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MINISTRY OF SCIENCE, TECHNOLOGY AND ENVIRONMENT
PEOPLE'S COMMITTEE OF QUANG NINH PROVINCE
THE SOCIALIST REPUBLIC OF VIETNAM

THE STUDY ON ENVIRONMENTAL MANAGEMENT FOR HA LONG BAY

FINAL REPORT

VOLUME IV
SUPPORTING REPORT 2

SEPTEMBER 1999

NIPPON KOEI CO., LTD.
METOCEAN CO., LTD.

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LIST OF VOLUMES

Volume I	Executive Summary
Volume II	Main Report
Volume III	Supporting Report 1
Volume IV	Supporting Report 2
Volume V	Data Book

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HA LONG BAY

FINAL REPORT

Volume IV Supporting Report 2

Table of Contents

List of Tables

List of Figures

ABBREVIATIONS

<Organization>

ADB	Asian Development Bank
BTED	Board of Tourist Ferry Dock
CBI	Carl Bro International
CEETIA	Center for Urban and Industrial Area Environment Technique
CIDA	Canadian International Development Agency
CMESRC	Center for Marine Environment Survey, Research & Consultation
CP	Counterpart
CP/T	Counterpart Team
CPUEC	Cam Pha Urban Environment Company
DANIDA	Danish International Development Agency
DARD	Department of Agriculture and Rural Development
DOC	Department of Construction
DOF	Department of Fisheries
DOI	Department of Industry
DOMAP	Department of Architecture Management and Planning
DOSTE	Department of Science, Technology and Environment
DOTOUR	Department of Tourism
DOT	Department of Transportation
DPI	Department of Planning and Investment
E/C	Executive Committee
EMD	Environmental Management Division
EU	European Union
FPA	Forest Protection Agency
GEF	Global Environmental Fund
GOV	Government of Vietnam
HIO	Haiphong Institute of Oceanology
HLESC	Ha Long City Environmental Sanitation Company
HLMB	Ha Long Bay Management Board
IAEA	International Atomic Energy Agency
ID	Inspection Division
IFIP	Institute of Forestry Investigation and Planning
IMSAT	Institute of Mining Science and Technology
ITDR	Institute of Tourism Development and Research
IUCN	International Union for Conservation of Nature and Natural Resources
JICA	Japan International Cooperation Agency
MOI	Ministry of Industry
MOSTE	Ministry of Science, Technology and Environment
MPI	Ministry of Planning and Investment
NACM	National Agency of Conservation and Museum
NEA	National Environmental Agency
OCDI	Overseas Coastal Development Institute
OECD	Organization for Economic Cooperation and Development
OECF	Overseas Economic Cooperation Fund
PA	Part Authority
QNPC	People's Committee of Quang Ninh Province
S/C	Steering Committee
SAN	Sanitation Company
SIDA	Swedish International Development Agency
STAD	Science, Technology and Administrative Division
STAMQ	Standards, Metrology and Quality Division
UNDP	United Nations Development Program

UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations International Children's Emergency Fund
UNIDO	United Nations Industrial Development Organization
QNEMA	Quang Ninh Environmental Management Authority
QNWSC	Quang Ninh Water Supply Company
VINACOAL	Vietnam National Coal Corporation
WB	World Bank
WHO	World Health Organization
WTO	World Trade Organization

<Plan and Project>

BAP	Biodiversity Action Plan
HLMP	Development Master Plan of Ha Long City for 1994-2010
EMS	Environmental Management System
HWSSP	Ha Long City Water Supply and Sanitation Project
NCS	National Conservation Strategy
NPESD	National Plan for Environment and Sustainable Development for 1991-2000
REPR	Resources and Environment Research Program
UNCED	United Nations Conference on Environment and Development
VCEP	Vietnam-Canada Environmental Project
VNNEAP	Vietnam National Environmental Action Plan

<EMP term>

AMZ	Active Management Zone
DZ	Development Zone
EMP	Environmental Management Plan
ERMU	Environmental Research and Monitoring Unit
IC	Implementation Committee
IPCU	Industrial Pollution Control Unit
CZ	Conservation Zone
SCZ	Special Conservation Zone
TFPU	Tidal Flats Protection Unit

<Economic term>

B/C	Benefit-cost ratio
BOT	Build, Operate and Transfer
CVM	Contingent Valuation Method
EIRR	Economic Internal Rate of Return
FDI	Foreign Direct Finance
FIRR	Financial Internal Rate of Return
GDP	Gross Domestic Products
L.S	Lump Sum
NPV	Net Present Value
ODA	Official Development Assistance
OVA	Objective Valuation Approach
SVA	Subjective Valuation Approach
TCM	Travel Cost Method
WTP	Willingness to Pay

<Chemical term>

BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
IL	Ignition Loss

I-N	Inorganic Nitrogen
I-P	Inorganic Phosphorus
NH_4-N	Ammonia Nitrogen
NO_2-N	Nitrite Nitrogen
NO_3-N	Nitrate Nitrogen
O-N	Organic Nitrogen
O-P	Organic Phosphorus
PO_4-P	Phosphate
SPM	Suspended Particulate Matter
SS	Suspended Solid
TDS	Total Dissolved Solids
T-N	Total Nitrogen
T-P	Total Phosphorus
TSS	Total Suspended Solid

<Others>

CSP	Coal Shipping Port
EIA	Environmental Impact Assessment
GPS	Global Positioning System
F/S	Feasibility Study
HCO	Hon Con Ong
HNFP	Hon Net Floating Port
LD	Light and Dark
LEP	Law on Environmental Protection
M/M	Minutes of Meeting
O&M	Operations and Maintenance
PPP	Polluter Pay's Principle
RKR	Redfield-Ketchum-Richards
TCVN	Vietnam Standards
R&D	Research and Development
QN	Quang Ninh Province
SBR	Sequencing Batch Reactor
SOE	State Owned Company
S/W	Scope of Work
TOR	Terms of Reference
QA/QC	Quality Assurance and Quality Control
WWTP	Wastewater Treatment Plant

MEASUREMENT UNITS

Length

mm	millimeter
cm	centimeter
m	meter
km	kilometer

Extent

m^2	square meter
km^2	square kilometer
ha	hectare

Volume

m^3	cubic meter
l	liter

Weight

kg	kilogram
ton	metric ton

Time

sec	second
min	minute
hr	hour
yr	year

Currency

VND	Vietnamese Dong

Others

%	percent
‰	permill
°C	degree centigrade
10^3	thousand
10^6	million
10^9	billion
CV	cylinder volume
DWT, dwt	dead weight ton
GRT	gross ton
KV, KVA	kilovolt-ampere
MPN	most probable number

CHAPTER 15

PART V. ENVIRONMENTAL MANAGEMENT PLAN FOR HA LONG BAY

CHAPTER 15 BASIC FRAMEWORK OF THE ENVIRONMENTAL MANAGEMENT PLAN

15.1 General

(1) Policy of the EMP

Ha Long bay is famous for the numerous islands and islets with spectacular geological characteristics. For its aesthetic landscape of these islands and islets, it is a major sightseeing spot in Vietnam, and was inscribed on the World Heritage List of UNESCO in 1994. Together with Hanoi and Hai Phong cities, the Ha Long bay area forms the North Focal Economic Triangle which is defined as one of the three priority economic and industrial development zones in the country. The socioeconomic development potentials of the bay area are: i) close access to coal mines and high energy potential, ii) deep seaport of Cai Lan developed to become a major port for export, and iii) favorable and attractive natural resources in Ha Long bay for tourism. The bay area is, thus, precious in terms of both natural environment and economic development with anticipated growth of industry and tourism, and accompanying increase in urban area in the hinterland of Ha Long bay.

The national policy on environmental management has been set out in the "National Plan for Sustainable Development and the Environment (the National Plan)" approved by the Council of Ministers, which came into force on 12 June 1991, and the "Law on Environmental Protection (LEP)" approved by the National Assembly, which came into effect on 10 January 1994. The essence of the national policy on environmental management is: a) harmonizing socioeconomic development with protection of natural resources and the environment, and b) establishing and enforcing policies, action plans and institutional frameworks to ensure the sustainable use of natural resources in the process of socioeconomic development.

Based on this national policy, the Quang Ninh People's Committee (QNPC) has set the provincial environmental management principles and regulations especially focusing on the environmental protection of Ha Long bay. The major principles are: a) promotion of cleaner technologies and pollution prevention facilities, b) introduction of "Polluter Pay's Principle (PPP)" and environmental fund, c) enforcement of public awareness related to environmental protection, and d) establishment of legal and institutional capability. The QNPC's environmental policy was summarized in the "Environmental Protection -Public Obligation-" in February 1998.

(2) Current Environmental Problems in the Study Area

As the results of basic study, issues and focal points in the study area such as polluters, pollutants, and environmental resources to be conserved were identified. The issues and focal points are largely classified into 3 groups such as problems related to the World Heritage, caused by socioeconomic activities, and on environmental management. Identified problems are summarized below:

1) Environmental problems concerned with the World Heritage

The water quality in the World Heritage area is not degraded on the whole at present, but the aesthetic value of the World Heritage area is degraded by the following problems:

a) Low transparency

Transparency in and around the World Heritage area is low. This condition turned out to be brought by the existence of organic and inorganic pollutants, and phytoplankton in the water. The Field Survey revealed that the water in the bays is rather stagnant, so that the bays' assimilative capacity is small. In addition, the internal production of organic substances is active. It is necessary to pay attention to nutrients inflow to the bays as well as organic pollutant for conservation of the water quality.

b) Possibility of water quality degradation by land based pollution

Total organic pollution load runoff in 2010 compared with the present will be 1.8 times of BOD, 1.4 times of COD. Nutrients runoff in 2010 will be 1.3 times in T-N and 1.1 times in T-P. The water quality simulation for in 2010 without countermeasures predicted increase of the COD level between Tuan Chau and Hong Gai areas covering a part of the buffer and core areas of the World Heritage. Preventive measures to water quality deterioration will be required.

c) Possibility of pollutants from offshore

The existence of water body with lower salinity was found in the offshore area. This condition is supported by the satellite image analysis of water temperature. The water quality, such as COD, SS, and nutrients of this water shows higher values than that in the center of Ha Long bay. It is necessary to pay special attention on the water quality in the southern outskirts of the World Heritage area.

d) Pollution load and garbage dumping from tourists

There are a number of tourists sailing to the Word Heritage area. But most of the tourist boats do not have a toilet installed, so consequently the wastewater is discharged directory to the bays. In addition, garbage generated by the tourists is dumped into the bays. The pressures on the World Heritage's environment will become larger with the increase of tourists in the future, requiring adequate countermeasures against this.

e) Oil pollution

The oil level observed in the whole bays of the study area is high compared with its environmental standard. The oil in the bays comes from the shipping activities such as discharge of bilge water and oil spill from the floating gas stations. Oil slicks can be seen near these activities and facilities. This problem is caused mainly by lack of treatment facility and use of old ships or port facilities. Countermeasures against oil pollution should be implemented by the port and harbor sector.

f) Landscape interference by shipping activities

The sea lines such as Mieu, Ghenh Cam, Hang Trong, Buom cross the World Heritage area. In addition, some large cargoes anchor there for reloading. These shipping activities would partially affect the naturalness of the landscape.

2) Environmental problems caused by socioeconomic activities

Current socioeconomic activities in the study area consist of urbanization, agriculture, industry, mining, and tourism, and land use change. Environmental problems caused by these activities are as follows:

a) Water quality deterioration nearshore

As the results of Field Survey, relatively high values of concentration of BOD/COD and SS in the water were observed nearshore of Bai Chay, Hong Gai, Cam Pha areas. This indicates that these areas are influenced by land based pollution loads. Bai Chay and Hong Gai areas show high values of organic parameters due to domestic wastewater. Cam Pha area has a high SS concentration mainly brought by coal mining activities.

In view of land based organic pollutants, domestic wastewater is the biggest contributor of BOD with share of 42% of the total runoff. About 22% of COD is discharged from domestic wastewater. Thus, countermeasures on domestic wastewater should be given a high priority. Non-specific pollution source is the biggest producer of SS. It occupies 80% of SS runoff. Among the SS runoff from non-specific pollution source, around 30% is from coal mining areas. Thus, countermeasures against the coal mining area are required urgently.

b) Lack of countermeasures for wastewater and solid wastes

The present sanitation conditions are unsatisfactory with respect to both sewage and solid wastes. In many cases onsite sanitation facilities are poorly constructed and septage is often disposed of by unhygienic and unacceptable methods. The sanitary drainage channels discharge untreated wastewater either directly to the sea or to watercourses which drain to the sea. The

coverage of solid wastes collection services is only about 50% by population and household garbage is often dumped at the roadside or in drainage channels. The landfill sites used for disposal of the collected solid wastes have neither been well controlled nor constructed as sanitary landfills.

c) Deforestation and sediment runoff

Forests have been logged for intensive agriculture, urbanization, limestone or cement exploitation, and coal mining activities, which is a significant change in land use. In the study area, about 2,000 km^2 of forested land in 1988 decreased to 1,800 km^2 in 1997, with a deforestation ratio of about 10% for the past 10 years. Deforestation had led soil erosion. Forest will be continuously decreased by the future development, consequently soil erosion in the study area will increase. Active control and management of deforestation and afforestation are required.

d) Decrease of tidal flat and mangrove swamp

Relatively rich biomass were observed in the tidal flats and mangrove swamps in the study area. They have the functions of purifying the water and providing nursery ground for fishery resources. But because the coastal zone is relatively narrow, there has been extensive land reclamation for urban development as well as dike construction for aqua-cultural ponds on tidal land and mangrove swamps. They are significant changes in land use within Bai Chay bay and along Ha Long bay. Tidal flat has decreased by 50%, and the dense mangrove areas are at present limited to the Hoang Tai island area, the estuary of Mong Duong river, the inlet of Quang Hanh area, and the seashore area of Bai Chay bay.

3) Problems on environmental management

The legal framework in general is well developed, but it doesn't work enough to lead an appropriate environmental management. Lack of trained staff, skills, and equipment are serious. Problems on environment management are as follows:

a) Unclear demarcation of responsibilities

Responsibilities of environmental management are not clear between MOSTE and other ministries. Moreover, each of these national ministries must set policies and delegate responsibility to the provincial authorities including QNPC. At the provincial level, there is also a need to clarify the responsibilities between DOSTE and the departments of other ministries.

b) No introduction of economic instruments

Economic instruments are least used within the Vietnamese regulations to prevent pollution and environmental damage partially due to its transition economy stage, although there is a legal mandate for such programs. A number of problems can be anticipated in obtaining agreement on new introduction of economic programs from industrial facilities and other polluters. Likewise, there are yet no pollution charges programs in Quang Ninh province.

c) Poor environmental monitoring

For implementing environmental management, scientific and technical information is needed. But existing monitoring in the study area is poor. No periodic monitoring station or systematic monitoring program exist, mainly due to budget constraint of the province. The shortage of technology, equipment, and skilled personnel needs to be improved to execute sufficient environmental monitoring. For example, quality assurance and control procedures are often inappropriately applied in the steps of the monitoring program, and experience in designing of monitoring programs is limited. It is necessary to prepare an urgent scheme as well as an advanced program to work in accordance with the national and international level of environmental monitoring.

d) Lack of trained staff for environmental management

More environmental staff is needed in most branches of the government. New and existing staff require considerable training and retraining. DOSTE has 5 divisions, but it does not have sufficient staff with adequate training to fulfill management responsibilities. The Port Authority does not have an

environmental management division, and few staff had an environmental training. Other provincial organizations such as the DOT and DOF also have very poor numbers of staff for environmental conservation activity. Environmental research and development to find new solutions and technologies must complement technical training and institutional capacity building.

e) Poor techniques and equipment

Capacity building is needed to put environmental management system as well as monitoring and laboratory systems in place. These systems are necessary to provide decision-makers with reliable information about the changes occurring in the environment as a result of human activities. It is also a problem that systematic linkage between environmental degradation monitoring and management strategy is hardly highlighted.

f) Limited financial resources and budget shortage of local agency

Most ministries do not have sufficient financial resources to fulfill their environmental responsibilities and to conduct the necessary research. Considerable effort and funding are required to increase the financial capacity of the existing agencies.

g) Poor public awareness

The general level of environmental awareness of the local people is relatively low. The pressure from socioeconomic development by those people lacking in environmental awareness, can decline the environmental quality. HLMB is facing a major difficulty of lack of public awareness of laws and regulations related to management of Ha long bay

4) Emergency Response against Environmental Accidents

Environmental accidents are another issue related to the port and harbor development in and around Ha Long bay. Different types of ports and harbors are under operation or preparation for a number of vessels including coal handling ships, car ferries, oil tankers and fishermen or tourists boats sailing in and around the bays. In addition, there are many floating gas stations in the bays. Thus, there

is always a possibility that environmental accidents such as fire, oil spill and vessels collision could occur, and consequently damage natural and social assets including human lives especially in the World Heritage area.

Reinforcement of capability for emergency response against accidents is recognized as most necessary in the EMP area. To cope with environmental accidents, urgent activities are required. Thus, enterprises of the development projects and owners of ships should take emergency remedial measures to deal with such accidents, and should report cause and effect of them to QNPC. It is also recommended that detail methods of emergency response should be examined in the course of EIA of individual development projects.

(3) Justification of the EMP

The development of a comprehensive Environmental Management Plan (EMP) for Ha Long bay is acutely needed, and it is justified by the specific background of Ha Long bay and the strong intention of Vietnamese people concerned.

The EMP for Ha Long bay is prepared basically subject to the socioeconomic development framework of the Development Master Plan of Ha Long City for 1994-2010 (HLMP). However, the EMP should propose various measures of environmental considerations which are specifically designed to be incorporated into the amenable elements of the city's master plan to attain the vision and goals mentioned below. The amendable elements should be specific processes or details of development projects in terms of land use, priorities, extent of development, schedule, phasing, and so forth. It means that the EMP for Ha Long bay shows the action plan of environmental consideration of the Ha Long bay area.

The EMP indicates the implementation program, the relation with the local development plans, and the environmental benefit of the local society as much as possible. Thus, the EMP should lead the people concerned to contribute and participate in environmental protection, and should guide the direction of environmental consideration in regional development plans by giving common environmental goals and targets of Ha Long bay.

15.2 Vision and Goals

The fundamental vision of the EMP for Ha Long bay is to be set as follows:

"Environmentally Sound and Sustainable Development of the Ha Long Bay Area".

The goals to attain this vision are to be set as follows:

(1) Absolute Protection of the World Heritage (Goal I)

Ha Long bay is designated the World Heritage because of its unique aesthetic seascape of islands and islets, and it is invaluable for all people both in Vietnam and the world. It needs no words to put a top priority for absolute protection of the World Heritage on the EMP.

(2) Achievement of Environmental Protection for Sustainable Economic Growth (Goal II)

The Ha Long bay area forms the North Focal Economic Triangle due to its high development potential, and QNPC has prepared the development master plan of Ha Long city. The officially promised development of the hinterland area will cause environmental impacts to Ha Long bay, so environmental protection is required to achieve sustainable economic growth.

(3) Establishment of Enforcement Capability of Environmental Management (Goal III)

Realization of the environmentally sound and sustainable development fully depends on the enforcement capability of responsible agencies. Thus, the legal and institutional enforcement capability and capacity building must be strengthened.

The general concept of vision and goals is shown in Figure 15.2.1.

15.3 Target Area of the EMP

Considering the invaluableness of the World Heritage area in Ha Long bay, the target area for the EMP is principally defined as i) the bays where the area designated for the World Heritage and its buffer area, and ii) the hinterland areas which may affect the environment of the bay.

The hinterland areas which directly affect environment of the bays are selected by watershed of the rivers flowing into Bai Chay bay, Ha Long bay, and Bai Tu Long bay. It includes the entire area of Ha Long city, and part of Cam Pha town, Hoanh Bo district, Yen Hung district, and Cat Ba island. Key points for setting the area of the EMP are as follows:

a) The World Heritage area extends to Ha Long bay and Bai Tu Long bay. Thus, these two bays need to be included in the area of the EMP taking environmental impacts from the hinterland into account.

b) The information related to socioeconomic development is basically provided through the "Master Plan of Ha Long City for 1994-2010, the Ministry of Construction, 1994 (HLMP)". Since HLMP envisages the following development stages to expand the area of Ha Long city, the area of the EMP needs to include these expansions.
   - 1st Stage (1993-2000): consolidation of Viet Hung and Dai Yen communes in Hoanh Bo district.
   - 2nd Stage (2000-2010): consolidation of a part of Troi, Le Loi, Thong Nhat, Vu Oai, and Son Duong communes under Hoanh Bo district, and Minh Thanh commune in Yen Hung district.
   - 3rd Stage (after 2010): consolidation of a part of Cam Pha town and several communes in Hoanh Bo district.

c) Coal mining activities could be the most significant environmental impact on Ha Long and Bai Tu Long bays. Thus, the area of the EMP should cover the major coal mining areas in Ha Long city and Cam Pha town.

d) Discharge of the Mip river clearly influences the environment of Ha Long bay and its river mouth area is considered an important ecological zone. So, the Mip river watershed and the Binh Huong estuary should be included in the area of the EMP.

e) The satellite image analysis implies that the Hong river would have little influence to the water quality of Ha Long bay, though some influence could be considered from the Thai Binh river and the Bach Dang river. To establish the EMP, however, it is reasonable that such impacts from offshore area be set as boundary conditions.

Thus, the area of the EMP can be delineated as the watershed of the Mip, Troi, Man, Dien, and Mong Duong rivers in the north, the river mouth area of the Mong Duong river in the east, the Binh Huong estuary in the west, and the World Heritage area in the south as shown in Figure 15.3.1. The total area of the EMP is about 2,500 km^2 including 1,300 km^2 of sea area.

15.4 Target Year

The EMP is prepared basically subject to the socioeconomic development framework of HLMP prepared by QNPC. Thus, the target year of the EMP is set as 2010, same as that of HLMP.

15.5 Targets Management Items

The target management items for Goals I and II can be categorized into 2 groups namely, water quality and environmental resources, while the target management items for Goal III consist of technical and institutional capacities. Considering the approaches and strategies of the EMP, the following target items were selected for formulating the EMP.

15.5.1 Water Quality

Although there are many kinds of environmental factors in the EMP area, the water quality is considered a key integrated factor from an environmental management viewpoint in the EMP area considering the mechanism of environmental degradation of Ha Long bay. Therefore, the EMP was developed putting high priority on water quality management.

15.5.2 Environmental Resources

(1) Natural Environment

Normally, forests and fishes are defined as renewable natural resources. As well, tidal flats, mangrove swamps, and coral reefs can be considered to be environmental resources in the EMP area, because they are playing important roles in maintaining good environment as well as ecosystem. Thus, target items were selected also from the components of natural environment.

(2) Landscape

To keep a beautiful and attractive landscape of the World Heritage area is the essential element of the EMP. Landscape in the EMP area is composed of shape and conditions of islands, water conditions surrounding islands, and their combination. For keeping the landscape of the islands in good condition, conservation of natural impression is very important. Thus, the elements of landscape in the World Heritage area were selected as target items of the EMP.

15.5.3 Technical and Institutional Capacities

To implement the EMP certainly and steadily, it is essential to strengthen the technical and institutional capacities responsible and executing agencies. Although it is hard to set rigid numerical indexes, it is required to select clear target items and set their desirable levels for capacity building. Thus, the target items were selected for each component of capacity building.

15.6 Approach and Strategy of the EMP

In order to attain the vision and goals of the EMP for Ha Long bay, it is necessary to set an administrative approach and strategy which will guide actual environmental components and projects of the EMP.

Since the goals of the EMP are set as (1) Absolute Protection of the World Heritage, (2) Achievement of Environmental Protection for Sustainable Economic

Growth, and (3) Establishment of Enforcing Capability; the approach and strategy should be taken from the factors which have close relation with the goals, and should lead quantitative indexes for evaluation of progress and effect of the EMP.

Although there are many kinds of environmental factors in the EMP area, the water quality is considered a key integrated factor from environmental management viewpoint in this area considering the mechanism of environmental degradation of Ha Long bay shown in Figure 15.6.1. Therefore, the EMP will be developed putting high priority on water quality management.

15.6.1 Absolute Protection of the World Heritage (Goal I)

For this goal, the following approach and strategy is taken for the EMP.

(1) Keeping Clean and Clear Water Quality of the World Heritage Area

Clean and clear seawater quality is no doubt the base of attractive seascape and landscape of the World Heritage area. It also enables conserving the habitat of the valuable ecosystem and marine resources. Thus, the strategies taken in the EMP are as follows:

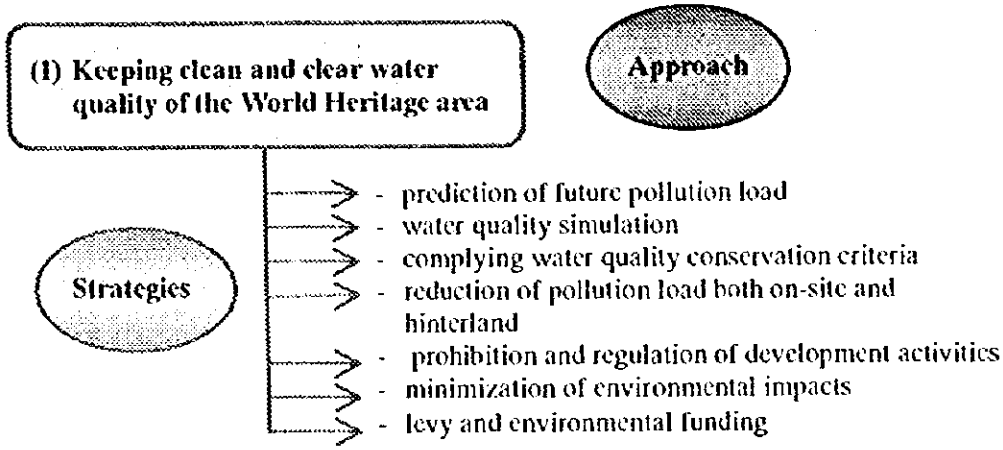
1) To control pollution load of both the World Heritage area and its hinterland

This is the most practical and effective prevention way to be tackled in the EMP. It requires clarification of water quality factors such as transparency, BOD, COD, SS, T-N, T-P, and allowable load volume. The quantitative figures should be proposed in the EMP based on the analysis results of water quality pollution mechanism, future pollution loads subject to economic development frame, and water quality simulation.

The water quality conservation criteria is to be set to show an actual management goal and to evaluate effectiveness of countermeasures. Although GOV has own environmental standard of water quality, it could not be applied directly to the area due to a lack of SS and higher values compared with the current water quality conditions in the area. Therefore, an appropriate water quality conservation criteria is to be newly applied for the World Heritage area.

2) To prohibit development activities in the core area, and to minimize environmental impacts in the buffer area of the World Heritage area

Any development activities in the core area are prohibited by the regulation of GOV. It is necessary to protect the environment in the World Heritage area. However, several development activities such as the Tuan Chau tourism resort project, the Hung Tang reclamation project, the Hon Net floating port project, are planned in the buffer area. The specific impacts caused by these projects should be controlled in accordance with the Environmental Impact Assessment (EIA) procedure introduced in Vietnam. There could be accumulative impacts in future even though each project complies with the national discharge standard, and this might cause indirect impacts to the core area. Therefore, the EMP needs to clarify this impact as quantitatively as possible, and to propose countermeasures to be taken by the responsible organizations.

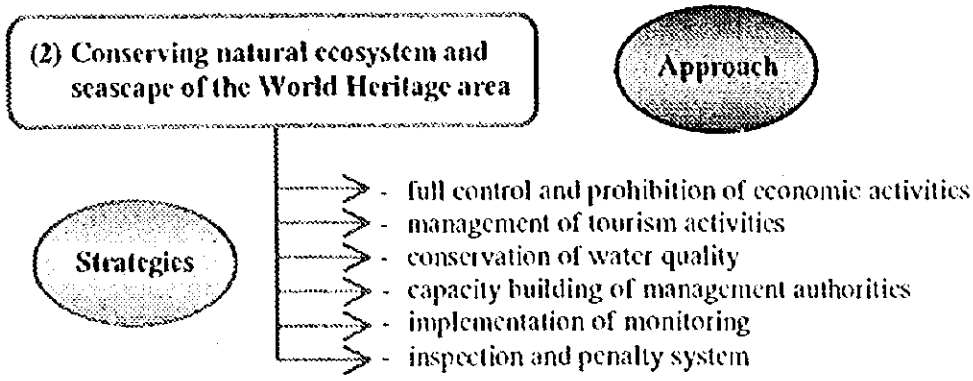


(2) Conserving Natural Ecosystem and Seascape of the World Heritage Area

The World Heritage area has valuable natural ecosystems such as coral reef area and fishing ground. Its natural beauty of harmonized islands, sea, and sky is invaluable for tourism attraction. Since a quantitative approach is not directly applicable for natural ecosystem and seascape, its conservation criteria is to be given in terms of water quality considering suitable habitat conditions for the natural ecosystem and the current beautiful seascape.

The present Vietnamese regulations strictly prohibits any economic activities that could damage the natural ecosystem of the area. This means that the conservation

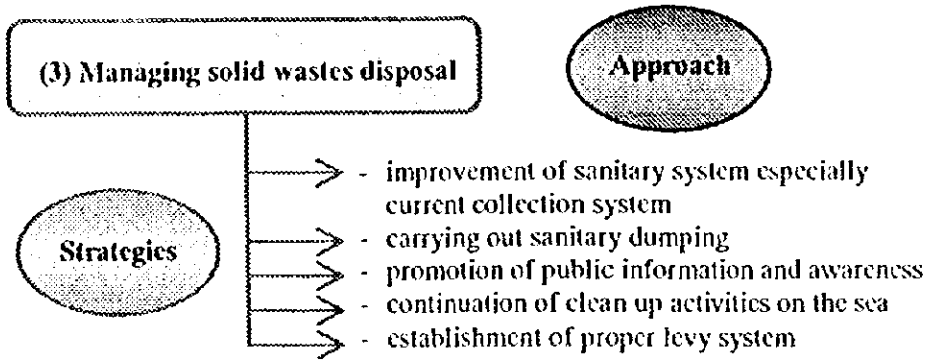
of natural ecosystem fairly depends on the enforcement capability of the Vietnamese management authority of the World Heritage area. Thus, the EMP focuses on the capacity building of the organization to monitor and inspect economic activities and penalize those that damage the environment.



(3) Managing Solid Waste Disposal

This component has a clear cause and effect relationship. Poor solid wastes collection service (less than 50% is collected) and improper waste dumping in the Ha Long bay area is considered a main problem to be tackled in the EMP. Thus, the establishment of a complete solid wastes management system should be a strategy of this matter.

Although there is no doubt about the importance of the public awareness and public education of wastes disposal, these measures could not ensure the effects. Therefore, a rigid numerical index is not set, but it is the strategy of continuous administrative efforts in the EMP.

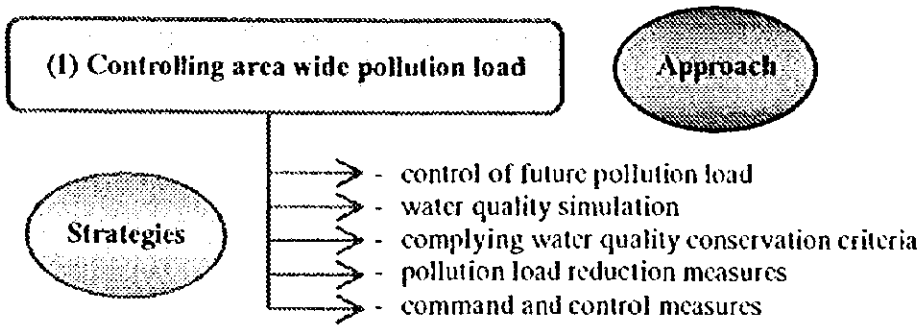


15.6.2 Achievement of Environmental Protection for Sustainable Economic Growth (Goal II)

For this goal, the following approach and strategy is taken for the EMP.

(1) Controlling Area Wide Pollution Load

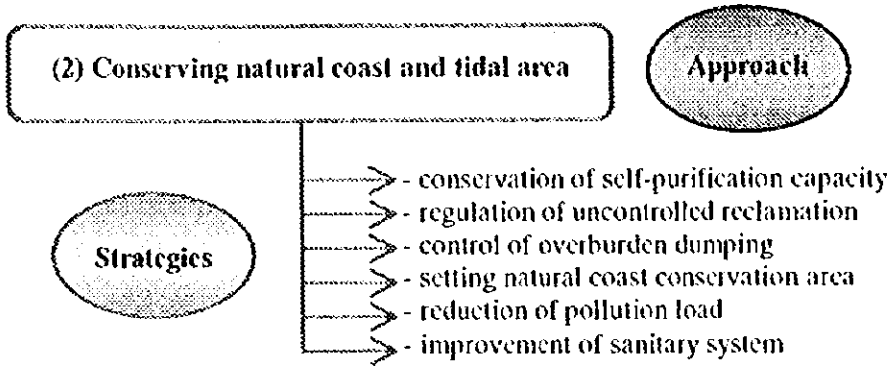
It is broadly understood in the world that the deterioration of the environment would bring about the degradation of its economic development potential. Based on the zoning results described in the section of "Environmental Zoning", an allowable pollution load of water quality items such as BOD, COD, SS, T-N, T-P, is set by each zone for protection of the environment of Ha Long bay in accordance with the national discharge standard. The quantitative figures should be shown in the EMP based on the analysis results of water quality pollution mechanism, future pollution loads, and water quality simulation. Considering the conditions of pollution sources, necessary countermeasures should be proposed to control and reduce pollution loads in the EMP.



(2) Conserving Natural Coast and Tidal Area

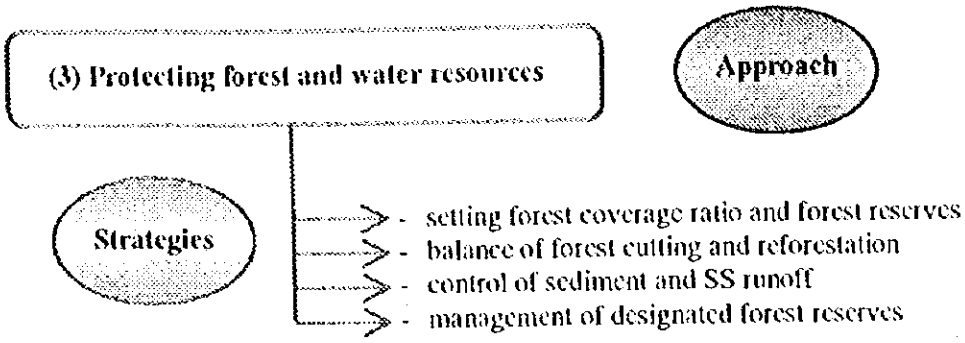
About 200 km^2 of natural coast and tidal area can be found in the EMP area, and it has very important functions such as self-purification capacity of water quality, habitat and hatchery ground of coastal fauna, and existence of mangrove forests. However, it is now threatened by reclamation, coal overburden dumping, and bridge construction. Moreover, further destruction and degradation could be considered by the actual progress of urban, industry, and tourism development in HLMP in future.

Due consideration of the importance of the natural coast and tidal area, the indexes of acreage and self-purification capacity are applied for the conservation strategy in the EMP. Moreover, an alternative land use plan is also proposed for conservation of the natural coast and tidal area especially focusing on mangrove forests.



(3) Protecting Forest and Water Resources

The amount of forest coverage is closely linked with the amount of sediment run off of the watershed which impacts on water quality of the downstream rivers and bays. This impact can be measured by the pollution load of SS as a non-specific pollution source. At present, the designated forest area is more than 60 % of total EMP area, but its actual forest coverage ratio is actually only 32 %. QNPC has an aggressive reforestation plan to meet the target of 40 % and to be well balanced by cutting and reforestation activities in accordance with the provincial forest sector development policy. Therefore, the target forest coverage ratio of 40 % could be an index for protection of forest and water resources. The Mip river forest reserve, Don Ho lake forest reserve, Hoa Binh forest reserve, Don Song Ky Thung forest reserve, Quan Hanh Stone Mountain forest reserve about 400 km^2 in total are designated as the forest reserves by the provincial government. Thus, the protection of these forests are made a high priority.



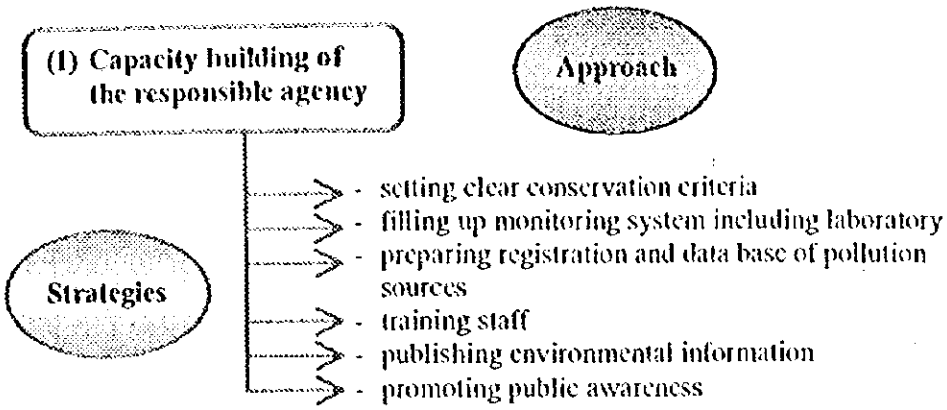
15.6.3 Establishment of Enforcement Capability of Environmental Management (Goal III)

Despite the great efforts of Vietnamese agencies responsible for environmental management in the Ha Long bay area, a lot of difficulties still remain in terms of enforcement capability. Reviewing the current situation, several key issues can be point out, for example 1) strengthen enforcement capability and decision support systems, 2) utilize economic and regulatory instruments, 3) increase public and stakeholder participation.

Although the goal of the establishment of enforcement capability is highly intangible and it is hard to set rigid numerical indexes, it requires more efforts with step by step approach envisaging a locally oriented appropriate system. There is no doubt that the environmental conservation mostly depends on the enforcement capability of the Vietnamese management authority of the Ha Long bay area. Therefore, the following two approaches are proposed, (1) Capacity building of the responsible agency and (2) Institutional set up for enforcement of the EMP.

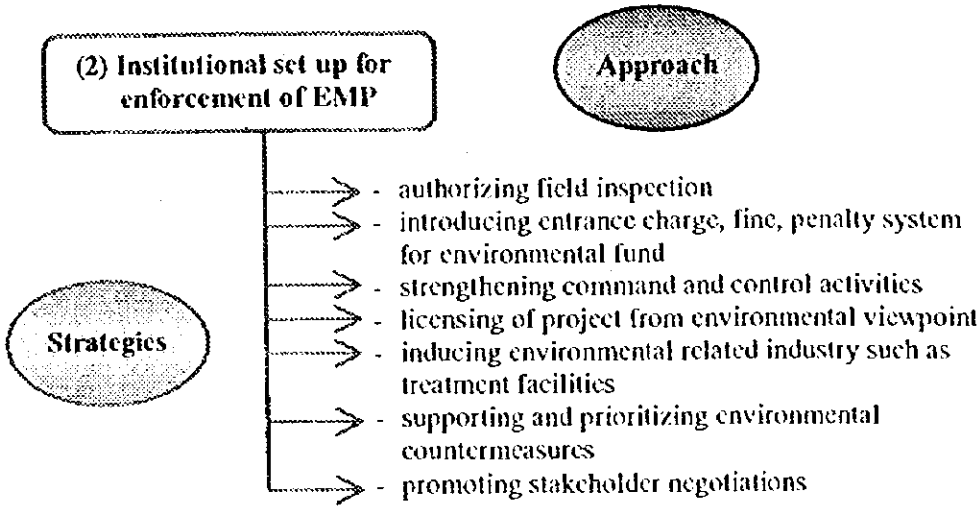
(1) Capacity Building of the Responsible Agency

Environmental monitoring is the essential element for this approach. It requires technical skills, installation and maintenance of equipment, and financial back support. This means that the environmental monitoring needs to be an integrated system having a clear conservation target. Therefore, the following strategies are taken in the EMP.



(2) Institutional Set up for Enforcement of the EMP

The enforcement capability should be supported by a strong commitment of the national and provincial policy and by the enough regulatory and institutional authorization. Thus, the institutional set up is one of the focal points of the goal of Establishment of Enforcing Capability of Environmental Management. The following strategies are taken in the EMP.



FIGURES

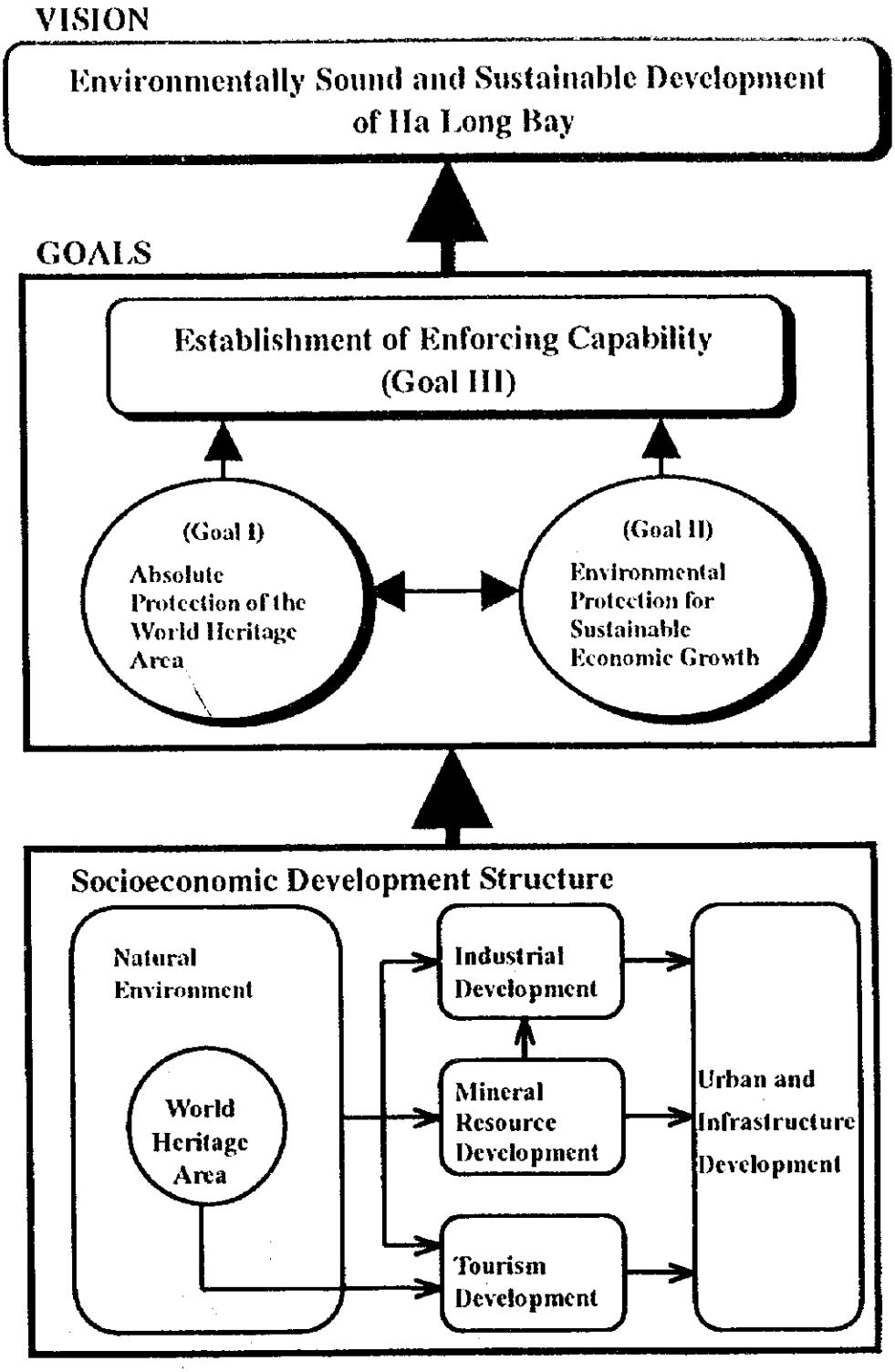


Figure 15.2.1 Concept of Vision and Goals of the Environmental Management Plan for Ha Long Bay

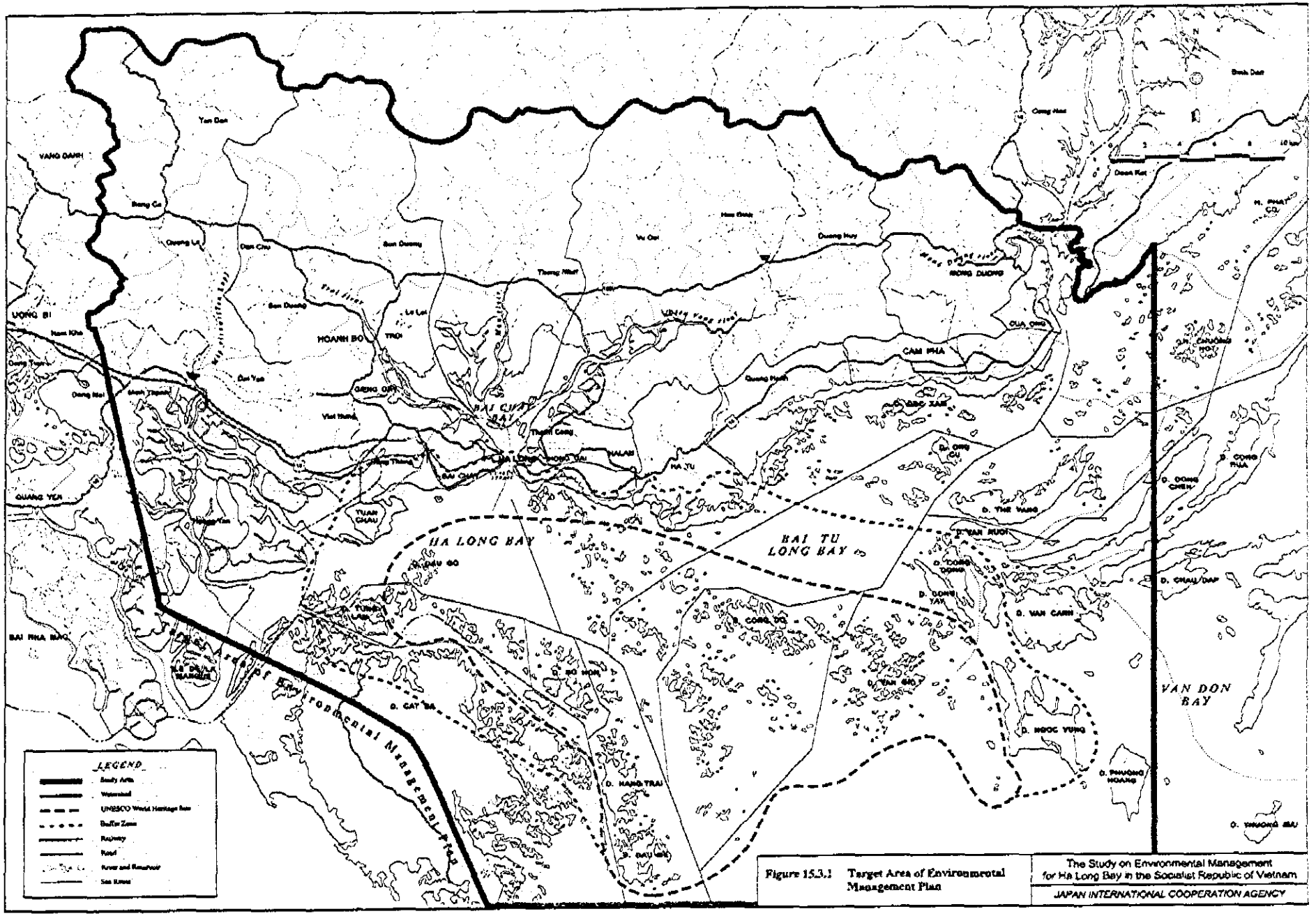


Figure 15.3.1 Target Area of Environmental Management Plan

The Study on Environmental Management for Ha Long Bay in the Socialist Republic of Vietnam

JAPAN INTERNATIONAL COOPERATION AGENCY

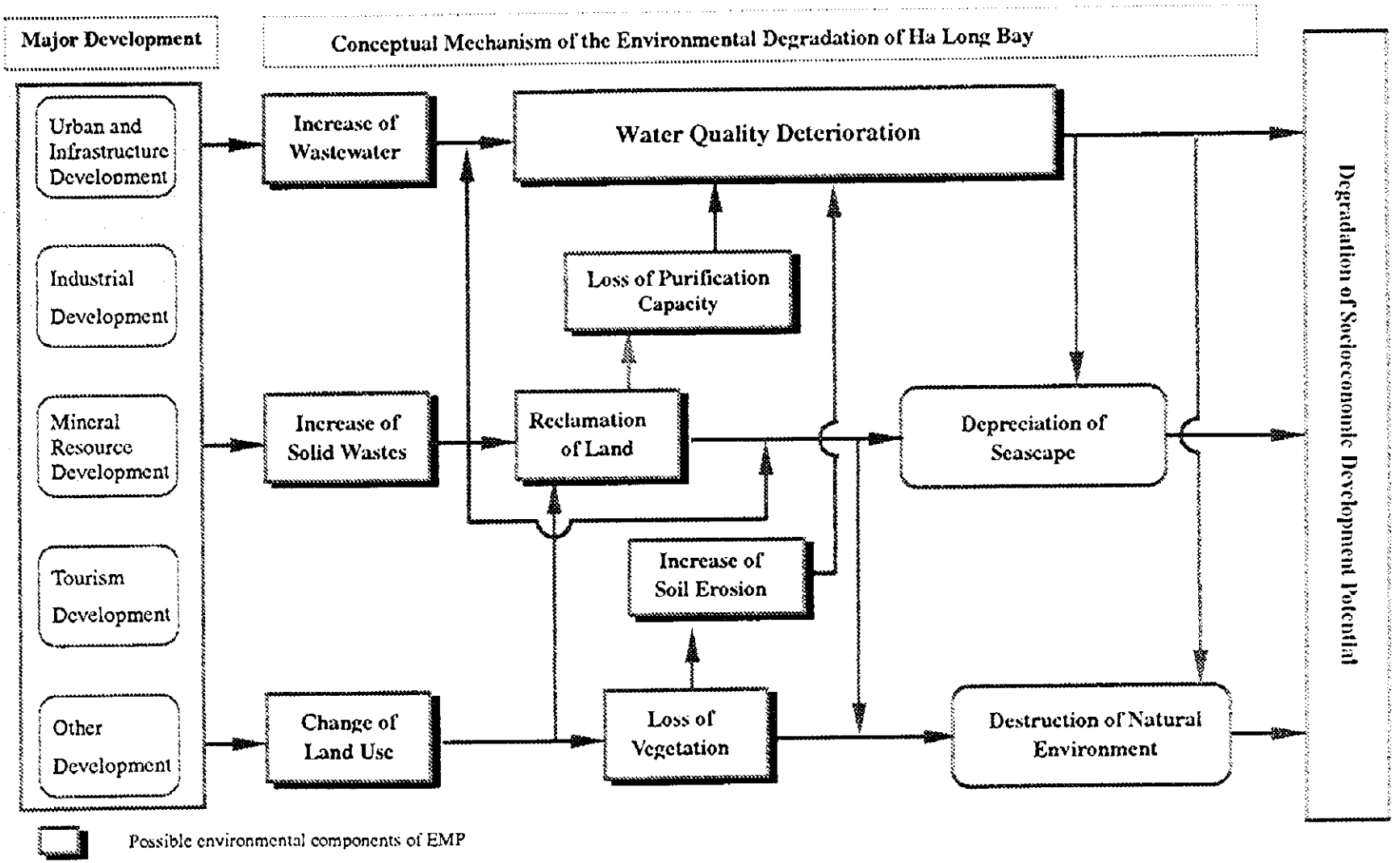


Figure 15.6.1 Concept of Environmental Degradation for Selection of Approach and Strategy of the Environmental Management Plan for Ha Long Bay

CHAPTER 16

CHAPTER 16 ENVIRONMENTAL ZONING

16.1 Categorization and Location of Environmental Zones

The target area of the EMP has notable characteristics from a viewpoint of environmental zoning which will guide a land use plan for sustainable development of the area. The most important characteristic is the World Heritage area including its buffer area. Besides that, the target area contains ecologically important areas such as a tidal area including mangrove forests, a national park, coral reef areas, forest and water reserves, and fishing grounds. Considering the current situation, the EMP area can be categorized into four environmental zones: 1) Special Conservation Zone (SCZ), 2) Conservation Zone (CZ), 3) Active Management Zone (AMZ), and 4) Development Zone (DZ).

SCZ is defined as most important environmental areas which are officially authorized by the national and local government. Thus, this zone should be put at higher priority for conservation, and be conserved and managed in accordance with the existing regulations for protection. In principle, the World Heritage buffer area is included in SCZ, but some of it is in AMZ due to existence of development activities.

Although most of the important environmental areas is covered by SCZ, other important environmental areas remain mostly in the upper reach of sub-catchment areas and the bay area surrounding the World Heritage buffer area. From the environmental viewpoint, these areas are providing habitat of fauna and flora and natural resources which have economic and scientific values. Therefore, the JICA study team proposed to set CZ as the other important environmental areas based on the analysis result of current and future environmental conditions.

DZ consists of those currently developed, those planned which are principally defined by the Development Master Plan of Ha Long City for 1994-2010 (HLMP), and the potential areas for further development beyond 2010. While, the areas confronting environment and development can be found where intensive countermeasures will be required in the EMP area.

The environmental zones are summarized below. The location of each zone is shown in Figure 7.1.1.

Zone	Total area (km^2)	%	Principal distribution
1) Special Conservation Zone	1,080	43	- World Heritage core and buffer areas- national park and forest reserves
2) Conservation Zone	720	29	- sub-catchment area- around the World Heritage buffer area
3) Active Management Zone	250	10	- tidal flat along the coastal line- Bai Chay bay
4) Development Zone	450	18	- around the planned development area- existing urban and mining area
Total EMP area	2,500	100	-

16.1.1 Special Conservation Zone (SCZ)

(1) World Heritage Area

Ha Long bay, which has an area of about 1,300 km^2 comprising 1,969 islands and inlets according to the Department of Culture and Information in QNPC, is a remarkable landscape in Vietnam. The system of grottos in multiform islands in the bay are described as "a real heavenly palace in the world". Three prehistory cultures, namely the Soi Nhu, Cai Beo, and Ha Long cultures, continuously developed in this landscape from the late Paleolithic age to early metal age. The bay is not only a great landscape but also a sacred and long-standing symbol for Vietnamese people. Moreover, almost all living coral reef areas and several fishing grounds are located in the World Heritage area. In 1994, Ha Long bay was inscribed in the World Heritage List by UNESCO recognizing its exceptional and universal value. The Government of Vietnam (GOV) has promulgated several regulations and guidelines related to protection of Ha Long bay.

The absolute protection area (core area) was designated by UNESCO and GOV including Cong Tay island, Cau Go island, and Ba Ham lake. The buffer area is the strip surrounding the core area extending in the west to northwest direction. It is defined by the bay's coastal line along the National Road No. 18 from the B12 oil storage facility to Km 11th in Cam Pha town. The width of the buffer area is 5-7 km from the core area. The neighboring area is defined as the area surrounding

the buffer area including the border area near Cat Ba island, but it is not clearly described in the regulation.

In the buffer area and neighboring area, almost all human activities are to be prohibited without any official permission. Thus, the developers and project executing agencies are required to submit an environmental impact assessment report and an environmental protection plan to the approval authorities in advance.

(2) Cat Ba National Park

Due to its great diversity of landscape and ecosystem, GOV designated about 152 km^2 comprising about 98 km^2 of the main land of Cat Ba island as a national park. Thus, the Cat Ba national park area should be included in SCZ.

(3) Forest and Nature Reserve Area

In the EMP area, there are six forest and nature reserve areas, namely the Mip river and the Hoa Binh forest reserves for water resources preservation, the Dong Son Ky Thung forest reserve for biodiversity preservation, the Bai Chay special use forest reserve for cultural, historical, and environmental preservation, and the Quan Hanh stone mountain special use forest reserve, and the Dien Vong reservoir conservation area for water supply. These reserves should be included in SCZ.

16.1.2 Conservation Zone (CZ)

The Conservation Zone (CZ) is defined as the important environmental areas which do not have authorized protection background at present. These are tidal flats along the coastal line including mangrove forests, upper reach of sub-catchment areas, and surrounding sea areas of the World Heritage buffer area including fishing grounds. Because of no protection background, these areas have been used and planned to be used for economic development activities, though it is desirable to conserve the same as the area of SCZ. As a manner of fact, many projects are planned to be located in these areas by HLMP. Thus, the larger part of the area is categorized in the AMZ, especially tidal flats.

Therefore, the major components of CZ are the upper reach watershed areas of the Troi, Man, Dien Vong, and Mong Duong rivers, and the surrounding areas of the World Heritage buffer area including fishing grounds outside of SCZ.

16.1.3 Active Management Zone (AMZ)

Many kinds of development activities are planned in HLMP, and some are on going conditions. At present, no project is located in the World Heritage core area except for a navigation channel, so little direct impacts would be caused by the development activities. However, several projects are planned in the buffer area and environmentally important areas such as tidal flats, mangrove areas, and fishing grounds. This means that there could be hot areas confronting environment and development issues to be protected through an active environmental management.

Based on the overlaying figure of SCZ, CZ, and DZ, the possible AMZ is defined, and it consists of the following five major zoning areas.

(1) Bai Chay Coastal Area

The Bai Chay coastal area is located in the World Heritage buffer area, and extends along the shoreline from the Cua Luc strait to a causeway to the Tuan Chau island with area of about 25 km^2. This area is to be primarily used for tourism development by tidal flat reclamation, so that an increase of pollution load and decrease of self-purification capacity would be expected. Moreover, the water quality of this area could bring about a direct impact to the World Heritage core area because of its adjacent location.

(2) Hong Gai Coastal Area

The Hong Gai coastal area is also located in the World Heritage buffer area, and extends along the shoreline from the Cua Luc strait to the Nam Cau Trang coal port. It covers an area of about 20 km^2. This area is currently threatened by pollution loads and solid wastes from commercial and residential areas, and it is to be developed as a commercial center of Ha Long city in future. Therefore, its

environmental conservation could be an acute issue because of the possibility of a direct impact to the World Heritage core area as well as the Bai Chay coastal area.

(3) Cam Pha and Cua Ong Coastal Area

The Cam Pha and Cua Ong coastal area is about 45 km^2 which includes the coastal area of Quang Hanh, Cam Pha, and Cua Ong including the Vung Due and Cua Ong coal ports, and the Mong Duong river mouth area. This area is characterized by the existence of active coal mines, and it will be developed mainly for coal shipping and urban development for employees of mine companies. The current water quality is fairly degraded by the pollution load from the coal mining area, and it sometimes exceeds the Vietnam environmental standards for coastal water quality.

(4) Bai Chay Bay Area

The Bai Chay bay area is a semi-closed inland sea area of about 50 km^2. Various kinds of development projects are to be implemented in this area, so the environment of the bay will be severely threatened by the impacts of pollution load increase and purification capacity decrease. The current water quality of the bay is rather good, but it is degraded easily due to its semi-closed geographic condition. Moreover, the water quality of the bay has close link with that of in the Bai Chay and Hong Gai coastal areas by moving pollution load through the Cua Luc strait.

(5) Binh Huong Estuary Area

The Binh Huong estuary has an area of about 80 km^2 which includes the Mip river mouth area, Minh Thanh, Hoang Tan, and the western part of the Tuan Chau island. This area keeps rather good ecological conditions at present. Not so many development projects are planned in this area; however, a reclamation of tidal area for expansion of agricultural land could have major environmental impacts in the future. Therefore, the conservation criteria should be set to protect the precious ecosystem through rigid land use planning.

16.1.4 Development Zone (DZ)

The Development Zone (DZ) includes the existing and planned development areas to be a part of the growth poles in the Northern Growth Triangle. It mainly consists of the areas for a) urban and infrastructure development, b) mining and industry development, c) tourism development, and d) agriculture and aquaculture development.

The existing and planned development areas can be delineated by the current land use map and the land use plan up to 2010 described in HLMP. While, the Ha Long bay area should be continuously developed even after 2010 to achieve the national economic target. Therefore, it is considered practical to include the potential development area for further expansion of development activities to DZ.

16.2 Key Regulative Issues

The proposed environmental zones have close implication with the regulative issues related to environmental conservation, and each zone must provide an appropriate direction for setting conservation criteria, for preparing environmental measures, for planning future land use, and for strengthening enforcement capability. The principal regulative issues from the legal, conservation and protection, and institutional viewpoints are summarized below.

Since SCZ is the currently regulated area, observance of the existing regulations, compliance of the proposed conservation criteria, and the regular monitoring and inspection are to be focused on the actual environmental management. In addition, public awareness is important because of the existence of the invaluable World Heritage. Although CZ does not have clear authorized background for its protection, its importance can not deny from overall environmental conservation of the EMP area especially for protection of SCZ. Thus, it should be focused on compliance of the proposed conservation criteria by monitoring and inspection.

AMZ is the focal point in the EMP area to attain the vision of "Environmentally Sound and Sustainable Development of the Ha Long Bay Area". A strong and aggressive commitment on environmental conservation of the officers and the local people concerned is fully required for a positive change of AMZ through the

investment to command and control measures, legal and institutional frame, and human and financial resources. The environmental condition of AMZ could be the direct result of the EMP.

The DZ is to be a center for socioeconomic development at present and in the future. In order to ensure the sustainable development conditions, it should be focused on command and control measures through EIA, monitoring, and inspection.

Regulation item - Environmental zone	SCZ	CZ	AMZ	DZ
A. Legal frame				
(1) Observance of the current regulations in each designated area	◎	○	◎	○
(2) Compliance of the proposed conservation criteria	◎	◎	◎	○
(3) Compliance of discharge standards	-	○	○	◎
(4) Administrative enforcement including penalty and fine system	○	○	◎	○
B. Conservation and protection measures				
(1) Pollution control measures	-	○	◎	◎
(2) Nature conservation measures including landscape	○	○	◎	○
(3) EIA and countermeasures	-	○	◎	◎
C. Institutional frame				
(1) Approval and licensing economic activities	-	○	◎	○
(2) Coordination with relevant agencies and stakeholders	-	○	◎	◎
(3) Regular monitoring and inspection	◎	◎	◎	◎
(4) Regulation of land use and reclamation	-	○	◎	○
(5) Public awareness	◎	○	○	-

Note:
1) SCZ: Special conservation zone, CZ: Conservation zone, AMZ: Active management zone, DZ: Development zone
2) ◎: most important linkage is expected, ○: important linkage is expected, -: some linkage is expected

16.3 Guidelines for Future Land Use Plan

16.3.1 Current Land Use

The existing land use pattern is presented in Section 2.2. A relatively small portion of land is used for agriculture, i.e. about 2-7% except Yen Hung district, most of which is not included in the study area. The agricultural land is mostly used for annual crops such as rice, and very little is used for perennial crops, i.e. cash crops such as fruit (ADB, Coastal and Marine Environmental Management for Ha Long Bay, 1995). The special use land which is for building, transport,

irrigation, and mineral exploitation has a substantial share of the land use in Cam Pha (33%) and Ha Long (43%). Most of special land in Cam Pha is coal mining area (ADB, *ibid.*) In the case of Ha Long the land seems to be used not only for coal mining, but also urban facilities. The forestry and the not used lands account for over 90% in Hoanh Bo district. Accordingly, it implies the district is least developed in the EMP area.

16.3.2 Current Land Use Plan

The current land use plan is shown in the Development Master Plan of Ha Long City for 1994-2010. After the master plan was approved in 1994, some new development projects were identified such as the land reclamation project for agricultural land use in Yen Hung district, but they are not included here.

16.3.3 Consideration for Modification of the Land Use Plan

(1) Feedback to the Present Land Use Plan

The water quality is regarded as an integrated key indicator for the Study, because the major environmental impacts are believed to be comprehensively reflected in it through the mechanism of environmental degradation of Ha Long bay. As the planned major development projects and related socioeconomic changes would bring about adverse environmental impacts on the water quality, their magnitudes were calculated to find out an appropriate feedback to the land use plan.

The calculation was conducted based on the three different scenarios: a case without countermeasures, a case to keep pollution loads at the present level, and a case to reduce the present level of pollution loads. The first scenario, which may bring about the worst environmental impacts, provides a basis for evaluation of the effectiveness of various possible countermeasures in the other scenarios. Therefore, the feedback to the land use plan will be made based on the results of the first scenario.

The general flow of feedback for the Study is as follows:

i) to forecast the increase of future pollution loads in the case without countermeasures,

ii) to analyze the general trend of pollution increase by pollutant and pollution source,

iii) to make a comparative analysis among the sub-catchment areas and to identify major pollution sources and the magnitude of increase of pollution loads by sub-catchment area,

iv) to identify the most affected areas by the increase of pollution loads, i.e. the priority areas for the feedback

v) to propose advisable changes and /or regulations for the land use plan of the priority areas.

(2) General Characteristics of Pollution

Table 16.3.1 shows the increase of pollutants by sub-catchment area. The method of calculation was already stated in Chapter 14. The increase of SS which is outstandingly the largest in terms of kg/day among the pollutants accounts for over 35,000 kg/day. This implies that solid wastes from the mining industry and deforestation may become the major pollution sources. The increases of the other pollutants, COD_{Mn} (9,800 kg/day), BOD (6,000 kg/day), T-N (4,700 kg/day), and T-P (900 kg/day) follow in this order.

The share of pollutant increases by pollution source is shown in Table 16.3.2 and Figure 16.3.1 which indicate another important characteristic of pollution increase in the area. The most significant pollution source is domestic source, i.e. population growth, in the observation period from 1996 to 2010. In particular, the domestic source has dominant shares in the increases of BOD (57.2%), T-N (55.9%), COD_{Mn} (55.1%), and T-P (35.8%). However, the non-specific source accounts for the top share (43.8%) exceptionally in the case of SS. On the other hand, the shares of industry following those of the domestic are relatively high in all pollutants and the livestock doesn't have significant shares in the area.

To avoid higher pollution costs in the wake of further growth in both population and industry, the study area will have to be more active in preventing expected environmental problems and reap the full benefits of a more sustainable economic

growth. The feedback to the land use plan should simultaneously consider domestic as well as industrial pollution, as the former will become the main pollution source in the near future and the latter will continuously be influential with the acceleration of industrial growth.

(3) Comparison of Increase of Pollution Loads in Sub-catchment Areas

Table 16.3.3 shows increase of pollution loads in sub-catchment areas which are ranked in order of volume of increased pollution loads. Furthermore, the next table in this section shows the frequency ranking of each sub-catchment area. Namely this table indicates which sub-catchment areas receive much higher pollution loads than others and then which areas need prompt and appropriate feedback to the land use plan more for its environmental protection. Each area's priority of feedback is rated by the total frequency.

As a result, the Troi river basin in Hoanh Bo district has the highest priority. In the case without countermeasures it receives the largest increase of pollution loads. Its shares of the increases by pollutant in the whole study area are absolutely higher than the other sub-catchment areas. The major pollution sources are industry and domestic, in other words, industrial development and the population growth. Apparently the land use plan of the Troi river basin should be reviewed based on the stated results with the top priority among the sub-catchment areas. The following sub-catchment areas also have the high or high-medium priority of the feedback. They are the Dien Vong river, Hong Gai north, and Hong Gai south basins.

Priority of Feedback to the Land Use Plan by Sub-catchment Area

No.	Sub-catchment Area	Frequency of Rank within No. 1 to 5	Frequency of Rank within No. 6 to 10	Total Frequency	Priority of Feed Back to Land Use Plan	Major Pollution Source
4	Toi River	10	1	11	High	Industry, Domestic
7	Hong Gai North Basin	5	1	6	High-Medium	Domestic, Non-specific
8	Hong Gai South Basin	4	0	4	High-Medium	Domestic
3	Bai Chay Basin	2	2	4	High-Medium	Domestic
6	Dien Vong River	1	5	6	High-Medium	Domestic, Non-specific, Livestock
9	Ha Tu Basin	1	4	5	Medium	Non-specific, Domestic
10	Cam Pha West Basin	1	3	4	Medium	Non-specific, Domestic
5	Man River	1	1	2	Medium	Non-specific
14	Mong Duong River	1	0	1	Medium	Non-specific
12	Cam Pha East Basin	0	3	3	Medium	Industry
13	Cua Ong Basin	0	3	3	Medium	Industry
1	Mip River	0	1	1	Medium-Low	Livestock
2	Hung Thao Basin	0	1	1	Medium-Low	Domestic
11	Cam Pha Central Basin	0	0	0	Low	
15	Cat Ba Island	0	0	0	Low	

Note:
High : Total Frequency > 10
High-Medium : Total Frequency > 6 or Frequency of Top No. 5 > 1
Medium : Total Frequency > 2 or Frequency of Top No. 5 > 0
Medium-Low : Total Frequency > 0 and Frequency of Top No 5 < 1
Low : Total Frequency = 0

(4) Direction for the Land Use Plan of the Priority Areas

The objective of feedback is to attain a harmonized balance between developing activities and environmental protection for the sustainable development, not simply to reduce developing activities and their environmental impacts. In general, the feedback is not an one-way but interactive action between environmental consideration and development activity and is necessary to find an optimal balance between them.

The feedback loops between the environmental consideration and developing activities may generally include various direct and indirect loops. One of the typical loops is the one between the forecasted environmental impacts and the development projects and programs. This is feedback to the land use plan. In addition, the feedback through the such following loops are also important, as a loop between cost and benefit in terms of socioeconomic and environmental aspects, a loop between forecasted environmental impacts and institutional countermeasures including land use regulations, environmental monitoring, and institutional building. This section mainly discusses the feedback loop between the forecasted environmental impacts and the land use plan.

In this Study, a general direction of land use modification is proposed based on the forecasted major pollutants by sub-catchment area identified in the previous table, "Priority of Feedback to the Land Use Plan by Sub-catchment Area". Each direction by sub-catchment area is suggested in the next table.

No.	Sub-catchment Area	Major Pollution Source	General Direction of Land Use Modification
4	Toi River	Industry, Domestic	- Reappraisal of type of newly planned industry - Control of expansion of residential area
7	Hong Gai North Basin	Domestic, Non-specific	- Control of expansion of residential area - Improvement and/or upgrading of the sewage treatment system, solid waste management system in existing urbanized area
8	Hong Gai South Basin	Domestic	- Improvement and/or upgrading of the sewage treatment system, solid waste management system in existing urbanized area
3	Bai Chay Basin	Domestic	- Improvement and/or upgrading of the sewage treatment system and solid waste management system in existing urbanized area
6	Dien Vong River	Domestic, Non-specific, Livestock	- Control of expansion of residential area - Regulation of animal husbandry
9	Ha Tu Basin	Non-specific, Domestic	- Prevention of impacts from coal mining activities - Improvement and/or upgrading of the sewage treatment system and solid waste management system in existing urbanized area - Control of expansion of residential area
10	Cam Pha West Basin	Non-specific, Domestic	- Prevention of impacts from coal mining activities - Improvement and/or upgrading of the sewage treatment system and solid waste management system in existing urbanized area - Control of expansion of residential area
5	Man River	Non-specific	- Prevention of impacts from coal mining activities
14	Mong Duong River	Non-specific	- Prevention of impacts from coal mining activities
12	Cam Pha East Basin	Industry	- Reappraisal of newly planned industry
13	Cua Ong Basin	Industry	- Reappraisal of newly planned industry
1	Mip River	Livestock	- Regulation of animal husbandry
2	Hung Than Basin	Domestic	- Control of expansion of residential area
11	Cam Pha Central Basin	-	-
15	Cat Ba Island	-	-

The future major pollution sources are domestic and industry in the EMP area. In the case of the domestic pollution source the magnitude of pollution loads are generally determined by the size of population and the progress of sewage treatment system and solid waste management system. The direction of land use modification may differ from area to area. For the suburbs of Ha Long city such as the Troi river basin, it is very important to carefully control the future expansion of residential area, i.e. to regulate the location and the size of residential development responding to the available environmental countermeasures.

On the other hand, for the existing urbanized area such as the Hong Gai South and North basins, a growth of urban population is inevitable and rather a precondition for the land use plan. Therefore, it is generally unrealistic to limit further population growth. Taking these stated conditions into account, the further progress of the sewage treatment system and the solid waste management system in the basins is evidently a crucial key to decrease or to keep the pollution loads from the domestic activities under a certain level.

In the case of the industrial pollution source, a basic feedback is to take action on the reappraisal of newly planned industry. The preferable industries in each sub-catchment area should be reviewed and selected again in terms of environmental protection criteria to avoid environmentally inappropriate industrial location. In addition, another basic feedback is to regulate the industrial wastewater and solid wastes from the existing industrial factories.

The non-specific pollution source is the major cause of SS in the study area. The direct and indirect impacts from the mining activities which may include deforestation caused by the open pit mining are presumed to increase SS values. Therefore, the general feedback to the area affected by the non-specific pollution source is to take appropriate action to prevent the coal mining activities from giving environmentally adverse effects to the area.

In addition, although the livestock is not a major pollution source in the area, it contributes to a growth of pollution loads in some areas such as the Dien Vong river and Mip river basins. The feedback to those areas is to suggest taking action to regulate the land use for the animal husbandry in the areas.

16.3.4 Guidelines for Future Land Use Plan

(1) General Direction for Future Land Use Plan in the Study Area

Before the Land Law was issued in 1993, a land use planning at the national level aimed only at agriculture and forestry development, not at land for special use or residential areas. Therefore, it did not provide integrated instructions and strategies for the use of land resources due to lack of cooperation among the different sectors. There were, generally in many cases, overlap and conflict

between different land use plans prepared by different sectors. However, the Land Law issued in 1993 stipulates that land use planning should include:

- Identification of agricultural land, forestry land, urban and rural residential land, specialized use land, land not yet be used, of each locality and of the whole country.
- Adjustment of this identification of individual lands has to be done consistent with each period of socioeconomic development of each locality and of the whole country.

Furthermore, the Land Law describes that the role of land use plan is to identify appropriate utilization options for different land categories in each period of development. The General Cadastral Department is responsible for building up overall land use plans and strategies and submitting them to the Government for approval. In 1994, the department sent an official letter concerning land use planning activities to the People's Committees of provinces and major cities which are directly under the central management. It should be noted that the letter sets out the general guidelines of land use planning and explicitly states the protection of natural resources and the environment as follows. This general guidelines stated above should be taken into account for the revision of the current and future land use plan in the EMP area.

- Protecting the peoples' land possession under the State management and encouraging socioeconomic developments, and
- Protecting natural resources and the environment.

The environmental zoning defined in the EMP provides the general instructions of future land use in the area. Each zone has an environmental conservation criteria which cover the following items: water quality, environmental resources such as forest, tidal flat, mangrove swamp, coral reef, fish, shellfish, landscape, and seascape. Therefore, all development activities in the area should be consistent with the environmental zoning and comply with the conservation criteria.

The feedback discussed in the previous section indicates a general advisable direction of actions to protect the environment of each environmental zone on a case by case basis. However, each feedback action should be integrated into the

general land use guidelines and be comprehensively reflected in the revision of the land use plan for the whole EMP area. For that purpose the review and revision of the present HLMP will be necessary primarily.

Although the EMP provides the groundwork for the revision, some additional surveys and basic information on the environment and the socioeconomic conditions in the area will be necessary. In particular AMZ and DZ should be put emphasis on most input for the further investigation, because a lot of major development projects will be concentrated there and their environmental impacts will be most influential in the whole area. The following items must be investigated and identified clearly prior to revising the master plan and the land use plan:

1) Structure and capacity of natural environment in the districts where major development projects are and/or will be planned in AMZ and DZ

The overall structure of natural environment in the Ha Long bay area has already been investigated and identified in the Study. Here the target areas for the investigation should be narrowed down to the development districts in AMZ and DZ. The detailed surveys on the following items are necessary to be undertaken such as topography, geology, soil, hydrology, plants and vegetation, animals, and landscape. The notable and considerable environmental resources and their values should be clearly identified first in terms of environmental conservation through synthesizing the results of surveys. The results should be summarized in the form of maps and/or inventory of environmental resources. Furthermore, the interactive relationship among the surveyed items should be concretely clarified and also the environmental capacities of the districts should be comprehended.

Furthermore, important ecosystems and inhabitants for fauna and flora should be also identified in the districts. Not only precious rare species but also locally common species should be included here in the inventory. Their distribution patterns and situations are necessary to be investigated. Based on the results, the species for protection and those for utilization can be selected.

Major Items for the Detailed Survey of the District

Item	Contents
Topography	Drawing a topographical map classified by inclination, contour, and comprehending a detailed topographical structure of the district
Geology	Drawing a geological map with the information on vertical section
Soil	Drawing a soil map, investigation of physical and chemical characteristics of soil, and surface soil conditions for vegetation
Hydrology	Drawing a hydrological map of surface and groundwater, and comprehending a local watershed structure
Plants and vegetation	Drawing a map of local vegetation, and making an inventory of precious and valuable species for conservation and utilization
Animals	Comprehending a present situation and living conditions of local inhabitants; birds, mammals, insects, amphibians, reptiles, and fish, and making an inventory of precious and valuable species for conservation and utilization
Land- and seascape	Drawing a map of scenic spots and zones, and comprehending their characteristics and structure of local land- and seascape

In addition, it is necessary to identify the historical and cultural relationship between human activities and the natural environment of the districts. The local community has maintained the natural environment of the area consistently together with the local agriculture, forestry and fishery. The community forest, paddy fields, irrigation channels, and ponds are regarded as environmental resources which have been fostered by this stated relationship. Comprehending their distribution and present situation also indicates a basic direction of environmental utilization and conservation consistent with the local socioeconomic conditions.

2) Allowable alternation of the present environmental conditions by the future development activities

The possibility of future environmental deterioration which would be brought about by alternation of environmental conditions should be investigated carefully. In particular, the responsible local agencies should comprehend allowable and controllable sizes of development activities and also allowable alternation of environmental conditions such as topography, surface conditions, and vegetation, judging from the environmental conservation criteria.

3) Development scheme of the districts consistent with the local ecological system

Based on additional detailed surveys and information on the districts, the basic development scheme of the districts should be presented. The scheme is necessary

to be consistent with not only the environmental capacities of the districts and their environmental conditions but also the entire scheme of the environmental zoning.

The aptitude for land use of each district should be determined through careful evaluation of its environmental conditions and spatial structure. A map of each district compiled and classified based on the local water system, topographical and geological conditions, vegetation and soil conditions, and landscape, may provide useful information for comprehending the local ecological system and its evaluation.

4) Long-term trends of both population and urban area growths

Although the present master plan describes forecasted population, its supporting data and assumptions are weak and not clear. The master plan does not describe explicitly the basis of land use demands. In particular, the causal relationship between future industrial growth and migration should be stated much clearer. Not only the natural population growth, but also migration from the suburbs and other regions are necessary to be explicitly taken into account. Otherwise, the accurate future demands for urban land in the area could not be forecasted.

After these items are clearly identified, the development master plan and the land use plan can be revised meaningfully. As for the land use plan, the basic land use zoning should be delineated in each environmental zone, in particular, in the active management zone and the development zone. The land use categories for the two zones may consist of the following: residential, business and commercial, industrial, educational and cultural facilities, transportation, public utilities, recreational park and/or open space, and conservation areas. Needless to say, the zoning is determined based on this stated development scheme and the forecasts of population sizes and of future demands for services by each category of users in different districts of the Ha Long bay area.

The well-organized framework of the land use plan is necessary to be designed for phased improvement and development of i) public utilities, including water supply, sewage and solid waste disposal, and ii) housing. This is very important to provide the necessary public utilities timely responding to the progress of development

activities. In other words, there should be provision for interaction between the development master plan and the relevant complementary sectoral plans, which can best be facilitated through proper sequencing and allowing for flexibility and adjustment. Intensive coordination among the relevant agencies is necessary to this.

(2) Land Use Planning for the Major Development Districts in the HLMP Area

The major development districts in the HLMP area are included in the proposed DZ. Therefore, a detailed land use planning with environmental consideration is essential for sustainable development of these development districts based on a general land use plan prepared by QNPC. This section provides a guideline for preparation of the detailed land use plan considering environmental protection.

Based on the economic development frame by the year of 2010 and the general land use plan prepared by QNPC, 18 major development districts can be designated in the development zone of the HLMP area as shown in Figure 16.3.2. These districts are classified into the 7 categories: A) urban core, B) tourism, C) residential, D) industry, E) mining, F) transportation, and G) agriculture. In those districts careful consideration of environmental impacts will be crucial to the sustainability of the area. The designated districts are listed below.

Major Development District

Category	No.	Development District	Major Land Use	Necessary Actions
A. Urban Core	A1	Hong Gai urban core district	Business, Commercial, Transportation, Residential	- Upgrading and expansion of the sewage treatment system and solid waste management system - Urban renewal including the central market, Hong Gai coal port and removal of the relating facilities, efficient urban road network not only for automobiles but also pedestrians - Preventive measures for land erosion from the steep slopes, in particular, for the future access road to Bai Chay Bridge - Appropriate layout and vegetation of public open space and/or park
	A2	Hung Than urban core district	Tourism, Business, Commercial, Residential	- Confirmation of reclamation line along the coast not to exceed the boundary of DZ - Least environmental impacts on the surrounding tidal flats
	A3	Cam Pha urban core district	Commercial, Residential, Industry, Transportation	- Confirmation of reclamation line along the coast not to exceed the boundary of DZ - Integration of small coal ports to a few main ports
	A4	Cua On urban sub-core district	Industry, Residential, Transportation, Commercial	- Preventive measures for land erosion from the steep slopes and the dumping sites - Improvement of urban roads and their network to prevent the dust caused by the coal transport trucks and for efficient traffic flow - Appropriate layout and vegetation of public open space and/or park, in particular as a buffer zone between the urban district and the mining district - Upgrading and expansion of the sewage treatment system and solid waste management system
	A5	Troi urban sub-core district	Commercial, Residential	- Development of the sewage treatment system and solid waste management system - Improvement of urban roads connecting the neighboring districts
B. Tourism	B1	Bai Chay tourism district	Tourism, Commercial, Residential	- Confirmation of reclamation line along the coast not to exceed the boundary of DZ - Appropriate layout and vegetation of public open space and/or park - Appropriate development control of mini hotels - Upgrading and expansion of the sewage treatment system and solid waste management system
	B2	Tuan Chau tourism district	Tourism, Residential	
C. Residential	C1	Hong Gai North residential district	Residential, Commercial	- Upgrading and expansion of the sewage treatment system and solid waste management system and prevention of increase of domestic pollutant inflow - Preventive measures for land erosion from the steep slopes

Category	No.	Development District	Major Land Use	Necessary Actions
D. Industry	D1	Cai Lan industrial district	Industry, Transportation, Residential	- Confirmation of reclamation line along the coast not to exceed the boundary of DZ - Improvement of transportation network consisting of the ports, urban roads, and railways - Appropriate layout and vegetation of public open space and/or park as a buffer zone between the factories and the residential districts
	D2	Hong Gai North industrial district	Industry, Transportation	
	D3	Gieng Day industrial district	Industry, Residential	
	D4	Hoanh Bo North industrial district	Industry, Residential	
E. Mining	E1	Hoanh Bo North mining district	Mining, Industry	- Preventive measures for land erosion - Reforestation - Least environmental impacts on the watershed structure in the district
	E2	Cam Pha mining district	Mining	
	E3	Hong Gai mining district	Mining	
F. Trans-portation	F1	Bieu Nghi airport district	Transportation	- Careful selection of the location for the airport to mininize environmental impacts on the surrounding tidal flats - Confirmation of reclamation line along the coast not to exceed the boundary of DZ
G. Agriculture	G1	Yen Hung East reclamation district	Agriculture	- Confirmation of reclamation line along the coast not to exceed the boundary of DZ
	G2	Hoang Tan agricultural district	Agriculture	

To guide the development activities properly, i.e., consistently with the EMP, the detailed land use plan for each development district must be established by the relevant agencies and announced broadly to the public and stakeholders such as the other governmental agencies, investors, and developers. Necessary actions, which should be taken into consideration and reflected in the detailed land use plan, are described above. Among the actions, confirmation of reclamation line and preventive measures for land erosion are generally regarded as more important than the others for the entire study area.

16.4 Conservation Guideline for the World Natural Heritage Area

The World Heritage in Ha Long provides one of the most precious environmental assets in the world. At the same time, it offers very attractive assets for tourism. To manage the World Heritage, therefore, these two aspects of World Heritage were taken into consideration.

16.4.1 General Strategies for Management

Strategy 1: Strict Control of Development

The entire core area and the most of the buffer area are designated as "Special Conservation Zone". Therefore, development in the World Heritage area should be strictly controlled.

Strategy 2: Limiting tourism activities within designated areas

The most significant environmental threat in the World Heritage area is tourism. However, major tourism attractions are not distributed throughout the area. In fact, most of the islands in the World Heritage area are too steep and/or too small for major tourism development. By limiting the tourism activities within designated tourism areas, therefore, the environmental impacts can be effectively isolated without impairing tourism.

Strategy 3: Monitoring and Feedback

Without good environmental data, it is difficult to develop effective management plan. Therefore, the World Heritage area should be closely monitored, and the results of the monitoring should be reflected in the management plan.

16.4.2 Levels of Environmental Protection

According to IUCN (International Union for Conservation of Nature and Natural Resources, 1992), environmental protection area can be classified into the following six general categories.

Classification of Protected Area

Category	Description	Orientation
Category 1	Strict Protection	Protection
Category 2	Ecosystem Conservation and Recreation	⇕
Category 3	Conservation of Natural Features	
Category 4	Conservation through Active Management	
Category 5	Landscape Conservation and Recreation	
Category 6	Sustainable Use of Natural Ecosystems	Sustainable Use

Note: IUCN (1992)

Reviews of environmental assets in the World Heritage area suggest that the area needs different levels of protection depending on the importance of specific areas.

Considering the use value of the World Heritage area, the following classification of protected area seems.

Suggested Protection Levels in the World Heritage area

Core/Buffer	Area	Protection Level*
Core Area	Non-tourism Area	Category 3
	Designated Tourism Area	Category 5
	Cat Ba National Park	Category 1-2
Buffer Area	Islands	Category 3
	Tuan Chau Isld. & Land Area	Category 5-6

Note: * level of protection equivalent to the classification of IUCN (1992)

16.4.3 Specific Guidelines for Core Areas

(1) Directions of Tourism Development

1) Boating and visits to caves will continue to be the major forms of tourism activities in the future. Caves on Dau Go Island are getting overcrowded. To accommodate growing number of tourists, development of other caves will be necessary. However, development of many caves is not advisable, because the curiosity of general tourists can be satisfied by visiting only one or two major caves, such as Thien Cung, and the demand to see minor caves will be generally small. Furthermore, it is difficult to ensure safety of tourists, especially in minor caves with less investment. Therefore, the development of cave should be limited to a few major caves, and other caves should be closed to general visitors. Tentatively suggested caves for further development are Sung Sot cave and Tam Cung cave.

2) The potentials for environmental education and eco-tourism shall be pursued further. The area offers ideal settings for these activities; it has unique geology, interesting landscape, diverse ecological environment, and archeological artifacts. Most of all, the area attract many people for such programs.

3) Bathing in the Core Area will be limited mainly due to the space constraints. Some beaches such as Soi Sim Beach and Luoi Liem Beach may provide certain potentials for development. Nevertheless, a development of a large man-made beach in the Core Area is not recommended. Tuan Chau Island

and schist islands in the east of the Core Area, such as Ngoc Vung Island and Quan Lan Island, probably offer better options for bathing.

(2) Access Control

1) The Government should clearly define the islands/area where tourists can visit (tourism island/area) and the island/area where tourists are discouraged to go (non-tourism island/area) based on the needs for environmental protection and tourism development plans. Suggested tourism area (islands/caves/ beaches) in the core area include Dau Go Island/Cave, Hoa Cuong Cave, Hang Trong Cave, Tam Cung Cave, Lau Dai Cave, Luon Cave, Titop Beach, Soi Sim Beach, Luoi Liem Beach, Me Cung Sea Park, Cong Do-Dau Trau area, and Ho Ba Ham area. These islands are either already developed, or the development of these places are already considered in the development plan of QNPC.

2) For safe access, wharves shall be provided for all tourism islands. Construction of wharves on non-tourism islands shall be discouraged, and the tourism boat operators should be instructed not to take tourists to non-tourism islands.

3) The peak number of tourists should be controlled by limiting the number of tourism boats/capacity. Therefore, it is important not to over-issue tourism boat licenses. Other potential measures to control total number of tourist include manipulating the entrance fee/tourism tax, limiting the number of entrance ticket, and regulatory control (e.g., banning access).

4) The peak number of tourists to a particular island may be controlled by limiting the capacity of the wharf, and by issuing a limited number of entrance ticket.

(3) Tourism Facilities

1) All tourism facilities constructed/installed in the World Heritage area shall be approved by the Government, and be built within the designated tourism

area. The locations of floating facilities, such as floating restaurants and floating hotels, should also be designated.

2) Tourism facilities on islands need to be design carefully such that the tourists can explore the area without damaging the surrounding environment. This requires the constructions of good access paths to important tourism spots, such as caves and scenic points. Fences may be needed to keep tourists off dangerous or environmental sensitive areas.

4) All tourism facilities shall be properly equipped with sanitation facilities, including toilets and garbage bins.

(4) Transportation

1) All ships/boats should be registered, and satisfy pertinent regulations on safety and sanitation. They should be equipped with holding tanks for wastewater and garbage bins.

2) All tourism boats should have special permits for tourism, in addition to the general maritime registration. The number of this permit should be controlled carefully to control the total number of tourists.

3) It is the responsibility of tourism boat operators to manage garbage, wastewater, and used oil. Tourism operators are also responsible for keeping the tourists in safe, designated tourism areas.

4) Anchoring of cargo ships in the core area should be prohibited.

(5) Activity Control

1) Any activities that have the potential to damage islands, such as construction, civil work, mining, tree cutting, fire making, etc., shall be strictly prohibited, unless approved by the Government.

2) Any direct damages to corals, stalactite, historical artifacts, and other environmental resources, and trade/sales/purchase of such items shall be strictly prohibited.

3) Any activities that have the potential to pollute the area, such as discharge of untreated wastewater, littering, and solid waste dumping shall be strictly prohibited.

(6) Environmental Education

1) Relevant agencies should clearly identify important environmental assets in the area, and select the assets for environmental education programs.

2) Diverse environmental education programs should be offered by trained experts. The proposed visitor center is an ideal place to offer classroom type courses. Field courses on geology, archeology, ecology, etc., can be offered in caves, beaches, and other places (e.g., Thien Long Cave and Me Cung Sea Park). It is also important to offer courses to local guides and tourism boat operators.

3) Signboards/pamphlets with explanation about local geology, ecology, archeology, etc, will also help. It is preferable that these signboards/ pamphlets are written in Vietnamese, English, and if possible in French and Chinese. Signs to promote environmental protection should also be placed at major tourism spots.

16.4.4 Specific Guidelines for Buffer Area

(1) Cat Ba National Park

Any activities in Cat Ba National Park, including the access to the island, should adhere to the management regulations of Cat Ba National Park. In the EMP, this area is designated as the "Special Conservation Zone". Therefore, any activities that have large environmental impacts, such as construction, civil work, mining, and deforestation, should be prohibited, unless permitted by the Government.

(2) Islands

Other area include Buffer Area around Cat Ba Island (e.g., Vung Ba Cua Island), and Buffer Area in the east of Core Area (Cong Dong Island, Cong Tay Island,

Ngoc Vung Island, and other small islands in Bai Tu Long – Van Don bays). These areas are designated as "Special Conservation Zone". Therefore, any activities that have large environmental impacts, such as construction, civil work, mining, and deforestation, should be prohibited, unless permitted by the Government.

(3) Tuan Chau Island and Land Area

The management of Tuan Chau Island and the land area of Bai Chay to Hong Gai area should be directly managed by QNPC. In the EMP, this area is designated as "Active Management Zone" or "Development Zone". Guidelines for this area is given in Section 7.3.

16.4.5 Environmental Monitoring

1) The following items have to be monitored at all major tourism sites: water quality, landscape element, ecological condition, number of tourist visiting the site, tourist satisfaction, amount of solid wastes collected, amount of wastewater collected, major environmental disasters/accident, and others.

2) The allocation of tourism area, designs of tourism facilities, number of tourism boats/capacities, entrance fee, and other important management issues shall be optimized based on the results of the monitoring.