Village of Hoi Xa Commune. However, there is not any house but wide farmland behind the Port. The access road will be connected with Phu Dong new Bridge approach road crossing the dyke and through the route along the foot of existing dyke.

The access road outside area of Dyke to Phu Dong Bridge approach road passes over a few large buildings by **Figure 39.3.2**. However, considering the accuracy of Map and original Plan it can be avoidable to move existing buildings by changing the route of the access road. It means no need to relocate buildings or houses.

As for the existing farmland, this area is under managing of the Peoples Committee of Hoi Xa Commune and farmers should get the approval of Peoples Committee to use these lands every year. So that it is easy to use for port development project with some subsidiaries to the farmers.

Present situation of West Port developing areas can be seen by **Photo 39.3.8**～**Photo 39.3.11**. Port areas will be realized in the farmland as the scenery of **Photo 39.3.9**. The access road will pass through the area along the foot of the dyke in **Photo 39.3.11.**

After New North Port will start to handle the cargo workers for the Port or trucks loading cargos or tractors and chassis carrying container will increase traffic volume. However surrounding areas of the access road and connecting point there is no houses and wide areas are stretching so that traffic safety matter could not be the subject for social consideration.

For the living peoples in Nong Vu Trung Village there might be a good chance to get port related jobs.

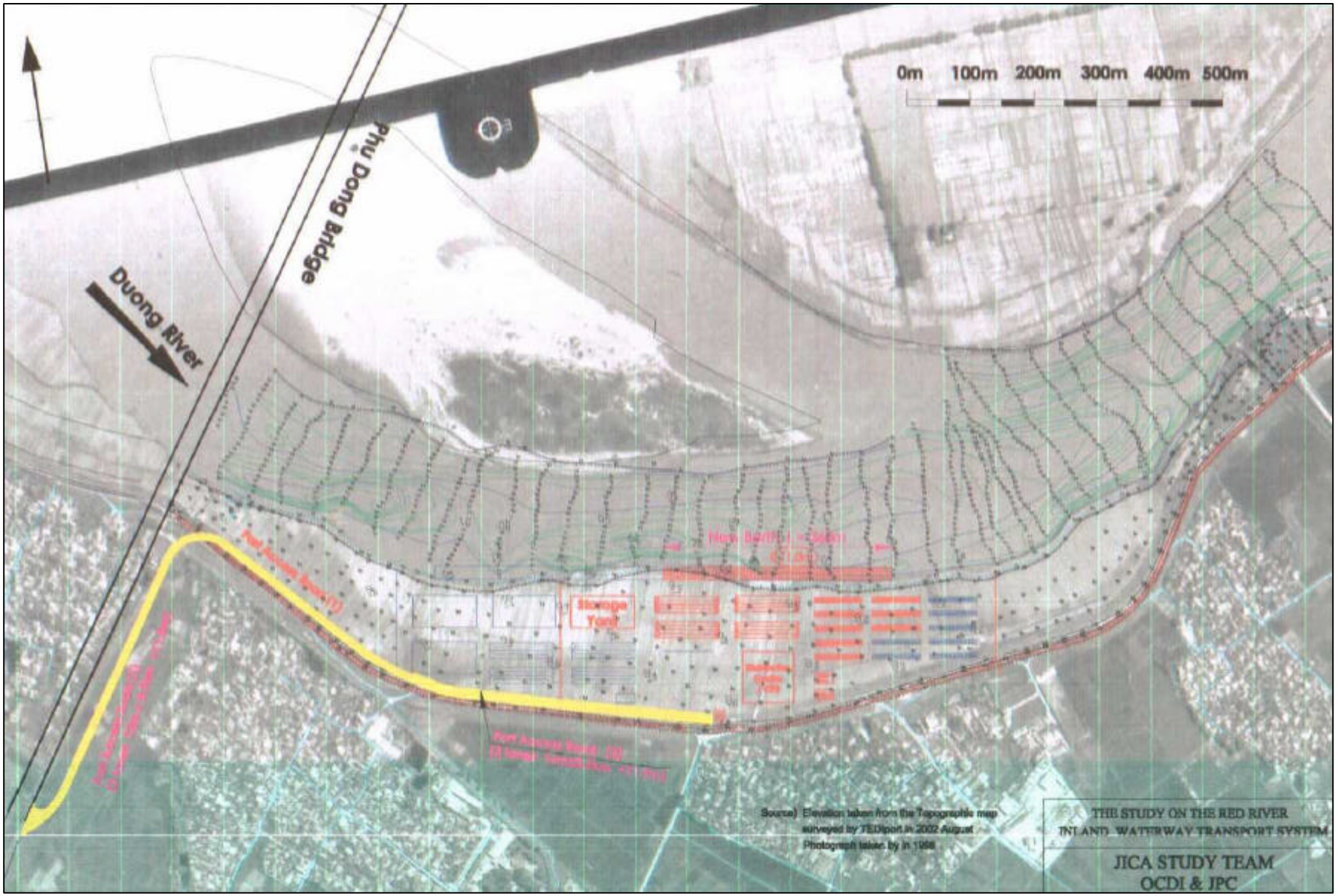

Figure 39.3.2 New East Port Plan

Photo 39.3. 8 New East Port Developing Area, Downstream of Existing Pomping Station

Photo 39.3. 9 Wide Area behind the Berth from Water Front Line to the Dyke

Photo 39.3.10 Upstream and Downstream Areas of Port Structure will be Constructed

Photo 39.3.11 Access Road will run at the Foot of Dyke and Parallel to Phu Dong Bridge

(4) Bank protection

Bank protection work is planed 1,000m from Van Kiep to the end of Hanoi Port as Short Term Plan and 2200m from Chuong Duong Bridge to Van Kiep in Long Term Plan. Comparing the section between Long Term Plan and Short Term Plan, Short Term Plan section is less populated areas that that of Long Term Plan section.

The aliment of this bank Protection works is set outside of existing bank shoulder principally, which means that relocation of existing houses will not occur. However, construction works will affect living peoples because the number of road going into the bank shoreline is limited and narrow. Furthermore the houses are located very closely to the shoulder of bank. It is difficult to spare for storing space of construction materials near construction site.

The first matter should be consider before starting bank protection works, construction method and work schedule will not affect daily livings of the inhabitant as much as possible and mitigation or moderating the impact should be carefully assessed. Then through the meeting with the inhabitants, getting opinions, amending construction plan and providing maximum information to them are essential effort by project execution side to proceed actual construction works.

The second important matter is to raise the beauty or make clean of these areas suitable for Hanoi City. As the **Photo 13.3.13** introduced in the Chapter 13 some peoples usually throw away garbage into the river. It makes environment getting worse and gives damage to the beauty of these areas.

It is proposed that structure of bank protection behind parapet walls will have some place for vegetations. Construction works should plant small threes or make flower pods. (cf. **Figure 38.1.2**) Then each living people just behind the structures should do maintenance of this small but longwise green area along the bank protection works. These green areas like green belts will make not only good impression to the people visiting Hanoi City but also give good environmental conditions. In addition to these effects this plan will raise amenity level of the areas more comfortable.

39.3 Environmental impact prediction and assessment of the project

39.3.1 Description of potential sources of environmental pollution and degradation

The potential sources of environmental pollution and degradation in preparation, construction and operation phases originated from the Short-term Development Plan for the IWT System in the Red River Segment through Hanoi are described in **Table 39.3.1**.

Table 39.3.1 Activities Causing Potential Environmental Pollution and Degradation

No	Project's components	Potential sources of environmental pollution and degradation		
		Preparation phase	Construction phase	Operation phase
01	New North Port	Site selection	Transportation of construction materials	Cargo loading and unloading
		Land clearance	Construction of berth, storage yard, access roads	Activities of cargo trucks and other transportation means
			Dredging	Activities of ships and vessels
			Installation of equipment	Accidents and oil/ chemical spills
			Worker's wastes	Worker's wastes
				Periodical dredging
02	Hanoi port	Land clearance	Transportation of construction materials	Activities of cargo trucks and other transportation means
		Resettlement	Construction of berth, storage yard, access roads	Activities of ships and vessels
			Worker's wastes	Accidents and oil/ chemical spills
			Dredging	Worker's wastes
			Installation of equipment	Periodical dredging

No	Project's components	Potential sources of environmental pollution and degradation		
		Preparation phase	Construction phase	Operation phase
03	Khuyen Luong port	Land clearance	Transportation of construction materials	Activities of cargo trucks and other transportation means
			Worker's wastes	Activities of ships and vessels
			Construction of berth, storage yard, access roads	Accidents and oil/ chemical spills
			Dredging	Periodical dredging
			Installation of equipment	Worker's wastes
04	New East port	Site selection	Transportation of construction materials	Cargo loading and unloading
		Land clearance	Worker's wastes	Activities of cargo trucks and other transportation means
			Construction of berth, storage yard, access roads	Activities of ships and vessels
			Dredging	Accidents and oil/ chemical spills
			Installation of equipment	Worker's wastes
			Transportation of construction materials	
05	Passenger berth for Chem Communal House	Land clearance	Transportation of construction materials	Traffic accidents
			Worker's wastes	Passenger's wastes
			Construction of berth	Activities of ferries and motor vehicles
06	Passenger berth for Bo De Pagoda	Land clearance	Transportation of construction materials	Traffic accidents
			Worker's wastes	Passenger's wastes
			Construction of berth	Activities of ferries and motor vehicles

No	Project's components	Potential sources of environmental pollution and degradation		
		Preparation phase	Construction phase	Operation phase
07	Passenger berth for Bat Trang Ceramic Village	Land clearance	Transportation of construction materials	Traffic accidents
			Worker's wastes	Passenger's wastes
			Construction of berth	Activities of ferries and motor vehicles
08	Passenger berth for Phu Dong Village	Land clearance	Transportation of construction materials	Traffic accidents
			Worker's wastes	Passenger's wastes
			Construction of berth	Activities of ferries and motor vehicles

Source) JICA Study Team, 2002

39.3.2 Assessment of potential impacts during the implementation of the project

The potential environmental impacts in preparation, construction and operation phases originated from the Short-term Development Plan for the IWT System in the Red River Segment through Hanoi are described in **Table 39.3.2.**

Table 39.3.2 Potential Environmental Impacts

Project activities	Potential Environmental Impacts	Impact levels
1. Impacts of the project in the preparation phase		
Site selection	Affecting sensitive habitats	+
Land clearance	Lose agricultural land.	++
	Influence to historical and customs places	0
	Influence to wild animal life	0
	Reduction of biodiversity	+
	Reduction of aquatic product	+
	Lose ecological tourist places	+
	Disturbance of life of the affected households	+
2. Impacts of the project in construction phase		
Transportation of construction materials	Air pollution caused by motorvehicle emissions containing dust, SO_2, NO_2, CO, VOC and dust from roads/construction materials and noise	+++

Project activities	Potential Environmental Impacts	Impact levels
Construction of berth, storage yard, access roads	Dust, noise, vibration generated from constructing facilities.	+++
	River's water polluted by rain water containing construction materials, sand, stone,…	++
	Land polluted by solid wastes such as construction materials, sand, stone,…	+
Dredging	Increasing saline intrusion	+
	Increasing erosion	+++
	Increased short-term turbidity at dredging site causing decreased light penentration and associated photosynthetic activity	++
	Dredging will cover the valuable benthic species (e.g. mussels, clams) by sediment	++
	Objectionable air pollution and noise to nearby residents, especially at night	+
Worker's wastes	River's water polluted by worker's wastewater.	++
	Environmental pollution caused by worker's solid wastes	++
3. Impacts of the project in operation phase		
Activities of ships and barges	Increasing oily ballast, bilge water, sewage water and solid wastes discharged from ships and barges	+
	These wastes will cause water and land pollution. Especially, oil pollution will affect to mangrove forests and may be damage them; finally, those will affect to ability of erosion protect as well as microclimate harmony.	+
	Waves from ship will increase erosion, influence to fisheries	+
Activities of cargo trucks and other transportation means	Increasing traffic density may increase air pollution, traffic accidents	++
	Air pollution caused by motor vehicle emissions containing dust, SO_2, NO_2, CO, VOC and dust from roads/construction materials and noise	+++
Accidents and oil/ chemical spills	Oil storage may cause oil spilling incident and fire	++
	Increasing ship density will lead to increasing potential accident about hitting.	++
	Increasing spilling incidents such as lubricants, hydraulic oils, fuels, liquid and solid chemicals	++
Dredging	Increasing saline intrusion	+
	Increasing erosion	+++
	Increased short-term turbidity at dredging site causing decreased light penentration and associated photosynthetic activity	++

Project activities	Potential Environmental Impacts	Impact levels
	Dredging will cover the valuable benthic species (e.g. mussels, clams) by sediment	++
	Objectionable air pollution and noise to nearby residents, especially at night	+
Worker's wastes	River's water polluted by worker's wastewater.	++
	Environmental pollution caused by worker's solid wastes.	++

Note)
0: Unclear effect
+: Light negative effect
++: Moderate negative effect
+++: Strong negative effect
Source) JICA Study Team, 2002

39.4 Negative impact mitigation measures

The measures those have to be implemented in preparation, construction and operation phases for mitigation of negative environmental impacts, originated from the Short-term Development Plan for the IWT System in the Red River Segment through Hanoi are described in **Table 39.4.1.**

Table 39.4.1 Negative Impact Mitigation Measures

Project activities	Mitigation measures
5.1 Mitigation measures in the preparation phase	
Site selection	Perform environmental screening analysis of sites.
	Proper site selection to minimize negative impacts on agriculture land, aquatic resources, biodiversity, tourism place
Land clearance	Evaluate local socio-cultural and economic conditions prior to project implementation
	Develop specific mitigation measures with community involvement.
	Develop rational compensation program.
	Develop reclamation plants for terrestrial sites
5.2 Mitigation measures in construction phase	
Transportation of construction materials	Regular maintenance of transportation means
	Transport regulation's enforcement
	Water spraying in the sunny day
Construction of berth, storage yard, access roads	Reduce air pollution and noise level by decreasing operating level during quiscent periods in the local community.
	Run-off rain water is collected into screen to remove garbage and suspended solids before discharging into the Red river.

Project activities	Mitigation measures
	Land is regularly clean up from solid wastes such as construction materials, sand, stone
	Workers should be encouraged not to leak the materials and cement into the water.
	Monitor local air quality and reduce operations if unacceptable quality arises
Dredging	Major modification to channel depth and cross section should consider the effect on saltwater encroachment. Analysis of effects on river flow will be helpful.
	Evaluate geology and hydrology of river bank prior to project design to ensure deepening will not cause modifications such as slumping and increased erosion.
	Reduce turbidity by efficient use of less intrusive dredging equipment, silt curtains, timing to coincide with low flow
	Monitor turbidity and maintain concentration below 2 g/l and limit dredging activity during critical spawn-and-set periods for shellfish.
	Reduce air pollution and noise level by decreasing operating level during quiscent periods in the local community.
Worker's wastes	Install temporary septic tanks to collect and treat the worker's wastewater before discharging to water resources.
	Install solid waste bins and sign a contract with Urban Environmental Company (URENCO) to collect and dispose the worker's solid waste.
5.3 Mitigation measures in operation phase	
Activities of ships and barges	Ships and barges should not be allowed to discharge wastewater, neither oil polluted water nor garbage into the river.
	All Ships and barges have to equip the oil separator to remove oil and dregs before being pumped into the river. An oil separator should be set up on board. The separated oil and dregs will have to be transferred to inland for recycling and / or further treatment.
	All ships should be equipped with appropriate means to prevent incidents such as fire, explosion and oil spill.
Activities of cargo trucks and other transportation means	Develop emergency contingency plans to minimize risk of accidents during transport.
	Transport regulation's enforcement
Accidents and oil/ chemical spills	Develop spill prevention and clean-up plans. Train a team to handle spills.
	Develop fire fighting plan. Train a team to handle fire.
	All ports have to be equipped with all necessary means to prevent oil spill, including an oil isolating float system, oil pumps, oil separators and/or centrifugers and so on

Project activities	Mitigation measures
Dredging	Major modification to channel depth and cross section should consider the effect on saltwater encroachment. Analysis of effects on river flow will be helpful.
	Evaluate geology and hydrology of river bank prior to project design to ensure deepening will not cause modifications such as slumping and increased erosion.
	Reduce turbidity by efficient use of less intrusive dredging equipment, silt curtains, timing to coincide with low flow
	Monitor turbidity and maintain concentration below 2 g/l and limit dredging activity during critical spawn-and-set periods for shellfish.
	Reduce air pollution and noise level by decreasing operating level during quiscent periods in the local community.
Worker's wastes	Collection and treatment of worker's wastewater before discharging to water resources.
	Install solid waste bins and sign a contract with Urban Environmental Company (URENCO) to collect and dispose the worker's solid waste.

Source) JICA Study Team, 2002

39.5 Follow-up environmental monitoring and management

39.5.1 Environmental management and training programs

The environmental management plans for the Short-term Development Plan for the IWT System in the Red River Segment through Hanoi consist of the following aspects:

- A plan for dredged material's management will be developed to ensure that the projects will be carried out on schedule with minimum environmental impacts. The plan will be based on: a characterization of the dredged materials, distribution of contaminants in the sediments, dredging equipment used, disposal of the dredged materials, effects on human health and environment etc.
- A plan for pollution control and waste reduction will be developed to manage the wastes originated from the project's activities in the preparation, construction and operation phases.
- A plan for environmental awareness rising, education and training will be developed for staffs and workers. The contents of the plan include occupational health, safety, emergent response (including accidents, spills, exploision or fires etc.).

- A plan for training for government officials charged with supervision of an environmental management and monitoring plan will be developed and implemented.

39.5.2 Environmental monitoring programs

The environmental monitoring program, that have to be carried out in preparation, construction and operation phases for observation of the negative environmental impacts originated from the Short-term Development Plan for the IWT System in the Red River Segment through Hanoi are described in **Table 39.5.1.**

Table 39.5.1 Environmental Monitoring Program

No	Monitoring components	Environmental monitoring programs		
		Preparation phase	Construction phase	Operation phase
1. Sediment				
	Location	New North port, Van Dong Site, Hanoi port, Bat Trang Village, Khuyen Luong Port, New East Port	New North port, Van Dong Site, Hanoi port, Bat Trang Village, Khuyen Luong Port, New East Port	New North port, Van Dong Site, Hanoi port, Bat Trang Village, Khuyen Luong Port, New East Port
	Sampling site	6 locations x 2 sites	6 locations x 2 sites	6 locations x 2 sites
	Parameter	Pesticide, N-hexan, Cd, Pb, Cr, As, Hd, Ignition lose.	Pesticide, N-hexan, Cd, Pb, Cr, As, Hd, Ignition lose.	Pesticide, N-hexan, Cd, Pb, Cr, As, Hd, Ignition lose.
	Frequency	2 times (Dry and Flooding season)	4 times/year (each 3 months), during construction phase	2 times (Dry and Flooding season), every year.
	Methods	Standard methods (TCVN or EPA)	Standard methods (TCVN or EPA)	Standard methods (TCVN or EPA)
	Funding	5,600 USD	11,200 USD/year	5,600 USD/year
2. Surface water quality				
	Location	New North port, Van Dong Site, Hanoi port, Bat Trang Village, Khuyen Luong Port, New East Port	New North port, Van Dong Site, Hanoi port, Bat Trang Village, Khuyen Luong Port, New East Port	New North port, Van Dong Site, Hanoi port, Bat Trang Village, Khuyen Luong Port, New East Port

No	Monitoring components	Environmental monitoring programs		
		Preparation phase	Construction phase	Operation phase
	Sampling site	6 locations x 2 sites x 3 depths	6 locations x 2 sites x 3 depths	6 locations x 2 sites x 3 depths
	Parameter	Temperature, Salinity, SS, DO, BOD_5, Nitogen, Phosphorus, Coliform, N-hexan, Cd, Pb, Cr, As, Hg, Distribution of particle size	Temperature, Salinity, SS, DO, BOD_5, Nitogen, Phosphorus, Coliform, N-hexan, Cd, Pb, Cr, As, Hg, Distribution of particle size	Temperature, Salinity, SS, DO, BOD_5, Nitogen, Phosphorus, Coliform, N-hexan, Cd, Pb, Cr, As, Hg, Distribution of particle size
	Frequency	2 times (Dry and Flooding season)	4 times/year (each 3 months), during construction phase	2 times (Dry and Flooding season), every year.
	Methods	Standard methods (TCVN or EPA)	Standard methods (TCVN or EPA)	Standard methods (TCVN or EPA)
	Funding	6,600USD	13,200USD/year	6,600USD/year
3. Biological resources				
	Location	New North port, Van Dong Site, Hanoi port, Bat Trang Village, Khuyen Luong Port, New East Port	New North port, Van Dong Site, Hanoi port, Bat Trang Village, Khuyen Luong Port, New East Port	New North port, Van Dong Site, Hanoi port, Bat Trang Village, Khuyen Luong Port, New East Port
	Sampling site	6 locations x 2 sites	6 locations x 2 sites	6 locations x 2 sites
	Parameter	Identification of names and numbers of all benthos by thieving and eye counting	Identification of names and numbers of all benthos by thieving and eye counting	Identification of names and numbers of all benthos by thieving and eye counting
	Frequency	2 times (Dry and Flooding season)	4 times/year (each 3 months), during construction phase	2 times (Dry and Flooding season), every year.
	Methods	Standard methods (TCVN or EPA)	Standard methods (TCVN or EPA)	Standard methods (TCVN or EPA)

No	Monitoring components	Environmental monitoring programs		
		Preparation phase	Construction phase	Operation phase
	Funding	5,400 USD	10,800 USD	5,400 USD
4. Air quality, noise and vibration				
	Location	New North port, Van Dong Site, Hanoi port, Bat Trang Village, Khuyen Luong Port, New East Port	New North port, Van Dong Site, Hanoi port, Bat Trang Village, Khuyen Luong Port, New East Port	New North port, Van Dong Site, Hanoi port, Bat Trang Village, Khuyen Luong Port, New East Port
	Parameter	SPM, SO_2, NO_2, CO, VOC , Noise, Vibration	SPM, SO_2, NO_2, CO, VOC , Noise, Vibration	SPM, SO_2, NO_2, CO, VOC , Noise, Vibration
	Sampling site	6 locations x 1 sites x 3 times x 2 days	6 locations x 1 sites x 3 times x 2 days	6 locations x 1 sites x 3 times x 2 days
	Frequency	2 times (Dry and wet season)	4 times/year (each 3 months), during construction phase	2 times (Dry and wet season), every year.
	Methods	Standard methods (TCVN or EPA)	Standard methods (TCVN or EPA)	Standard methods (TCVN or EPA)
	Funding	3,000 USD	6,000 USD	3,000 USD
5. Social impacts				
	Location	New North port, Van Dong Site, Hanoi port, Bat Trang Village, Khuyen Luong Port, New East Port	New North port, Van Dong Site, Hanoi port, Bat Trang Village, Khuyen Luong Port, New East Port	New North port, Van Dong Site, Hanoi port, Bat Trang Village, Khuyen Luong Port, New East Port
	Sampling site	6 locations x 5 households	6 locations x 5 households	6 locations x 5 households
	Parameter	Questionnaire sheets	Questionnaire sheets	Questionnaire sheets
	Frequency	2 times (Dry and Flooding season)	4 times/year (each 3 months), during construction phase	2 times (Dry and Flooding season), every year.
	Methods	Standard methods (TCVN or EPA)	Standard methods (TCVN or EPA)	Standard methods (TCVN or EPA)
	Funding	3,000 USD	6,000 USD	3,000 USD
	Total	**23,600 USD**	**47,200 USD**	**23,600 USD**

39.6 Conclusions and recommendations

(a) The environmental impacts assessment study covers a Short-term Development Plan for the IWT System in the 40 km Red River Segment through Hanoi, including construction of 2 new ports (i.e. New North port, New East port) and expansion of 2 existing ports (i.e. Hanoi port, Khuyen Luong port) and 4 passenger's berths as well as construction of some works for navigation channel and channel stabilizations.

(b) The environmental state at the proposed project areas, including natural, social and environmental conditions is presented in this Chapter. As a part of the Red River Delta, Hanoi City has to face with the same environmental problems as in the region with higher intensity, those are related to flooding in the raining seasons, poor technical infrastructure, rapid growth of the population, surface and ground water pollution, industrial pollution, motorvehicle air pollution and traffic jams, solid waste pollution etc.

(c) The project's activities those may cause potential environmental pollution and degradation in preparation, construction and operation phases are described in the Chapter, which include site selection, land clearance, transportation of raw materials, construction of ports, berths, storage yard, access roads, dredging, activities of cargo trucks, ships, barges, activities of workers. The potential environmental impacts caused by the project's activities in preparation, construction and operation phases comprise water pollution, air pollution, noise and vibration, change of hydrological regime, increasing erosion, reduction of aquatic and terrestrial resources, increasing accidents and oil/chemical spills, disturbance of life of the affected households etc.

(d) The measures those have to be implemented in preparation, construction and operation phases for mitigation of negative environmental impacts are described in this Chapter. The main measures are proposed as follows:

- Proper site selection to minimize negative impacts on agriculture land, aquatic resources, biodiversity, tourism place etc.
- Develop a rational compensation program.
- Strictly enforce the motorvehicle emission control regulations and safety transportation regulations.
- Reduce air pollution and noise level by decreasing operating level during quiscent periods in the local community.

- Evaluate geology and hydrology of river bank prior to project design to ensure deepening will not cause modifications such as slumping and increased erosion.
- All ships should be equipped with appropriate means to prevent incidents such as fire, explosion and oil spill.
- All ports have to be equipped with all necessary means to prevent oil spill, including an oil isolating float system, oil pumps, oil separators and/or centrifugers and so on
- Collection and treatment of worker's wastewater before discharging to water resources.
- Install solid waste bins and sign a contract with Urban Environmental Company (URENCO) to collect and dispose the worker's solid waste.

(e) The environmental management, training and monitoring programs are developed for the preparation, construction and operation phases. The monitoring locations, sampling sites, parameters, frequency, methods and monitoring costs for each phase are recommended in this Chapter.

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