

3. Sustainable Tourism Master Plan

CHAPTER 3 SUSTAINABLE TOURISM MASTER PLAN

3.1 Sustainable Tourism Development Framework

1) Current Policy Direction for Sustainable Tourism Development

The initiative of Palawan to promote sustainable development led to the creation of the Palawan Council for Sustainable Development (PCSD) in 1992 through Republic Act No. 7611, otherwise known as Strategic Environmental Planning (SEP) for Northern Palawan. It is supported by the Palawan Council for Sustainable Development Staff (PCSDS). The main functions of PCSD include the following: 1) formulation of plans and policies to carry out the provisions of the SEP Law, 2) coordination with local governments to ensure that plans conform with those of SEP, 3) enforcement of the provisions of the SEP Law, 4) coordination with government and private agencies/organizations for cooperation and assistance in performing its functions, and so on. PCSDS is tasked to implement an “environmental monitoring and evaluation system,” “environmental education extension,” “environmental research,” and the “Environmentally Critical Area Network (ECAN).” It is also responsible for planning, monitoring and coordinating the activities of the Second Palawan Integrated Area Development Project (SPIADP). While PCSD has been institutionalized for the first time in the country to oversee and manage development activities and to enhance the environment, it still lacks a more concrete regulatory framework, specific guidelines, organization and staffing, reliable databases, technical capabilities, implementing mechanisms, financial resources, and so on. The capabilities of PCSD therefore still need to be strengthened as it is considered critical to the promotion of sustainable development in Northern Palawan.

Regional development policy aims to mitigate poverty by expanding livelihood opportunities and improving agriculture and fishery production which are the main industries in Northern Palawan. However, lack of necessary infrastructure and marketing facilities seriously hamper the actualization of industry potentials. Although infrastructure development is implemented or coordinated by SPIADP, it is neither supported by an overall regional development plan, nor clearly integrated with an industry promotion program. Furthermore, adequate environmental measures and their costs are not considered in construction and maintenance. Lack of water resources is also an impediment to agricultural and industrial development. The high rate of migration, in addition to high natural growth of population, is a cause for concern in socioeconomic development, which however has not been properly addressed in the current development policy.

The tourism sector, whose contribution to the present economy of Northern Palawan is still insignificant, has not yet been adequately incorporated in the regional development policy and framework. The establishment of tourism offices is limited to the Provincial Government, Puerto Princesa City and the municipality of El Nido. For example, the Palawan Tourism Council and El Nido Tourism Council have only been recently established. Tourism development and promotion strategies for Northern Palawan at the national level need further study, while those at the provincial level are still unclear.

2) Potential Role of Tourism in Promoting Sustainable Development

Northern Palawan has been constrained from accelerated development in many ways: poor infrastructure, lack of water resources, poor soil, limited arable lands, low productivity, insufficient marketing/distribution system, lack of technological and financial support, high rate of population growth, poor land management system, and so on. The rich natural environment has been providing the people with direct and indirect livelihood opportunities but it has been deteriorating due to various harmful activities. Stricter management of the environment has become a primary concern of the government. However, it is very likely that, unless alternative ways are provided to increase the people's income, the remaining environment will not be enhanced, but further degraded and aggravated by the area's poverty incidence. While efforts are made by the government to improve the productivity of traditional industries, particularly agriculture and fishery, these alone may not be sufficient. The rich environment and abundant human resource are considered to be major factors in establishing tourism as an alternative sector to promote socioeconomic development in Northern Palawan. Tourism is a rather labor intensive-industry with wide economic spillover effects. It also does not consume the environment directly, if properly managed. Since tourism requires quality environment, it is expected that tourism by itself can contribute to conserving the environment. Accordingly, tourism in Northern Palawan can play a much larger role in improving the economy and conserving the environment.

3) Tourism Development Goals

Tourism development goals for Northern Palawan have been more specifically delineated as follows:

- (1) Tourism as a strategic means of promoting sustainable development of Northern Palawan through effective integration with environment and local socio-economy: Tourism benefits the local community through direct employment and purchase of local supplies, protects the environment within its activity area, and generates additional revenues for the government which can be used for environmental management and infrastructure development.
- 2) Tourism as a primary industry: In order to maximize the effects of tourism, developments should be significant in scale and quantity as well as quality within the framework of sustainable development.

Tourism in Northern Palawan as a tool to contribute to the enhancement of the overall image of Philippine tourism, thus inducing tourist arrivals to the country: Northern Palawan has a great potential to become a highly competitive tourist destination in the international market which can generate more tourist arrivals not only for Northern Palawan but for the entire country as well owing to its more enhanced image.

3.2 Environmental Management Plan

3.2.1 Environmental Management Area Classification

1) Objectives of Environmental Management Area Classification

Under PCSD Resolution No. 94-44, municipal governments must prepare ECAN zoning maps. Most of the municipal governments have not completed the work due to lack of reliable data and proper technical support. Therefore, the Study Team worked out its own Environmental Management Area Classification which provided the basis for environmental management and tourism development planning. It should be noted that the study does not intend to prepare ECAN Zoning, however, the philosophy and concept of ECAN Zoning have been duly considered.

The Environmental Management Area Classification considered different criteria in relation to an area's unique environmental characteristics for sustainable tourism development. The objectives of Environmental Management Area Classification are more specifically as follows:

- to preserve environmentally important and critical areas; and their unique features;
- to protect critical habitats, ecosystems and ecological processes;
- to separate conflict of human activities; and
- to minimize effects of human use on environment.

2) Concept of Environmental Management Area

Environmental Management Area consists of PRESERVATION AREA and CONSERVATION AREA, as follows:

PRESERVATION AREA is defined as the area where utmost efforts are exerted to protect target environments. PRESERVATION AREA corresponds to Core Zone in ECAN Zoning. The areas to be included are:

- areas rich in natural resources and well preserved;
- areas with high ecological value, including scientific value; and
- areas ecologically sensitive, especially to human activities.

CONSERVATION AREA is defined as the area surrounding a PRESERVATION AREA to function as buffer and reduce the impact of human activities on the preservation areas. Human activities should also be restricted. CONSERVATION AREA corresponds to Restricted Use Area of ECAN Zoning. CONSERVATION AREA intends to provide and contribute to the following effects:

- serve as physical barriers from human activities;
- rehabilitate the natural environment and expand wildlife habitats; and
- aid in the sustainable use of natural resources.

The correspondence in criteria between ECAN Zoning and Environmental Management Area Classification is shown in Table 3-1.

Table 3-1 Criteria of Environmental Management Area and ECAN Zoning

Terrestrial Environment	
ECAN Zoning	Environmental Management Classification
<p>Core Zone</p> <ul style="list-style-type: none"> area above 1,000 m elevation virgin forest or first growth forest areas with slope above 50% mountain peaks with elevation above 50 m a.s.l. covering 500 m horizontal distance from epicenter 	<p>Preservation Area</p> <ul style="list-style-type: none"> area above 1,000 m elevation mossy forest and old growth forest conserved, unique and biologically significant ecosystems as follows: <ol style="list-style-type: none"> Lowland evergreen rainforest Lowland semi-deciduous rainforest Submontane forest Forest over ultra-basic rocks Forest over limestone area with slope above 50%
<p>Buffer Zone Restricted Use</p> <ul style="list-style-type: none"> area with elevation range 500-1,000 meters area with slope range of 38%-50% habitat of wildlife species 10 km belt around core zone poor, stunted and sparse stands of semi-deciduous forest which has low regeneration capacity lower altitude limit can be below 300 m base in areas adjacent to critical ecosystems 	<p>Conservation Area</p> <ul style="list-style-type: none"> area with elevation of 100-1,000 m area with slope range of 18-50% area with 100 m elevation facing a preservation area based on mossy forest and old growth forest
<p>Controlled Use</p> <ul style="list-style-type: none"> area with elevation range of 100-500 m area with slope range of 19%-35% lower altitude limit can go up to 300 m if it would not cause negative ecological impact but high altitude limit can exceed 500 m area where a community is adjacent / within a Restricted Area, a Controlled Area shall be delineated from the Restricted Area 	
<p>Traditional Use</p> <ul style="list-style-type: none"> areas above 18% slope but below 100 m elevation which have been deforested but has stabilized or is suitable for upland farming intact forests where traditional land use is already stabilized or is being stabilized open brushland/grassland that are classified as timberland or public land timberland or public land with elevation below 100 m 	
Marine/Coastal Environment	
ECAN Zoning	Environmental Management Area Classification
<p>Core Zone</p> <ul style="list-style-type: none"> intact coral reefs, with fair to excellent coral condition or 25%-100% coral cover coralline sites with all coral genera found in the management unit mangrove areas bordering waterways, extending 20 m from riverbank and 50 m from shore mangrove areas in small islands mangrove areas of old growth stand and reproductive brush mangrove areas with all species found in the management unit seagrass beds with at least 50% cover of macrophytes seagrass beds with sightings of dugong 	<p>Preservation Area</p> <ul style="list-style-type: none"> intact coral reefs with good to excellent coral condition or more than 75% coral cover slightly disturbed mangrove forest with more than 500 ha, and moderately disturbed mangrove forest with more than 1,000 ha. seagrass beds bordering mangroves and corals in preservation areas seagrass beds with sightings of dugong sightings of sea turtles
<p>No buffer zone defined</p>	<p>Conservation Area</p> <ul style="list-style-type: none"> area around preservation zone, 1 km from preservation zone and 7 km from shoreline

Source: SEP and Study Team

3) Criteria for the Environmental Management Area Classification

(1) Terrestrial Component

PRESERVATION AREA: Five unique and biologically significant ecosystems identified in this Study should be particularly preserved. They are:

- a) Lowland evergreen rainforest
- b) Lowland semi-deciduous rainforest
- c) Submontane forest
- d) Forest over ultra-basic rocks
- e) Forest over limestone

Mossy forests and old growth forests have been identified based on the Land Use and Forest Type Maps and Forest Register (Japan Forest Technical Association, 1993), which was modified by the supplemental aerials survey conducted by the Study Team (January, 1996). Slope maps prepared by the Palawan Provincial Government (Slope Map, Land Resources Evaluation Project) were used for the assessment of slope.

CONSERVATION AREA: Buffer zones surrounding Preservation Area will be allocated by considering watersheds. Areas with 18% - 50% slope is also designated under Conservation Area.

(2) Marine Component

PRESERVATION AREA: According to the ECAN Zoning, fair to excellent coral reef or those with 25 - 100% live coral cover will be under Core Zone. However, in this study, coral reef in excellent condition or more than 75% live coral cover are designated under Preservation Area, considering that 25 to 75% range is too wide to deal with in the same category. It is also difficult to rehabilitate corals when the condition degrades to "fair" or less than 75% live coral cover.

Mangrove forest has been classified into three categories by the Study Team, according to the criteria shown in Table 3-2. Slightly disturbed mangrove forests with more than 500 ha and moderately disturbed mangrove forest with more than 1000 ha are included in the Preservation Area. Seagrass beds with sightings of dugong as well as sightings of sea turtles and dugong have not been studied so intensively. These may have to be reviewed once updated data becomes available.

Table 3-2 Criteria on Mangrove Classification

Size: ha	Conditions		
	Almost Intact ^{1/}	Disturbed ^{2/}	Severely Disturbed ^{3/}
more than 1000	A	A	B
500-1000	A	B	C
less than 500	B	C	C

Source: Study Team

1/ : Almost intact or slightly disturbed

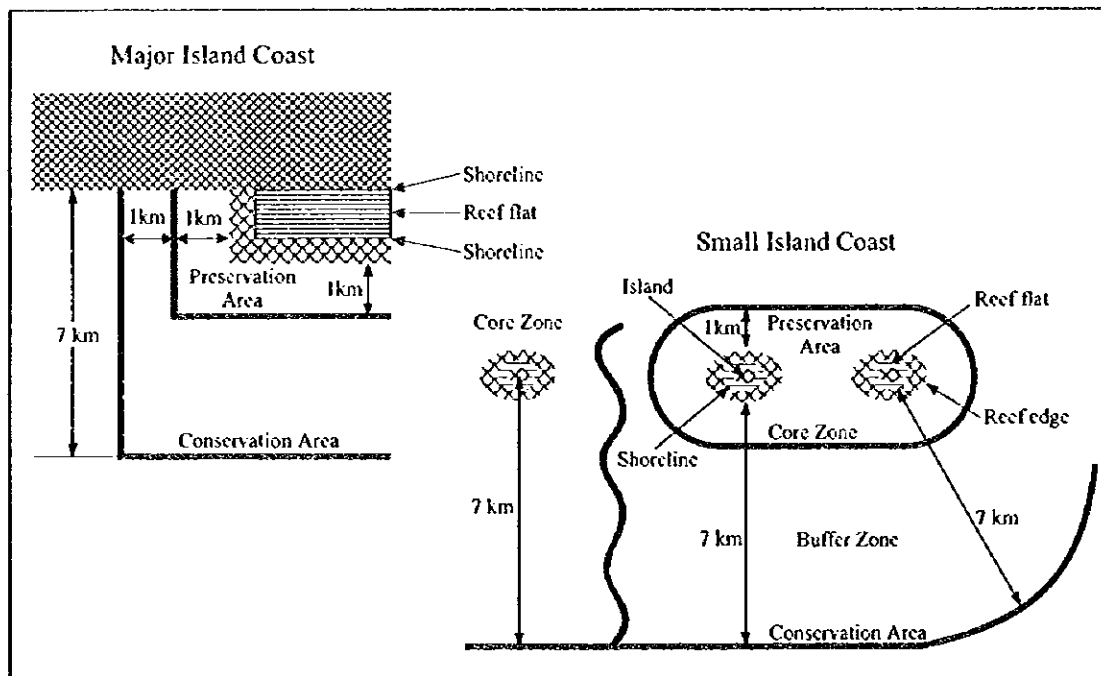
2/ : Disturbed with clear indication of logging

3/ : Disturbed by extensive logging or fishpond

CONSERVATION AREA: Considering that marine ecosystems are more closely integrated with each other through water and current, it is not as effective as in terrestrial environment to provide buffers for immediate surrounding areas alone. It is considered, though there is no academic ground, that wider water areas are to be designated as Conservation Area from the practical viewpoint to preserve target ecosystems.

Considering the boundary of municipal waters is established at 15 km from the shoreline, the proposed conservation area, which is seven km from the shoreline, is considered sufficient to mitigate indirect impact.

Figure 3-1 Schematic Drawings for Delineation of Preservation Area and Conservation Area



Source: Study Team

Accordingly, the terrestrial and marine ecosystems to be covered under Preservation Area have been identified as follows:

- a) Terrestrial ecosystems including areas above 1000 m, mossy forest and old growth forest and areas with slope above 50% (refer to Figure 3-2);
- b) Mangrove forests with community scale of more than 1,000 ha which are almost intact or in slightly disturbed condition, and those with 500 to 1,000 ha which are almost in intact condition (refer to Figure 3-3);
- c) Marine ecosystems including coral reef with relatively good to excellent condition or more than 25% live coral cover, seagrass beds bordering the core zone (Preservation Area) of mangrove and corals, seagrass beds with sightings of dugong and sightings of sea turtle (refer to Figure 3-4).

This identified Preservation Area can be compared with marine environment identified by the Study Team according to ECAN Zoning criteria (refer to Figure 3-5). As it has been discussed, it is more practical to consider the criteria on coral and mangrove to differentiate the more important ones from less important ones.

4) Proposed Environmental Management Area

On the basis of the analysis and assessment of relevant ecosystems, an integrated Environmental Management Area classification has been done (refer to Figure 3-6). Both terrestrial and marine components have been classified into Preservation Area, Conservation Area, and non-designated area. This classification is used as a basis for further environmental management and tourism planning in the study.

3.2.2 Approach

Environmental management requires a more specific framework for effective preservation and conservation of the precious ecosystems and environment. While the Environmental Management Area, which is to be eventually replaced by the legal ECAN Zoning, provides the basis of management plan formulation, it is necessary to determine specific management areas for target ecosystem or environment because management work and measures required may be different by area or target environment. The approach is conceptually shown in Figure 3-7

Classification of Environmental Management Area into sub-areas can be understood from Figure 3-8. In Northern Palawan, it is to be noted that the existing environments have degraded in many locations, therefore, considerable restoration work will be needed together with preservation and conservation activities. Unless the reservation work is timely and effectively done, the designated environments for preservation may lose environmental values. Environmental management planning based on sub-area classification has been undertaken for the selected case study areas.

Figure 3-2
Identified Terrestrial Preservation Area

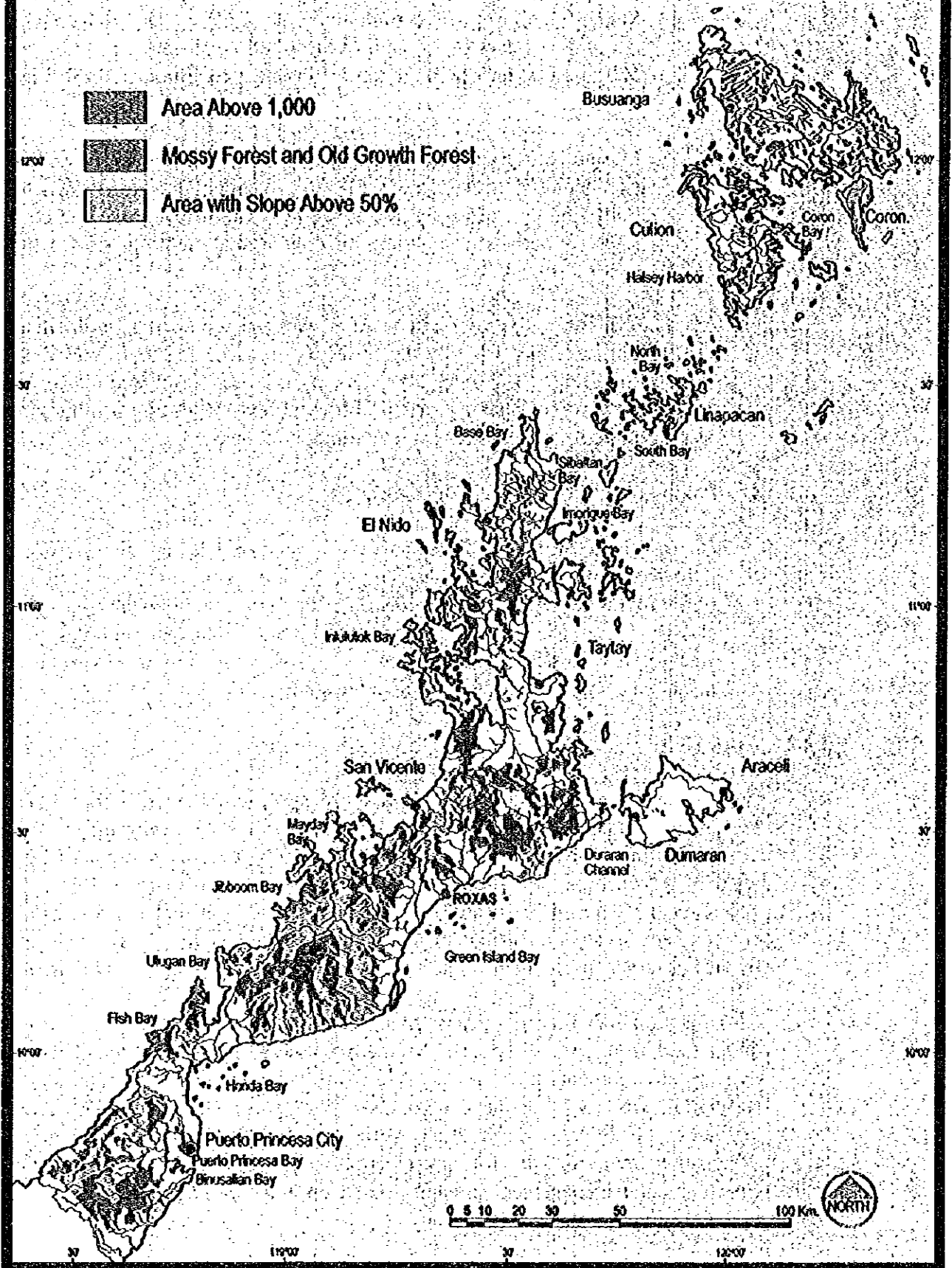
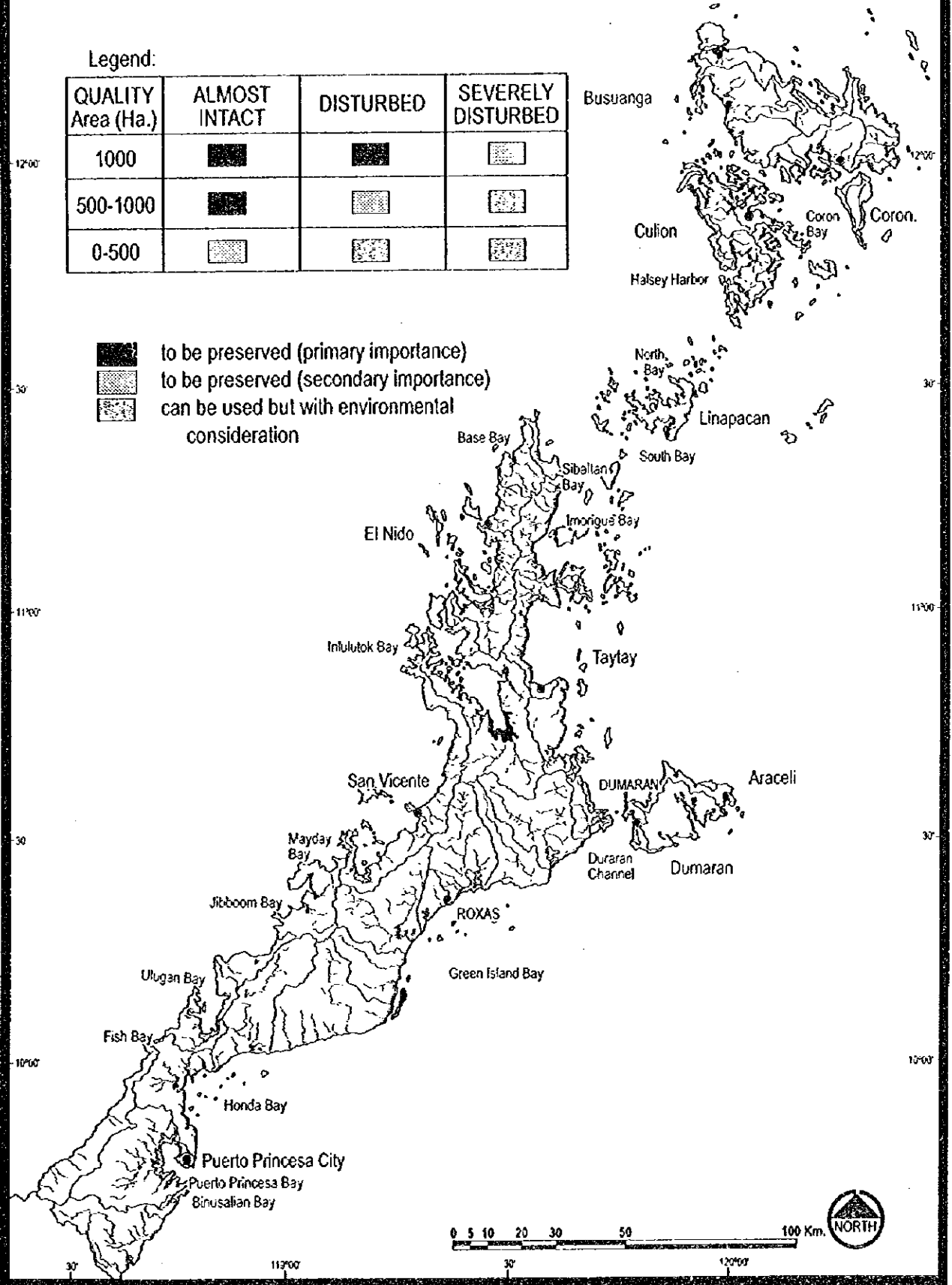


Figure 3-3
Classification of Mangrove Forest

Legend:

QUALITY Area (Ha.)	ALMOST INTACT	DISTURBED	SEVERELY DISTURBED
1000			
500-1000			
0-500			






- to be preserved (primary importance)
- to be preserved (secondary importance)
- can be used but with environmental consideration



Source: Study Team

Figure 3-4
Marine Environment to be
Designated under Preservation Area
(Proposal of Study Team)

Legend:

-  Coral Reefs with Relatively Good to Excellent Coral Condition or more than 75% Live Coral Cover
-  Slightly Disturbed Mangrove Forest more than 500 ha. and moderately disturbed Mangrove Forest 1000 ha.
-  Seagrass Beds Bordering Preservation Area of Mangrove and Corals
-  Seagrass Beds with Sightings of Dugong
-  Sightings of Sea Turtle

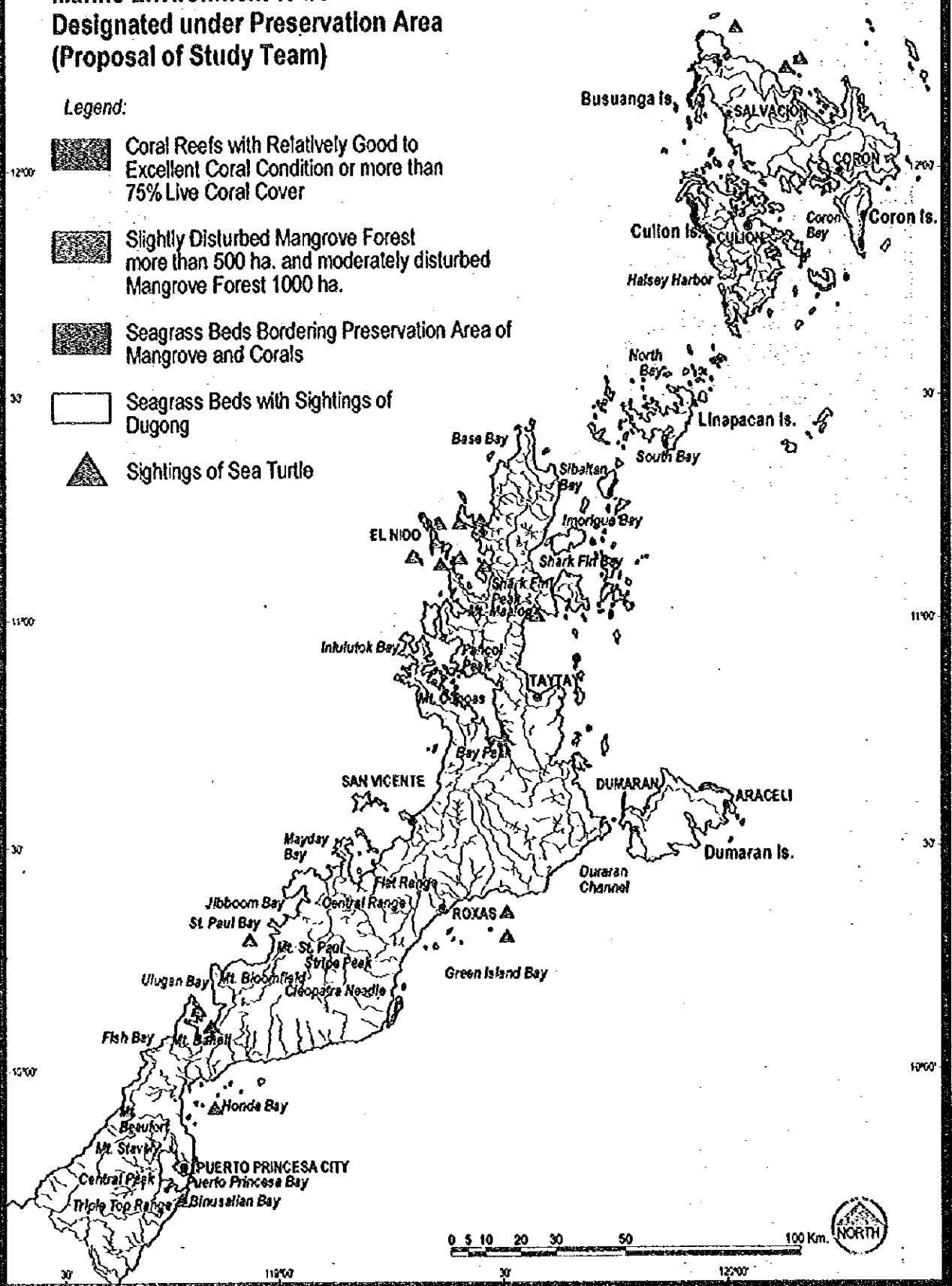




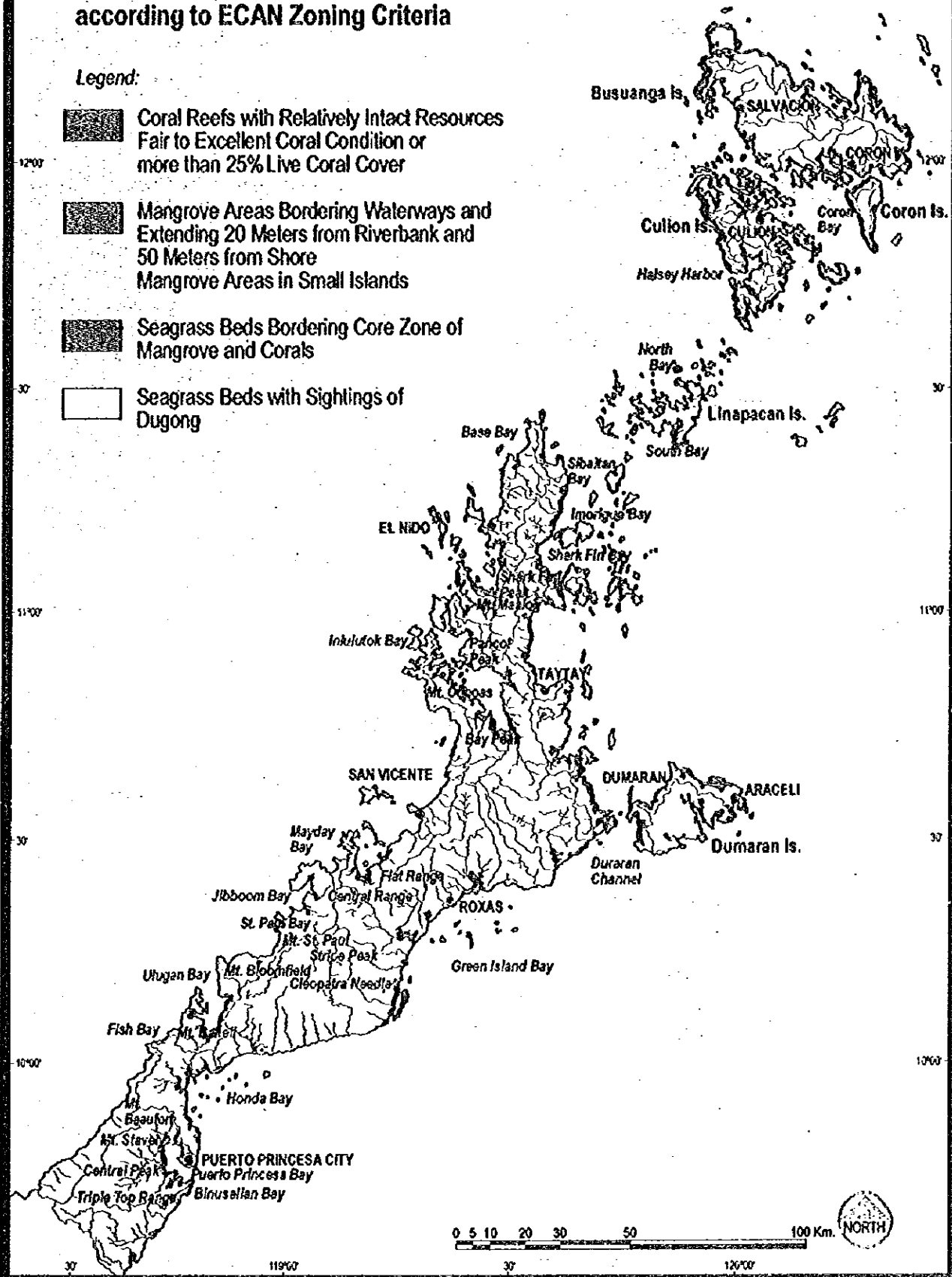


Figure 3-5
Marine Environment Identified as Core Zone
according to ECAN Zoning Criteria

Legend:

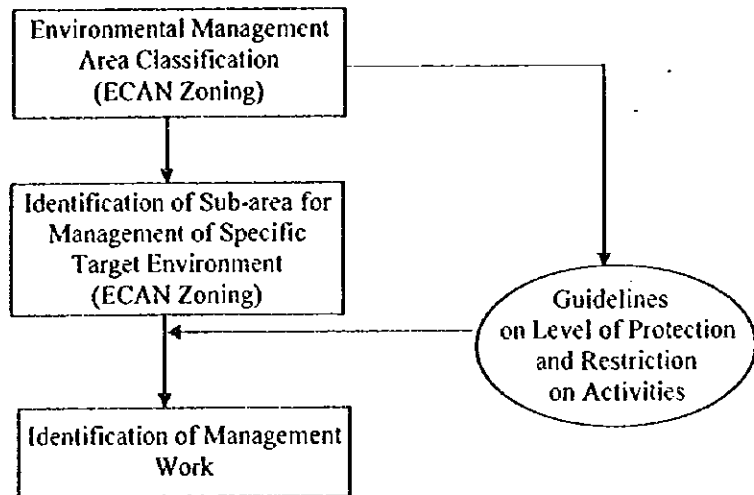
-  Coral Reefs with Relatively Intact Resources
Fair to Excellent Coral Condition or
more than 25% Live Coral Cover
-  Mangrove Areas Bordering Waterways and
Extending 20 Meters from Riverbank and
50 Meters from Shore
Mangrove Areas in Small Islands
-  Seagrass Beds Bordering Core Zone of
Mangrove and Corals
-  Seagrass Beds with Sightings of
Dugong



The necessary major environmental management activities for Northern Palawan will include the following:

- ① Restoration work
- ② Control of illegal activities
- ③ Conservation of marine environment
- ④ Conservation of terrestrial environment
- ⑤ Conservation on social environment
- ⑥ Establishment of protected area
- ⑦ Environmental monitoring

Figure 3-7 Approach to Environmental Management Plan Formulation



Source: Study Team

Figure 3-8 Concept for Sub-area Classification of Environmental Management Area

	Terrestrial Environment			Marine Environment					Social Environment	Others
Preservation Area	Forest Preservation Area	Slope Preservation Area		Coral Reef Preservation Area		Mangrove Forest Preservation Area				
Conservation Area	Forest Conservation Area	Slope Conservation Area	Terrestrial Wildlife Conservation Area	Coral Reef Conservation Area	Sea-grass Conservation Area	Mangrove Forest Conservation Area	Sea Turtle Conservation Area	Dugong Conservation Area	Indigenous Cultural Community Area	Landscape Conservation Area
Environmental Restoration Area	Restoration Area	Restoration Area	Restoration Area	Restoration Area	Restoration Area	Restoration Area	Restoration Area	Restoration Area		Restoration Area

Source: Study Team

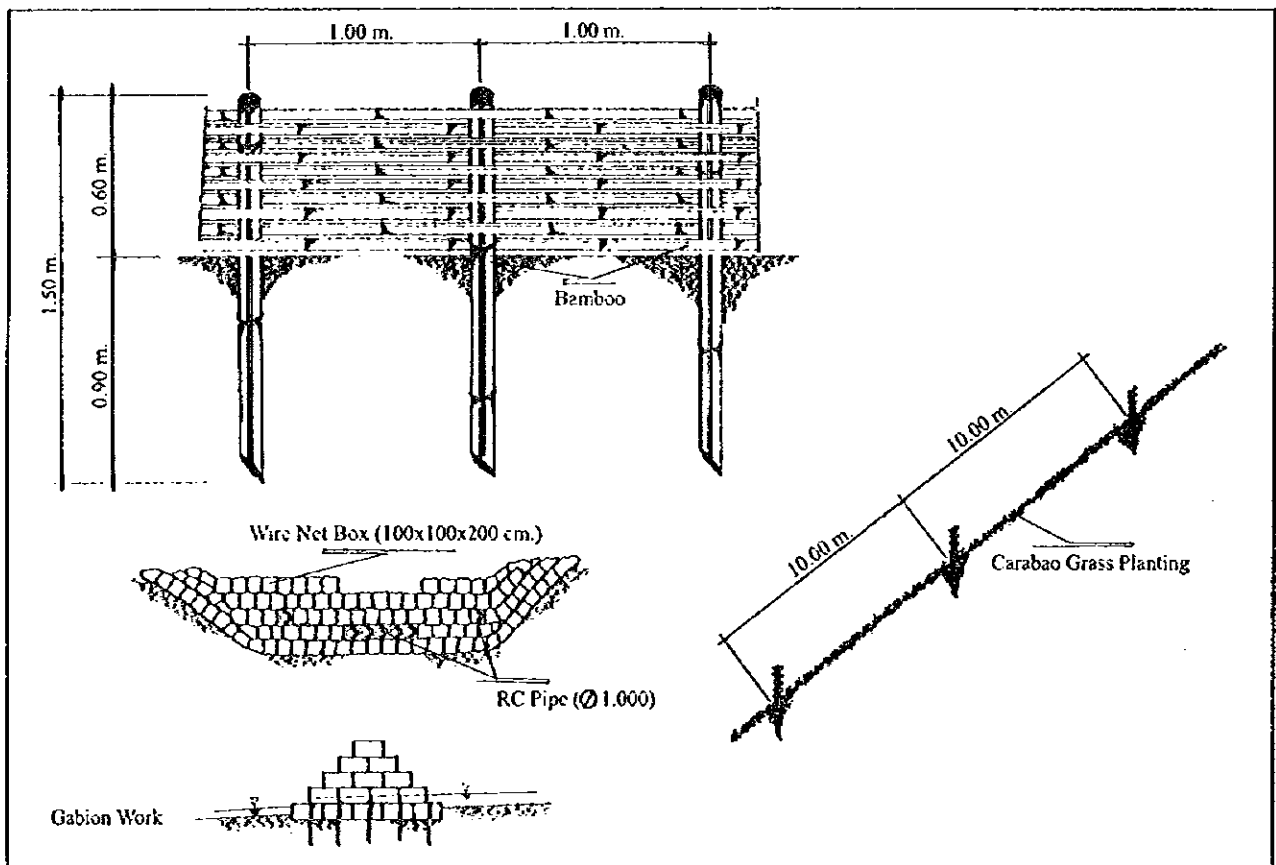
3.2.3 Restoration Work

Necessary restoration work include mainly the following:

- a) Control of Soil Erosion/Landslides: Soil erosion and landslides caused by tree cutting/kaingin and inappropriate infrastructure projects have deteriorated the ecosystem significantly. Measures that can be applied for soil stability, though depending on topographic and soil conditions, are:
- vegetation planting
 - slope stability work
 - soil erosion control works

Bamboo fence work is effective for slope stability (refer to Figure 3-9). Construction materials are locally available. Wire net gabion box work, masonry retaining wall work and mechanically stabilized earth net gabion box work may be combined.

Figure 3-9 Conceptual Plan on Fence Work for Slope Stabilization



Source: Study Team

- b) Closing of Logging Roads: Logging roads often bring about soil erosion and landslides. Those that are used and needed as community roads should be reconstructed, otherwise, these should be closed. After closing these roads, the roadside should be stabilized, for example, by planting local species of trees.

- c) Prevention of Siltation: Siltation is the cause of deteriorating corals, seagrass and mangrove. Many inner parts of reefs in shallow waters have already been buried with silt deposits. For example, in St. Paul, El Nido, Northern Taytay, and along the coast of Dumarán, the coral reef environment has changed to *Sargassum* communities. This change is irreversible. The deposits carried by ocean currents may have secondary effects on healthy corals. It may take forty to fifty years for corals to recover in areas where corals had already been killed by siltation. One hope is that there are some faster-growing coral species which may recover in a matter of years. Since it is very hard to remove already settled silt from the bottom of the ocean, prevention is the only effective restoration measure in the long run. Land restoration areas for marine environment are shown in Figure 3-10.
- (d) Prevention of Coral Destruction by Destructive Fishing Methods: In the Coron Island and Tangat Island areas, healthy coral reef are observed, but at reef edges, corals destroyed by dynamite fishing are also observed. Partially destroyed coral communities are also frequently observed. In these areas, it is highly possible that corals will recover their healthy state as soon as the destructive activities stop.
- (e) Prevention of Nutrification: Nutrification is expected to change the entire coral reef ecosystem. When nutrification continues, recovery of coral communities becoms very difficult. Measures to prevent water pollution and to protect coral communities are necessary. Water quality should be monitored in bay areas including Honda Bay, Green Island Bay and Taytay Bay.

Measures on Old Mercury Mining Site: There is an old mercury mining site, of the open-pit type, at approximately 14 kms. north of Puerto Princesa. The site was closed in 1975. The mining company conveyed the tailings to Honda Bay in the construction of a jetty. At present, people are concerned about mercury poison from the old mining site and jetty.

The tailings of mercury content may flow into the river, cultivated lands and sea. As reported in the Assessment of Mercury Toxicity Hazard Associated with Former Cinnibar Mining and Tailings Disposal in Honda Bay, Palawan, Philippines (Williams, T.M. et al., 1996), the adverse effects of the jetty is apparent although the affected area is limited to the exact vicinity of the jetty.

Two types of counter-measures are available: removing or capping. In the former method, after the people who are living on the site of the jetty have been resettled, the soil will be removed from the former mining site. In the latter, after dredging work has been done for surrounding areas, and after about 15 ha. of polluted bottom sediment has been removed, the jetty will be covered by a concrete structure (refer to Table 3-3 and Figure 3-11.) Although further study is necessary, the capping method is considered more effective.

Figure 3-10
Areas to be Restored for Marine Ecosystem Conservation

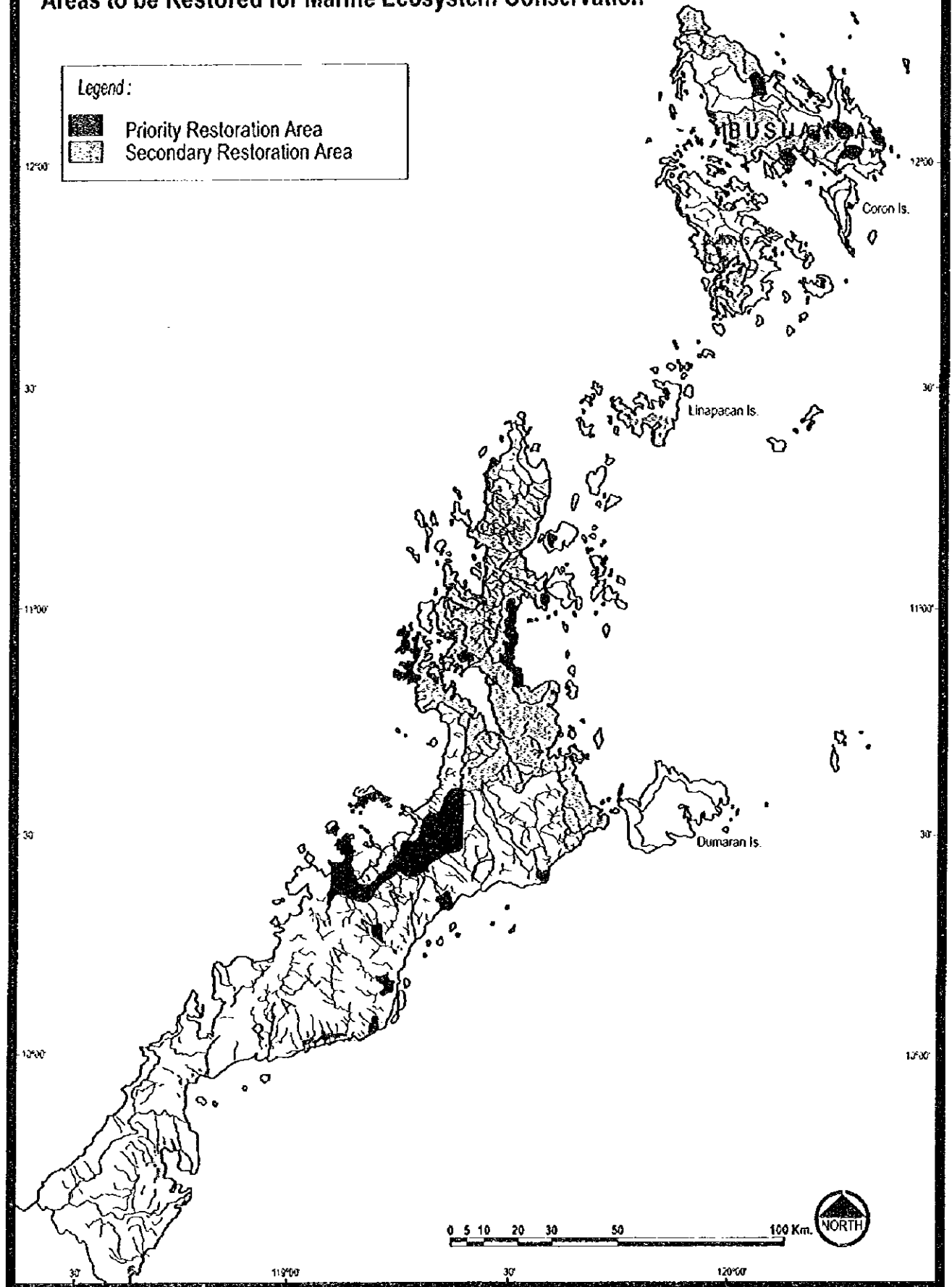
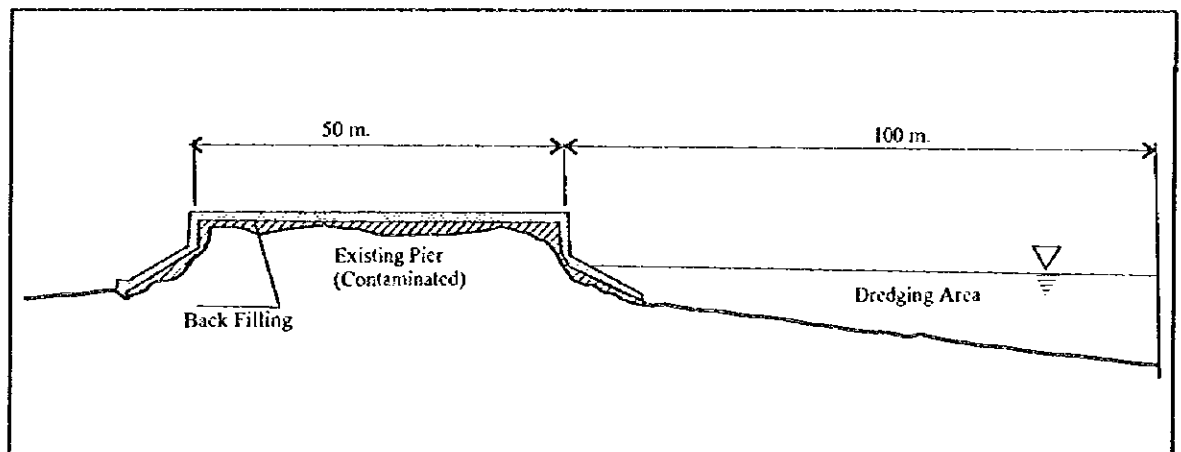


Table 3-3 Proposed Measures for Mercury-Contaminated Jetty

Item	Removal	Capping
Description of Work	Complete removal of the jetty and its surrounding bottom sediment to the former mining site	Covering of jetty with concrete, together with dredging of surrounding area
Estimated Work Volume	Estimated dredging volume: jetty : 600m (L) x 50m (W) x 4m (D) =120,000m ³ surrounding area : 30,000m ³ Total : 150,000m ³	Assuming the size is the same as the removal method: area of capping : 40,000m ³ concrete : 13,000m ³ dredging of surrounding area : 30,000m ³
Likely Environmental Impact	<ul style="list-style-type: none"> • re-suspension and dispersion of jetty soil and bottom sediment (serious) • change in coastal process (topographic change) • social impacts due to resettlement 	<ul style="list-style-type: none"> • re-suspension and dispersion of bottom sediment • social impacts due to resettlement
Environmental Consideration Required	<ul style="list-style-type: none"> • prevention of tailings and mining turbid water dispersion • preparing environmental management at disposal site • human resettlement 	<ul style="list-style-type: none"> • strengthen structures • maintenance of structures • resettlement
Estimated Cost	P 120 million	P 77 million

Source: Study Team

Figure 3-11 Capping of Mercury-Contaminated Jetty



Source: Study Team

g) Rehabilitation of Improper Infrastructure Projects

The rehabilitation of improperly contracted infrastructure projects is also critical as explained and discussed in 3) Environmental Review of Development Projects in section 2.4 Current Environmental Management.

3.2.4 Control of Illegal Activities

1) Illegal Fishing Activities

Dynamite fishing, cyanide fishing and other destructive illegal fishing activities have deteriorated coral reef areas. These should be stopped immediately. Programs to fight illegal fishing activities include the following:

- (a) Strengthening of Patrol and Monitoring: Strengthening the monitoring and patrolling of fishing activities is the most effective way of curbing illegal activities, as shown in Bantay Palawan and Bantay Puerto. Bantay Palawan recently employed public monitoring of illegal activities which is supported by fishermen and those who live along or near the shore. With this, Bantay Palawan now has many monitoring points enabling patrol boats to rush directly to crime sites.

As for cyanide fishing, the Cyanide Detection Test (CDT) Laboratory established by the BFAR and International Marine Life Alliance-Philippines, an NGO, has expanded its activity which is based in Puerto Princesa City. Random sampling of fish are carried out at markets, piers and Puerto Princesa Airport. In the first half of 1995, fish cages in Balabac, Aborlan, Taytay, Dumarán, and San Vicente were also inspected. However, it is difficult for one laboratory to cover all of Palawan. It is proposed that the following branch laboratories be established for cyanide detection in Coron and Liminangcong.

- (b) Promotion of Public Awareness: Illegal fishermen are not only local fishermen but also those from other provinces. Therefore, environmental protection measures should be undertaken nationwide. The awareness of fishermen should be promoted through seminars, campaigns, broadcast and public announcements proper media.
- (c) Provision of Alternative Livelihood: Without alternative livelihood opportunities, it may be difficult to curb or solve the problem. The currently on-going Tropical Rainforest Project with the assistance of EU intends to achieve this objective.

2) Illegal Cutting of Trees and Kaingin

Although the pace of forest disappearance has slowed down in Palawan recently, further forest loss is apparent when aerial photographs taken were compared with the Landsat images (JAFTA, 1993), most likely due to kaingin and clearing. Control of illegal cutting, kaingin and clearing is required immediately. The following measures may be considered:

- (a) Strengthening of Patrol: DENR has monitoring stations along the main roads for inspection of timber and control of illegal activities.

- (b) Establishment of Communal Forest: Even if illegal logging is prohibited, there is a local demand for timber for construction of buildings. DENR promotes the establishment of communal forests at the municipal level, which can curb illegal cutting of trees.
- (c) Promotion of Public Awareness: Public awareness campaigns and education need to be intensified. People should be informed properly on how the environment has deteriorated due to illegal cutting and kaingin.

3.2.5 Conservation of Terrestrial/Marine/Social Environment

1) Conservation of Terrestrial Environment

There are five unique and biologically significant ecosystems in Northern Palawan, including lowland evergreen rainforest, lowland semi-deciduous rainforest, submontane forest, forest over ultra-basic rocks, and forest over limestone. These five ecosystems should be conserved effectively by formulating a detailed management plan.

2) Conservation of Marine Environment

(1) Coral Reef

Palawan's coral reef have been damaged due to siltation from land and illegal fishing. The conservation of coral reef areas can be divided into the following two methods:

- conservation of terrestrial environment to avoid negative impact on coral reef; and
- direct conservation of coral reef .

Coral reef damaged by siltation can be seen widely in Northern Palawan. Land areas require restoration and conservation, if soil erosion and land slides exist, through reforestation, fence-work, check dam and others. Soil protection should be undertaken on watershed basis. Illegal fishing, anchorage, reclamation and other destructive activities against coral reefs should also be prohibited. These kinds of damages can be rehabilitated within a relatively short period of time. Patrolling is effective for the control of these illegal activities. The following are proposed to save coral reef areas:

- a) Strengthening Patrol against Illegal Fishing: Dynamite fishing, cyanide fishing and other destructive illegal fishing activities have been deteriorating coral reef areas. By constantly monitoring and patrolling against illegal fishing activities, the remaining healthy coral reef, as well as the dwindling fishery resources, can be protected.

- b) Immediate Implementation of Countermeasures against Soil Discharge: A principal cause of coral reef degradation in the study area is soil discharge to the sea and consequent siltation. Protective measures against landslides along logging roads and other measures to reduce the soil particle load to the sea should be undertaken immediately. Priority for the execution of these countermeasures shall be watersheds near healthy coral reef areas.
- c) Monitoring Survey: Monitoring sites for observing periodic change in coral communities shall be set considering the location of environmental impact and the existing condition of coral communities.
- d) Conservation Awareness Campaign: Information dissemination to fishermen and coastal residents on the importance of healthy coral reef as an environmental and tourism resource, as well as the threats of siltation and illegal fishing, should be undertaken through relevant organizations so as to accelerate conservation efforts.
- e) Environmental Education on Coral Reef Conservation: Environmental education should commence in primary schools aided by textbooks and visual aid materials.
- f) Research on Coral Reefs: Philippine coastal water is known for having the most abundant coral species in the world, and the surrounding area of Palawan is believed to have coral reef of the highest quality in the Philippines. Therefore, Palawan is a suitable location for research on coral reef communities. Studies on the ecological properties of coral species, such as growth rates, seasonal characteristics of the life cycles, tolerance to environmental changes and so forth, are indispensable to conserve coral communities.

(2) Seagrass Beds

The healthy communities of seagrass beds are distributed in the eastern to northern coasts of Busuanga Island and the western coast of Culion Island. Since seagrass beds are feeding sites of the dugong, their conservation is necessary. Although seagrass beds can resist water pollution relatively well, prevention of siltation is the key to conserving seagrass beds like in conserving corals. Proposed short-term actions include the following:

- a) Implementation of Countermeasures against Soil Discharge: Siltation has the most adverse effect on seagrass as well as on corals. Therefore, similar countermeasures to be taken for coral conservation should be considered.

- b) Monitoring Survey: Seagrass beds have been extensively identified by the Study Team. Some species on which dugongs and green sea turtles mainly feed shall be the main target for conservation. Coverage of these selected species should be monitored periodically. Grain size bottom sediment which is the most critical factor for seagrass shall also be observed.
- c) Conservation Awareness Campaign: The importance of seagrass beds as feeding ground for dugongs and green sea turtles and as nursery ground for fishery resources should be recognized, together with the adverse effect of siltation.

(3) Mangrove Forest

There are large-scale mangrove forests in the Malampaya Sound and Puerto Princesa areas. Other mangrove forest areas are Ulugan Bay, Honda Bay, Green Island Bay, the coastal areas of Dumaran Island and Culion Island. The Malampaya Sound area and the area between Busuanga Island and Calauit Island are considered to be relatively healthy mangrove forest areas. There are numerous species of flora and fauna in mangrove forests. It has the function of providing fishery resources, beach protection, settling of suspended solids, and others.

Cutting mangrove trees, developing fish ponds, pier and waterways, and using coastal resources inappropriately by dumping garbage should be prohibited in high density and wide mangrove areas. Land development should be done carefully in a way that will not cause excessive siltation. Proposed short-term actions include the following:

- a) Species Distribution Survey: Inventory of mangrove species should be prepared by conducting necessary field surveys for significant mangrove forests identified by the Study Team.
- b) Implementation of Countermeasures against Soil Discharge: In order to prevent excessive soil discharge to the mangrove area, land-based countermeasures should be taken.
- c) Monitoring Survey: Mangrove flora should be monitored periodically. Monitoring sites shall be put up considering the location of human impacts and tidal zones which define the mangrove species composition.
- d) Feasibility Study on Mangrove Plantation: This program can be conducted if the recovery of mangrove forest is required. Both seeding and seedling methods can be applied. Selection of species is very important and should be done based on adequate knowledge of habitats of mangrove species and of plantation sites.

- e) Conservation Awareness Promotion and Environmental Education: Coastal residents should be made aware of the importance and functions of mangrove forests. This campaign should be conducted by government officers and relevant organizations.

(4) Marine Wildlife

- (a) Dugong: The dugong has been declared as a protected marine mammal in the Philippines by Administrative Order No. 55, s. of 1991. Palawan's coastal water is the only area in the Philippines today where dugong sightings and reports are regularly received and confirmed, although dugongs were once distributed nationwide (Dugongs of the Philippines - A Report of the Joint Dugong Research and Conservation Program, May 1995, PCP and Toba Aquarium). Dugongs utilize Palawan's coastal water because of its suitable temperature range, abundant seagrass and shelter from rough sea conditions. The study report mentioned above suggests that the dugong population around Palawan Island is less than 30. It is very urgent that conservation measures are taken. Proposed conservation programs include the following:
 - (i) Dugong habitat survey and preparation of inventory of grazing grounds: Interviews, field reconnaissance and tagging of dugong caught accidentally are considered effective.
 - (ii) Installation of a database system which includes information on grazing grounds, historical records, traditional knowledge and traditional importance.
 - (iii) Designation of dugong sanctuary: The declaration of Taytay Bay and Green Island Bay as dugong sanctuaries will be done soon upon endorsement by the respective municipal governments. Other potential habitats of dugong shall also be considered based on further surveys. In these sanctuaries, any artificial change in topography will not be permitted. The adverse effect of soil discharge from the land on seagrass beds should immediately be reduced through appropriate measures. Dugong watching should be done with licensed tour guides. No fishing activity will be allowed to prevent incidental catching of dugongs.
 - (iv) Provision of immediate rescue activity: In the event that a dugong rescue operation needs to be undertaken, release of funds from the 'Adopt a Dugong Project,' which aims to establish a Dugong Conservation Fund from "seed" money donated by Bristol-Myers Squibb (Phils.), Inc., will be immediately expedited.
 - (v) Conservation awareness campaign: This should be conducted by government officers, NGOs and relevant organizations. The target communities are fishermen and people who live along and near the coasts.

- (b) Sea Turtles: Sea turtles are among the world's most endangered species. As declared by the International Union for the Conservation of Nature and Natural Resources, sea turtles are decreasing due to human impacts and natural causes. Three species of sea turtles have been recorded in the seas around Palawan, namely *Chelonia mydas* (green turtle), *Eretmochelys imbricata* (hawksbill) and *Dermochelys coriacea* (leatherback). Among these, only the hawksbill nests in Northern Palawan. They feed mainly on sponges growing on the coral reef. Green turtles inhabiting this area and grazing on seagrass seem to nest in other regions, mainly in Tawi Tawi. Leatherback observed around northern Palawan is regarded as merely migrating. Therefore, Palawan waters play an important role in providing nesting and feeding grounds for the hawksbill and grazing grounds for the green turtles.

Proposed sea turtle conservation programs also consist of short-term and long-term programs. Short-term programs include the following:

- (i) Turtle habitat survey and preparation of inventory of nesting beaches through interviews and field reconnaissance surveys: Tagging is one of the most effective methods.
- (ii) Installation of a database system which involves information on grazing grounds, historical records, traditional knowledge and traditional importance.
- (iii) Regulation and monitoring of hawksbill egg collection: Egg collection should be regulated through limited harvest by consent of local people. Local people including fishermen should be involved in the monitoring activity on beaching, feeding and other behavior of sea turtles together with appropriate egg collection.
- (iv) Designation of marine turtle sanctuary: DENR-PAWB has already prepared a set of criteria for the selection of sites as marine turtle sanctuaries. The general criterion is that the area should accommodate one or more species of marine turtles and their associated habitats, such as beaches, lagoons, bays or even oceans, where sea turtles nest, congregate, feed, grow, disperse and migrate.

Criteria for Selecting Marine Turtle Sanctuary

1. *Type and intensity of turtle activity in the area (i.e., nesting, breeding, feeding, etc.) For example, the site should record an average of ten nesting per week during the nesting season.*
2. *Degree and nature of any threats to the habitat and population. Major habitats are most threatened and in need of immediate action.*
3. *Status of the area relative to private and public ownership. Government-owned areas will usually be considered before privately-owned beaches.*
4. *Overall importance of the area to the species involved. A major nesting beach for a low density nester such as the hawksbill may actually contain a far lower number of actual nests than more aggregate nesters such as the loggerhead and thus are yet to be of higher priority.*

Source: DENR-PAWB

In these sanctuaries, any artificial change in topography which may impede sea turtle movement to beaches will not be permitted. Soil discharge from land should be reduced immediately through appropriate measures, because seagrass and sponges which green turtles and hawksbills feed on are easily affected by siltation. Bushes which provide shade for nesting turtles should be expanded and illumination should also be reduced. Installation of a hatchery will be considered provided care is taken so as not to disturb the sea turtle's round trip journey behavior in their life cycle. Turtle watching should also be a supervised activity under the direction of licensed tour guides. Visitors will not be allowed to approach beaching turtles, to use flashlights and to photograph turtles before egg laying. Limited number of tourists will be allowed to stay overnight in the area. No fishing activity will be allowed to prevent incidental catching of sea turtles.

- (v) Conservation awareness campaign and environmental education

3) Considerations on Social Environment

There are two major Indigenous Cultural Communities (ICCs) identified in the study area namely, Bataks and Tagbanuas. They are under pressure of cultural extinction either by limited population or limited area of distribution (in case of Tagbanuas). Different from the natural ecosystems, the social environment is difficult to either 'conserve' or 'restore' as it is constantly changing due to its interaction with the outside world and increasing awareness of the members of the community. Even so, the unique characteristics of these ICCs should be preserved for the sake of cultural diversity, or at least measures should be taken towards a harmonious co-existence with the other prevailing cultures.

At present, the only measure taken to protect their rights and interests is to award them Certificate of Ancestral Lands/Domains Claims. With this, they can maintain their traditional and indigenous way-of-life through their own initiative provided that the public supports them on such measures as alternative sources of production and income, minimum public services, information dissemination and improvement of their self-management capacity. Section 3, Article VI of DAO #2, s. of 1993, vests preparation of Ancestral Domain Management Plans on ICCs. "The Management Plan shall, among other things, take into consideration the following issues:

- (i) indigenous community participation in the protection, conservation development and use of natural resources in the area;
- (ii) protection and maintenance of indigenous community rights over livelihood sources;
- (iii) provision of supplemental source of livelihood;
- (iv) encroachment of the domain by outsiders;
- (v) treatment and participation of non-ICC members inside the ancestral domain;

- (iv) prevention of degradation of the domain and maintenance of ecological balance therein;
- (vii) resolution of overlapping claims and boundary conflicts;
- (viii) maintenance of the community's indigenous socio-cultural and spiritual integrity;
- (ix) rehabilitation of denuded forest areas;
- (x) provision of the necessary technical and financial assistance;
- (xi) inter-agency participation; and
- (xii) insurance of ICC population inside the ancestral domain."

This Management Plan is designed only for the management of individual ICCs and their Ancestral Domains. But it could be expanded into a Comprehensive ICC Development and Area (i.e., Ancestral Domain) Management Plan without losing the principle mentioned above. In proposing such Comprehensive Social Environment Development and Management Plan, due consideration should be given not only to the harmonious co-existence of socio-cultural and economic aspects of the lives of ICCs but also to sustainable environmental management and regional development.

This kind of Social Environment Planning for the ICCs can be adapted not only in the study area but also in any other area in the Philippines where the Indigenous Cultural Communities are identified and their Ancestral Domains are claimed. For this reason, it is strongly recommended that Department Administrative Order (DAO) No. 2, series of 1993, be raised to the higher status of national law at the soonest possible time.

3.2.6 Establishment of Protected Areas

The establishment of protected areas is one of the more effective environmental conservation measures which involves legal and institutional methods. Areas for possible inclusion under NIPAS include the following:

- a) National Park in Coron Island: The spectacular island of Coron should be conserved as a national heritage from the point of view of biodiversity and for landscape purposes.
- b) Lake Manguao Conservation Area: The establishment of a protected area in the lake is quite an urgent issue due to significant modification of the lake and surrounding catchment forest ecosystem. A proper study is necessary.
- c) St. Paul National Park Expansion: This expansion makes the area large enough for sustaining viable population of wildlife species. The present area covered by the national park focuses on the Underground River (cave) only. Little attention was given to various forest ecosystems. Thus, the present expansion of the national park, which incorporates terrestrial ecosystem conservation, should be immediately pursued.

- d) Irawan and Iwahig River Conservation Area: As part of Iwahig Penal Colony, the ecosystem has been relatively conserved. However, lowland forest and fresh water ecosystems have been much more threatened than before due to population pressure. The area should be established as a protected area as soon as possible, taking into consideration ecological components and utilization plans.
- e) Coral Community in Busuanga West: Along the west coast of the Busuanga Peninsula in Busuanga Island, the coral reef areas and seagrass communities are so much richer compared to other areas in Northern Palawan. This area should be protected against illegal activities, and should be designated as a marine protected area immediately.

3.2.7 Enhancement of Environmental Monitoring

Environmental monitoring is an important component in effective management. However, no one is monitoring the environment regularly in Northern Palawan. DENR and PCSD do not have monitoring capabilities due to lack of human resource and budgetary constraints. Necessary actions/programs for strengthening environmental monitoring include the following:

- a) Building Environmental Database: Environmental data is necessary for environmental administration and scientific study. Environmental data should be collected, compiled and maintained up to date. Database management and maintenance is very important. The monitoring capacity of the government, particularly PCSD, should be strengthened.
- (b) Terrestrial Environment Monitoring for Conservation Purpose: This specifically includes changes in vegetation by making use of satellite data and monitoring swift bird population with regard to Nido hunting in Bacuit Bay.
- (c) Marine Environmental Monitoring for Conservation: This covers coral reef, seagrass beds and mangrove forests. Monitoring of coral reef can be done by way of analyzing aerial photos which should be taken periodically, and by spot diving survey for detailed assessment. Survey items include coral species, living and dead coral cover, existence of crown of thorns and degree of damage, degree of siltation, existence of bleaching, seaweed cover, coral fishes, reef-associated fishes and water quality (water turbidity and water transparency) at selected monitoring sites (refer to Table 3-4.)

Seagrass condition can be monitored based on the same method used for coral reefs. Aerial photo analysis is also applicable for mangrove monitoring.

- (d) Marine Environmental Monitoring for Restoration Activities: Periodic underwater surveys are required to monitor the effect of restoration of corals. Major data and information to be recorded in the survey include depth of siltation, coral condition, and *Sargassum* condition. The survey should be conducted at selected stations periodically. Seagrass, under the current

Table 3-4 Recommended Monitoring Sites of Marine Environment

Coral Condition	Area	Survey Sites
Healthy Corals	North-western Coast of Busuanga Island	1
	Western Coast of Culion Island	2
Damaged by Siltation	Taytay Bay	1
	Sharks Fin Bay	1
Small Healthy Corals	Coron Island	1
	North-eastern Islands of the Main Island	1
	Off-shore Islands of Bacuit Bay	1
	Honda Bay	1
	Green Island Bay	1
Total		10

Source: Study Team

condition, does not require intensive monitoring. Siltation conditions in mangrove forests should be monitored together with the restoration work in hinterlands. Monitoring points should be selected adequately to examine species and growths of mangroves. This survey includes structure of species, height, seed growth and condition of silt deposit in the root area.

- (e) Monitoring Survey on Hawksbill Sea Turtle Nesting Beaches in Bacuit Bay Conservation Area: Small islands in Bacuit Bay serve as Hawksbill sea turtle nesting sites. At the same time, unique limestone karst islands have become tourist destinations. In order to share beaches with sea turtles, monitoring of sea turtle nesting is essential so that an effective management program can be formulated and implemented.

3.2.8 Strengthening Environmental Management Organizations

Local governments and PCSDS do not have the capacity to implement environmental management schemes. It is therefore proposed that the Palawan Natural Resource Conservation Center (PNRCC) be established in order to assist those agencies by providing:

- training for local government staff, PCSDS, and guides;
- research on natural resources;
- collection and provision of environmental data and information;
- environmental education and dissemination; and
- accommodation for trainees and researchers.

Activities of PNRCC could initially cover the province of Palawan and then later on expanded nationwide. The existing marine reserve (established under DENR AO No. 4, s. of 1991), nesting beaches of sea turtles, and dugong habitats make PNRCC's establishment appropriate for the area. PNRCC may be managed by PCSD in cooperation with DENR. Training of provincial and municipal government staff, PCSDS, Barangay Environmental Managers, tourism guides, diving guides etc., may be conducted by DENR, academic institutions, NGOs and foreign technical assistants. Possible training courses, are as follows:

- Topographic survey, including field survey
- Principle of terrestrial resources management
- Field survey technique for terrestrial environmental survey
- Principle of marine resources management
- Field survey technique for marine environmental survey
- Data analysis
- Environmental impact assessment
- Philippine environmental regulations and system

Proposed PNRCC research program necessary to facilitate proper environmental planning and management are as follows:

Table 3-5 Proposed Research Program of PNRCC

Research Period	Research Programs
Short Term Programs	<ul style="list-style-type: none"> - Terrestrial Environmental Profile - Marine Environmental Profile - Terrestrial Endangered Species Protection Program - Sea Turtle Protection Program - Dugong Protection Program - Establishment of Palawan Natural Resources Data Base
Long Term Programs	<ul style="list-style-type: none"> - Monitoring for Terrestrial Environment - Monitoring for Marine Environment

Source: Study Team

A sea turtle and dugong museum will be established to facilitate research and to provide environmental information and educational opportunities to the public. The following facilities and equipment are required:

<u>Training and Research Section</u>		
(1) Building (4,800 m ²)		
a) <u>Main building (RC 2 floors)</u>		
office room	1 rm.	(80m ²)
staff room	4 rms.	(200m ² X 4 rooms)
seminar room	3 rms.	(50m ² x3rms)10px/rm.
library	1 rm.	(80 m ²)
chemical laboratory	1 rm.	(100 m ²)
biological laboratory	1 rm.	(100 m ²)
data processing room	1 rm.	(50m ²)
storage room	2 rms.	(50 m ² x 2 rooms)
b) <u>Lodging house (RC 2 floor)</u>	20 rms	(300 m ²)
c) <u>Warehouse for equipment</u>	1 bldg.	(100 m ²)
d) <u>Car park (2 buses, 20 cars)</u>		(800 m ²)
(2) Other facilities		
- improvement of existing pier		(200 m)
- warehouse for boat maintenance		(150 m ²)

(3) Equipment	
- chemical analysis equipment	1 set
- biological analysis equipment	1 set
- boats for survey	2 boats
- researcher/trainee SCUBA gear	15 sets
- topographic survey equipment	5 sets
- Global Positioning System	3 sets
- Geographic Information System & computer	1 set
<u>Museum Section</u>	
(1) Building	
a) <u>Sea Turtle and Dugong Museum</u>	
floor size	(700m ²)
area	(900m ²)
b) <u>Visitor Center/Kiosk/Coffee shop</u>	
floor size	(300m ²)
area	(1,000 m ²)
c) <u>Souvenir shop for a Product Featuring a Character</u>	
floor size	(400m ²)
area	(1,400m ²)
(2) <u>Car Park</u>	
capacity: 7 buses/40 cars	(1,400m ²)

Source: Study Team

3.2.9 Cost Estimate of Environmental Conservation and Restoration

Costs necessary for environmental conservation and restoration for the period 1997 and 2010 have been preliminarily estimated and shall cover the following:

- Management for Environmental Management Area
- Protected Area Management
- Illegal Fishing Patrol Operations
- Rehabilitation of Eroded Areas
- Road Improvement

1) Estimated Cost of Management for Environmental Management Area

The proposed Environmental Management Area requires proper management. A total of 40 stations should be established for effective patrol and monitoring (refer to Table 3-6). Each station covers approximately 15 km². A total of P63 million initial cost and about P20 million annually are required.

Table 3-6 Estimated Cost of Management for Environmental Management Area by Municipality, 1997-2010

Municipality	Core Zone (km ²)	Buffer Zone (km ²)	Number of Stations	Initial Cost ^{2/} P million	Operation & Maintenance ^{3/}		Total :P million (1997-2010)
					P 000 per year	P mil (1997- 2010)	
Busuanga	100	170	2	3.1	1,070	15	18.1
Coron ^{1/}	300	220	3	4.7	1,500	21	25.7
Culion	80	200	2	3.1	1,070	15	8.1
Linapacan	30	50	1	1.6	500	7	8.6
El Nido	240	240	3	4.7	1,500	21	27.7
Taytay	230	320	4	6.3	2,070	29	35.3
Dumaran	190	220	4	6.3	2,070	29	35.3
Araceli	10	20	7	11.0	3,570	50	61.0
Roxas	540	390	3	4.7	1,500	21	25.7
San Vicente	530	140	1	1.6	500	7	8.6
Puerto Princesa ^{4/}	1,400	390	10	16.1	5,070	71	87.0
TOTAL	3,650	2,360	40	63.1	20,420	286	349.1

Source: Study Team

1/ Excluding the protected areas of Coron Island

2/ Initial cost includes equipment procurement + basic infrastructure

3/ Operation and maintenance cost includes staff and operations

4/ Excluding St. Paul/Mt. Bloomfield/Cleopatra Needle

2) Protected Area Management

Two protected areas proposed by the Study Team including Coron Island (3,070 ha.) and St. Paul/Mt. Bloomfield and Cleopatra Needle (33,900 ha.) be established. Cost estimate for the management of these areas, based on "Conservation of Priority Protected Areas Project, 1994" (The World Bank), is P9.9 million for initial cost and P2.1 million/year for operation and maintenance (refer to Table 3-7).

Table 3-7 Estimated Cost of Protected Area Management, 1997-2010

Item	Coron Island (3,070 ha) : P 000	St. Paul/Mt. Bloomfield/ Cleopatra Needle (33,900 ha) P 000	Total : P 000	Total: P mil. (1997-2010)
Initial Cost				
• Equipment Infrastructure	1,360 ^{1/}	1,755	3,115	3.1
• Basic Infrastructure	470	470	940	0.9
• Protected Area Management	150	5,700	5,850	5.8
Total	1,980	7,925	9,805	9.8
Operation and Management Cost				
• Staff Build-up	600/yr.	800/yr.	1,400/yr.	19.6
• Operation	140/yr.	600/yr.	740/yr.	10.4
Total	740/yr.	1,400/yr.	2,140/yr.	30.0

Source: Study Team

1/ for year 2004, only for replacement of equipment

3) Illegal Fishing Patrol Operation

Patrol is an effective measure against illegal fishing. For this purpose, Northern Palawan is divided into 48 patrol sub-areas. A total initial cost of P 60 million and P179 million per year are needed for this activity (refer to Table 3-8).

Table 3-8 Estimated Cost of Patrol Operation Against Illegal Fishing by Municipality

Municipality	No. of Patrol Areas	Initial Cost: P million ^{1/}	Operation and Maintenance Cost ^{2/}		Total 1997-2000 P 000
			P 000/yr.	P million (1997-2010)	
Busuanga	3	3.8	800	11.2	15.0
Coron	6	7.5	1,600	22.4	29.9
Culion	4	5.0	1,070	15.0	20.0
Linapacan	6	7.5	1,600	22.4	29.9
El Nido	4	5.0	1,070	15.0	20.0
Taytay	7	8.8	1,870	26.2	35.0
San Vicente	3	3.8	800	11.2	15.0
Roxas	2	2.5	530	7.4	9.9
Dumaran	3	3.8	800	11.2	15.0
Araceli	3	3.8	800	11.2	15.0
Puerto Princesa	7	8.8	1,870	26.2	35.0
TOTAL	48	60.3	12,810	179.4	239.7

Source: Study Team

1/ Initial cost: P1 million/boat and P250,000/set of equipment

2/ Operation and maintenance cost: A crew is composed of a pilot, a head and two rangers with annual salaries of P60,000, P36,000 and P27,000, respectively. Fuel consumption is assumed at 50 liters/day for 250 days a year.

4) Rehabilitation of Eroded Areas

Damaged areas have been divided into priority restoration areas and secondary restoration areas (refer to Figure 3-10). Priority restoration areas are severely eroded areas. Countermeasures to soil erosion include reforestation, fence work and gabion box. The estimated costs add up to as much as P4.3 billion (refer to Table 3-9)

5) Road Improvement

A total of 60 km of road sections have been identified for rehabilitation in terms of drainage and slope protection. The estimated cost is P202 million (refer to Table 3-10.)

Table 3-9 Estimated Cost of Rehabilitation of Eroded Areas^{1/}

Municipality	Eroded Area: ha.	Reforestation Work ^{1/} : P million	Required Fence Work: P million	No. of Gabion Box (small): P million	No. of Gabion Box (large): P million	Total: P million
Busuanga	1,601	32	0	0	0	32
Coron	4,987	98	0	0	0	98
El Nido	295	45	0	0	0	45
Taytay	9,384	129	362	0	0	491
San Vicente	21,876	302	1,862	7	60	2,231
Roxas	11,130	153	949	2	12	1,116
Puerto Princesa	2,829	39	240	2	18	299
Total	52,103	798	3,413	11	90	4,312

Source: Study Team

1/ Reforestation in Busuanga island is assumed to be 100% of eroded area, while that in mainland, 80% of eroded area. For areas which require reforestation with fence work, only 70% of each eroded area and fence work at 5% of each eroded area will be done..

Table 3-10 Estimated Cost of Road Improvement

Name of Road	Section	Length: km	Cost P million
1) El Nido San Fernando Road	El Nido - Barotoan	0.5	2
2) - do -	Barotoan - San Fernando	1.5	6
3) Pancol - Binaluan Road	Pancol - Binaluan	4.0	15
4) Pamantolon - Busy Bees Road	Pamantolon - Busy Bees	16.0	34
5) Tumarbong - Sta. Teresita Road	Taradungan - Ilfan	5.0	17
6) San Jose - Port Barton Road	San Jose - Port Barton	6.0	23
7) - do -	- do -	2.5	10
8) Magara - Caruray Road	Magara - Little Caramay	4.0	15
9) Puerto Princesa - Roxas	Manalo - Binouyan	17.0	65
10) - do -	Binouyan - Tinitian	4.0	15
Total		60.5	202

Source: Study Team

6) Total Cost for Conservation and Restoration of Environment

It will roughly cost P5.3 billion pesos to carry out environmental restoration work in 1999-2010, as follows:

i) Environmental zoning management	P 349 million
ii) Protected area management	P 40
(iii) Illegal fishing patrol operation	P 240
(iv) Rehabilitation of eroded area	P4,312
(v) Road improvement for environment	P 202
Total	P5,143 million

The estimated costs by municipality are summarized in Table 3-11. It is clearly seen that larger environmental restoration/conservation costs are needed for San Vicente, Roxas, Taytay, and Puerto Princesa, largely due to the rehabilitation of eroded areas.

Table 3-11 Estimated Cost of Environmental Restoration/Conservation in Northern Palawan

Municipality		P million						Total (1997-2010)
		Environ-mental Area Mgt.	Protected Area Mgt.	Illegal Fishing Patrol	Rehab. of Eroded Areas	Road Rehab.	Total	
Busuanga	Capital	3.1	-	3.8	32.0	-	38.9	65.5
	O&M/yr.	1.1	-	0.8	-	-	1.9	
Coron	Capital	4.7	1.9	7.5	98.0	-	112.1	165.3
	O&M/yr.	1.5	0.7	1.6	-	-	3.8	
Culion	Capital	3.1	-	5.0	-	-	8.1	38.9
	O&M/yr.	1.1	-	1.1	-	-	2.2	
Linapacan	Capital	1.6	-	7.5	-	-	9.1	38.5
	O&M/yr.	0.5	-	1.6	-	-	2.1	
El Nido	Capital	4.7	-	5.0	45.0	-	54.7	89.7
	O&M/yr.	1.5	-	1.0	-	-	2.5	
Taytay	Capital	6.3	-	8.8	491.0	-	506.1	562.1
	O&M/yr.	2.1	-	1.9	-	-	4.0	
Dumaran	Capital	4.7	-	3.8	-	-	8.5	49.1
	O&M/yr.	2.1	-	0.8	-	-	2.9	
Araceli	Capital	1.6	-	3.8	-	-	5.4	67.0
	O&M/yr.	3.6	-	0.8	-	-	4.4	
San Vicente	Capital	6.3	-	3.8	2,231.0	-	2,241.1	2,259.3
	O&M/yr.	0.5	-	0.8	-	-	1.3	
Roxas	Capital	11.0	-	2.5	1,116.0	-	1,129.5	1,157.5
	O&M/yr.	1.5	-	0.5	-	-	2.0	
Puerto Princesa	Capital	16.0	7.9	8.8	299.0	-	331.7	449.3
	O&M/yr.	5.1	1.4	1.9	-	-	8.4	
N. Palawan	Capital	-	-	-	-	201.4	201.4	201.4
Total	Capital	63.1	9.8	60.3	4,336.0	201.4	4,607.6	5,143.6
	O&M/yr.	20.6	2.1	12.8	-	-	35.5	
Total (1997-2010)		351.5	39.2	239.5	4336.0	201.4	5,143.6	

Source: Study Team

3.2.10 Financing of Environmental Management Costs

While the importance of environmental conservation has been recognized more and more by various government agencies and people, a concrete management system has hardly been established. Particularly, the absence of a reliable financing mechanism is a critical issue. Therefore, in this section, possible ways of financing needed for environmental conservation and restoration in Northern Palawan have been studied in conjunction with tourism development.

Estimated costs required for environmental conservation and restoration are roughly P4.6 billion as initial cost and at least P35 billion per year. The estimated costs, however, involve the following characteristics:

- (a) Rehabilitation of the eroded areas requires the most part of initial cost which is needed in the earliest time; and
- (b) Rehabilitation cost needs vary by area. San Vicente needs almost 50% of the total capital cost, followed by Roxas 25%, Taytay 10%, Puerto Princesa 7%, and so on.

In financing the environmental conservation, a conventional mechanism should be first practised properly. For example, rehabilitation of roads should be the responsibility of agencies who implemented the projects before spending money for new construction; patrol of illegal fishing should be strengthened at municipal level wherein initial financing for adequate facilities, equipment and training be assisted by higher administration but operation costs should be shouldered by beneficiaries; protected area management be responsible by central government. Environmental area management should be the responsibility of relevant municipalities who should also shoulder operation costs, however, initial technical and financial assistance in preparing ECAN Zoning and proper organization/facilities be assisted by higher administration. Although the seriously eroded areas are concentrated in limited municipalities, the issue should be viewed from the regional and national levels considering that the impacts spread widely.

Absolute lack of finance at all levels of administration is the most critical issue. It is difficult to divert the available funds more to environment, unless new source of funding becomes available. Possible ways are suggested as follows:

- a) **Creation of Environmental Tax:** In principle, whether it is called tax, fee, or contribution, the beneficiaries of environment should contribute to the conservation of the environment. They are those engaged in the tourism industry, including tourists, as well as fishing and agricultural industries, etc. This new revenue source would be able to cover operation and maintenance costs of the proposed environmental management sufficiently.
- b) **Introduction of ODA:** How to generate a large amount of initial costs is the most critical. However, if the above environmental tax concept is adequately realized, it can generate considerable amount of additional revenue, especially in the later years when tourism is fully developed. Therefore, in order to meet the immediate financial requirements, the most realistic way is the introduction of ODA in the form of grant and soft loan.