“Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand”

National Reports on Wetlands in South China Sea
NATIONAL REPORT

on

Wetlands in South China Sea

CAMBODIA

Mr. Koch Savath
Focal Point for Wetlands
Department of Nature Conservation and Protection, Ministry of Environment
48 Samdech Preah Sihanouk
Tonle Bassac, Chamkarmon, Cambodia
Table of Contents

1. INTRODUCTION .............................................................................................................................1
2. COASTAL WETLAND ECOSYSTEM .............................................................................................1
3. CURRENT WETLAND SYSTEMS .................................................................................................2
   3.1 WETLAND CLASSIFICATION SYSTEM ..................................................................................2
   3.2 COASTAL WETLAND TYPES ...............................................................................................3
      3.2.1 Marshes .....................................................................................................................3
      3.2.2 Swamps ....................................................................................................................3
      3.2.3 Peatlands ..................................................................................................................3
   3.3 INTERNATIONALLY SIGNIFICANT WETLAND SITES .........................................................4
      3.3.1 Brackish Water Wetland Sites ................................................................................4
      3.3.2 Marine Wetland Sites ..............................................................................................4
4. WETLAND RESOURCES AND ECONOMIC VALUATION .........................................................6
   4.1 COASTAL WETLAND RESOURCES ....................................................................................6
   4.2 ECONOMIC VALUATION OF WETLANDS ...........................................................................7
5. CAMBODIAN DATA AND INFORMATION ON WETLANDS ....................................................9
   5.1 GENERAL DATA ................................................................................................................9
   5.2 INFORMATION RELATED TO WETLANDS ......................................................................10
   5.3 MAPPING DATA RELATED TO WETLANDS ......................................................................10
6. CONCLUSION AND RECOMMENDATIONS .............................................................................11
REFERENCES .................................................................................................................................12

List of Tables and Figures

Table 1 Relationship between Shrimp Farm Productivity and Age
Table 2 Price of Charcoal Production from 1997-2000
Table 3 Direct Use Value per ha of the Mangrove by the Local Populations
Table 4 Indicative Economic Value of Major Coastal Ecosystems
Table 5 Total Value within the Three Wetland Sites per Year
Figure 1 System for the Classification of Wetlands
Figure 2 Description of the Classification of Wetland Systems

Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand
1. INTRODUCTION

The Kingdom of Cambodia is rich in wetland environments. Over 30 percent of the country is considered wetlands (according to the wetlands inventory and management project). Following internationally accepted criteria for wetland identification (defined by the Ramsar Convention) over 20 percent ($36,500km^2$) of the country may be classified as wetlands of international importance. This represents over five percent of Asia's total area of wetlands of international importance.

Wetland areas support rice and fish production – the primary sources of food for the vast majority of the population and currently Cambodia's most economically productive sectors. Fish and fish products are the single most important sources of protein for the Cambodian population, representing 75 percent of the animal protein intake. Wetlands provide nutrient-rich and sheltered habitats for fish (breeding, spawning and nursery areas or habitats for adults) and therefore they play a central role in the supply of animal protein in Cambodia. Agriculture is supported by water from wetlands. Wetland water may be stored for use in the dry season or withdrawn for irrigation purposes. Other economic activities utilizing wetland resources include aquaculture, tourism, inland transport, and energy (hydro-electricity).

Wetlands serve a wide variety of ecological functions that support economic activities or are of economic value. In addition to supporting agriculture and fisheries, they play a vital role in maintaining the water cycle and protecting inland areas from flooding. Coastal wetlands act as barriers against storm surges and protect the coastline from erosion. Many wetlands are important as filtering systems - cleaning up polluted water and removing silt, encouraging plant growth, and further improving water quality. Cambodia's wetlands are important sanctuaries for birds and other species of wildlife not commonly found in other countries in the world. They are also important for research and educational purposes.

2. COASTAL WETLAND ECOSYSTEM

The Cambodian coastline extends along 435km of some of the least populated areas in all of tropical Asia. The coastal region features a number of closely interrelated ecosystems, embracing beach forest and strand vegetation, mangroves (including a Melaleuca dominated swamp forest referred to as “rear mangrove,” estuarine ecosystems, seagrass, coral reef and the unstudied marine ecosystems of the gently sloping, relatively shallow seabed (only 80 meters of water depth at the outer limit of the 200 nautical mile Executive Economical Zone), and of the water column above.

Estuaries are semi-enclosed bodies of water that are connected to the sea and in which salt water is diluted by fresh water from land drainage. Estuaries are often highly productive areas due to the nutrients they receive from the land and the sheltered environments that they provide.

The major estuarine areas in Cambodia occur in the region around Koh Kong province and near Kampot province. The Stung Koh Pao and Stung Kep estuaries are recognized as wetlands of international significance. Both rivers originate in the Cardamom range and discharge their flow into Koh Kong Bay. The Bay is protected from southwest storms by the large island of Koh Kong. The estuarine system is "a complex of channels and creeks, low islands, mangrove swamps, tidal mudflats and coastal lagoons."

Mudflats occurs when sediment settles out of the water due to a decrease in current and/or wave action. Mudflats are often associated with estuaries, but also occur in low-energy, coastal environments, such as in large bays or in the lees of islands. They are commonly continuous with mangrove areas. Mudflats can be very productive system as a result of nutrients recycling through the sediments. Typically there are high diversities of invertebrates living in and on the mud, and as a result, the mudflats provide rich feeding grounds for vertebrates such as fish and waterbirds.

Mudflats adjacent to the mangroves and in natural mangrove streams are exploited for cockles, although this is generally an unrewarding activity practiced only by those with no alternative form of income.

The productivity of estuaries and mudflats is threatened by pollution from a range of sources, e.g. construction activities outside mudflats can have adverse effects by causing the inflow of water, which either erodes the mudflats or prevents further deposition. The location, extent, and significance of mudflat areas in Cambodia have not been adequately studied.
3. CURRENT WETLAND SYSTEMS

3.1 Wetland Classification System

In the Cambodian Wetlands Inventory, for a site to be classified as a wetland, it must meet one of the following criteria:

- Plants able to tolerate inundation by water for a period of greater than six weeks (hydrophilic plants);
- Soils are classified as hydric soils; and
- The area is inundated by water for a period on an annual and periodic basis (see below for further explanation).

A system for the classification of wetlands has been developed for Cambodia since 2000. This system provides for the classification of wetlands based on a number of functional characteristics. These characteristics allow for the classification into systems, categories, sub-categories, and modifiers that describe the wetland sites (Figure 1). This classification system proposes to describe the important characteristics of particular wetland sites. It considers the wetlands in terms of water regime, substrate, vegetation type, etc. In combination, these definable characteristics should be able to provide a clear categorization of each wetland type.

This system can be called a "Hierarchical approach" to the classification of wetlands. This is a process to evaluate a particular set of characteristics through a series of levels related to the characteristics of each particular site. At each step of this process more detailed information is gathered to refine the description of the area. At the end of this process, the unique characteristics to identify the wetland habitat will have been identified.

![Figure 1 System for the Classification of Wetlands.](image-url)

The first level of classification is the system. The system level allows for the classification of wetland habitats into broad functional ecosystems. The system is classified into Saltwater Wetland Systems and Freshwater Wetland Systems. Saltwater Wetland Systems are classified into Marine and Estuarine. Freshwater Wetland Systems are classified into Riverine, Lacustrine and Palustrine. Figure 2 represents the classification of the wetland system of Cambodia.
Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand

3.2 Coastal Wetland Types

3.2.1 Marshes

Marshes have a number of specific characteristics: they are usually dominated by reeds, rushes, grasses and sedges. These plants are commonly referred to as emergents since they grow with their stems partly in and partly out of the water. Marshes are sustained by water sources other than direct rainfall. They can vary a lot in response to often-subtle hydrological and chemical differences. Marshes include some of the most productive ecosystems in the world.

Dominant plants in most freshwater marshes include species of reeds (Phragmites; traing), bulrush (Typha), clib rush (Scirpus; kok), spike rushes (Eleocharis) and grasses such as paragrass (Brachiaria mutica; smau barang). In Cambodia a good example of a marsh can be found close to Phnom Penh in the Bassac marshes, which is an area between the Mekong and Bassac Rivers that floods very year.

3.2.2 Swamps

Swamps are often confused with marshes. They are, however, very different. Swamps generally have saturated soil or are flooded for most, if not all of the growing season. They are often dominated by a single emergent herb species or are forested (e.g. the Plain of Reeds in the Mekong Delta). The Tonle Sap lake, for example, was until recently surrounded by a belt of freshwater swamp forest (the flooded forest).

According to a study by the Mekong Secretariat in 1991, there are 1.2 million ha of grassland and other swampy areas associated with the flooded forests in Cambodia (MRC, 1997).

3.2.3 Peatlands

Peat is formed when decomposition fails to keep up with the production of organic matter. This is a result of water logging, a lack of oxygen or of nutrients, high acidity or low temperatures. Peat can be found in many types of wetland, including floodplains and coastal wetlands such as mangroves. Where the peat deposits are deeper than 300 to 400 mm, they create a variety of distinctive wetland ecosystem such as bogs and fens.

- **Bogs** from where a high water table, fed directly by rain, results in waterlogged soil with reduced levels of oxygen. Rainfall leaches out nutrients in the soil, and the slow fermentation of organic matter produces acids. Bogs are characterized by acid loving vegetation, including mosses. Sphagnum bog mosses are likely sponges and can hold more than ten times their dry weight of water. Bogs are not very common in Cambodia, but some have been reported from Bokor.

- **Fens** are fed by ground water rather than by rain. They produce wetlands higher in nutrient content than bogs, but still able to accumulate peat. The combination of more nutrients and low acidity results in very different vegetation, often a species rich cover of reeds, sedges and herbs.
3.3 Internationally Significant Wetland Sites

Totally, 29 wetland sites were identified as significant habitats, or internationally important sites for migratory birds. These sites have been classified into freshwater, brackish or marine wetlands. The identification of these wetlands are based on the criteria of size, habitat, biodiversity richness, distribution of species and cultural, landscape, and recreational values.

3.3.1 Brackish Water Wetland Sites

These types of coastal wetlands are located on the coastal plain and are linked to the sea. The water component seasonally changes into brackish during the rainy season and saline during the dry season. The main vegetation types in these wetlands are mangroves and rear mangroves, which support reptiles, small mammals, and aquatic species. There are two brackish wetland sites:

1) Stung Metoek Mangrove and Creek System
   - Coordination: 11° 32' 00" – 11° 51' 00" N 102° 51' 00" – 103° 06' 00" E
   - Location: About 1km north of Koh Kong Provincial town
   - Total Area: 22,500ha
     - Water surface: 10,000ha
     - Marshes: 12,500ha
   - Altitude: Average: 116.6m
     Maximum: 153m
   - Wetland Types: Mangrove, creek systems, rear mangrove and shrimp ponds
   - Soil Types: Coastal complex

2) Prek Piphot Creek System and Swamp Mangroves
   - Coordination: 11° 04' 30" – 11° 19' 00" N 103° 18' 30" – 103° 36' 30" E
   - Location: 10km north of Sre Ambel, Koh Kong Province
   - Total Area: 21,250ha
     - Water surface: 12,750ha
     - Marshes: 85,000ha
   - Altitude: Average: 62m
     Maximum: 262m
   - Wetland Types: Mangrove, creek systems, mud, sand and a little rear mangrove
   - Soil Types: Acid lithosol and alumisol

3.3.2 Marine Wetland Sites

Marine wetlands are located in coastal areas similar to the brackish wetlands, however the water regime is permanent although the water table can move with the start of the rainy season.

Six sites have been identified as internationally important habitats for migratory birds or marine aquatic species:

1) Kampong Trach Marshes and Salt Ponds
   - Coordination: 10° 24' 30" – 10° 33' 30" N 104° 24' 00" – 104° 36' 00" E
   - Location: About 2 km east of Kep town
   - Total Area: 7,500ha
     - Water surface: 2,500ha
     - Marshes: 15,000ha
   - Altitude: Average: 89.7m
     Maximum: 144m
   - Wetland Types: Salt ponds, marshes, mangrove swamps, sand and seagrass
   - Soil Types: Coastal complex
### 2) Prek Kampong Bay, Creek System, Mangrove and Marshes

**Coordination:** $10^\circ\ 30'\ 00'' - 10^\circ\ 41'\ 00''\ N$
$104^\circ\ 08'\ 30'' - 104^\circ\ 18'\ 00''\ E$

**Location:** Kampot Provincial town

**Total Area:** 16,250ha
- Water surface: 7,500ha
- Marshes: 8,800ha

**Altitude:**
- Average: 94m
- Maximum: 351m

**Wetland Types:** Mangrove, swamps, sand and creek systems

**Soil Types:** Coastal complex and red-yellow podzol

### 3) Prek Toek Sap Creek System, Mangrove and Marshes

**Coordination:** $10^\circ\ 24'\ 00'' - 10^\circ\ 37'\ 30''\ N$
$103^\circ\ 40'\ 00'' - 103^\circ\ 59'\ 00''\ E$

**Location:** 15km east of Ream Navy Base, Sihanouk Ville

**Total Area:** 21,250ha
- Water surface: 12,250ha
- Marshes: 8,750ha

**Altitude:**
- Average: 328m
- Maximum: 564m

**Wetland Types:** Mangrove, creek systems, coral reef, seagrass and rear mangrove

**Soil Types:** Acid lithosol and red-yellow podzol

### 4) Chhok Veal Rinh

**Coordination:** $11^\circ\ 05'\ 00'' - 11^\circ\ 15'\ 00''\ N$
$103^\circ\ 47'\ 30'' - 103^\circ\ 58'\ 30''\ E$

**Location:** 170km southwest of Phnom Penh

**Total Area:** 14,900ha
- Water surface: n/a
- Marshes: n/a

**Altitude:**
- Average: 3m
- Maximum: 5m

**Wetland Types:** Mangrove, marshes, rear mangrove and rice fields

**Soil Types:** Peat, mud and sand

### 5) Koh Kapik Ramsar Site

**Coordination:** $11^\circ\ 24'\ 00'' - 11^\circ\ 32'\ 00''\ N$
$102^\circ\ 59'\ 10'' - 103^\circ\ 09'\ 45''\ E$

**Location:** Koh Kong Province

**Total Area:** 12,000ha
- Water surface: n/a
- Marshes: n/a

**Altitude:**
- Average: 3.3m
- Maximum: 5m

**Wetland Types:** Estuary, mangrove, creek and tidal mudflats

**Soil Types:** Mud, sand and peat

### 6) Prek Kampong Som Mangrove, Swamp and Marshes

**Coordination:** $11^\circ\ 01'\ 30'' - 11^\circ\ 09'\ 00''\ N$
$103^\circ\ 37'\ 30'' - 103^\circ\ 45'\ 15''\ E$

**Location:** About 52.5km north of Sihanouk Ville

**Total Area:** 10,800ha
- Water surface: 3,300ha
- Marshes: 7,500ha

**Altitude:**
- Average: 2.5m
- Maximum: 10m

**Wetland Types:** Mangrove, swamps, marshes and rice fields

**Soil Types:** Mud, sand and brown soil
4. WETLAND RESOURCES AND ECONOMIC VALUATION

4.1 Coastal Wetland Resources

There is a 435km-long strip of coastal wetlands stretching from the border with Thailand eastwards to the border with Viet Nam. Several areas of mangrove and *Melaleuca* forest are of potential international importance. In addition, there is one large estuarine system with about 16,000ha of mangrove forest near Koh Kong in the north. Smaller areas of mangrove are found along the shores of the Veal Renh and Kompong Som Bays. It may be assumed that over 20 percent of Cambodia is one or another type of wetland.

Some areas, such as Prek Kaoh Pao, are formed mainly by two communities, namely: mangrove and *melaleuca*. In most places, the mangrove fringe is narrow, but contains a variety of species. Many epiphytes including orchids and *Asplenium nidens* are found in mangrove forest. Immediately behind the mangrove fringe, *Melaleuca* occurs, either as a monoculture or in a mixed assemblage. This assemblage has often been called the rear mangrove formation. Melaleuca occurs above tidal influence at an elevation around two meters above sea level, where there is the possibility of seasonal freshwater inundation. The monoculture is due to repeated burning. The mixed assemblage consists of *Melaleuca* with *licualaspinosa*, *Pandanus*, *Acrostichicum aureum*, *A. speciosum*, *Hibiscus tiliaeus*, *Xylocarpus granatum*, *Heritiera littoralis*, and *Phoenix paludosa*. However, some areas, such as Koah Kapik, are formed by three main communities, namely: Mangrove forest, *Melaleuca* forest, and Beach strand vegetation. Beach strand vegetation is dominated by *Casuarina equistifolia*.

The coastal zone is composed of alluvial islands, river estuaries, creeks, sand flats, rivers with brackish water influence, rivers with tidal influence, mixed *Melaleuca* woodland, freshwater-influenced mangrove, mangrove and *Melaleuca*, shrimp ponds, and mud flats. The catchments are comprised mainly of the southern slopes of the Cardamom Mountains, which are mainly forested.

**Mangrove:** Most of the mangrove communities are characterized by areas that are inundated only at some high tides, and where there is a large degree of freshwater influence. The islands and creeks are typically fronted by *Rhizophora apiculata*, one of the most common of the mangrove species present, and stands of *Nypa fruticans*. Immediately behind this fairly narrow strip of *Rhizophora* there is an interesting mixture of other mangrove species, of which the following are most common: *Brugiera gymnorrhiza*, *B. sexangula*, *Ceriops tagai*, *Lumnitzera littorea*, *Heritiera littoralis*, *Xylocarpus granatum*, *hibiscus tiliaceus*, *Phoenix paludosa*, *Acrostichicum speciosum*, *Aegialitis sp.*, and *Acanthus sp.* Avicennia and *Sonneratia* are relatively infrequent in Koh Kapik.

**Rear mangrove community:** On some of the islands and on the mainland between Prek Khlang Yai and Prek Thngo, the mangrove community is only a narrow band and is replaced by a community which is above the high tide mark and is probably only subject to fresh water inundation during the wet season. This community is dominated by *Melaleuca leucadendron*. In many places, there is an almost pure stand of this tree, but this may be due to repeated burning rather than it being a layer of humus. Other plants typical of this community are: *Pandanus*, *licualaspinosa*, *Acrostichicum aureum*, *A. speciosum*, *Hibiscus tiliaeus*, *Xylocarpus granatum*, *Heritiera littoralis*, *Phoenix paludosa*, *Melostoma sp.* (in more distributed areas), and *Scleria sp.* This is found together with several rattans and epiphytes such as orchids and the bird nest fern *Asplenium niden*.

**Beach strand vegetation:** At the southwest side of Koh Kapik and on sandy areas of some of the islands, there are small areas of typical beach strand vegetation dominated by *Casuarina equistifolia*, with some *Terminalia catappa*.

**Fisheries resources:** Common fisheries include: fish (grouper and sea bass), wild shrimp, crabs (mostly mangrove mud crabs), and squid. Some aquatic fauna migrate depend on the season. There is no exact data about the aquatic fauna in this area yet. However, the research conducted at Peam Krosop Wildlife Sanctuary showed that this area is rich in aquatic fauna including the Dolphin and Sea Cow.

**Wildlife:** The research conducted in Peam Krasop Wildlife Sanctuary, Koh Kong Province, showed that more than 190 species of birds have been identified. Some are present over the whole year, but some use this area as a migration place. There are also 29 species of reptiles that are present in the Peam Krasop Wildlife Sanctuary. Some species are rare species such as *Dermochelys sp.*, *Eretmochelys sp.*, and *Scaly anteater*. In addition, around ten species of mammals have been found. This number has decreased because of destruction of the mangrove habitat.
Corals: Little data exists for coral within the mangrove ecosystem. Local Cambodian coral experts have identified 56 different types of hard and soft corals within wetlands in Peam Krasop. This area is a good habitat for *Greasy grouper* and *Yellow grouper*, and the habitats have been disturbed by fishing.

The land and water is state owned, but some land may be privately leased. The water and mangrove areas are under the jurisdiction of the Fishery Department, while the *Melaleuca* areas beyond the tidal influence are under the jurisdiction of the Department of Forestry and Wildlife. Some areas, such as Peam Krasop, along with much of the catchments, have recently been designated as the Wildlife Sanctuaries.

4.2 Economic Valuation of Wetlands

Koh Kapik Ramsar Wetland Site

In 1997, a case study was conducted to find out the socioeconomics of protected areas provided a short data of logging activities including Peam Krasop, where Koh Kapic is located. Both Khmer and Thai logging companies are operating in the upland areas in Koh Kong. The logs are typically sold directly to Thailand. Companies employ 200-300 workers. In addition, many workers from Peam Krasop are involved in the collection of timber from nearby Koh Kong Island, which is under the control of the navy. It is estimated that more than 100 electric saws are in use on the island (one owner may have 2-3 saws). One machine can cut 1-2m³ wood per day. Soldiers are paid 10,000 Baht/month (US$400) per machine. Anyone can cut wood provided they pay the soldiers. The workers, who carry wood from the island, can earn 400-1000 Baht per m³ depending on the distance the wood is carried. A worker can transport on average 2-3m³ per day, thereby earning between 800-2000 Baht per day (US$32-$80). Workers operating cutting machines are paid between 500-700 Baht (US$20-28)/m³ (i.e., US$40-$56 per day including food). Trees are reportedly cut indiscriminately, often on steep slopes.

Commercial Shrimp Farms

Investment at the construction stage includes the cost of a license and expenditure on farm construction and equipment (e.g., dike construction, gates, fan for aerating water). The average expenditure at the construction stage was estimated to be US$28,662 per hectare.

Only 25 percent of farms surveyed were operating under licenses. Licenses are valid for the lifetime of the farm and cost between US$800-$1,200. Technically, the fisheries department needs to be informed each year of the farm's intention to continue its operations.

Productivity per harvest ranges from 3-16 tonnes per hectare, with an average of five tonnes per hectare. Sixteen tonnes per hectare is very high and represents the first harvest of a newly constructed farm. Excluding this figure, productivity per harvest ranges from 3.1-4.4 tonnes per hectare, with an average of 3.6 tonnes per hectare. Relationship between shrimp farm productivity and shrimp age is shown in Table 1.

<table>
<thead>
<tr>
<th>Age of farm / years</th>
<th>Yield/ha/Harvest</th>
<th>Gross value US$ per hectare / harvest @120Baht/kg</th>
<th>Gross value US$ per hectare / harvest @ 35Baht/kg</th>
<th>Gross value US$ per hectare / harvest @ 185 Baht/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>16</td>
<td>76,800</td>
<td>22,400</td>
<td>118,400</td>
</tr>
<tr>
<td>2</td>
<td>3.78</td>
<td>18,144</td>
<td>13,230</td>
<td>27,972</td>
</tr>
<tr>
<td>3</td>
<td>3.26</td>
<td>15,648</td>
<td>4,564</td>
<td>24,124</td>
</tr>
<tr>
<td>4</td>
<td>3.12</td>
<td>14,976</td>
<td>4,368</td>
<td>23,088</td>
</tr>
</tbody>
</table>
The price of shrimp ranges from 30-185 Baht/kg depending on size and quality. The shrimp are sold to Thailand. Prices are dependent on the international market and have fallen over recent years from a high of 210 Baht. Using a price of 120 Baht/kg (weighted average) and using the average productivity of 5.1 tonnes/hectare/harvest, the average gross income from shrimp production per harvest can be estimated at US$24,480 per hectare.

Assuming a five-year productive life of a shrimp farm, and two successful harvests per year at 5.1 tonnes/hectare/harvest, net income per farm is estimated at US$4,451 per hectare. If however, one harvest fails because of disease or technical problems (very common), the farm will lose US$20,029 per hectare. A year of loss in which both harvests fail means losses of US$44,509. At 120 Baht/kg, productivity has to be at least 4.7 tonnes/kg to break even. At a productivity rate of 3.6 tonnes per harvest, a loss of US$9,949 per hectare is incurred.

Given the risks facing shrimp farming, it is becoming increasingly rare for farms to have two successful crops a year. Half of the farms surveyed have incurred losses ranging from 1-6 million Baht (US$40,000-$240,000).

The calculations for each of the eight farms surveyed revealed that 50 percent of farms are making profits of between US$17,508-$100,880 (US$1,782-$100,880 per hectare), and 50 percent to be incurring losses of between US$3,602-$162,216 (US$1,125-$20,481 per hectare).

Excluding the farm with the unrealistically high productivity rate of 16 tonnes/harvest, profits range from US$74,658-17,508 per farm (US$11,109-1,782 per hectare). Overall, the farms are incurring a loss of US$8,826, or US$1,103 per hectare.

Calculations for individual farms are based on the investment, operating and productivity figures, and selling price of shrimp of the individual farms covered in the survey. Shrimp prices ranged from 98-158 Baht/kg and obviously affected profit margins.

Therefore the TEV of the Koh Kapic can be calculated and mentioned as important in reference to the general studies of Peam Krasom, where Koh Kapic is located within this area. There have been no specific research studies on the economic valuation of the site yet, due to the lack of financial and technical support. Even though it is fair enough to show the general picture of the economic, social, and cultural values that come purely from the wetland site.

Table 2 Price of Charcoal Production from 1997-2000.

<table>
<thead>
<tr>
<th>Year</th>
<th>Price</th>
<th>Cost per kg in Thai Baht</th>
<th>Price per kg in $ US</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>2.15</td>
<td>Baht</td>
<td>$0.05</td>
</tr>
<tr>
<td>1998</td>
<td>2.4</td>
<td>Baht</td>
<td>$0.05</td>
</tr>
<tr>
<td>1999</td>
<td>2.55</td>
<td>Baht</td>
<td>$0.06</td>
</tr>
<tr>
<td>2000</td>
<td>4.16</td>
<td>Baht</td>
<td>$0.1</td>
</tr>
</tbody>
</table>


Sragnam-Russey Srok Wetland Site

In the actual case of the Russey Srok-Tourl Sragnam site, not every household earns income from the mangrove forest. The forest is not as productive as it was before it was degraded, although it is recovering. The case of Russey Srok-Tourl Sragnam represents villages that are mangrove, salt farm and fishing dependent. Since there is no real data on the case, the assumption was made that every household earns the same average net annual return per household as in the case for a sustainable basis. The local use value per ha per year has been calculated (Table 2). The local use value is per hectare/year in the case with charcoal production has been calculated and shown in Table 3.

Table 3 Direct Use Value per ha of the Mangrove by the Local Populations.

<table>
<thead>
<tr>
<th>Cases</th>
<th>Direct use value per ha per year (baht)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Case of a Mangrove without Charcoal Production</td>
<td>1,937.98</td>
</tr>
<tr>
<td>The Case of a Mangrove with Charcoal Production</td>
<td>4,237.16</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6,175.14</strong></td>
</tr>
</tbody>
</table>
The total value of the economic valuation of wetlands, as well as others, is indicated below in US dollars and illustrates in Table 4.

<table>
<thead>
<tr>
<th>Ecosystem</th>
<th>Estimated Net Annual Benefits (US $/ha/yr)</th>
<th>Estimated Existing Area in Cambodia (ha)</th>
<th>Total Estimated Net Annual Benefits (million US $/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mangrove Forest</td>
<td>183</td>
<td>26,650</td>
<td>4.9</td>
</tr>
<tr>
<td>Coastal Wetlands</td>
<td>130</td>
<td>54,500</td>
<td>7.1</td>
</tr>
<tr>
<td>Coral Reefs</td>
<td>300</td>
<td>476</td>
<td>0.14</td>
</tr>
<tr>
<td>Seagrass</td>
<td>300</td>
<td>175</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>81,801</strong></td>
<td><strong>81,801</strong></td>
<td><strong>12.2</strong></td>
</tr>
</tbody>
</table>


Based on the table referenced above, the direct use value of the three wetland areas per year can be computed in

<table>
<thead>
<tr>
<th>N</th>
<th>Site</th>
<th>Cost (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Koh Kapic Wetland Site</td>
<td>1,755,000</td>
</tr>
<tr>
<td>2</td>
<td>Beung Kachhang</td>
<td>585,000</td>
</tr>
<tr>
<td>3</td>
<td>Tourl Sragnam-Russey Srok</td>
<td>650,000</td>
</tr>
</tbody>
</table>

5. **CAMBODIAN DATA AND INFORMATION ON WETLANDS**

5.1 **General Data**

The general data provides a description of the existing situation that excludes the data depicted above, and is not mappable data. This includes the biodiversity, socio-economic, and education data.

1. Biodiversity data: this database covers all the natural resources, as well biodiversity that includes the fauna and flora explored during the past. It was set up by the Support Programme to the Environment Sector in Cambodia, European Union in 1998, and the direct collaboration with the Ministry of Environment, especially the department of Nature Conservation and Protection. It accounts totally for more than 3,000 species. And it includes some site surveys at Bokor National Park, and Tonle Sap areas.

2. Socio-economic data: this section logically came from the Cambodian National Census in 1998 that was supported by the UNFPA programme (National Institute of Statistic 1998). The database includes four systems:
   - Pop Map: this is a population map;
   - Priority Data: this is a table with the priority data for Cambodia;
   - Village level: this is the detail for the village level;
   - WinR+: the system of database that was set up for using multi-purposes and facilitation for the easy extraction of data with many compatible formats.

3. Education: The school census is a database system that was created by the EMIS, Ministry of Education, Youth and Sport and supported by the UNESCO and UNICEF. It includes all the information and data related to Cambodia’s education statistics and indicators from preschool until the university degrees. It is an annual census for Cambodian education that comprises the number of students (enrolment, drop-out, repeater), teachers, schools, classes, and its facilities in all grades.

Overall, the quality of physical, biological, environmental, and socio-economic data and information for the coastal and marine areas of Cambodia is inadequate for good planning and management:

---

1 These economic valuations simply measure the annualized Net Present Value of some of goods and services provided by these ecosystems. A comparison of different types of uses for these ecosystems (e.g., shrimp farm conversion, agriculture, etc.) could show even higher economic values for existing ecosystems (e.g., Sathirathai 1998 estimates that the economic value of mature mangrove ecosystems increases to about US $250/ha/yr when compared to shrimp farming).
5.2 Information Related to Wetlands

The information collected relates purely to environment, natural resources and wetlands within Cambodia. It is mainly focusing on the coastal areas in Cambodia. Furthermore, the information includes the report formats written in different reports for each activity, research project, or programme in the Cambodia’s Coastal zone (see the meta-database for Cambodian Wetlands in spreadsheet as attached).

Referring to this meta-database, the information can be seen as made up of different parts, where each part represents different areas, scales, and subjects. However the information generally represents the Nation, the entire coastal zone, each protected area (such as Bokor National Park, Ream National Park, Peam Krasop, Dong Peng) and/or each province as indicated as the whole image. Most information was produced by the Coastal Zone Management Project supported by DANIDA since 1997, and the Participatory Management of Mangrove Resources Project that has been supported by IDRC since 1997 (IRIC and IDRC, 1997). The information basically describes the physical infrastructures in place, water quality, some sources of pollution, mangrove plantations, tourism issues, source of mangrove destruction and fishing activities.

Despite a great deal of information, it has only been interpreted and analysed from community approaches. This means that approaches to evaluate and assess it were through the consultations, meetings, discussions and interviews. This is good in some ways, however it is not scientifically based. The information is just the vision of the people involved. Moreover the information indicated the holistic management issues for the whole nation or coastal zone.

On the other hand, the coastal wetland classification has not yet been planned or considered. In order to maximize the use of the existing data and information, we need to adjust the information to focused areas. This is the main challenge and sometimes is not feasible. There is not any specific research yet on wetland areas and the issues in coastal areas.

5.3 Mapping Data Related to Wetlands

The mapping data refers to the data that can be produced in a GIS map. The mapping data is from different sources of databases in Cambodia, such as the Department of Geography, Support Unit of the MRC, DoF/LUMO/MAFF, JICA/MPWT, MoE/GIS/RS Unit, MoP/NIS, MoEYS/EMIS, WFP/UN and EU projects/programmes (please see the Cambodian Wetland Meta-database that was produced in the spreadsheet).

After reviewing all these data, there are five mains parts including:

1. **Administrative data:** This includes information on national boundaries, provinces, districts, communes’ polygon as boundaries, and central points with the points of the villages. These data are updated annually and managed by the Department of Geography, Ministry of Land Management, Urbanization and Construction. There is collaboration between the department with the Ministry of Public Works and Transport that is supported by JICA.

2. **Infrastructure:** this includes information on all roads (national roads, main roads, secondary, paved roads), all the railways (two lines, 1st to Sihanouk ville and the 2nd to Battambang/Banteay Meanchey), all rivers (entire the main rivers, 2nd rivers, 3rd rivers, up till to the small streams), Oceans and lakes (Tole Sap, all other lakes). These maps were produced from the Ministry of Public Works and Transport, in collaboration with the JICA project. There are two phases, the 1st phase was already finished in 2000, and the 2nd phase began, and is nearly finished.

3. **Physical and chemical condition of the land:** this includes information on watershed classes, contour lines, soil, climate, catchment’s areas, geology, landforms, hydrogeology, and landscape conditions. These data were produced from the MRC, FAO, JICA, and collaborations with the national institutions such as the Ministry of Agriculture, Forestry and Fisheries, Ministry of Environment, Ministry of Land Management and Ministry of Public Works and Transport.

4. **Land Use, Land Cover and Forest Cover:** these data came from different sources at various times, including the FAO, UNEP, Department of Forestry, Land Use Management Office of the Ministry of Agriculture and the MRC. The data was found in 1971 for vegetation, then 1992-93 and 96-97 for forest and land cover of Cambodia (MRC 1997).
5. **Population:** there is a population density map that was produced from the National Institute of Statistics, Ministry of Planning (National Institute of Statistic, 1998). Its source is mainly based on the data from the National Census in 1998 and using the PopMap application that is more or less similar to the MapInfo application. The data within the application not only produced the population density, but also the distribution of population activities, of education, of age groups, households, gender, and utilization of water, light and cooking. This map can be produced at the commune, district, and provincial scales. Moreover, there was an old map of the Ethnic distribution that describes the different ethnic groups in Cambodia.

6. **CONCLUSION AND RECOMMENDATIONS**

According to the descriptions above, the data and information is still very limited, especially for the specific issues such as Wetlands in local areas. Most of the supports are likely to work at this stage on the national level. In other words, nobody takes care yet for the local level, even though Cambodia is in the process of decentralization. Regarding the local data and information, it mostly focuses on the socio-economic and health issues, which are the immediate objectives to help people to survive, maintain, and develop their own life. Environmental issues are the secondary or long-term objectives.

Therefore, the national self-management of the data and information is the key issue. Concerning its management, there are a lack of knowledge and skills in information and data management and its supporting infrastructures. People do not appropriately consider the data and information for decision making, planning, and monitoring as well as evaluation. The principle causes are lack of mechanisms for data and information sharing among other people, and lack of dissemination, which would allow people to understand its importance, and to use and manage it effectively.

In order to maintain and keep records up to date, the key issue is to compile and manage the existing data and information in a national database system that can be used by other people. As Cambodian human resources are very limited, thus the capacity building in data and information use and management is a prerequisite as an immediate objective.

Gathering and giving data and information are the principle issues to promote and maximize its sharing and dissemination. There needs to be established the coordination for data and information management with the enhancement of flow mechanisms with its free access.

Good information is crucial for sound coastal and marine environmental management and, by and large, this good information does not yet exist in Cambodia. There has been a lack of data and information, especially for coastal and marine resources, throughout the history of Cambodia. Although the DANIDA coastal zone project prepared coastal resource profiles and mapping, as well as community socio-economic survey reports, more information, and more up to date information, especially data and information relevant to the biophysical characteristics of the natural resources, is required for proper coastal and marine zone planning and management. Because of this, one of the first items of work in the coastal and marine zone has to be basic gathering and assembly of data and information.

The collection of data in and of itself should not be the goal. Resources are too scarce in Cambodia for collecting data and information that do not meet practical needs. It is also impossible to substitute for local knowledge of coastal conditions and resources. Sometimes dismissed with regards to essentially anecdotal, unsystematic, or unverifiable, local knowledge may represent the distillation of the experience of generations of those who have had 'hands-on' knowledge of a particular matter with a particular issue.

There is an important institutional issue with respect to the sharing of information. Coastal and marine environmental management is: (i) always multi-sectoral, meaning that many different types of information are needed, and (ii) should be integrated, meaning that institutions often need information collected by other institutions to provide a necessary and useful contribution. Overcoming this barrier requires particular effort on the part of the practitioners of coastal and marine environmental management.
Finally, coastal and marine environmental management cannot wait for perfect information. In fact, not all of the scientific and technical issues germane to many of the proposed programs have been resolved. For example, feasible farm models may not yet be perfectly tested, or the best method of rehabilitating abandoned shrimp ponds may not be well known. This must be balanced against the need to take steps quickly in some cases and locations to halt or reverse natural resource degradation. Coastal and marine environmental projects in Cambodia will have to be implemented with incomplete knowledge. This reality demands an adaptive approach to program implementation and delivery. This adaptive approach will require environmental monitoring so that unanticipated effects can be detected quickly, and lessons learned can be used to quickly modify and re-design investments and technical assistance.

REFERENCES


NATIONAL REPORT

on

Wetlands in South China Sea

CHINA

Ms. Chen Guizhu
Focal Point for Wetlands
Institute of Environmental Sciences
Zhongshan University, 135 West Xingang Road
Guangzhou 510275
Guangdong Province, China
Table of Contents

1. INTRODUCTION .............................................................................................................................................. 1

2. REVIEW OF CHINA’S WETLAND RESOURCES ............................................................................................... 1
   2.1 GENERAL STATUS OF WETLANDS IN CHINA .......................................................................................... 1
      2.1.1 China’s Wetland Resources ............................................................................................................ 1
      2.1.2 Chinese Wetlands on the Ramsar Convention List of Wetlands of International Importance ......................... 2
   2.2 DISTRIBUTION OF WETLANDS IN CHINA ALONG THE SOUTH CHINA SEA ........................................... 2
   2.3 TOTAL AREAS OF WETLANDS IN CHINA .............................................................................................. 4

3. UTILIZATION OF, AND THREATS TO, WETLANDS ......................................................................................... 4
   3.1 UTILISATION OF WETLANDS ................................................................................................................. 4
      3.1.1 Land-use Resources .......................................................................................................................... 4
      3.1.2 Coastal Beach Wetland Resources .................................................................................................. 5
      3.1.3 Mineral Resources ............................................................................................................................ 6
      3.1.4 Estuary Resources .............................................................................................................................. 6
      3.1.5 Utilisation for Tourism ...................................................................................................................... 6
   3.2 CAUSAL CHAIN ANALYSIS FOR THREATS TO WETLANDS ................................................................... 7
      3.2.1 Global Climate Change .................................................................................................................... 7
      3.2.2 Typhoons and Storm Tides .............................................................................................................. 7
      3.2.3 Red Tides ........................................................................................................................................... 8
      3.2.4 Enclosing Beaches for Land Reclamation ..................................................................................... 8
      3.2.5 Urbanization and Industrial Development .................................................................................... 8
      3.2.6 Other Causes of Destruction ......................................................................................................... 9

4. THE ASSESSMENT OF THE ENVIRONMENTAL ECONOMIC VALUE OF THE WETLANDS ALONG THE SOUTH CHINA SEA ......................................................................................................................... 9
   4.1 THE ENVIRONMENTAL ECONOMIC VALUE OF WETLANDS ................................................................. 9
   4.2 THE ECONOMIC VALUE OF EXPLOITATION AND UTILIZATION OF THE WETLANDS ALONG THE SOUTH CHINA SEA ................................................................................................................................. 9
      4.2.1 Total Benefit Value of the Coastal Wetland Ecosystem in the South China Sea ................................. 10
      4.2.2 Assessment and Analysis of the Value of Wetland Tourism along the South China Sea ..................... 10
      4.2.3 Environmental Economic Analysis of the Value of Land Resources along the South China Sea ........ 10
      4.2.4 Analysis of the Transportation Value of Wetlands along the South China Sea ................................. 11
      4.2.5 Value of Ecological Services of Wetlands along the South China Sea ........................................... 11

5. THE LEGISLATION AND MANAGEMENT SYSTEM FOR WETLANDS PRESERVATION IN THE SOUTH CHINA SEA REGION ......................................................................................................................... 13
   5.1 RELEVANT ADMINISTRATIVE BODIES AND CONSERVATION ACTION PROGRAMS ............................ 13
      5.1.1 Establishment of Administrative Bodies ............................................................................................ 13
      5.1.2 Conservation Action Programs ........................................................................................................ 15
   5.2 INTRODUCTION TO THE CREATION OF NATURE RESERVES ............................................................. 15
      5.2.1 Wetlands and Wetland Nature Reserves in Guangdong Province .................................................... 15
      5.2.2 Wetlands and Wetland Nature Reserves in the Guangxi Zhuangzu Autonomous Region ......................... 16
   5.3 MANAGEMENT OF WETLANDS AND WETLAND NATURE RESERVES ..................................................... 17
      5.3.1 Management of Wetlands in Guangdong Province ........................................................................... 17
      5.3.2 Management of Wetlands in the Guangxi Zhuangzu Autonomous Region ....................................... 18
      5.3.3 Management of Wetlands in Hainan Province ................................................................................. 20
      5.3.4 The Wetland Management System and Legislation of the Hong Kong Special Administrative Region (HKSAR) ..................................................................................................................................................... 20
      5.3.5 The Wetland Management System and Legislation of Macau ........................................................... 21
5.4 WETLAND LAWS AND REGULATIONS ................................................................................................................................. 22
  5.4.1 Legislation on Land and Maritime Resources ................................................................................................................. 22
  5.4.2 Legislation on Protection of Wetland Animal and Plant Species .................................................................................... 25
  5.4.3 Legislation on Wetland Nature Reserves .......................................................................................................................... 27
5.5 PROBLEMS AND RESOLUTIONS WITH WETLAND MANAGEMENT .................................................................................. 28
  5.5.1 General Problems ................................................................................................................................................................. 28
  5.5.2 Resolution of Problems ......................................................................................................................................................... 28
6. CONCLUSION ........................................................................................................................................................................... 28
REFERENCES ............................................................................................................................................................................... 29

List of Tables and Figures

Table 1 Total Area of Coastal Wetlands of the South China Sea (km²).
Table 2 Land Reclamation in the Lingdingyang Area of the Pearl River Estuary from 1966 to 1996 (unit km²).
Table 3 The Gross Product of the Main Industries Associated with Coastal Wetlands along the South China Sea from 1996 to 1999 (unit: billion YMB Yuan)
Table 4 Total Economic Income of Tourism of South China Sea Wetlands
Table 5 Analysis of Land Resource Value along the South China Sea
Table 6 Economic Income from Transportation at Wetland Seaports and Gulfs along the South China Sea (1999-2001)
Table 7 Assessment of the Principle Ecological Services Values of the Shantou Wetland Demonstration Area
Table 8 Assessment of the Principle Ecological Services Values of the Pearl River Estuary Wetland Demonstration Area
Table 9 Assessment of the Principle Ecological Services Values of the Hepu Wetland Demonstration Area
Figure 1 Map of Coastal Wetland Types along the South China Sea based on Remote Sensing Images.
1. **INTRODUCTION**

China has 6,888 kilometres of coastline along the South China Sea (including 403 kilometres of coastline in Hong Kong and Macau) from Raoping County in Guangdong Province, to the Beilun Estuary in the Guangxi Zhuang Autonomous Region. There are five administrative regions located along the coast of the South China Sea: 1) Guangdong Province, 2) Hong Kong Special Administrative Region, 3) Macau, 4) the Guangxi Zhuang Autonomous Region, and 4) Hainan Province.

The majority of relevant data was totalled from the county to the city level, from the city to the provincial or autonomous region level and finally to the national level. Therefore, the analysis of China’s coastal area along the South China Sea is divided into five sub regions, which are: 1) Guangdong, 2) Hong Kong, 3) Macau, 4) Guangxi, and 5) Hainan.

2. **REVIEW OF CHINA’S WETLAND RESOURCES**

2.1 General Status of Wetlands in China

China is located in the southeastern part of the Eurasian mainland. Its territory spans 9,600,000 km² and extensive territorial waters. China is a large country with diverse physical characteristics, geography, and environmental and climatic conditions that also contains large numbers of varied wetlands.

2.1.1 China’s Wetland Resources

1) **Characteristics of China’s Wetlands**

There are many types of wetlands in China. They span large areas, appear in large numbers, and are widely distributed. Differences among regions are notable and biodiversity is plentiful.

(1) **Types of Wetlands:** According to the Ramsar convention, there are 31 types of natural wetlands, and nine types of artificial wetlands in China. The primary types include marsh wetlands, lake wetlands, river wetlands, estuary wetlands, coastal wetlands, wetlands in the neritic zone, reservoirs, garden ponds, and paddy fields.

(2) **Expansive area:** The area of wetlands in China is approximately 65,940,000 hm² (not including rivers, garden ponds etc.) This represents ten percent of the total global wetlands, the largest amount in Asia, and the fourth largest in the world. Chinese wetlands include 25,940,000 hm² of natural wetlands and 40,000,000 hm² of artificial wetlands.

(3) **Wide distribution:** In China, wetlands extend from the frigid-temperate region to the tropics, from coastal to inland areas, from plain to altiplano. Many types of wetlands exist in the same region and one type of wetland can exist in many regions. This high degree of variation makes for a colourful composition of different types of wetlands.

(4) **Notable differences among regions:** There are many river wetlands in eastern China, many marsh wetlands in north-eastern China, few wetlands in the west, and abundant lake wetlands in the middle and lower reaches of the Yangtze River and Qingzang Altiplano. Many salt lakes and saline lakes exist in the Qingzang Altiplano and the arid area of northwest China. Special mangrove forests and tropical and subtropical artificial wetlands spread from Hainan Island to the foreland of northern Fukien. The Qing Zang Altiplano has the highest altitude and amplitude marshes and lakes, forming a particular habitat.

(5) **Rich biodiversity:** China has many wetland habitat types with numerous species. Not only are the number and quantity of species large, but many of them are endemic to China. Thus, the wetlands are important to science, research, and the economy. According to recent statistics, there are approximately 172 families (15.5 percent), 495 genera (48.7 percent), and 1642 species (5.5 percent) of national plants found in Chinese wetlands. More than 100 species are endangered. There are 770 species or sub-species of fresh water fish, including many migratory fish stocks whose reproduction depends on wetland ecosystems. There are numerous waterfowl in Chinese wetlands, amounting to

\[^1\] 1 square hectometer = 0.01 square kilometer.

---

Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand
280 species, including crane, umbrellases, wild geese, gulls, and storks. There are many rare or endangered waterfowl found in Chinese wetlands, including 15 national Class-A protected rare birds, such as the Red-crowned Crane, and 45 Class-B protected rare birds, such as swans, Black-faced Spoonbill, and Tringa guttifer. There are 57 species of endangered birds in Asia, out of which 31 species of endangered birds are present in Chinese wetlands, accounting for 54 percent of the total. There are 166 species of wild geese in the world, with 50 species present in Chinese wetlands, accounting for 30 percent of the total. There are 15 species of cranes, and nine of them are found in China. Moreover, China is home to many migratory birds. Several Chinese wetlands provide the only wintering grounds for some species along their migratory routes.

2) Status of Primary Types of Chinese Coastal Wetlands

Coastal wetlands and wetlands in the Neritic Zone: Coastal wetlands in China are primarily distributed among 11 littoral provinces and districts, and the Hong Kong-Macau-Taiwan area. There are approximately 1,500 rivers flowing into oceans in China. They form six types of coastal/marine wetlands with more than 30 types of ecosystems.

The northern section of Hangzhou Bay consists of sandy and silty beaches, except for the rocky beach of the Shandong Byland and sections of the Liaodong Byland. Wetlands in the Huan-bohai Sea and Jiangsu littoral area have the same composition. The Yellow River delta and Liaohe River delta are important littoral wetlands in the Huan-bohai Sea. The Huanbohai Sea littoral area also contains the Laizhou Bay Wetland, Mapengkou Wetland, BeidaGang Wetland, and Beitang Wetland. The total area is 6,000,000hm². The Jiangsu littoral wetland is made up of sections of the Yangtze River delta and Yellow River delta. The total beach area amounts to 550,000hm², including the Yancheng Wetland, Nantong Wetland, and Lianyungang Wetland.

The southern part of Hangzhou Bay primarily consists of rocky beach. The major estuaries and gulf are located at the mouth of the Qiantangjiang – Huangzhou Bay, Jinjiangkou – Quanzhou Bay, Pearl River, and North Gulf.

2.1.2 Chinese Wetlands on the Ramsar Convention List of Wetlands of International Importance


2.2 Distribution of Wetlands in China along the South China Sea

(1) Estuarine Waters: These wetlands include the river water areas from the non-tidal reach to the division of saltwater and freshwater. The estuarine waters are mainly distributed in the reaches of tidal flats, which meets the mouth of the river, such as the reaches from the Xijiang River, Dongjiang River and Beijiang River to the Pearl River Estuary (Lingdingyang Estuary) in the Pearl River Delta in Guangdong; the estuary reaches of the Ganjiang River and Rongjiang River in the east of Guangdong; the estuary reaches of the Moyangjiang River, Loujiang River and Zhanjiang River in the west of Guangdong; the estuary reaches of the Kangjiang River in Beihai in Guangxi; the estuary reaches of the Qingjiang River in Qingzhou, Guangxi; the estuary reaches of the three river systems of Hainan, that is the Wanquanhe River, Nanduhe River and Changhuajiang River.

(2) Intertidal Flats: These wetlands lie from the shoreline to the lowest low water limit that is the beach land which comes out when the seawater falls to the lowest low water limit. The intertidal flats include sandy gravel beaches, sands beaches, mud beaches, grass beaches, and mangrove
swamps. Most of the mud beaches, mangrove swamps, and grass beaches are distributed in the estuaries, both sides of the bays or the bay heads. The sandy gravel beaches are mostly distributed on the rocky shores.

(3) **Coastal Lagoons:** These wetlands are mostly formed in bays with a narrow mouth. When a sand bank, sand spit, or sand bar appears in the bay mouth resulting from a washed deposit, a lagoon will form—a salt water lake with one or more outlets, such as the Pingqing Lake in Shanwei, Guangdong, the Dazhou Bay in Huidong, Guangdong, the Qingzhou Bay in Guangxi, the Dongzai Port, the Gangbei Port and the Qinglan Port in Hannan.

(4) **Shallow Marine Waters:** These wetlands cover the area between the depths of 0m to 6m at low tide, which can be determined with reference to charts. Another method is to obtain the tidal levels corresponding to the imaging time of the satellite images, and the depths of 0m to 6m can be determined roughly through image processing.

(5) **Rocky Marine Shores:** Because the shoreline of the South China Sea is meandering with a large number of ports, rocky marine shores are distributed in each province, especially in the Guanghai Bay in the west of Guangdong, and the Daya Bay, Dapeng Bay and the Dapeng Island in the east of Guangdong. These wetlands also exist in the Pearl River delta, the Tiexian Port in Beihai, Guangxi, the Qingzhou Port in Qingzhou, Guangxi, and the Yulin Port, Sanya Port and Yazhou Port in Sanya, Hainan.

Based on the data from Remote Sensing, Geographic Information Systems, and Global Positioning Systems, the resources of the coastal wetlands in China are shown to be plentiful (refer to Map 3-2). The statistics show that there are: 1) estuarine waters with a total area of 4,550.12km$^2$; 2) intertidal flats with a total area of 2,824.71km$^2$; 3) coastal lagoons with a total area of 365.83km$^2$; 4) shallow marine waters with a total area of 6,908.15km$^2$; and 5) rocky marine shores with a total area of 666.55km$^2$.

Figure 1 shows Map of Coastal Wetland Types along the South China Sea based on Remote Sensing Images.
2.3 Total Areas of Wetlands in China

Based on the above map of the coastal wetland classification at a scale of 1:250,000, the area of the map polygons of each type of wetland was measured by GIS software (Arc/info) and summarised according to the district divisions of the UNEP/GEF project, county, city, and province respectively. Thus, the statistics of the coastal wetlands in the South China Sea have been obtained (Table 1). In the tables, the data are area statistics from 2002 obtained from the remotely sensed images as described above.

<table>
<thead>
<tr>
<th></th>
<th>Guangdong</th>
<th>Hong Kong</th>
<th>Macau</th>
<th>Guangxi</th>
<th>Hainan</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estuary Waters</td>
<td>3,974.56</td>
<td>28.08</td>
<td>11.97</td>
<td>403.31</td>
<td>160.28</td>
<td>4,578.20</td>
</tr>
<tr>
<td>Intertidal Flats</td>
<td>1,582.03</td>
<td>11.10</td>
<td>0.00</td>
<td>853.72</td>
<td>392.73</td>
<td>2,839.57</td>
</tr>
<tr>
<td>Coastal Lagoon</td>
<td>119.67</td>
<td>20.25</td>
<td>0.00</td>
<td>0.00</td>
<td>245.29</td>
<td>385.21</td>
</tr>
<tr>
<td>Shallow marine Waters</td>
<td>4,502.66</td>
<td>295.59</td>
<td>61.24</td>
<td>1,390.87</td>
<td>933.13</td>
<td>7,183.49</td>
</tr>
<tr>
<td>Rocky marine Shores</td>
<td>374.63</td>
<td>17.37</td>
<td>0.00</td>
<td>2.30</td>
<td>12.98</td>
<td>407.29</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10,553.55</strong></td>
<td><strong>372.39</strong></td>
<td><strong>73.21</strong></td>
<td><strong>2,650.20</strong></td>
<td><strong>1,744.40</strong></td>
<td><strong>15,393.75</strong></td>
</tr>
</tbody>
</table>

3. UTILIZATION OF, AND THREATS TO, WETLANDS

3.1 Utilisation of Wetlands

3.1.1 Land-use Resources

1) **Enclosing Beaches for Fisheries and Aquaculture in Shallow Seawater**
The total aquaculture products from the South China Sea over the period from 1999 to 2001 were 44,570 thousand tonnes. In Guangdong Province from 1999-2001, beach enclosure and land reclamation created 40,683 ha for aquaculture, and the total aquaculture products was 24,110 thousand tonnes. These areas became important sites for fisheries and aquaculture production.

2) **Coastal Mangrove Swamp Wetlands**
Mangrove swamp wetlands are important resources that are mainly distributed in estuaries. They provide many important ecosystem functions, such as shielding against wind and erosion, maintaining banks, enduring huge waves, providing reproduction sites for fish, shrimp, crabs, and shellfish, and providing nesting grounds for water birds. The area of coastal mangrove wetlands in the South China Sea (including Hong Kong and Macao) was 22,121hm² during the period from 1950-1959. From 1990-1999 the area of coastal mangrove wetlands fell to 14,567hm², and 7,554hm² currently. Land reclamation is the primary cause of wetland loss. Land reclamation of these mangrove swamps has provided the land to develop the Guanghai Farm in Taishan, Niutianyang Farm in Shantou, the Huanggang tax-free Industrial Park in Shenzhen, the Mawan Oil Dock in Shenzhen, the Huangtian Airdrome in Shenzhen, and the Aotou Industrial Park in Dayawan.

3) **Land Resources for Coastal Salt Fields**
The natural conditions in the South China Sea are very advantageous for the salt industry, especially in western Guangdong Province and in western Hainan Province. The salinity of the South China Sea is 33 percent. The area of salt fields in the South China Sea was 21,613hm² in 1992, including 11,656.92hm² in Guangdong, 4,512.64hm² in Hainan, and 5,444.16hm² in Guangxi; the original output of salt was 659,100 tonnes, including 351,700 tonnes in Guangdong, 152,000 tonnes in Hainan, and 155,200 tonnes in Guangxi. Over the period from 1996 to 1999, the economic value of salt industry production was 0.6 billion, and the annual mean was 0.15 billion.

4) **Delta Low Plane Land Resources**
The important delta wetlands in the South China Sea include the Pearl River Delta, Hanjiang Delta, Jianjiang Delta, Nanliujiang Delta, and Nandu River Delta. These areas have mainly been used for...
3.1.2 Coastal Beach Wetland Resources

The total area of coastal beach wetlands in the South China Sea is 3,535.7hm², which is mainly used for aquaculture, the salt industry, enclosing beaches for land reclamation, and building mangrove wetlands. Through remote sensing and GIS techniques, it has been determined that 210.00km² of beaches were enclosed for land reclamation from 1978 to 1997 in the Pearl River Estuary. Of the 210.00km², 160.00km² occurred in the western Pearl River Estuary, and 50km² in the eastern Pearl River Estuary. In the eastern Pearl River Estuary, land reclamation in the south was mainly used for urban development, industrial development, and establishment of foundations, while land reclamation in the north was mainly used for agriculture and aquaculture. In the western Pearl River Estuary, land reclamation was mainly used for agriculture and aquaculture. In recent years, land reclamation of wetlands was mainly conducted to develop cities, transportation networks, airports, harbours, industrial lands, and aquaculture.

Over the past 100 years, the siltation rate of the delta and evolution of the coastline has increased rapidly, especially over the past 30 years. The natural rate of beach formation was approximately 1,000hm²/year, while the enclosure rate of beaches for land reclamation was approximately 1,100hm²/year.

Wetland Utilization in the South China Sea region mirrors that in the Pearl River Delta estuary as described below:

The Pearl River Delta estuary is one of the largest estuaries in the world, which was densely covered by networks of rivers. The beach resources were mainly distributed along the coast of the Lingdingyang and Huangmaohai Districts, while the shallow areas were distributed in the Modaomen and Jitimén districts. The pushing rate of Xijiang and Beiijing delta was increased to 4,050m/year. Delta pond wetlands are very famous in China. In this ecosystem, mulberry, fruit, sugar cane, and other economic crops were planted along the banks, fish were cultivated in the ponds, and the leaves of the mulberry gave birth to the silkworm.

In the Pearl River Delta Estuary, land reclamation is a serious problem. At the present time, the proportion of enclosing and silting is three to five. There is a delay in construction of the protected zone.

The Pearl River empties into the South China Sea through eight outlets in the delta. The evolution of the outlets, the rates of delta reclamation, and the changes in the coastline from 1966 to 1996 has been quantitatively studied through remote sensing and GIS techniques. The total reclaimed area in the entire delta during the period has been calculated to be 344km², at the average rate of 11.47km²/year, which is much greater than in the historical period. Of this total, 146km² has been reclaimed in the Lingdingyang District, where four eastern outlets (Humen, Jiaomen, Hongqili and Hengmen) are found. In the Modaomen and Jitimén Districts in the western part of the delta, 115km² has been reclaimed, and around the Yamen and Hutiaomen in the Huangmaohai district, 73km² has been reclaimed.

By contrast, the eastern coast of the Lingdingyang estuary has grown much more slowly, with some sections even experiencing a slight retreat due to erosion. In the western part of the delta during the same period, the coastline has moved seaward by 4.7km, at the rate of 156m/year, due to rapid reclamation, which has seriously affected the hydrological conditions and sediment dynamics in each outlet and its adjoining channel. This has caused the channels to lengthen greatly and resulted in channel splitting, distribution of runoff and sediment load, and frequent river flooding.
Rapid reclamation from 1966 to 1996 led the Modaomen outlet to rapidly advance seaward by 4.7km. After the completion of a planned reclamation project, shown in the area with the dashed line, the present Modaomen outlet will advance further seaward by more than 11km, while in the Huangmaohai Estuary, the Yamen and Hutiaomen outlets are merging into a new outlet due to rapid reclamation. Table 2 shows Land Reclamation in the Lingdingyang Area of the Pearl River Estuary from 1966 to 1996.

Table 2  Land Reclamation in the Lingdingyang Area of the Pearl River Estuary from 1966 to 1996 (unit km$^2$).

<table>
<thead>
<tr>
<th>Time</th>
<th>Jiposha and Shaken Area</th>
<th>Wanqingsha Reclamation Area</th>
<th>Hengmen Reclamation Area</th>
<th>Jinxingmen Reclamation Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1966-1986</td>
<td>ignore</td>
<td>23.6</td>
<td>ignore</td>
<td>10</td>
</tr>
<tr>
<td>1986-1996</td>
<td>21.7</td>
<td>26.3</td>
<td>21</td>
<td>ignore</td>
</tr>
<tr>
<td>Total</td>
<td>21.7</td>
<td>49.9</td>
<td>21</td>
<td>10</td>
</tr>
</tbody>
</table>

Data Source: Yuefeng et al. (1998).

3.1.3 Mineral Resources

According to statistics, there have been 662 mineral deposits discovered in the South China Sea wetlands; of this total, there have been 21 large mineral deposits, 60 medium-sized mineral deposits, and 123 small mineral deposits discovered. Besides these mineral deposits, 60 underground hot mineral springs have been discovered. In Guangdong, mineral deposits include zirconium quartz, ilmenite, tin mine, niobium and tantalum mine; while in Hainan, reserves of titanium and zirconium are the highest in China. Groundwater springs are also abundant in the wetland. For example, in the Zhuhai coastal hot spring, the temperature of water is approximately 80°C.

3.1.4 Estuary Resources

There are more than 200 large harbours in the South China Sea. The Dapeng Bay, Daya Bay, Hongkong, Hailing Bay, and Yulin are large enough to build huge deep water harbours, while the Zhanjiang Harbor, Guangzhou Harbor, Fangcheng Harbor, Mawan Harbor, Shenzhen Harbor, Yangpu Harbor, Sanya Harbor, Qinzhou Bay, and Tieshan Harbour are also suitable for huge deep water harbours if dredging is conducted.

In the South China Sea, the following ports have a throughput which exceeds 10,000 thousands tonnes: the Guangzhou Port (throughput of 84,320 thousands tonnes in 1997; throughput exceeds 0.1 billion tonnes presently); Shenzhen Port (throughput of 19,350 thousand tonnes in 1993); Zhanjiang Port (throughput of 18,000 thousand tonnes in 1996); Shuidong Port in Maoming (throughput of 14,250 thousand tonnes in 1995); and the Hong Kong Port (throughput of 0.12 billion tonnes in 1992). In the South China Sea, the following port has a throughput which exceeds 5,000 thousands tonnes: the Shantou Port (throughput of 8,000 thousands tonnes in 1997, and throughput of 65,000 thousands tonnes in 1997).

3.1.5 Utilisation for Tourism

Wetlands provide many values essential for tourism, including their innate biodiversity, landscape diversity, and culture diversity. From the point of view of sustainable eco-tourism, tourism within wetlands may be developed up to the carrying capacity of the wetland; that is, of the development of tourism should only be developed to the point where it will not have a negative effect on the wetland ecosystem function.

There are many famous tourist spots, including the Huizhou Western Lake (which is a famous coastal lake wetland tourist spot); Dameisha and Xiaomeisha in Shenzhen; Zuhai Coastal Park, Shangchuan Island and Zhao in Yangjiang; Fangji Island in Dianbai; Jiaweili Coral Reef Wetland in Xuwen; Wenchang Coco Forest in Hainan; Dadonghai, Yalongwan and Tianyahaijiao in Sanya in Hainan; Silver Beach in Beihai in Guangxi; and the Hepu-Shankou Mangrove Wetland. Utilizing wetland land resources, 33 coastal tourism areas have been created, including 11 coastal tourist holiday areas at the provincial level, and 22 scenic tourist spots that involve coastal scenery.
In recent years, wetland tourism has sprung up in Guangdong, including the ecological Paradise in Jun’an in Shunde; Fazenda on the Sea; Lotus Pond and Sunflower Garden in the town of Wanqingsha in Panyu; and the Rural Holiday spot in the town of Shajing in Shenzhen.

The annual mean number of tourists in these areas totalled 30,343.5 thousand from 1999 to 2001, and the gross economic earnings from tourism were 39.74 billion.

In recent years, officials at all levels of government have considered opening up and suspending the development of wetland environments. Integrated investigation and research of coastal beach and sea recourses in the SAS (which includes three Provinces in South China) was carried out throughout the 1980’s. Management and planting of mangroves were stressed during the 1990’s. For example, seven protected areas of coastal mangroves (32,585.5hm²) were established in the Guangdong Province from 1997 to 1999. From 1985 to 1995, 1,867.4hm² of mangrove was established in Zhanjian, Guangdong, and the mangrove wetland eco-tourism was exploited.

3.2 Causal Chain Analysis for Threats to Wetlands

3.2.1 Global Climate Change

According to one study, the Pearl River Delta Sea-Level Rise and its Defending Measures, Huang Zhenguo, if the sea-level rises by one meter, the low-lying plains area of the Pearl River Delta (including the city of Guangzhou) would be submerged; if the sea-level rises by 0.6m, 74 percent of the Pearl River Delta low-lying plains would be submerged. The rates of relative sea-level rise will greatly influence coastal wetlands. According to research results from the Chinese Academy of Science (1993), the rates of relative sea-level rise will reach 0.4m to 0.6m by the year 2050. The result, according to the National Mapping Bureau and National Marine Information Centre (1996), is that the rates of relative sea-level rise will reach 0.42m. Based on the above research results, sea-level rise will lead to the following consequences: raising the water depth and sea-level height of the eight River outlets, slowing the rate of delta edge sediment deposition, eroding and causing the destruction of banks and coastlines, and submerging the low-lying, reclaimed land areas.

3.2.2 Typhoons and Storm Tides

The Pacific Ocean and South Sea are the main source of these typhoons. From 1949-1982, an average of 12.7 typhoons per year affected Guangdong and Hainan. From 1949-1984, the number of annual mean typhoons that affected Guangxi was 2.3. Storm gusts, rains, tides, and gigantic waves followed typhoons and caused severe destruction. Typhoon No. 8607 landed on the Jieshi Bay in the city of Lufeng in Guangdong, and led to the complete destruction of many coastal counties and cities. The direct loss exceeded 1,100 million; 1387 people were injured or died; more than 533,333ha of agricultural fields were destroyed; 500 thousand tonnes of early rice paddies were lost; and crops, dykes (embankments), fish ponds, and shrimp ponds were also damaged. In 1996, Typhoon No.15 hit the Leizhou Peninsula, which suffered a 1.6 billion loss. However, a 30km long sea wall protected 1,400hm² of farmland (with an economic value of approximately16,000 thousand RMB Yuan) and 10,000 people.

On July 6, 2001, the eastern coastal zones in Guangdong were devastated by a storm tide called “Youte,” the aftermath of which included a 2.45 billion economic loss, destruction of 57km of dikes, 17 bursts, 1,169 damaged dams, and aquaculture loss of 56 thousands tonnes.

In 2002, three tropical storms hit Guangdong; seven cities were affected, 220m of banks were destroyed, 115 ships were damaged, four people died, and 23 fishermen disappeared.

In 2002, Tropical Cyclones No. 0214 and No. 0220 hit. In the station of Haikou Xiuying, the water rose by 58cm as a result of Cyclone No.0214, and the largest tidal level was 145cm (Yulin 76 base level). In the station of Haikou Xiuying, the water rose by 53cm as a result of Cyclone No. 0220.
3.2.3 Red Tides

The coastal areas which suffer from red tide encroachment along the Guangdong Coast includes the Peal Estuary, Da-peng Bay, Da-ya Bay, and coast of Zhanjiang. Over the period from 1980-1990, there were 26 red tides that occurred in Guangdong, 14 red tides in the Peal Estuary, approximately seven in the Da-peng Bay, and five in the Da-ya Bay. Since 1983, red tides have occurred every year. In April of 1983, red tides occurred simultaneously in the Da-peng Bay and Da-ya Bay. In 2002, nine red tides occurred in the area of the Guangdong Sea. The affected areas covered approximately approximately 500km². The main species of the red tide included Thalassiosira sp., Skeletonema costatum, Gyrodinium instriatum, Noctiluca scintillans, Mosodinium rubrum, and Phaeocystis sp.

On May 1, 2002, a red floater seawater strap appeared east of Weizhou Island, in Beihai, Guangxi. Although monitoring was conducted, the algae leading to the red tide could not be identified. On June 19, 2002, a red tide occurred east of Weizhou Island, with an area of approximately 20km². The biomass of this red tide was 2×10⁶ entries/L. On February 19, 2002, a red tide also occurred in the coastal area near Danzhou.

3.2.4 Enclosing Beaches for Land Reclamation

From 1978 to 1997, the area of beach enclosure in the Pearl River Estuary was 210km². One example can be seen with the town of Wangnqsha, in the southern part of the city of Guangzhou, which is a new town that was created by enclosing beach land.

Guangdong Province has one of the most abundant distributions of mangrove wetlands of any coastal city. There were 40,000ha of mangrove wetlands in the 1950s; however, there were only 147,000ha left by the 1990s. There have been 7,911.2ha of mangrove wetlands destroyed or occupied since 1980, including 7,767.5ha which were dug as ponds to breed aquatic species; 139.4ha which were used for construction; and 5.3ha which were turned into salt fields. From 1966 to 1996, the total reclaimed area in the entire delta was 344km², at an average rate of 11km²/year, which is much greater than in the historical period. Most of these reclaimed areas are located along the western coast of the Lingdingyang and Modaomem districts, and coast of Huangmaohai.

From 1950 to 1997, the total area of land reclamation was 44,640hm². Of the enclosed lands, 753hm² were used for urban development and industry, 669hm² for ports and harbours, 2,336hm² for plantations, and 33,809hm² for aquaculture. A similar situation occurred in both Guangxi and Hainan.

3.2.5 Urbanization and Industrial Development

The main causes of wetland pollution include the following:

1) Drainage of municipal wastewater and industrial wastewater

According to the statistical yearbook of the Guangdong Province in 2003, the total wastewater drainage of the Pearl Delta area was 3.4 billion tonnes in 2002, accounting for 69.75 percent of the Province total. Of the total amount, industrial wastewater drainage amounted to one billion tonnes, and household sewage amounted to 2.41 billion tonnes. The sewage is usually disposed directly into wetlands, due to the shortage of wastewater treatment facilities. The total sewage exceeded one billion tonnes in Guangzhou and Dongguan.

2) Non-Point Source Pollution

Many water bodies and waterways in the delta of the South China Sea are nutrient enriched and eutrophic. Nutrients come from point sources (e.g., inadequately treated sewage) and non-point sources (e.g. agricultural and urban runoff).

3) Oil Pollution

The seawater is polluted by oil from the petroleum survey, residences, and leaks or accidents.

When mangrove wetlands are heavily polluted, they are destroyed. For example, the mangrove wetlands in the city of Zhanjing (town of Haitou in the Xiashan District) have been mostly destroyed by pollution. From 1992 to 1993, a great deal of pollutants was discharged to the Pearl Estuary, which caused more than 100 species of fish and 20 species of shrimp to die off.
3.2.6 Other Causes of Destruction

Other causes of wetland destruction include the illogical use of the wetland water resources, the annual accumulation and rate of sedimentation, and the expansion of coastal erosion.

4. THE ASSESSMENT OF THE ENVIRONMENTAL ECONOMIC VALUE OF THE WETLANDS ALONG THE SOUTH CHINA SEA

4.1 The Environmental Economic Value of Wetlands

In order to exploit and protect the wetlands resource within reason, we should assess the wetlands environmental economic value. In generally, wetlands can provide the following services for the environmental economic system:

1) Wetlands are the source of some raw and processed materials of the economic system, such as primary products, aquatic species, and mineral products;

2) Some compositions of the wetland ecosystem provide necessary services for the life system, including nitrogen balance maintenance, moisture regulation, promotion of soil replacement, regulation of floods and droughts, and enhancement of system stability;

3) Wetland systems can provide appealing services, especially wetland tourism; and

4) The wetland ecosystem can break down some pollutants.

In 1997, an article on wetland valuation was published in the journal Nature. In this paper, the author estimated the total value of the world’s wetlands. In this estimation, the total value of the world’s wetlands was approximately 15,000 billion US dollars. Among the above, the value of the tidal wetlands and mangroves was approximately 1,640 billions US dollars, or 9,990 US dollars per hectare/year.

4.2 The Economic Value of Exploitation and Utilization of the Wetlands along the South China Sea

According to the theory of environmental economics, the wetland resource should have an economic value. Based on fundamental economic data, the direct market value method was adopted to estimate the direct use value of the coastal wetlands along the South China Sea (Table 3).

Table 3 The Gross Product of the Main Industries Associated with Coastal Wetlands along the South China Sea from 1996 to 1999 (unit: billion YMB Yuan).

<table>
<thead>
<tr>
<th>Area</th>
<th>Year</th>
<th>Total</th>
<th>Aquatic Products</th>
<th>Oil and Gas</th>
<th>Costal Sand Mines</th>
<th>Salt Industry</th>
<th>Coastal Shipbuilding</th>
<th>Transportation</th>
<th>International Coastal Tourism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guangdong</td>
<td>1996</td>
<td>79.013</td>
<td>24.092</td>
<td>17.231</td>
<td>0.95</td>
<td>3.087</td>
<td>13.377</td>
<td>21.098</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1997</td>
<td>84.976</td>
<td>23.988</td>
<td>19.309</td>
<td>0.051</td>
<td>3.078</td>
<td>16.674</td>
<td>21.858</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1998</td>
<td>79.1</td>
<td>26.4</td>
<td>13.4</td>
<td>0.03</td>
<td>0.1</td>
<td>3.2</td>
<td>13.1</td>
<td>22.8</td>
</tr>
<tr>
<td></td>
<td>1999</td>
<td>89.6</td>
<td>31.6</td>
<td>16.7</td>
<td>0.1</td>
<td>0.1</td>
<td>3.6</td>
<td>12.1</td>
<td>25.4</td>
</tr>
<tr>
<td>Guangxi</td>
<td>1996</td>
<td>7.614</td>
<td>5.586</td>
<td>0.033</td>
<td>0.024</td>
<td>1.968</td>
<td>0.027</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1997</td>
<td>7.765</td>
<td>7.324</td>
<td>0.024</td>
<td>0.03</td>
<td>1.968</td>
<td>0.027</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1998</td>
<td>9.3</td>
<td>8.8</td>
<td>0.002</td>
<td>0.04</td>
<td>0.4</td>
<td>0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1999</td>
<td>10</td>
<td>9.5</td>
<td>0.002</td>
<td>0.05</td>
<td>0.4</td>
<td>0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hainan</td>
<td>1996</td>
<td>4.302</td>
<td>2.774</td>
<td>0.053</td>
<td>0.025</td>
<td>0.812</td>
<td>0.658</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1997</td>
<td>4.72</td>
<td>3.105</td>
<td>0.025</td>
<td>0.012</td>
<td>0.723</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1998</td>
<td>5.3</td>
<td>3.8</td>
<td>0.02</td>
<td>0.1</td>
<td>0.8</td>
<td>0.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1999</td>
<td>5.5</td>
<td>4.8</td>
<td>0.02</td>
<td>0.03</td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>387.19</td>
<td>152.79</td>
<td>66.64</td>
<td>0.174</td>
<td>0.601</td>
<td>12.977</td>
<td>59.991</td>
<td>94.021</td>
<td></td>
</tr>
<tr>
<td>Annual Mean</td>
<td>96.798</td>
<td>38.198</td>
<td>16.66</td>
<td>0.044</td>
<td>0.151</td>
<td>3.244</td>
<td>14.997</td>
<td>23.505</td>
<td></td>
</tr>
</tbody>
</table>
4.2.1 Total Benefit Value of the Coastal Wetland Ecosystem in the South China Sea

In 2000, two Chinese researchers, Zhang Zhong-xin and Zhang Xinshi, estimated the value of the wetland ecosystem in the South China Sea. By their estimation, the benefit value of the wetland ecosystem in China is approximately 2,676.351 billion YMB Yuan per year. In 2003, the area of wetlands in China was estimated to be 3,848hm². According to remote sensing estimations of the wetlands in the South China Sea, the area of the coastal wetland in the South China Sea was 15,333.35km². According to the above parameters, the benefit value of the coastal wetlands in the South China Sea was calculated to be approximately 106.46 billions YMB Yuan per year.

4.2.2 Assessment and Analysis of the Value of Wetland Tourism along the South China Sea

1) The Value of Wetlands for Tourism and Education and Scientific Research

1. The Tourist Value of Wetlands

Wetlands are often areas for tourism because of their high biodiversity. Wetland biodiversity is attractive due to the high number of species found there, their unique habitats, communities, ecosystems, landscape, natural processes, and special wetland types. For example, the Futian mangrove wetland protected area in Shenzhen occupies 367.5ha, and provides the habitat for many winter migratory birds. Every year, many people come here to visit the reserve, for both study and tourism, which brings many economic benefits to the surrounding region. In the area of the South China Sea, there are many such areas like Futian, and many famous wetlands are already famous tourist destinations now.

2. Value for Education and Scientific Research

Wetlands provide a good laboratory for many scientific activities (for example monitoring, experiments, and comparison). Wetlands are increasingly the site for research studies on global change trends, because wetlands carry both the past markers and today's eco-processes. Through these studies, scientists can begin to understand more about the evolution process between humans and nature.

In addition, scientists need to also maintain wetlands as areas for education and research. Wetland ecosystems, with their diverse communities and species which are endangered, have an important value for scientific research, because they provide the objects, material, and experiment for these studies. In some wetlands, biological and geological information has been maintained.

2) Analysis of the Value of Wetland Tourism along the South China Sea

There are many famous tourist sites in South China Sea wetlands. For example, in Guangdong, these famous tourist sites include the Dameisha and Xiaomeisha coastal wetland areas in Shenzhen, the Futian Mangrove Wetland Protected Area in Shenzhen, the Coastal Park in Zhuhai, and Shangchuan Island and Zha-po in Yangjiang; in Hainan, the famous tourist sites include Dadonghai and the East Coco Forest in Wenchang; and in Guangxi, a famous tourist site is the Silver Beach in Beihai.

These wetland tourist sites provide great benefits to South China Sea region. According to the statistics, the average mean of tourists between 1999 and 2001 reached 30.3435 million, and the income produced was 39.738 billion RMB Yuan. In the Pearl River Estuary, the income from wetland tourism reached 32.73 billion RMB Yuan (Table 4).

Table 4 Total Economic Income of Tourism of South China Sea Wetlands.

<table>
<thead>
<tr>
<th>Province District</th>
<th>Number of traveller (million person-time)</th>
<th>Outlay income ( billion Yuan)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guangdong Shantou</td>
<td>2.1290</td>
<td>3.538</td>
<td></td>
</tr>
<tr>
<td>Guangzhou</td>
<td>6.5211</td>
<td>8.515</td>
<td></td>
</tr>
<tr>
<td>Shenzhen</td>
<td>6.1250</td>
<td>7.420</td>
<td></td>
</tr>
<tr>
<td>Zhuhai</td>
<td>4.2930</td>
<td>7.860</td>
<td></td>
</tr>
<tr>
<td>Zhongshan</td>
<td>3.1260</td>
<td>4.522</td>
<td></td>
</tr>
<tr>
<td>Jiangmen</td>
<td>5.4462</td>
<td>4.413</td>
<td></td>
</tr>
<tr>
<td>Guangxi chuang municipality Heipei</td>
<td>0.3216</td>
<td>0.413</td>
<td></td>
</tr>
<tr>
<td>North beilunkou</td>
<td>0.1620</td>
<td>0.208</td>
<td></td>
</tr>
<tr>
<td>Wenchang</td>
<td>1.2594</td>
<td>1.616</td>
<td></td>
</tr>
<tr>
<td>Danzhon-lingao</td>
<td>0.9612</td>
<td>1.233</td>
<td></td>
</tr>
</tbody>
</table>

average number of travellers from 1999 to 2001 reaches 30.3435 million person-time, the income reaches 39.738 billion Yuan
4.2.3 Environmental Economic Analysis of the Value of Land Resources along the South China Sea

Wetlands are a type of land resource, because they have a potential land value. Without wetlands, there will be no people. Wetlands will have a high value when people conduct business and market exchange based on their resources. The value of wetlands differ in various locations. The value is high in rich economic regions, while low in poor economic regions. The value of different wetlands will change with its type, purpose, and location. The six wetland demonstration areas in the South China Sea were analyzed for their land value in Table 5 below.

Table 5 Analysis of Land Resource Value along the South China Sea.

<table>
<thead>
<tr>
<th></th>
<th>Shantou</th>
<th>The Pearl River Estuary</th>
<th>Hepu</th>
<th>Beilun Estuary</th>
<th>Wenchang</th>
<th>Dnzhou - Lingao</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area (ha)</td>
<td>20,090.92</td>
<td>12,783.43</td>
<td>3,950.68</td>
<td>1,082.84</td>
<td>217.69</td>
<td>805.69</td>
<td>38,931.25</td>
</tr>
<tr>
<td>Value/unit Million RMB Yuan/ha</td>
<td>2.001</td>
<td>8.004</td>
<td>1.0005</td>
<td>1.0005</td>
<td>1.502</td>
<td>1.502</td>
<td></td>
</tr>
<tr>
<td>Total Value Billion Yuan</td>
<td>40.202</td>
<td>102.318</td>
<td>3.952</td>
<td>1.083</td>
<td>0.327</td>
<td>1.21</td>
<td>149.092</td>
</tr>
</tbody>
</table>

4.2.4 Analysis of the Transportation Value of Wetlands along the South China Sea

The coastal seaports along the South China Sea are often located in areas of coastal wetlands. In Guangdong, there are 65 seaports, 1,430 docks, 155 ten thousand docks, throughput reached 0.2346 billion tonnes, and income reached 12.148 billion Yuan (Table 6).

Table 6 Economic Income from Transportation at Wetland Seaports and Gulfs along the South China Sea (1999-2001).

<table>
<thead>
<tr>
<th>Guangdong</th>
<th>Guangxi</th>
<th>Hainan</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shantou</td>
<td>The pearl river estuary</td>
<td>Hepu</td>
<td>Beilun estuary</td>
</tr>
<tr>
<td>Billion Yuan</td>
<td>2.123</td>
<td>0.7082</td>
<td>0.513</td>
</tr>
<tr>
<td>Rate (percent)</td>
<td>18.9</td>
<td>62</td>
<td>6.9</td>
</tr>
</tbody>
</table>

4.2.5 Value of Ecological Services of Wetlands along the South China Sea

The value of the ecological services of three of the six wetland demonstration areas of the GEF project in the South China Sea were determined: the Shantou wetland, the Pearl River Estuary, and Hepu wetland areas.

1) The Value of the Ecological Services of the Shantou Wetland Demonstration Area

The total area of the Shantou Wetland Demonstration area is approximately 20,090.92hm². The resource value, environmental value, and human cultural values were estimated as follows in Table 7 below.
Table 7  Assessment of the Principle Ecological Services Values of the Shantou Wetland Demonstration Area.

<table>
<thead>
<tr>
<th>Values</th>
<th>Categories</th>
<th>Basis for Calculation</th>
<th>Value per Unit Area (YMB Yuan/ha/year)</th>
<th>Value (ten thousand YMB Yuan/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource Value</td>
<td>Land</td>
<td>Land usufruct: 200.1 ten thousand YMB Yuan/ha²</td>
<td>2,001,000</td>
<td>4,020,193.09</td>
</tr>
<tr>
<td></td>
<td>Mangrove forest</td>
<td>The biomass is 46.20t/ha, the price for timber purchasing is 0.4 Yuan/k; one time every 30a for cutting down; the area of mangrove forest is 1192 ha²</td>
<td>616</td>
<td>73.43</td>
</tr>
<tr>
<td>Environmental Value</td>
<td>Habitat protection</td>
<td>Based on the world average mean for wetland ecosystem habitat protection</td>
<td>2,520</td>
<td>5,062.91</td>
</tr>
<tr>
<td></td>
<td>Purifying water quality</td>
<td>Based on the world average mean for wetland water purification</td>
<td>3,500</td>
<td>7,031.82</td>
</tr>
<tr>
<td>Human Cultural Value</td>
<td>Tourism</td>
<td>The price of entrance ticket is 50Yuan/person, annual mean tourists is about 30 ten thousands</td>
<td>6,250</td>
<td>1,500.00</td>
</tr>
<tr>
<td></td>
<td>Research and education</td>
<td>Based on the world average mean for wetland research and education</td>
<td>7,300</td>
<td>14,666.37</td>
</tr>
</tbody>
</table>

2)  The Value of the Ecological Services of the Pearl River Estuary Wetland Demonstration Area

The total area of the Pearl River Estuary Wetland Demonstration Area is approximately 12,783.43 ha². The resource value, environmental value, and human cultural values were estimated as follows in Table 8 below.

Table 8  Assessment of the Principle Ecological Services Values of the Pearl River Estuary Wetland Demonstration Area.

<table>
<thead>
<tr>
<th>Values</th>
<th>Categories</th>
<th>Basis for Calculation</th>
<th>Value per Unit Area (YMB Yuan/ha²/year)</th>
<th>Value (ten thousand YMB Yuan/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource Value</td>
<td>Land</td>
<td>Land usufruct: 800.41 ten thousand YMB Yuan/ha²</td>
<td>8,004,000</td>
<td>10,231,985.20</td>
</tr>
<tr>
<td></td>
<td>Mangrove forest</td>
<td>The biomass is 112.60 t/ha, the price for timber purchasing is 0.4 Yuan/kg; one time every 30a for cutting down; the area of mangrove forest is 1859 ha²</td>
<td>1,501</td>
<td>279.03</td>
</tr>
<tr>
<td>Environmental Value</td>
<td>Habitat protection</td>
<td>Based on the world average mean for wetland ecosystem habitat protection</td>
<td>2,520</td>
<td>3,221.42</td>
</tr>
<tr>
<td></td>
<td>Purifying water quality</td>
<td>Based on the world average mean for wetland water purification</td>
<td>3,500</td>
<td>4,474.20</td>
</tr>
<tr>
<td></td>
<td>Water regulation</td>
<td>Based on the world average mean for wetland water regulation</td>
<td>3,200</td>
<td>4,090.69</td>
</tr>
<tr>
<td>Human Cultural Value</td>
<td>Tourism</td>
<td>The price of entrance ticket is 50Yuan/person, annual mean tourists is about 100 ten thousands</td>
<td>6,250</td>
<td>5,000.00</td>
</tr>
<tr>
<td></td>
<td>Research and education</td>
<td>Based on the world average mean for wetland research and education</td>
<td>7,300</td>
<td>9,331.90</td>
</tr>
</tbody>
</table>

3)  The Value of the Ecological Services of the Hepu Wetland Demonstration Area

The area of Hepu wetland demonstration area is approximately 3,950.68 ha². The resource value, environmental value, and human cultural values were estimated as follows in Table 9 below.
Table 9  Assessment of the Principle Ecologic al Services Values of the Hepu Wetland Demonstration Area.

<table>
<thead>
<tr>
<th>Values</th>
<th>Categories</th>
<th>Basis for Calculation</th>
<th>Value per Unit Area (YMB Yuan/hm²/year)</th>
<th>Value (ten thousand YMB Yuan/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource Value</td>
<td>Land</td>
<td>Land usufruct: 100.05 ten thousand YMB Yuan/hm²</td>
<td>1,005,000</td>
<td>395,265.53</td>
</tr>
<tr>
<td></td>
<td>Mangrove forest</td>
<td>The biomass is 52.72 t/ha, the price for timber purchasing is 0.4Yuan/kg; one time every 30a for cutting down; the area of mangrove forest is 1585hm²</td>
<td>702.93</td>
<td>111.41</td>
</tr>
<tr>
<td>Environmental Value</td>
<td>Habitat protection</td>
<td>Based on the world average mean for wetland ecosystem habitat protection</td>
<td>2,520</td>
<td>995.57</td>
</tr>
<tr>
<td></td>
<td>Purifying water quality</td>
<td>Based on the world average mean for wetland water purification</td>
<td>3,500</td>
<td>1,382.74</td>
</tr>
<tr>
<td></td>
<td>Water regulation</td>
<td>Based on the world average mean for wetland water regulation</td>
<td>3,200</td>
<td>1,264.22</td>
</tr>
<tr>
<td>Human Cultural Value</td>
<td>Tourism</td>
<td>The price of entrance ticket is 30Yuan/person, annual mean tourists is about 50 ten thousands</td>
<td>6,250</td>
<td>1,500.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The price of the other tourism items is two times of the price of the entrance ticket</td>
<td>12,500</td>
<td>3,000.00</td>
</tr>
<tr>
<td></td>
<td>Research and education</td>
<td>Based on the world average mean for wetland research and education</td>
<td>7,300</td>
<td>2,883.99</td>
</tr>
</tbody>
</table>

5. THE LEGISLATION AND MANAGEMENT SYSTEM FOR WETLANDS PRESERVATION IN THE SOUTH CHINA SEA REGION

5.1 Relevant Administrative Bodies and Conservation Action Programs

5.1.1 Establishment of Administrative Bodies

1) National Administrative Bodies

The administrative bodies that are responsible for the protection of wetlands include the State Environmental Protection Administration, the Ministry of Forestry, the Ministry of Agriculture, the State Scientific and Technological Commission, the State Oceanic Administration, and the Ministry of Construction.

(1) The Status of Environmental Protection Administration

The State Environmental Protection Administration is a functional department under the State Council, which is directly responsible for environmental protection in China (Legal Office of the State Council, 2000). It is not only responsible for the general management and supervision of nature reserves and species, but also the integrated coordination of efforts in different areas to protect the biodiversity of China.

The Department of Nature and Ecological Conservation under the State Environmental Protection Administration is the primary agency responsible for wetland protection and the affairs related to it. Its main responsibilities are as follows: to formulate and supervise the enforcement of the nature conservation laws and regulations; to formulate the plan for biodiversity conservation; to develop the national plan for nature reserves; to propose recommendations for establishing new nature reserves of various kinds at the national-level; to supervise the management of national-level nature reserves; to supervise environmental protection efforts in the activities of natural resource exploitation; to guide and monitor land reclamation in mining areas, the recovery of ecological damages, wetland conservation, and desertification prevention and control; to supervise the management of marine environmental pollution prevention and control related to coastal projects and land-based activities; to manage the environmental safety of biotechnology; and to manage rural ecological conservation projects and guide the construction of national ecological demonstration areas and eco-agriculture projects.
2) The State Forestry Administration
The State Forestry Administration is a functional department directly under the State Council responsible for the management and protection of forests and terrestrial wildlife resources (Legal Office of the State Council, 2000).

3) The State Oceanic Administration
The State Oceanic Administration is the administration under the Ministry of Land and Resources responsible for supervising the use of the seas, protecting the oceanic environment, safeguarding oceanic rights and interests, and organizing research on oceanic science and technology.

The main responsibilities of the Department of Oceanic Environmental Protection under the State Oceanic Administration are as follows: organizing the investigation, surveillance and assessment of the oceanic environment; monitoring the pollution caused by oil exploration and exploitation at sea caused by dumping waste into the ocean and oceanic construction projects; drafting the programs, standards and criteria for oceanic environmental protection and restoration; drafting the standards for pollutant emission and discharge into the ocean; establishing the overall control systems; supervising pollutant discharges from the land into the ocean pursuant to national standards; supervising the oceanic nature reserves and specially protected areas; organizing the observation and monitoring of the oceanic environment; and managing the disaster forecast and alarm system.

4) The Ministry of Agriculture
The Ministry of Agriculture is a functional department directly under the State Council responsible for the management of agriculture, fisheries and livestock production. It is responsible for protecting the natural environment and animal and plant resources in agricultural wetlands.

The responsibilities of the Fisheries Bureau under the Ministry of Agriculture include: studying and proposing recommendations for fishing development strategies and programs, technology improvement measures, and relevant laws, regulations, and policies; formulating and implementing the policies, measures, and programs for the protection and wise use of fishery resources, and protection of the natural environment of fishery areas and aquatic wildlife.

The responsibilities of the Animal Husbandry and Veterinary Bureau are: protecting and using grassland resources wisely, protecting the natural environment, and organizing the protection and wise use of domestic animal and bird species, livestock resources, and fodder resources.

The responsibilities of the Department of Crop Industry Management are: studying and proposing recommendations for policies to promote the development of the crop production industry, including broad development strategies, programs and the annual plan; guiding the adjustment of the structure and overall arrangement of the crop production industry; drafting relevant laws, regulations, and rules on the crop production industry; formulating related standards and technical criteria; studying and proposing policies and measures on the protection, compensation, and improvement of cultivated land; implementing programs and supervising and enforcing policies and programs.

2) Local Administrative Bodies
Among the local administrative bodies at various levels of government, the departments of environmental protection, forestry, agriculture, oceans and aquatic species are concerned with the protection of the natural environment and biodiversity in wetlands. But the administrative institutions at the provincial level are different in various Provinces. In Guangdong Province, the departments of oceans and aquatic species have been combined into one department, the Department of Oceans and Aquatic Species, while in the Guangxi Zhuangzu Autonomous Region and the Hainan Province, these two departments remain distinct entities. In Hainan, the departments of environmental protection, and land and resource management, have been united as the Department of Environment and Land Resources, while in Guangxi and Guangdong, the Environmental Protection Bureaus are independent administrations. Their functions are similar to those of the national administrative bodies (Environmental Protection Bureau of Guangdong Province, 2000).
The Departments of environmental protection, forestry and oceans are responsible for wetland nature reserves. The institutional arrangements for management of nature reserves are introduced below.

5.1.2 Conservation Action Programs

There are several conservation action programs for the protection of wetlands, which are mainly national programs, including the following:

1) China’s Agenda 21 Process

In order to implement the national sustainable development strategy, the State Council of the Chinese Government passed and published “China's Agenda 21-Report on China's Population, Environment and Development in the 21st Century” in May 1994 (Legal Office of the State Council, 2000). It describes the sustainable development strategy, policy, and action framework for China's population, economics, society, resources, and environment. The protection and wise use of wetlands were mentioned in many sections of the report.

2) Action Plan for the Conservation of Biodiversity

The Action Plan for the Conservation of Biodiversity was finalized in 1994. It is the principal document guiding the conservation of biodiversity in China. The Action Plan sets forth the threats to various biological resources and their ecological systems, including wetland resources, and the causes of those threats. It proposes the general objectives, specific objectives, and action plan for the conservation of biodiversity. It also proposes the measures by which the action plan should be carried out.

3) China’s Agenda 21-Action Plan for Forestry

The Action Plan for Forestry was formulated in 1995 as one of the special action plans to implement “China’s Agenda 21.” It sets forth the general strategic objectives and policies on Chinese forestry development. The report also proposed the objectives and action framework for the conservation and wise use of wetland resources.

4) China National Wetland Conservation Action Plan

China’s National Wetland Conservation Action Plan was formulated in 2000 and serves as the principle guiding document on the protection, management, and sustainable use of wetlands in China. The report sets out the guidelines, objectives, and preferential actions for wetlands protection.

5.2 Introduction to the Creation of Nature Reserves

5.2.1 Wetlands and Wetland Nature Reserves in Guangdong Province

By the end of 1999, there were 27 wetland nature reserves that had been established in Guangdong Province. There are four national nature reserves, including the: 1) Guangdong Neilingding—Futian Nature Reserve, 2) Guangdong Zhanjiang Mangrove Nature Reserve, 3) Huidong Port Turtle Nature Reserve, and 4) Zhaoqing Xinghu National Scenic Spot. There are seven provincial nature reserves, including the: 1) Haifeng Gongpingdahu Nature Reserve, 2) Nanao Migratory Birds Nature Reserve, 3) Daiyawan Aquatic Species Nature Reserve, 4) Guangdong Leizhou White-Butterfly’s Shellfish Nature Reserve, 5) Longchuan Fengshuba Nature Reserve, 6) Heyuan Xingang Nature Reserve, and 7) the Qujiang Luokeng Nature Reserve. There are 16 nature reserves at the city or county level.

These wetland nature reserves in Guangdong Province can be classified by the habitat protected. There are 15 offshore and coastal wetland nature reserves, two potamic wetland nature reserves, seven lacustrine wetland nature reserves, one swampy wetland nature reserve, two pond wetlands, and one geothermal wetland. The wetland nature reserves can also be classified in terms of the flora and fauna protected. There are seven reserves that protect the species in mangroves, 12 wetland nature reserves providing habitat for migratory birds, eight wetland nature reserves for the protection and breeding of aquatic species, and seven wetland reserves for the protection of other species.
Of the wetland nature reserves in Guangdong Province, as in Guangdong, the offshore and coastal wetland nature reserves and the nature reserves for protection and breeding of aquatic species are the largest. The proportion of their surface area to that of all the wetland nature reserves, 49.86 percent to 66.45 percent, is also the highest, which indicates that Guangdong Province has a high degree of oceanic resources.

Among the 27 wetland reserves mentioned above, 17 are managed by the Forestry Administration (including two that are managed by the Provincial Forestry Bureau), eight are managed by both the Provincial Forestry Bureau and the local Forestry Bureau at the city or county level (seven of which are managed by the local Forestry Bureau at the city or county level); eight are managed by the Marine Aquatic Species Administration (including three that are managed by the Provincial Marine Aquatic Species Department, and five that are managed by the local Marine Aquatic Species Bureau at the city or county level); one is managed by the Tourist Administration; and one is managed by the Environmental Protection Administration.

The wetland nature reserves in Guangdong Province comprise a total area of 244,856.2hm², which represents only 13.08 percent of the total wetland area in Guangdong. Therefore, these nature reserves are not sufficient to protect the natural environment and species in wetlands. According to government programs, Guangdong Province plans to establish 31 wetland nature reserves over the period from 2001 to 2005, totalling 442,190hm², which would represent 23.62 percent of the total wetlands area of Guangdong. These wetland nature reserves will be established mainly for the protection of dolphins, different types of marine ecosystems, near shore islands, and shallow seas.

5.2.2 Wetlands and Wetland Nature Reserves in the Guangxi Zhuangzu Autonomous Region

The Guangxi Zhuangzu Autonomous Region is situated next to the Beibu Bay in southern China. The coastline begins from the Hepu Yingluo Harbour in the east, and ends in the Beilun River in the Town of Dongxing in the west. The total coastline is 2,199km long, and is winding with many bays. Along the coastline, there are many types of wetlands, including shallow seas, coral reefs, tidal seashores, mangrove swamps, lagoons, and estuaries. The climate of the region is tropical monsoon. The average yearly temperature ranges from 22 to 23°C, the average temperature in January is 15.2°C, and the average temperature in July is 28.4°C. The frost-free period is 354 days, and annual rainfall is approximately 2,000mm. It rains mostly from May to August. The main vegetation are mangrove forests, made up of Aegiceras corniculatum, Avicennia Marina, Bruguiera gymnorrhiza, and Rhizopora styrosa. The biggest mangrove forest in China’s coastal area is located in this region.

There are 79 species of water birds in the coastal area in the northern Beibu Bay. This area lies on the migratory route from Northeast Asia to Southeast Asia, the Malay Archipelago, and Australia. When the migratory season occurs (in spring or autumn), there are many species of water birds migrating through the area. The extent of water birds found in the area is much greater than in the inland areas of the Guangxi Zhuangzu Autonomous Region. For example, there are 17 species found here that cannot be found inland in Guangxi.

There have been three wetland nature reserves established by the country along the coast of the Guangxi Zhuangzu Autonomous Region, which include the Shangkou Mangrove Ecological Nature Reserve, the Beilun Hekou Marine Ecological Nature Reserve, and the Dugong Marine Ecological Nature Reserve. These three nature reserves are among the first-class of national marine ecological nature reserves and are managed by the Marine Bureau of the Guangxi Zhuangzu Autonomous Region. Besides these reserves, the Guangxi Zhuangzu Autonomous Region has not yet established further nature reserves that protect wetlands in particular.

The Guangxi Zhuangzu Autonomous Region is also home to 12 man-made nature reserves, 35 watershed forest nature reserves, and eight rare animal and plant nature reserves. The wetland ecosystems in these nature reserves are well protected. But the protection of wetlands outside the nature reserves is not as good as within the nature reserves, because they lack regular and scientifically-based protection measures. Protection of wetlands outside the reserves completely depends on the degree of education and the level of management of the users of the land.
The 55 nature reserves mentioned comprise a total area of 17,099 km$^2$, which represents only 7.1 percent of the total area of the district. Compared to the large area of wetlands in the Guangxi Zhuangzu Autonomous Region, the extent of nature reserves is still very small and they cannot provide enough protection for the wetlands.

### 5.2.3 Wetlands and Wetland Nature Reserves in Hainan Province

There are 20 different types of wetlands in Hainan Province, which comprise a total area of 311,830.2 ha (excluding man-made paddy field wetlands). Shallow sea wetlands are the largest, followed by pond wetlands, and perpetual rivers. Mangrove wetlands and coral reef wetlands are the most important types of wetlands in Hainan, due to their three important characteristics:

1) The wetlands along the coasts are vast. There are 12 predominant types of wetlands, including shallow sea wetlands, delta wetlands, coral reefs, and mangrove swamps. The wetland area along the coasts represents 61 percent of the total wetland area in Hainan Province, while the area of shallow sea wetlands represents 26 percent of the total wetland area;

2) The largest mangrove wetland in China is located in Hainan Province. The area of mangrove wetlands is the largest, with the most mangrove plants in them. The total mangrove area of China is approximately 5,886.1 hm$^2$, and the mangrove area in Hainan Province represents 82 percent of the total area. There are 16 families, 19 genera, and 29 species of mangrove plants in China, and 26 of these species can be found in Hainan Province; and

3) Hainan Province is the place where coral reef grows best in China. The area of coral reef wetlands represents 6.3 percent of the total wetland area of Hainan Province. There are many coral reefs along the coastline, especially from Wenchang to Qionghai, from Danzhou to Lingao, and in Sanya.

There are 34 varied wetland nature reserves in Hainan Province, totalling an area of 2,543,572.15 ha. Hainan Province has the second most wetland nature reserves in China. These nature reserves are located in 11 cities or counties, and in Xisha and Nansha. The city of Danzhou has the most nature reserves, with a total of 11. The city of Sanya has eight nature reserves, Lingao County has five, and the city of Wenchang has two reserves. Among the 34 nature reserves in Hainan Province, there are two national nature reserves, which are the Dongzhaigang Mangrove National Nature Reserve and the Sanya Coral Reef Nature Reserve; nine provincial nature reserves; and 23 nature reserves at the city or county level.

Of the 19 mangrove wetland nature reserves in China, nine of them are located in Hainan Province, which represents 47.4 percent of the total number of mangrove wetlands. Among the seven coral reef wetland nature reserves in China, six of them are in Hainan Province, which represents 85.7 percent of the total number of coral reef wetlands. Eight of these 34 nature reserves are managed by the Forestry Administration, 12 are managed by the Environmental Protection Administration, four are managed by the Water Conservancy Administration, three are managed by the Aquatic Species Administration, two are managed by the Marine Administration, two are managed by the Agricultural Administration, and three are managed by other administrations.

### 5.3 Management of Wetlands and Wetland Nature Reserves

#### 5.3.1 Management of Wetlands in Guangdong Province

1) **Fundamental Research on Wetland Resources**

In order to gain a thorough understanding of the wetland resources in the whole district, the Government of Guangdong Province has spent a lot of manpower and resources on two research studies on wetland resources and the natural environment. The first project was an investigation on the resources and ecology of coastal wetlands, which was carried out from 1995 to 1997. The second was an investigation and computer-aided mapping of wetland resources in Guangdong Province, which was carried out from 1999 to 2000. As a result of these research studies, data on the classification, quantity, quality, distribution, conditions of use and threats to wetland resources in Guangdong Province have primarily been collected. Two reports, entitled “The Report on the
Investigation into Wetland Resources in Guangdong Province” and “Report Form of the Statistics of Wetland Resources in Guangdong Province,” chiefly edited by Professor Chen Guizhu, were completed as a result of these studies. The studies also provided a good foundation to establish a database and information system on wetland resources in Guangdong Province in the future. Furthermore, the researchers gained experience in utilizing technological tools to program, manage, and use wetland resources wisely.

2) **Wetlands Administration**

The administrative agencies and staff responsible for managing the national and provincial nature reserves have been running smoothly, and are carrying out the job of protecting and managing wetland resources. Some nature reserves have done an exceptional job with protection and management, such as the 1) Guangdong Neilinding Futian Nature Reserve, 2) Guangdong Zhanjiang Mangrove Nature Reserve, 3) Huidong Port Turtle Nature Reserve, and 4) Guangdong Leizhou White Butterfly’s Shellfish Nature Reserve.

The administration of nature reserves at the city or county level is mostly within the departments of related organizations. For example, the administration of mangrove nature reserves is mostly under the jurisdiction of the Forestry Bureau at the county level, while the administration of aquatic species nature reserves is under the jurisdiction of the Marine Aquatic Species Bureau. Some agencies are not currently operating, and the management and protection of wetlands is not strong enough. Some nature reserves are operating effectively, such as the Xinhui Birds’ Heaven Nature Reserve, Huidong White Basin Pearl Nature Reserve, Huidong Mangrove Nature Reserve, Zhuhai Mangrove Nature Reserve, and Nanhai Huangji Nature Reserve, while others are not functioning.

5.3.2 **Management of Wetlands in the Guangxi Zhuangzu Autonomous Region**

1) **Fundamental Research on Wetland Resources**

In 1994, on the basis of the “Notice on the Initiation of Research on Wetland Resources” issued by the General Office of the Ministry of Forestry in 1994, the Forestry Department of the Guangxi Zhuangzu Autonomous Region formulated a “Research Plan on the Wetland Resources in Guangxi.” (Ministry of Forestry, 2000). In order to ensure that the research could be carried out smoothly, the Government of the Autonomous Region decided to establish a coordinating group in 1996 according to the requirements of the “Research Plan on Terrestrial Wild Animals and Plants.” The coordinating group for research on wetland resources and the coordinating group for research on terrestrial wild animals and plants were then united. The director of this group was the Vice Chairman of the Government of the Guangxi Zhuangzu Autonomous Region. The deputy directors and members of the coordinating group included the general directors of relevant departments. The coordinating group was responsible for ensuring that the research could be conducted smoothly. A general office was created under the research study’s coordinating group. Both the study on wetland resources and the study on the animal resources were conducted at the same time. The study on wetland resources in the Guangxi Zhuangzu Autonomous Region was organized by the Forestry Department of the Autonomous Region (now the Forestry Bureau of the Guangxi Zhuangzu Autonomous Region) (Forestry Bureau of Guangxi Zhuangzu Autonomous Region, 2000). Several organizations contributed to the completion of the report, including Guangxi University, Guangxi Normal University, Guangxi Natural Museum, Guangxi Academy of Sciences, Administrative Agencies for Wild Animals, Plants, and Nature Reserves under the Forestry Bureau of the Autonomous Region, and the local Forestry Bureaus at the city or county level. In order to carry out the research successfully, the Forestry Department of the Guangxi Zhuangzu Autonomous Region drew upon numerous documents, and asked for the support and cooperation of relevant departments and of the Forestry Bureaus at the city or county level (Forestry Bureau of Guangxi Zhuangzu Autonomous Region, 2000). These organizations provided a great deal of organizational and technological support for the study on wetland resources. The fieldwork was completed at the end of 1999, but supplementary fieldwork was completed from January to May 2000. Based on this work, a report was published entitled the “Report on Research into the Wetland Resources of the Guangxi Zhuangzu Autonomous Region,” which was verified and accepted by the National Forestry Administration.
Wetlands Administration

To date, the only nature reserves specially designated for the conservation of wetlands in the Guangxi Zhuangzu Autonomous Region are the 1) Hepu Shatian-Yingluo Harbour Dugong Marine Ecological Nature Reserve, 2) Shangkou Mangrove Ecological Nature Reserve, and 3) Beilun Hekou Marine Ecological Nature Reserve.

The Hepu Shatian-Yingluo Harbour Dugong Marine Ecological Nature Reserve lies along the coast in Southern China (to the east of the Guangxi Coast, next to Beibu Bay in the south). The total area of the nature reserve is 350km² and the core area is 120 km². Worldwide research on dugong species has shown that the distribution of dugongs mainly occurs between 15 and 22 degrees north latitude. The Dugong Marine Ecological Nature Reserve is located within this latitude, which is the perfect natural sea area for the dugongs. The State Council ratified this nature reserve as a national nature reserve in 1992. However, because of a budget shortfall, the management organization was not established, and the boundaries of the reserve area were not defined. In 1996, the North Sea Marine Environmental Monitoring Centre, entrusted by the Guangxi Environmental Protection Bureau, established a protection program and defined the boundaries and area of the nature reserve (Environmental Protection Bureau of Guangdong Province, 2000). The Management Station of the Guangxi Hepu Shatian-Yingluo Harbour Dugong Marine Ecological Nature Reserve, which was established in 1998, is responsible for the protection and management of the nature reserve, and controlling the damage to the seaweed and the living environment of the dugongs. The management organization also monitors to ensure that people are prevented from fishing by explosion and electric fishnet. It also regularly monitors all indicator species of the natural environment that are useful for the protection of the coastal areas, in order to provide a favourable natural marine habitat for the dugongs to reproduce. This nature reserve is managed by the Environmental Protection Bureau of the Guangxi Zhuangzu Autonomous Region, under which there is a management station (Environmental Protection Bureau of Guangdong Province, 2000). The management station is also a part of the North Sea Marine Environmental Monitoring Centre. There are 23 people working in the management organization, three of whom work in the office, five in the laboratory, two in the exploitation branch, four in the management branch, five in the Shatian Station, and four in the police station.

The Beilun Hekou Marine Ecological Nature Reserve was established by the government of the Guangxi Zhuangzu Autonomous Region in March 1990, and is one of the autonomous region-level nature reserves. The main protected species are the natural ecological system of mangroves and its related resources. This nature reserve later became designated as a national nature reserve. The boundary of this nature reserve begins from Beilun Hekou in the west, and ends in the Zhenzhugang Bay in the Bailong Peninsula in the east. It lies on the border with Viet Nam. The Beilun Hekou Marine Ecological Nature Reserve is not only one of the most important oceanic nature reserves along the south-western border of the coast of China, but also a unique mangrove nature reserve located in a minority region along China's border. The total area of the nature reserve is 11,927hm². The reserve's coastline is 105km. The reserve contains many species of mangroves, and the largest continuous South Asia tropical mangroves in China. There is a high degree of oceanic resources and diversity of creatures, which the local people often rely on for their livelihoods. The mangroves in Beilun Hekou play a very important role in maintaining the rights and interests of the estuarine territory of China. There is currently a working force of ten people in the nature reserve. In order to strengthen the management, 15 native people have been hired to protect the forests, and six guards have also been temporally hired. The reserve staffs often exchange their experiences and improve their professional skills. It is necessary for them to master the knowledge of both the oceans and the mangrove forests to protect and make wise use of the mangroves. They not only work hard, but also continue studying to improve their jobs. The government of the Guangxi Zhuangzu Autonomous Region published a report on “Measures of the Guangxi Zhuangzu Autonomous Region on the Management of the Beilun Hekou Marine Nature Reserve” in 1994, which provided the foundation for the implementation of protection measures in accordance with the law. The management organization has also published and implemented many bylaws, such as the “Rules of Patrol and Monitoring” and the “Responsibilities of Guards to Protect the Forest,” which reinforce the protection and management of the nature reserve.

Though the establishment of these three nature reserves has greatly improved the management of the mangroves in the Guangxi Zhuangzu Autonomous Region, not all of them can be well protected. Many problems frequently arise, including, deforestation, illegal manufacturing and management within the boundaries of the nature reserves, land reclamation of oceanic shoals, and harvesting the
fruits from the mangroves. Some problems are very serious. In the town of Zhakou in the Shakou Nature Reserve, 5,000 mus of the shoal have been reclaimed, and 2,000 mus of the mangroves have been destroyed since 1999. Although the media reported on the problem, and government at all levels ordered an investigation and punishment for those responsible, the final result is not yet clear yet. Furthermore, the mangrove nature reserves are managed by the Marine Bureau after it was established in the Guangxi Zhuangzu Autonomous Region, but the Marine Bureau is often short of personnel to address cases such as this, because it has no professional monitors like the forestry police.

Protection of the wetlands in the Guangxi Zhuangzu Autonomous Region can be attributed to the establishment of the nature reserves. There are currently 12 synthetic nature reserves, 35 waterhead forest nature reserves, and eight rare animal and plant nature reserves in the Guangxi Zhuangzu Autonomous Region. In these nature reserves, the ecosystems in the wetlands are well protected.

5.3.3 Management of Wetlands in Hainan Province

1) Wetland Administration

Hainan Province has abundant and varied wetland resources. Hainan’s Mangrove wetlands and coral reef wetlands are of great importance to the entire nation. Nature reserves at different levels have been established to protect those wetlands of special value and great importance. Altogether, there are 34 various wetland nature reserves in Hainan Province. This number is the second largest of all China’s Provinces. The government at all levels has attached great importance to the management and protection of these wetlands.

On January 3, 1980, the Dongzhaihang Mangrove Wetland was established as a provincial nature reserve by ratification of the government of the Guangdong Province. In July, 1980, the State Council recognized it as a national nature reserve. In 1992, it was placed in the list of wetlands of international importance under the Convention on the National Important Wetlands Especially as the Habitats of the Water Birds. Since the nature reserve was established, protection of mangrove forests has been strongly supported by the local government and people, and management measures to protect the resources have been highly effective. The local government, the Qiongshan County government, published subsequent announcements in 1980, 1983, 1984, and 1986, requiring people to do a better job with the management and protection of the animals and plants in the Dongzhaihang Mangrove Nature Reserve. In September 1988, the People’s Congress in Hainan Province passed the first local legislation on mangroves in China, entitled “Provisions of Hainan Province on the Protection of Mangroves.”

Over several years, through the support of all levels of government, the management organization of the Dongzhaihang Nature Reserve have carried out the following responsibilities: (1) The government organized several joint defence and protection committees with participation of leaders of the towns and villages, and thus strengthened the management of resources in the nature reserve; (2) The Sanjiang Management Station and the Tashi Management Stations were created with full-time enforcement officers, which contributed a lot to the protection of the nature reserve. (3) Police stations were established to investigate and penalize those persons destroying the forests.

5.3.4 The Wetland Management System and Legislation of the Hong Kong Special Administrative Region (HKSAR)

1) The Wetland Management System

The functions of this agency in terms of nature protection are as follows:

a. To manage national parks, special areas, marine parks and marine reserves in order to realize the aim of nature conservation, recreation, tourism, and education, etc;

b. To offer advice on nature conservation and development, formulate plans and strategies and environmental impact assessments, and recognize the regions with special scientific values;

c. To raise public awareness of nature protection, and execute rules and regulations on nature protection;
d. To coordinate nature protection programs and development strategies for harbours and airports, in order to mitigate their effect on the ecology; and

e. To regulate the international trade in endangered species through permits and licenses, and also constrain the illegal trade in endangered species that happens through Hong Kong;

2) **Wetland Conservation Regions and Administrative Measures**

In Hong Kong, most of the wetlands are located in the northwest of the New Territories section of Hong Kong. They include mangroves, mudflats, reedbeds, fishponds and gei wai (inter-tidal shrimp ponds), etc. In September 1995, the central government, in accordance with the Ramsar Convention, recognized the 1,500hm² wetland in Mai po and the Inner Deep Bay as a Ramsar Wetland.

Wetland protection in Hong Kong is the responsibility of the AFCD, which also cooperates with some environmental protection agencies, as well as the public, to implement environmental protection programs.

3) **Important activities and programs**

In 1996, the then Agriculture and Fisheries Department (now renamed the Agriculture, Fisheries and Conservation Department) commissioned a consultancy study on the "Development of a Comprehensive Conservation Strategy and Management Plan in Relation to the Listing of the Mai Po and Inner Deep Bay Site as a Wetland of International Importance under the Ramsar Convention."

- Protective aims: to achieve the aim of conservation and wise use of wetlands and their resources by means of maintaining and increasing their biodiversity (especially bird species);

- Administrative aims: to perform the international obligations under the Ramsar Convention; to maintain and raise the standard value of the wetland under the Ramsar Convention; to maintain and increase the value of biodiversity comprehensively; to educate citizens and raise their knowledge of the value of wetlands in order to explore the full potential of the wetland; and to promote Hong Kong’s opportunities while undertaking the regional and international obligations of the Ramsar Convention and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention);

- Management Agencies: the AFCD is the designated administrative management agency of the Ramsar wetland and the Director of the AFCD works as the management authority of the Ramsar Convention. Moreover, a wetland advisory committee composed of both members from within and outside of the government has been founded to provide advice to the Director of the AFCD;

- Division of Management Regions.

4) **Legislation Related to Wetlands**

- So far, there is no legislation that particularly addresses wetlands in Hong Kong. However, numerous statutes have some elements related to wetland protection.

- The above legislation emphasizes the management and protection of the animals, plants, and special areas of great ecological value in Hong Kong.

- The Rules and regulations related to wetland protection include.

- Up to now, the existing legislation related to animals, plants and environmental protection has been adequated.

5.3.5 The Wetland Management System and Legislation of Macau

In order to effectively protect the mangrove resources in Macau, the local government plans to develop two wetland protection zones. One of them is the natural conservation region, covering an area of approximately 40 hectares, located on the west bank of the city of LuDang in the sea stuffing area. This wetland zone extends from the site of the original Future Yacht Club to the LuHuan sewage factory. The government plans to separate the protection zone from the surrounding highways in order to create good conditions for meeting the needs of ecological protection, environmental education, and tourism. The other piece of the wetland protection zone is a swamp of 15 hectares.
The agency responsible for environmental matters in the Macau government is the Environmental Committee. It operates the functions of formulating policies on environmental protection, putting forward legislative advice on environmental and ecological protection, supervising the execution of environmental laws, and implementing environmental education programs, etc.

5.4 Wetland Laws and Regulations

5.4.1 Legislation on Land and Maritime Resources

1) Current Legislation

Costal wetlands are usually located at the intersection of the land and the sea. They are often made up of certain areas of land and maritime space, so land and marine resources are two important resources in the wetlands. The legislation on these two resources includes:

(1) National Statutes

A. Land Administration Law of the People's Republic of China

In order to strengthen the wise use and management of land, the “Land Administration Law of the People's Republic of China” was promulgated in 1986, and modified in 1998. Several systems were further improved, e.g., land tenure, land programming, expropriation, and compensation for land. Moreover, “sustainable development” was regarded as the guiding tenet behind this law. The coordination between the exploitation and protection of the land was emphasized. Several new systems were introduced into this law, such as the system of control of land use, the system of protection of cultivated land, and the system of overall control of land use. The modified law reflected the new developments and requirements of the legislation on resources. In 1998, the State Council published the “Regulations for the Implementation of Land Administration Law of the People's Republic of China,” which provided further interpretation of the law and help to enforce it effectively.

B. Marine Environment Protection Law of the People's Republic of China

In order to strengthen the management of the marine environment, the “Marine Environment Protection Law of the People's Republic of China” was promulgated in 1982, and modified in 1999. Some provisions were substantiated, including the management of pollution within specified times, the evaluation of influences on the environment, “three simultaneities” and civil compensation for marine environmental pollution. Several new legal provisions were introduced in the law to ensure marine ecological protection and programs for marine environmental protection, including: the overall control of the amount of pollutants in key maritime areas, standards for the marine environment, charges for pollution and dumping, prohibition of backward techniques and equipment that do great harm to the marine environment, supervision of the marine environment and management of supervision information, provisions for responding to marine pollution emergency accidents, provisions for on-the-spot inspections, requirements for marine oil pollution insurance, and establishment of a fund for compensation for oil pollution damages.

C. Fisheries Law of the People’s Republic of China

The Fisheries Law of the People’s Republic of China was enacted in 1986 and modified in 2000. The promulgation and implementation of the modified fisheries law gave prominence to the protection of fishery resources and the natural environment. In the past, there was no supervision or management of bait and feed use during the course of breeding, which led to the degradation of the quality of aquatic species. Therefore, a new provision was added to the modified fisheries law, which stipulated, “People who are engaged in aquatic breeding should not use bait or feed containing poisonous or harmful substances.” In some places, water bodies are heavily polluted because some aquaculturists use fertilizers, bait and medications, and discharge sewage arbitrarily. A new provision was added which stipulated that persons engaged in aquatic breeding should “scientifically determine the breeding density, and use fertilizers, bait, and medication reasonably. Furthermore, they should not pollute the water bodies used for aquatic breeding.” A unified program for protection of water bodies by the state was stressed. The system of aquatic breeding licenses was modified and improved, and the protection of the water bodies used for aquatic breeding was also stressed. The management of young aquatic species was standardized. The prevention and cure of diseases in breeding was added. At the same time, attention was paid to the control of fishery intensity and adjustment of the structure of fisheries. Related legal systems are being constituted and improved.
D. Law of the People’s Republic of China on the Administration of Coastal Areas

The “Law of the People’s Republic of China on the Administration of Coastal Areas” was promulgated on October 27, 2001, which replaced the “National Interim Provisions on the Administration of Coastal Areas.” The main provisions of the law include: the partition of marine functional areas, the application and approval of the use of coastal areas, the right to use coastal areas, the using fee and the inspection of the use of coastal areas. The promulgation of the law on administration of coastal areas guarantees that Chinese marine economics will develop quickly and sustainably. It is a watershed law in the history of Chinese marine exploitation. People used to freely exploit marine resources without limit ad in a disorderly fashion. Now marine resources will be utilized in a scientific, reasonable, harmonious, and orderly fashion.

In addition to these laws, the State Council and its departments, such as State Bureau of Land Management, State Oceanic Administration, State Environmental Protection Administration and Ministry of Agriculture, have promulgated many regulations. These include the Provisions on the Land Reclamation; Regulations on the Protection of Fundamental Farmland; Interim Measures for Handling Activities that Go Against the Land Administration Law; Registration Measures for the Right to Use Coastal Areas (2002); Interim Measures for the Application and Approval of the Use of Coastal Areas (2002); Mediation and Settlement Measures for Disputes Regarding the Rights to Use Coastal Areas (2002); Implementing Measures for Maritime Administrative Punishments (2003); Regulations of the People’s Republic of China on the Management, Control, and Prevention of Pollution of the Marine Environment from Land-Based Pollutants (1990); Regulations of the People’s Republic of China on the Management, Control, and Prevention of Pollution of the Marine Environment from Coastal Construction Projects (1990); Regulations of the People’s Republic of China on the Control of Pollution Prevention from Ocean Vessels (1983); Regulations of the People’s Republic of China on the Control of Dumping Wastes into the Ocean (1985); Administrative Measures on Fishery Licenses (1989); and Provisions on Fishery Administrative Punishments (1997).

(2) Local Legislation

The government of Guangdong Province has constituted several local regulations, including: Implementing Measures of Guangdong Province for Land Administration (1986); Management Measures of Guangdong Province for the Compensation for the Expropriation of Collectively-Owned Land in the County (1994); Regulations of Guangdong Province for the Settlement of Land-Tenure Disputes (1995); Provisions of Guangdong Province for the Administration of Coastal Areas (1996); Decision on the Modification of Provisions of Guangdong Province for the Administration of Coastal Areas; Interim Standard of Guangdong Province for the Collection of the User Fee for Coastal Areas; Partition of the Environmental Functional Areas of the Seashore Coastal Areas in Guangdong Province (1999); Implementing Measures of Guangdong Province for Fishery Management (1990); Decision of the Standing Committee of Guangdong People’s Congress on the Construction of Man-Made Reefs to Protect Marine Resources and the Environment (2001); and Management Measures of Guangdong Province for the Protection of Aquatic Breeding in Shallow Coastal Waters (1994).

Many counties and cities have also constituted some related regulations, for example the: Management Provisions of the Shenzhen Neilingding-Futian National Nature Reserve; Management Measures of the Huidong Port Turtle Nature Reserve; and Management Provisions of the Dayawan Aquatic Species Nature Reserve. These regulations also contained some articles related to fisheries and the use and management of coastal areas.

The government of the Guangxi Zhuangzu Autonomous Region has promulgated several local regulations, including: Implementing Measures for Land Administration; Implementing Measures for Fishery Administration; Administrative Measures for the Use of Coastal Areas (1997); Administrative Measures on Young Aquatic Species; and Administrative Provisions for the Protection of Aquatic Wildlife.

Some counties and cities have also promulgated some local provisions, such as the Standard of the City of Qinzhou for the Collection of User Fees for Coastal Areas; Provisions of the City of Beihai on the Administration of the Use of Coastal Areas; Working Scheme of the Fangcheng District on User Registration for Coastal Areas; and Administrative Measures for the Use of Coastal Areas for Aquatic Breeding in Hepu County.

Some counties and cities have also promulgated several local provisions, such as the Provisions of the City of Haikou on the Management of Coastal Area Use (1998); Interim Measures of the City of Saya on the Management of Coastal Area Use (1992); and Implementing Measures of the City of Dongfang on the Management of Coastal Area Use (1997).

2) Deficiencies with Legislation

The above-mentioned laws and regulations provide protection for the wise use and management of coastal wetlands, land-use, and aquatic breeding in Guangdong Province, the Guangxi Zhuangzu Autonomous Region, and Hainan Province. The promulgation of the Law on the Administration of Coastal Areas was of great importance. This law established the basic legal systems for the management of use of coastal areas. As a result, management practices are now standardized and greatly improved. The modified Fisheries Law stipulates the legal protection for the sustainable development of fisheries. Over the past few years, the creation and modification of the laws on the management of coastal area use and aquatic breeding by the national and local government has contributed a lot to the protection of maritime wetlands. However, most of the wetland resources in these three Provinces are in economically flourishing coastal areas. For example, coastal wetlands in Guangdong Province are found along open coastal areas, where industry, agriculture, aquaculture, real estate, and tourism industry are well developed. The coastal wetlands in the Guangxi Zhuangzu Autonomous Region are also under great pressure because of the development of industry, aquaculture, real estate, and tourism. Hainan Province is located at the edge of the tropics. The growing period for crops is long and the productivity of wetlands is high. Therefore, overexploitation and blind use of wetlands are serious problems.

As a result of these threats, the main problems with the creation and implementation of the laws and regulations on the management of coastal area use are as follows:

- Lack of Integrated Legislation on Resource Limits or Integrated Management of Wetland Resources
- Lack of Updated, Effective Local Legislation
- Emphasis is on Resource Exploitation, not Conservation and Rehabilitation
- Lack of Clarity Regarding Rights to Resources

3) Suggestions for Improving Legislation

In order to resolve the problems with the formation and implementation of laws and regulations on the management of coastal area use, the following suggestions are made:

-Integration of Statutes

There is a trend in many countries to formulate an integrated legal system for the protection of natural resources, since separate statues cannot adequately protect natural resources. It will be difficult to establish such an integrated legal system in China in the short term. However, some interim measures should be taken under the framework of the current legal system to mitigate the impact of the existing problems. For example, the coordination of the statutes should be stressed. The responsibility for formulating laws should be given to neutral organizations, such as the People’s Congress or the legal departments of the government, which may compile a code of the relevant statutes as necessary.

-Adjusting the Purposes and Principles of the Legislation

From the second half of the 20th century, environmental crises have become increasingly serious. In order to alleviate the crises, many countries have recognized the goals of “sustainable development” in their development strategies. Thus, the coordination between the wise use of resources and the protection of natural environment is beginning to be emphasized in the legislation on resources. In
some countries, priority has been given to the protection of the natural environment instead of the exploitation of resources. China is still a developing country. It is impossible for China to give priority to the protection of the natural environment. But the harmony between the wise use and the protection of the resources should be stressed if we want to achieve the goal of sustainable use of natural resources. Nevertheless, the legislation on resources in China seldom reflects this requirement, especially local regulations. This point should be given priority when the relevant local statutes are created and modified.

- **Updating and Modifying Local Legislation in Accordance with National Legalisation**

Local governments should enact new regulations that accommodate the local situation and comply with such national laws as the Land Administration Law, Marine Environment Protection Law, Law on the Administration of Coastal Areas, and Fisheries Law. Several existing regulations need to be updated and modified, such as the Provisions of Guangdong Province for the Administration of Coastal Areas, Implementing Measures of Guangdong Province for Fisheries Management, Implementing Measures of the Guangxi Zhuangzu Autonomous Region for Fishery Administration, and Measures of Hainan Province for the Implementation of the Fisheries Law of People's Republic of China. A local legal system for the administration of use of land and coastal areas should be established.

- **Clearly Defining the Rights to Resources**

The implementation of the system of non-gratuitous use of coastal areas should be evaluated and improved. The State's ownership of coastal areas must be safeguarded. At the same time, the users' interests and the fishermen's right to protect their livelihoods should also be protected. The fishermen's right to use coastal areas should be recognized if it can be proved that they have historically used these areas for aquatic breeding. Fishermen should be given the priority rights to use the specially-demarcated coastal areas nearby their residential area, and the user fees for these fishermen should be abated or even exempted.

### 5.4.2 Legislation on Protection of Wetland Animal and Plant Species

1. **Current Legislation for the Protection of Animals**

   A. National statutes for the protection of animals


   B. Local legislation for the protection of animals

   The government of Guangdong Province has promulgated the Provisions of Guangdong Province on the Protection and Management of Wild Animals (2001), which was a special statute for the protection of animals. Related local legislation and regulations include the Detailed Rules for Implementation of the Regulations of Guangdong Province on the Management of Forestry and Wild Animal Nature Reserves (1986), and Measures of Guangdong Province for the Administration of Licenses on the Domestication and Breeding of the Wild Animals. Several county governments where nature reserves are located have also published some relevant provisions. For example, the government of Huidong County published the Provisions on the Management of the Daiyawan Aquatic Species Nature Reserve (1984), and Provisions on the Sea Turtle Nature Reserve in Port (1985).

The People's Congress of Hainan Province amended the Measures of Hainan Province for Implementing the Law of the People's Republic of China on the Protection of Wildlife in 1986, which provided the fundamental system for the protection of wild animals. In September 1998, Provisions of Hainan Province on the Protection of Coral Reefs were published, which gave some protection to the corals and their habitat.

The existing statutes contribute to an intact legal framework for the protection of animals. Local legislation is more detailed than the national statutes, and provides the means to address special local issues. Several useful systems have been established, including:

a) License systems. Licenses are required if people want to make use of animals. There are different types of licenses, such as concessionary hunting licenses, hunting licenses, domestication and breeding licenses, and licenses for transporting wild animals. During the course of the implementation of the license system, much useful information has been collected, which helps the administration make an effective supervision and management of the wild animal resources.

b) The system for public outreach and education on the protection of wild animals. Public outreach is guided by the Regulations for the Implementation of the Protection of Terrestrial Wildlife, which stipulates that government at all levels, can choose the proper time to celebrate the “Wild Animal Month” or “Bird’s Week,” etc. The government may launch public outreach campaigns and education about the need for the protection of wild animals. The public will be more willing to protect wild animals if they are better educated. Detailed provisions have been established in the local legislation, including Article 12 of the Measures of Hainan Province for Implementing the Law of the People’s Republic of China on the Protection of Wildlife.

c) The system of research into animal resources and the system of animal resources data. The statutes provide that the administration should organize research on animal resources periodically and keep data on them. This is a very useful activity because the administration can get more information and understand the historical and current situation of wild animals. If the situation changes, they can find the cause easier, and predict future situations. All these systems contribute a great deal to the protection of wild animal resources.

2. Current Legislation on Plant Protection

A. National statutes on the protection of plants

B. Local legislation on the protection of plants


Though there are few statues for the protection of plants, especially plants living in wetlands, some fundamental protection systems have been established, including: a) The license system. The government grants different types of licenses to the users of the plants in order to supervise their activities and protect the plants effectively, such as the deforestation license and herborization license; b) The system of research into plant resources and the system of plant resource data; and c) The system of the forestry fund and fund for the compensation of forestry ecological benefits. These funds can provide the money for the conservation of the forest.

2) Problems with the Legislation

After several years of work, there is now an intact legal system for the protection of the animals and plants in China. Each level of government has constituted some relevant statutes. These local laws also provide some level of protection for wildlife. However, there are still some problems in the legislation, as outlined below:

- Fundamental Laws on Wildlife Protection are Outdated
- Articles in the Laws on Animal and Plant Protection are too abstract to be Effectively Implemented
  - The System for rewards is not practicable
  - The compensation clauses are vague
  - The statutes do not stipulate how the different departments should coordinate and cooperate to protect wildlife.
  - The liability that the government employees should bear when they break the law is not clear.
- Lack of Liability or Compensation Principles in the Legislation
- Lack of Attention to Local Conditions/Wildlife in Local Laws

3) Suggestions for Improvement of the Legislation

- National Wildlife Laws should be modified using Financial Mechanisms
- Local Legislation is Needed, Taking into Account Local Features

5.4.3 Legislation on Wetland Nature Reserves

1) Current Legislation
   (1) National Statutes on Nature Reserves
      a) Nature Reserve Regulations of the People's Republic of China
      b) Administrative Measures on Marine Nature Reserves
      c) Land Administrative Measures in Nature Reserves
   (2) Local Legislation on Nature Reserves

2) Problems with the Legislation
   (1) The Importance of Nature Reserve Regulations is ignored
   (2) Lack of Implementation by Local Governments
   (3) Flaws in Design of the Management Systems
   (4) Lack of Clarity Regarding Land Tenure in Nature Reserves
   (5) Lack of Dispute Settlement Mechanisms
3) Suggestions for Improvement of Legislation
   (1) Increase Consistency of Statutes
   (2) Strengthening Nature Reserve Regulations

5.5 Problems and Resolutions with Wetland Management

5.5.1 General Problems
   1) Lack of Human and Financial Capacity
   2) Lack of Integrated Laws and Regulations on Wetland Management
   3) Lack of Clear Wetland Boundary Designations
   4) Overlapping Wetland Administration
   5) Lack of Operation of some Nature Reserves
   6) Pressure for Wetland Exploitation from Development
   7) Destruction of Wetlands outside Nature Reserves

5.5.2 Resolution of Problems
   1) Specialized administrative organizations responsible for wetland protection and management should be created and improved at all levels, with hiring of professional staff.
   2) The integrated management of wetland resources should be reinforced, with all types of laws and regulations for the management of wetland resources enacted.
   3) A general plan for the protection and wise use of wetlands should be put in place, which will direct all departments in the local government to consider the overall situation, long-term interests, and benefits of wetlands before their exploitation.
   4) Additional wetland nature reserves should established, with particular emphasis on important wetland sites.
   5) The control over the environment in the three Provinces should be strengthened.
   6) Public Outreach and Education on the function, values, and protection of the wetlands should be intensified.
   7) Funds, especially for science and technology, should be increased to allow more research on wetlands to be conducted.

The following tasks should be carried out as soon as possible:
   (1) An information database and system on wetlands should be constructed as soon as possible.
   (2) The changes in wetland resources, their use, and ecological conditions should be monitored continuously and in a timely manner.
   (3) Some wetland demonstration areas should be established.

6. CONCLUSION

The investigation area of the project covers all Chinese regions along the South China Sea, including Guangdong, Guangxi and Hainan Provinces, and the Hong Kong and Macao Special Administrative Regions and their coastal areas. The geographical location is 107°59'E ~ 111°00'E, 18°05'N ~ 18°05'N.

There are a total of 179 families, 593 genera and 829 species of wetland plants in the South China Sea. Rare protected species in the research area include the following species: Category I Protected Plants: Glyptostrobus pensilis (Staunt.) Koch, Cycas revoluta Thunb, etc; Category II Protected Plants: Aquilaria sinensis (Lour.) Gilg, Oryza meyeriana (Zoll.etMorex steud.) Baill subsp granulata (Nees et Arn.ex Watt), Nelumbo nucifera Gaertn, Brainnea insignis (Hook.) J.Sm etc 9.

In the South China Sea, there are 490 species of zooplankton, 649 species of large benthic animals, 332 species of fish, 29 species of amphibians, 43 species of reptiles, 238 species of birds, and 35 species of mammals. There are 18 species of peculiar animals, 76 endemic species, and among these, there are 3 endemic amphibian species, 10 endemic reptile species, 55 endemic bird species,
and eight endemic mammal species. There are 95 rare species, including eight large benthic animals, eight amphibians, 12 reptiles, 44 birds, and 23 mammals. There are 30 endangered and threatened species, including seven species of reptiles, 17 species of birds, and six species of mammals. There are 168 migratory species in the South China Sea, including five reptiles, 146 birds, and 17 mammals.

There are both natural and man-made present and future threats to the South China Sea wetlands. Natural threats include the effects of global climate change, disasters of typhoons and giant tides, and frequent occurrences of red tide, all of which endanger marine organisms and reduce biological diversity. The primary man-made causes of wetland loss include the blind reclamation of wetlands and destruction of mangrove and coastal wetlands and their natural environment due to increased urbanization and development of industry, pollution threats to the wetlands, and over-exploitation of the biological resources of wetlands.

Current problems with the legislation on wetlands include the following: there is no comprehensive legislation on wetlands to provide an integrated approach to wetlands administration, the speed of development of local legislation is too slow and can’t keep up with the practical requirements, and there has been more attention paid to wetland exploitation than protection of the resources. The status of resources is not clear. In order to address the existing problems with wetland administration and protection in the legislation, several proposals were put forward: strengthening and harmonizing wetlands legislation, and clarifying the legislative goals and purposes. Amendments to national legislation must be carried out as quickly as possible. In terms of clarifying property rights, due consideration must be given to each side as much as possible.

In order to improve the existing problems with wetland administration, the following measures have been proposed:

- Establish a special agency responsible for comprehensive wetland protection at all levels, equipped with professional and highly-skilled personnel;
- Strengthen the integrated administration of wetland resources, improve the laws and regulations for all types of wetland resources, prepare a wetland protection scheme and comprehensive plan for the use of wetlands, which will lead local agencies to develop a comprehensive viewpoint on wetland use which takes into consideration the long-term benefit of wetlands;
- Further strengthen the establishment of wetland nature reserves, in order to ensure that important wetlands receive proper protection;
- Strengthen the environmental management of wetlands in the three Provinces;
- Strengthen environmental outreach and public awareness and education programs on the functions, benefits, and protection of wetlands; and
- Increase financial outlays, to increase the science and technology input, and strengthen research on wetlands.

REFERENCES


NATIONAL REPORT

on

Wetlands in South China Sea

INDONESIA

Ir. Antung Deddy Radiansyah
Focal Point for Wetlands [New]
Assistant to the Deputy Minister
For River and Lake Degradation Control, Ministry of Environment
Jl. D.I. Panjaitan, Kebon Nanas
Jakarta 13410, Indonesia
Table of Contents

1. INTRODUCTION .............................................................................................................................1
   1.1 COASTAL WETLANDS OF INDONESIA ...........................................................................................1
   1.2 DATABASE DEVELOPMENT OF COASTAL WETLANDS BORDERING SCS .........................................1

2. LEGAL AND INSTITUTION ASPECTS IN THE MANAGEMENT OF COASTAL-WETLANDS
   IN INDONESIA................................................................................................................................2
   2.1 NATIONAL LEGISLATIONS ...........................................................................................................2
      2.1.1 Acts .......................................................................................................................................2
      2.1.2 Other Acts related to Coastal Wetlands Management ..................................................4
      2.1.3 Other Government Regulations ....................................................................................5
      2.1.4 Presidential Decree.......................................................................................................5
   2.2 INSTITUTIONAL ASPECTS ...........................................................................................................6
      2.2.1 Government Institutions ................................................................................................6
      2.2.2 Non-governmental Organisations .................................................................................9

3. CONCLUSION ...............................................................................................................................10

REFERENCE ........................................................................................................................................10

List of Tables and Figures

Table 1  Types and Extent (ha) of Indonesian Wetlands
Table 2  Institutions are Responsible on the Management of Coastal Wetlands
Figure 1  Hierarchy of National Legislation of Indonesia
1. INTRODUCTION

1.1 Coastal Wetlands of Indonesia

Wetlands based on Ramsar Convention’s definition are “Areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters”. Based on Ramsar’s definition, Indonesia possesses at least 40 millions hectares of wetlands, excluded rivers. Of those 40 millions, at least 281 sites recognized as wetlands as international importance (Table 1).

Table 1 Types and Extent (ha) of Indonesian Wetlands.

<table>
<thead>
<tr>
<th>Type</th>
<th>Original Area (ha)</th>
<th>Remaining Area (ha)</th>
<th>Protected Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Peatswamp</td>
<td>16,266,000</td>
<td>13,203,000</td>
<td>1,882,000</td>
</tr>
<tr>
<td>2. Freshwater Swamp</td>
<td>11,544,000</td>
<td>5,185,500</td>
<td>984,250</td>
</tr>
<tr>
<td>3. Mangrove Forest</td>
<td>9,248,038</td>
<td>5,326,870</td>
<td>3,720</td>
</tr>
<tr>
<td>4. Coral Reef</td>
<td>3.000</td>
<td>3,000</td>
<td>N.D</td>
</tr>
<tr>
<td>5. Seagrass</td>
<td>2.000</td>
<td>2.000</td>
<td>N.D</td>
</tr>
<tr>
<td>6. Coastal Vegetation</td>
<td>180,000</td>
<td>78,000</td>
<td>33,000</td>
</tr>
<tr>
<td>7. Mud/sand flat</td>
<td>774.894</td>
<td>308,000</td>
<td>73,800</td>
</tr>
<tr>
<td>8. Lake</td>
<td>155.216</td>
<td>80.995</td>
<td>N.D</td>
</tr>
<tr>
<td>10. Rivers</td>
<td>N.D</td>
<td>N.D</td>
<td>N.D</td>
</tr>
<tr>
<td>11. Freshwater pond</td>
<td>8.393.290</td>
<td>7.787.339</td>
<td>N.D</td>
</tr>
<tr>
<td>12. Dams</td>
<td>N.D</td>
<td>N.D</td>
<td>N.D</td>
</tr>
<tr>
<td>13. Brackish Water</td>
<td>304.623</td>
<td>435.000</td>
<td>N.D</td>
</tr>
</tbody>
</table>

Jumlah 54,968,061  40,506,704  6,693,237

One of major types of wetlands is coastal wetlands which are consisting of 11 types of ecosystems i.e.: coral reef, mangrove, seagrass, estuary, tidal flat, lagoon, and coastal swamp. The South China Sea Project limited its definition for coastal wetlands to 5 ecosystems type only namely: Estuary, intertidal flat, lagoon, coastal lake, and peat/non peat swamp.

Based on South China Sea Project’s definition, coastal wetlands of Indonesia bordering South China Sea can be found stretching alongside coastal area in 11 provinces. The result of South China Sea Project’s study revealed that 39 wetlands sites in those 11 provinces are coastal wetlands of international importance, based on Ramsar Convention’s definition.

Management system for coastal wetlands of Indonesia being implemented today has not sufficient yet to secure its sustainability function. As a developing country, that still highly depends on natural resources for its economic growth, exploitation efforts and function conversion is massive and in many cases exceeds its self-recovery capability. One indication of such coastal wetlands degradation is the data published by Ministry of Forestry in 1999. The data revealed that total area of mangrove had been damage was 57%, mostly located at the coastal area bordering South China Sea.

1.2 Database Development of Coastal Wetlands Bordering SCS

Information related to status and distribution of coastal wetlands that bordering South China Sea is rare. The best available data mostly informed coastal wetlands as a whole, which are, consist of ecosystems like mangrove, coral reef and seagrass. There is no specific information about coastal wetlands as defined by South China Sea Project.

Related to the gathering data and information about coastal wetlands bordering South China Sea, National Wetlands Committee for SCS Project agreed to recommend the National Focal Point to cooperate with National Conservation Information Centre (PIKA) of Ministry of Forestry. The chosen of PIKA as partners in data collection was based on PIKA’s data reliability that more comprehensive compare to others.
Up to now, PIKA has successfully identified 39 coastal wetlands site that bordering South China Sea which are internationally importance based on Ramsar Convention's criteria. The data and information provide by PIKA, and then reviewed by NWC based on criteria developed by South China Sea Project.

The best available data of coastal wetlands site bordering South China Sea that provide by PIKA mostly based on survey conducted before year of 2000, except data of Sembilang National Park that updated in the recent year. The situation caused by minimum the lack of capability and operational support for field operator in doing regular survey and inventory. The information on coastal wetlands site bordering South China Sea is attached.

2. LEGAL AND INSTITUTION ASPECTS IN THE MANAGEMENT OF COASTAL-WETLANDS IN INDONESIA

Since 1999 Indonesia has starting to reform its natural resources management by giving high portion of power to local authorities which are Province authority and District/Municipality Authority. However, the management of area that ecologically linked but shared by two or more local authority must be manages by higher-level authority coordination.

Abovementioned condition is also occurring in coastal wetlands bordering South China Sea that stretch across 10 provinces. Therefore, in term of institutional, integrated management of coastal wetlands bordering South China Sea require coordination from central government as superior level of provincial authority.

There are many laws and regulations pertaining management of coastal wetlands bordering South China Sea. Related to the condition, NWC suggested reviewing laws, regulations and institutions that directly affecting coastal wetlands bordering South China Seas. The level of laws and regulations also limited to the LAWS, Government Regulations, and Presidential Decrees.

The National Wetlands Committee for South China Sea Project also recommended PIKA as partner in developing Institutional and Legislation Review. The result of the Review then studied by NWC for South China Sea Project before published. The Review attached in this report.

2.1 National Legislations

2.1.1 Acts

**Act No 6 of 1994 Concerning Ratification of Climate Change Convention**

Indonesia has ratified United Nation Framework Convention on Climate Change (UNFCCC) through Act No 6 of 1994. This Act becomes an umbrella regulation mitigation and adaptation activities to combat global climate change.

The Convention is one efforts of global community to find solution for global climate change problems. However, the Convention is the minimum effort that could be afford by the whole nation on earth, since many political and economical consideration of each nation is likely impede such progress to combat global climate change.

Main concern of the Convention is to stabilize concentration of green house gases in the atmosphere to such level that safe for climate system. The concentration level should be achieved in stipulated period to such extent could provide sufficient time for ecosystem to naturally adapt with climate change, assuring that food production is not interrupt, and economic development is work properly.

The Act is not directly shape the management system of coastal wetlands of South China Sea. However, the Act that aimed to mitigation and adaptation will encourage activities to enhance coastal wetlands condition.

**Act no 24 of 1992 Concerning Spatial Planning**

Act No 24 of 1992 for Spatial Planning is one of important references in coastal wetlands management since the Act’s aim is to utilize in environmental sound based on Archipelagic Sense and National Resilience. The Act of Spatial Planning divide the area into two main function categories, they are Protected Area and Cultured Area.
The Act is also aimed to regulate spatial utilization between protected area and cultured area. Protected area is consist of protected forest, peatlands and peatswamp, catchments area, coastal are, river’s border, the area surrounding lake and dam, area surrounding spring, nature reserve, mangrove, national park, recreational park, cultural and science reserve area, and area which prone to disaster.

Cultured area is the area that stipulated mainly for culture, based on the condition of area and human resources availability. Cultured area consist of forest production area, agriculture area, settlement, industrial area, integrated economic area, tourism area, praying area, education area, and defense and security area.

Act for Spatial Planning is important basis for developing regional spatial planning for coastal wetlands bordering South China Sea, since South China Sea has various functions and utilize by various stakeholder. Therefore, without clear regional spatial planning, quality of coastal wetlands of South China Sea will become worst. Unfortunately, until now, most of coastal wetlands area bordering South China Sea still has no spatial planning.

**Act no 41 of 1999 Concerning Forestry**

Act No 41 of 1999 about Forestry is one of legislation product that mostly influence pattern of natural resources management in national level. This comes from the fact that total forestry area in Indonesia is 109.96 million hectares, half of total area of Indonesian land (Departmen Kehutanan, 2002). Therefore, management of that area should be based on Act of Forestry.

Despite bright implementation progress from decentralization of natural resources management, the Act is possibly abused by local authority in exploiting forest in their area. Weak position of central government in Act of Forestry in some cases has lead to the ignorance of national and international interest on forest since local authority has it own agenda on the forest.

There are at least 39 sites of coastal wetlands bordering South China Sea that internationally importance, of which 19 sites are forestry area (for conservation and production) where management authority falls to central government based on Act No 41 of 1999. Moreover, most of coastal wetlands bordering South China Sea bear impact of land based activity from forestry area far away from coastal wetlands. Therefore, Implementation of Act no 41 of 1999 about Forestry is a paramount importance for the health of coastal wetlands bordering South China Sea.

**Act No 22 of 1999 Concerning Regional Government**

Act no 22 year of 1999 concerning local government is the turning point on natural resources management paradigm in Indonesia that previously centralized on central government. Through this Act, local stakeholders now play important role in managing natural resources compare to central government. The Act that fully came into force on 2000 in many cases caused confusing in authority distribution between central and local government and between two ore more neighboring local government. However, enforcement of this Act has grown hope for the betterment of environmental condition as well as prosperity of local community that once abandoned.

Management of coastal wetlands in decentralization era has emerged a new challenge. This came from reality that the number of coastal wetlands lying through two or more local authority area. As the result, the wetland is possibly managed partially based on administrative boundary. Whereas wetlands should be managed integratedly based on its ecological boundary.

Act No 22 of 1999 has wide implication on the condition of coastal wetlands bodering South China Sea. The Act has caused weaken position of central government in managing natural resources. Therefore national policies can not directly applied on local level, for example national policy on the management of South China Sea. Solving this problem can only be done through close consultation and coordination between central and local government.
Act No 23 of 1997 Concerning Environmental Management

Act No 23 of 1997 concerning Environmental Management is aimed to create sustainable development that environmentally sound. Therefore, objectives environmental management is to protect Republic of Indonesia from impact of such activities that cause pollution and/or damaging environment.

One important part of this Act is obligation to apply Environmental Impact Assessment (EIA) prior to the development activities that possibly have impacted to the environment. The obligation is arranged in detail in Government Regulation No 72 of 1999. Implementation of EIA is not always achieving the goal of EIA itself, to protect environment from possible impact. However, EIA in many cases proved effective to avoid environmental damage caused by various activities.

Related to the protection of wetlands environment, there are several lower level of regulation that aimed to protect wetlands by stipulate standard for pollution as well as provide specific EIA for wetlands. This Act has strong link to the coastal wetlands of South China Sea, since many spots on the area are occupied by industrial activity.

Act No 5 of 1990 Concerning Living Resources Conservation and Its Ecosystem

Act No 5 of 1990 concerning Conservation of Living Resources and Its Ecosystem is developed to achieve sustainability of living resources and balance ecosystem to such extent could support human well-being and quality of life. Act of Conservation consist of phrase "life supporting system" that can be defined as natural process of various living and non living component to assure continuation the life of organism. Living resources conservation and its ecosystem can be done by protecting life supporting system to maintain ecological process, preservation of biodiversity, and wise utilization.

Conservation area based on this Act consists of two types namely:

a. Strict Nature Reserve Area to preserve flora (so called Cagar Alam) and fauna (Suaka Margasatwa).


Based on criteria mentioned in Act of Conservation, Indonesia has about 23 millions ha of conservation area, where about 4.7 millions are wetlands (including deep ocean waters). Along South China Sea, there are 19 conservation areas, of which, 5 are National Park. Coastal wetlands conservation areas along South China Sea are important assets since they have capability to maintain and restore quality of South China Sea. Therefore protection of the conservation areas is a paramount importance for the region of South China Sea.

Coastal wetlands as life supporting system have not being optimally protected under Act of Conservation as the Act tend to protect coastal wetlands that lying inside "conservation area". Where as, most of wetlands areas are located outside conservation areas. Therefore, local stakeholders are key player that should be encouraged to protect coastal wetlands in their areas.

2.1.2 Other Acts related to Coastal Wetlands Management

There are many other Acts that pertaining management of coastal wetlands bordering South China Sea. However, the Acts are not explained in detail in this paper as the Acts has no direct implication on the effort to reverse degradation trend in coastal wetlands bordering South China Sea. Some other Acts are:

a. Act no 6 of 1996 concerning Indonesia Waters: The Act describe concept of Archipelagic Sense to explain the sovereignty of nation on archipelagic waters.

b. Act no 7 of 2004 concerning Water Resources: The Act explain about management of water resources including the role government, private sector, and civil society on water resource. During public consultation in preparation of The Act, many controversial issues were arisen especially on indication that public will no longer have right on water resources due to privatization.

c. Act No 5 of 1994 regarding ratification of Convention on Biodiversity. The Convention is basis for all activities pertaining protection, research, trade, and bio-engineering of biodiversity.
2.1.3 Other Government Regulations

Government Regulation is regulation that made to explain paragraph, article mentioned on Act’s. Following is government regulation pertaining coastal wetlands management.

1. PP No. 82 of 2002 concerning Water Quality Management and Water Pollution Control
2. PP No. 4 of 2001 concerning Environmental Degradation and Pollution Control caused by Forest Fire
3. PP No. 150 of 2000 concerning Land Degradation Control for Biomass Production
4. PP No 25 of 2000 concerning Central Government Authority and Provincial Government Authority as Autonomous Region
5. PP No. 19 of 1999 concerning Pollution and/or Degradation of Marine Environment
6. PP No. 8 of 1999 concerning Utilization of Wildlife Flora and Fauna
7. PP No. 68 of 1998 concerning Nature Reserve Area and Conservation Area
9. PP No. 28 of 1985 concerning Forest Protection
10. PP No. 2 of 1982 concerning Water Resources Utilization
11. PP No. 27 of 1991 concerning Swamp Management
12. PP No. 35 of 1991 concerning Riverine Management
13. PP No. 27 of 1999 concerning Environmental Impact Assessment (AMDAL)

2.1.4 Presidential Decree

Presidential Decree is a decree issued by president, based on its authority of original power. Presidential decree should not contradict with above level legislation. Following are two Presidential Decrees that most related to coastal wetlands management.

Presidential Decree No 48 of 1991 Concerning Ratification of Convention on Wetlands of International Importance Especially as Waterfowl Habitat

Ramsar Convention is the only convention that has holistic approach in protecting ecosystem on earth. The Convention is the first multilateral agreement in the world that introduce the need to combine conservation and wise use on managing natural resources. Countries that ratify the Convention should designate at least one wetlands area that internationally importance as Ramsar Site. Today, there are 111.9 millions ha of wetlands area listed as Ramsar Site (Ramsar Secretariat, 2003).

Indonesia is one of important signatories among other countries member of Ramsar Convention, as Indonesia has at least 40 millions ha of wetlands, second largest after china. Coastal wetlands of Indonesia are also important area as resting area for migratory bird.

Along coastline of Indonesia bordering South China Sea, there are at least 39 internationally important sites of coastal wetlands. However, up to now, there is only one that designated as Ramsar Site, which is Berbak National Park.

Presidential Decree No 32 of 1990 Concerning Protected Area

Presidential Decree No 32 of 1990 concerning Management of Protected Area is one of important policy emphasize the need to protect wetlands for its capability as water resource, life supporting system, and disaster mitigation. The Presidential Decree of Protected Areas explains criteria of protected area as well as limitation of activity on the areas.

The Decree doesn’t specifically describe protection of coastal wetlands, but stipulated that 100 meters from shoreline at highest level of tide is green belt and should be protected. Whereas, if coastal wetlands occupied by mangrove, the area that should be protected is the area from shoreline toward upland as long as 130 times the range of highest and lowest tide.

Figure 1 shows the Hierarchy of National Legislation of Indonesia.
2.2 Institutional Aspects

Nowadays there is no single authority in managing the whole coastal wetlands bordering South China Sea. Therefore, there is no single government institution that possesses more power over the other. To deal with the situation some sectoral ministerial in central government has established a kind of commission or national committee in coordinating their activities pertaining wetlands management issues in national level, not specifically for South China Sea.

The established committee/commission to coordinate management issue, in many cases, is powerless and ineffective. The member of committee is representative of high rank officer in sectoral ministerial, where the change of ministerial structure is persist due to turmoil of political situation in the last 8 years.

Management of coastal wetlands bordering South China Sea, in general, carries out, partially by government institution (central, provincial, district, municipality). Table 2 below shows some institutions that responsible on the management of coastal wetlands.

2.2.1 Government Institutions
### Table 2  
**Institutions are Responsible on the Management of Coastal Wetlands.**

<table>
<thead>
<tr>
<th>Central Government</th>
<th>Tasks and Responsibilities</th>
<th>Province</th>
<th>Related Agency on the Province</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ministry of Environment - KLH - Kementerian Lingkungan Hidup (Ministry of Environment, 1996)</strong></td>
<td>Responsible in coordination of regulation, direction, monitoring, and evaluation. Ministry of Environment is national focal point in international agreement and convention such as climate change and biodiversity.</td>
<td>Riau</td>
<td>Agency for Environmental Impact Control (BAPEDALDA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jambi</td>
<td>Agency for Environmental Impact Control (BAPEDALDA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sumatera Selatan</td>
<td>Agency for Environmental Impact Control (BAPEDALDA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bangka Belitung</td>
<td>Agency for Environmental Impact Control (BAPEDALDA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lampung</td>
<td>Agency for Environmental Impact Control (BAPEDALDA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Banten</td>
<td>Agency for Environmental Impact Control (BAPEDALDA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DKI</td>
<td>Agency for Environmental Management (Badan Pengelola Lingkungan Hidup Daerah)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jawa Barat</td>
<td>Agency for Environmental Control (Badan Pengendalian Lingkungan Hidup Daerah)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kalimantan Barat</td>
<td>Agency for Environmental Impact Control (BAPEDALDA)</td>
</tr>
<tr>
<td><strong>Ministry of Forestry - DEPHUT - Departemen Kehutanan (Ministry of Environment, 1996)</strong></td>
<td>Responsible in utilization and conservation of forestry area including wetlands within forestry area. In local level, the tasks fall to Forestry Office or Natural Resources Conservation Unit (BKSDA). Ministry of Forestry is National Focal Point for Ramsar Convention.</td>
<td>Riau</td>
<td>Forestry Office (Dinas Kehutanan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jambi</td>
<td>Forestry Office (Dinas Kehutanan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sumatera Selatan</td>
<td>Forestry Office (Dinas Kehutanan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bangka Belitung</td>
<td>Agriculture and Forestry Office</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lampung</td>
<td>Forestry Office (Dinas Kehutanan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Banten</td>
<td>Forestry and Plantation Estate Office (Dinas Kehutanan dan Perkebunan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DKI</td>
<td>Agriculture and Forestry Office (Dinas Pertanian dan Kehutanan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jawa Barat</td>
<td>Forestry Office (Dinas Kehutanan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kalimantan Barat</td>
<td>-</td>
</tr>
<tr>
<td><strong>Ministry of Marine and Fisheries Affairs - DKP - Departemen Kelautan dan Perikanan (Departemen Kelautan dan Perikanan, 2003)</strong></td>
<td>Responsible in the management of fisheries resources in upland and marine. The Ministry possesses authority in regulating fisheries activity coastal wetlands.</td>
<td>Riau</td>
<td>Fisheries Affair Office (Dinas Kelautan dan Perikanan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jambi</td>
<td>Marine and Fisheries Affair Office (Dinas Kelautan dan Perikanan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sumatera Selatan</td>
<td>Marine and Fisheries Affair Office (Dinas Kelautan dan Perikanan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bangka Belitung</td>
<td>Marine and Fisheries Affair Office (Dinas Kelautan dan Perikanan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lampung</td>
<td>Marine Affair Office (Dinas Kelautan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Banten</td>
<td>Marine and Fisheries Affair Office (Dinas Kelautan dan Perikanan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DKI</td>
<td>Husbandry, Fisheries, and Marine Affair Office (Dinas Peternakan, Perikanan, dan Kelautan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jawa Barat</td>
<td>Fisheries Affair Office (Dinas Perikanan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kalimantan Barat</td>
<td>Marine and Fisheries Affairs Office (Dinas Perikanan)</td>
</tr>
<tr>
<td><strong>Ministry of Public Works - DEP PU - Departemen Pemukiman dan Prasarana Wilayah (Department of Public Works, 2006)</strong></td>
<td>Possess authority to coordinate and direct local government in water resource utilization as well as provide infrastructure for the management of water resources.</td>
<td>Riau</td>
<td>Office of Settlement and Regional Infrastructure (Dinas Pemukiman dan Prasarana Wilayah)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jambi</td>
<td>Office of Public Works (Dinas Pekerjaan Umum)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sumatera Selatan</td>
<td>Office of Public Works (Dinas Pekerjaan Umum)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bangka Belitung</td>
<td>Office of Public Works (Dinas Pekerjaan Umum)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lampung</td>
<td>Office of Public Works (Dinas Bina Marga)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Banten</td>
<td>Office of Public Works (Dinas Pekerjaan Umum)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DKI</td>
<td>Office of Public Works (Dinas Pekerjaan Umum)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jawa Barat</td>
<td>Office of Spatial Planning and Settlement (Dinas Tata Ruang dan Pemukiman)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kalimantan Barat</td>
<td>Office of Settlement and Regional Infrastructure (Dinas Pemukiman dan Prasarana Wilayah)</td>
</tr>
</tbody>
</table>
Table 2 cont.  Institutions are Responsible on the Management of Coastal Wetlands.

<table>
<thead>
<tr>
<th>Central Government</th>
<th>Tasks and Responsibilities</th>
<th>Province</th>
<th>Related Agency on the Province</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indonesian Institute of Science - LIPI - Lembaga Ilmu Pengetahuan Indonesia</td>
<td>LIPI is scientific authority of Indonesia, including responsible in conducting research regarding wise use and conservation of wetlands.</td>
<td>Riau</td>
<td>Agency for Research and Development (Badan Penelitian dan Pengembangan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jambi</td>
<td>Agency for Research and Development (Badan Penelitian dan Pengembangan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sumatera Selatan</td>
<td>Agency for Research and Development (Badan Penelitian dan Pengembangan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bangka Belitung</td>
<td>Agency for Research and Development (Badan Penelitian dan Pengembangan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lampung</td>
<td>Agency for Research and Development (Badan Penelitian dan Pengembangan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Banten</td>
<td>Agency for Research and Development (Badan Penelitian dan Pengembangan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DKI</td>
<td>Agency for Research and Development (Badan Penelitian dan Pengembangan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jawa Barat</td>
<td>Agency for Provincial Research and Development (Badan Penelitian dan Pengembangan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kalimantan Barat</td>
<td>Agency for Provincial Research and Development (Badan Penelitian dan Pengembangan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jambi</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sumatera Selatan</td>
<td>Office of Culture and Tourism (Dinas Kebudayaan dan Pariwisata)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bangka Belitung</td>
<td>Office of Culture, Arts, and Tourism (Dinas Kebudayaan dan Pariwisata)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lampung</td>
<td>Office of Culture and Tourism (Dinas Kebudayaan dan Pariwisata)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Banten</td>
<td>Office of Culture and Tourism (Dinas Kebudayaan dan Pariwisata)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DKI</td>
<td>Office of Tourism (Dinas Pariwisata)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jawa Barat</td>
<td>Office of Culture and Tourism (Dinas Kebudayaan dan Pariwisata)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kalimantan Barat</td>
<td>Office of Culture and Tourism (Dinas Kebudayaan dan Pariwisata)</td>
</tr>
<tr>
<td>Ministry of Health - Depkes - Departemen Kesehatan</td>
<td>Responsible in maintaining health standard of community by controlling water quality, drugs quality, and disease related coastal wetlands. Degradation trend of South China Sea could ignite various disease, Ministry of Health possess responsibility to avoid the event.</td>
<td>Riau</td>
<td>Health Office (Dinas Kesehatan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jambi</td>
<td>Health Office (Dinas Kesehatan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sumatera Selatan</td>
<td>Health Office (Dinas Kesehatan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bangka Belitung</td>
<td>Health Office (Dinas Kesehatan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lampung</td>
<td>Health Office (Dinas Kesehatan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Banten</td>
<td>Health Office (Dinas Kesehatan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DKI</td>
<td>Health Office (Dinas Kesehatan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jawa Barat</td>
<td>Health Office (Dinas Kesehatan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kalimantan Barat</td>
<td>Health Office (Dinas Kesehatan)</td>
</tr>
<tr>
<td>National Board for Development Planning - Bappenas - Badan Perencanaan Pembangunan Nasional</td>
<td>Responsible in coordinating programs planning of government including budget plan related to coastal wetlands.</td>
<td>Riau</td>
<td>Provincial Development Planning Board (Badan Perencanaan Pembangunan Daerah)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jambi</td>
<td>Provincial Development Planning Board (Badan Perencanaan Pembangunan Daerah)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sumatera Selatan</td>
<td>Provincial Development Planning Board (Badan Perencanaan Pembangunan Daerah)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bangka Belitung</td>
<td>Provincial Development Planning Board (Badan Perencanaan Pembangunan Daerah)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lampung</td>
<td>Provincial Development Planning Board (Badan Perencanaan Pembangunan Daerah)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Banten</td>
<td>Provincial Development Planning Board (Badan Perencanaan Pembangunan Daerah)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DKI</td>
<td>Provincial Development Planning Board (Badan Perencanaan Pembangunan Daerah)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jawa Barat</td>
<td>Provincial Development Planning Board (Badan Perencanaan Pembangunan Daerah)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kalimantan Barat</td>
<td>Provincial Development Planning and Controlling Board (Badan Perencanaan dan Pengendalian Pembangunan Daerah)</td>
</tr>
</tbody>
</table>
### Table 2 cont. Institutions are Responsible on the Management of Coastal Wetlands.

<table>
<thead>
<tr>
<th>Central Government</th>
<th>Tasks and Responsibilities</th>
<th>Province</th>
<th>Related Agency on the Province</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Energy and Mineral Resources - Dep ESDM - Departemen Energi dan Sumberdaya Mineral</td>
<td>Responsible in regulating mining activity around coastal wetlands area, including post mining rehabilitation.</td>
<td>Riau</td>
<td>Office of Mining and Energy (Dinas Pertambangan dan Energi)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jambi</td>
<td>Office of Mining and Energy (Dinas Pertambangan dan Energi)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sumatera Selatan</td>
<td>Office of Mining and Energy Development (Dinas Pertambangan dan Pengembangan Energi)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bangka Belitung</td>
<td>Office of Mining and Energy (Dinas Pertambangan dan Energi)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lampung</td>
<td>Office of Mining and Energy (Dinas Pertambangan dan Energi)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Banten</td>
<td>Office of Mining and Energy (Dinas Pertambangan dan Energi)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DKI</td>
<td>Office of Mining (Dinas Pertambangan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jawa Barat</td>
<td>Office of Mining and Energy (Dinas Pertambangan dan Energi)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kalimantan Barat</td>
<td>Office of Energy and Mineral Resources (Dinas Energi dan Sumberdaya Mineral)</td>
</tr>
<tr>
<td>Ministry of Agriculture - DEPTAN – Departemen Pertanian</td>
<td>Responsible in provide technical direction related to agriculture activity within and around wetlands.</td>
<td>Riau</td>
<td>Office of Food Agriculture (Dinas Tanaman Pangan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jambi</td>
<td>Office of Agriculture (Dinas Pertanian Tanaman Pangan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sumatera Selatan</td>
<td>Office of Food Agriculture and Horticulture (Dinas Tanaman Pangan dan Hortikultur)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bangka Belitung</td>
<td>Office of Agriculture and Husbandry (Dinas Pertanian dan Peternakan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lampung</td>
<td>Office of Agriculture (Dinas Pertanian)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Banten</td>
<td>Office of Agriculture and Husbandry (Dinas Pertanian dan Peternakan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DKI</td>
<td>Office of Agriculture and Forestry (Dinas Pertanian dan Kehutanan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jawa Barat</td>
<td>Office of Agriculture (Dinas Pertanian Tanaman Pangan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kalimantan Barat</td>
<td>Office of Agriculture (Dinas Pertanian Tanaman Pangan)</td>
</tr>
</tbody>
</table>

| Army, Police, and Attorney (TNI, Polri, dan Kejaksaan) | Responsible in securing and enforcing laws regarding wise use and conservation of wetlands’. | Riau |  |
| | | Jambi |  |
| | | Sumatera Selatan |  |
| | | Bangka Belitung |  |
| | | Lampung |  |
| | | Banten |  |
| | | DKI |  |
| | | Jawa Barat |  |
| | | Kalimantan Barat | Authority of Central Government |

#### 2.2.2 Non-governmental Organisations

1. **Community** in several area of coastal wetlands bordering South China Sea play important role in controlling coastal wetlands utilization through collective rules, custom, and norms. Community also participates in rehabilitation efforts such as in Tembilahan, Berbak National Park, Jakarta, and West Java.

2. **Non Government Organizations (NGOs)** actively participates in doing non formal education to community regarding wise use and conservation of coastal wetlands. Supporting the development of policy and management and conducting rehabilitation action. Some of the NGOs are Laksana Samudera of Riau Province, Yayasan Pinse of Jambi Province, Yayasan Wahana Bumi Hijau of South Sumatera, and Yayasan Mangove of Bogor. Usually, NGOs form a network to strengthen their bargaining position to other stakeholder. Two of the most prominent networks are WALHI (Indonesian Environment Forum) and Jaring Pela (Coastal and Marine NGOs Network).

3. **Private Sectors** play important role in harvesting coastal wetlands resources as well as support development local community’s economic activities. However, in many cases private sector activities in coastal wetlands tend to neglect ecosystem services. The most prominent cases are the conversion of coastal wetlands of Muara Angke Jakarta into luxurious housing complex has caused regular flooding around the housing complex.
3. CONCLUSION

The management of coastal wetlands bordering South China Sea has to be unique compare to other waters in Indonesia since South China Sea is stretch through various countries. Therefore, transnational issues as well as issues mentioned in many International Conventions are important part that should be consider in developing legislation and regime of Indonesian coastal wetlands bordering South China Sea.

There is no single legislation that covers and/or coordinates all aspects of management of coastal wetlands bordering South China Sea. Each management issues regulate by sectoral Act and execute by related sectoral institution. Therefore many of sectoral legislation are overlap and not compatible with other legislation as happened on status of mangrove wetlands on Act of Fishery, Act of Conservation and Act of Forestry.

In general, legislations for management of coastal wetlands bordering South China Sea is sufficient to deal with current issues. However, weak enforcement efforts and coordination among sectors has lead to inefficient implementation of the legislation.

Institutionally, there are no specific management institutions for coastal wetlands bordering South China Sea. However each institution usually has activity or program related to coastal wetlands bordering South China Sea. Unfortunately, as happened on sectoral legislation, coordination among institutions is usually weak.

Indonesia had possessed National Strategy and Action Plan (NSAP) for wetlands management, developed in 1996. Along with the change of natural resources management’s paradigm and the change of Government’s structure, the NSAP of 1996 become irrelevant and require immediate revision.

Efforts to revised NSAP of 1996 had been starting since the end of 2002, simultaneously with the starting of South China Sea Project. The effort facilitated by Ministry of Environment (Ministry of Environment, 1996). The result of NWC for South China Sea Project’s meeting related to Strategic Plan for Coastal Wetlands Management recommended that the development of Strategic Plan should not be separated from the process that facilitated by Ministry of Environment. Separation would risk the creation of confronting strategy between NSAP for Wetlands that developed by Ministry of Environment and the Strategy for Coastal Wetlands that developed by NWC for South China Sea.

In order to avoid above situation, through Wetlands International - Indonesia Programme, some of the member of NWC for South China Sea Project actively participated in discussion and consultation facilitated by Ministry of Environment. In March 2004, after series national consultations, Ministry of Environment and Ministry of Forestry was publishing the NSAP for wetlands management (Ministry of Environment, 1996). The NWC for South China Sea Project developing Strategy for Coastal Wetlands Management by extracting coastal wetlands related strategy from NSAP for Wetlands. The Strategy and Action Plan is attached.

REFERENCE


NATIONAL REPORT

on

Wetlands in South China Sea

MALAYSIA

Mr. Zainuddin Ab. Shukor
Focal Point for Wetlands [New]
The Protected Area Division
Department of Wildlife and National Parks
KM 10, Jalan Cheras, 56100
Kuala Lumpur, Malaysia
Table of Contents

1. INTRODUCTION .............................................................................................................................1

2. WETLAND TYPES AND DISTRIBUTION.......................................................................................2
   2.1 SITE DESCRIPTION ....................................................................................................................2
   2.2 NATURAL WETLANDS .................................................................................................................3
   2.3 CONSTRUCTED WETLANDS .........................................................................................................8
   2.4 FUNCTION AND VALUES OF WETLANDS .......................................................................................9
   2.5 THREATS TO WETLANDS ..........................................................................................................10

3. CONCLUSION AND RECOMMENDATIONS ...............................................................................11

REFERENCES......................................................................................................................................12

List of Tables

Table 1  Wetland Sites Proposed at the Second National Wetlands Committee Meeting
Table 2  Mangrove Areas in Malaysia
Table 3  Peat Swamp Areas in Malaysia
Table 4  Freshwater Swamp Forest in Malaysia
Table 5  Nipa Swamps in Malaysia
Table 6  Melaleuca Swamp Forest in Malaysia
Table 7  Marshes in different states of Malaysia
Table 8  Intertidal Mudflats in Malaysia
Table 9  Sandy Beaches in Malaysia
Table 10 Rocky Shore Areas in Malaysia
Table 11 Coral Reefs Areas in Malaysia
Table 12 Rice Field Areas in Malaysia
1. INTRODUCTION

Wetlands contribute significantly to the economy of Malaysia; firstly through agricultural production, forestry and fisheries; second, and increasingly, for water supply (for domestic use as well as for irrigation). Other economic and ecological benefits of wetlands include groundwater replenishment, maintenance of water tables for agriculture, flood control, shoreline protection and stabilization, climate change mitigation, sediment and nutrient retention, water purification and habitats for biodiversity. Tourism in wetlands is also becoming increasingly important.

Ten percent of the total land area of Malaysia is comprised of wetlands (IPT-Asian Wetland Bureau 1994). Different communities near and around these important ecosystems have used the wetland resources for centuries. In 1994, Malaysia ratified the Ramsar Convention of Wetlands of International Importance, and soon thereafter designated Tasek Bera, a unique freshwater swamp as its first Ramsar site. The Malaysian Wetland Directory was compiled in 1987 and highlights 96 wetland sites of national importance.

Malaysia’s land use policy is “use-oriented”, i.e. designed for maximum exploitation and development (Ministry of Science and Technology and Environment (MoSTE) 1997). Thus, conversion of land for urbanization, industrial, agricultural, mining and forestry development has higher priority than that of conservation, although it is probable, in many cases, that conservation for sustainable use of resources has a higher rate of return on investment in the long term. This is because, when decision are made on the conversion of wetlands to other land uses, the cost/benefit analyses used in these situations often do not take into account the full range of benefits of the wetland area to be converted. The National Land Code (NLC) is applicable only in Peninsular Malaysia while in East Malaysia, the Sabah Land Ordinance and Sarawak Land Ordinance form the basis of land laws and administration. The Land Capability Classification (LCC) which is applicable throughout Malaysia divides land use into five categories: mining, agriculture covering a wide range of possible crops, agriculture for a restricted range of possible crops, forestry and conservation, based on potential productivity and economic yield of the land in question. Land designated for conservation has the lowest priority in this order. Since its implementation, the LCC has introduced major land use changes which have been financially beneficial and have done much to address problems of rural poverty and social inequality. The LCC’s weakness is its limited applicability to adequately address biological diversity and conservation issues, although conservation has been widely defined as the judicious use and management of nature and natural resources for the benefit of human society and ethical reasons. Development projects in wetland areas, for example agriculture (whether planned or unplanned) compromises the ecological integrity of intact wetland areas, and result in loss or degradation of these sensitive, yet fragile ecosystems.

Most key wetland sites in Malaysia are included in the Permanent Forest Estate (PFE), managed primarily as source of timber and non-timber goods. The value of wetland forests for instance, peat swamp forests, and mangrove forests in performing various environmental or cultural services has rarely been considered in decision-making. The term PFE, however, may be misleading since it implies that the forest areas are permanent. This is not guaranteed since the Executive Council within state governments can declassify any area of PFE for infrastructure development, agriculture, housing or other purposes (PFEs are the jurisdiction of respective state governments). Very few wetland areas in Malaysia that are designated as nature parks and wildlife sanctuaries are legally protected for conservation, while some wetland areas forming part of state land forests are essentially viewed as land earmarked for development.

The Ramsar Convention stresses the importance of wetlands as rich areas of biological diversity and productivity and as life support systems for human populations. This has been a key theme in the evolving global support and political commitment for sustainable development and environmental conservation as articulated in the Ramsar Convention’s Strategic Plan 1997-2002; the World Conservation Strategy; Caring for the Earth, the report of the Brundtland Commission; and Agenda 21. The role of wetlands has emerged as a key element in the conservation of natural ecosystems through the Convention on Biological Diversity and the United Nations Framework Convention on Climate Change, among others.
The importance of wetlands goes beyond their status as habitats for many endangered plant and animal species. They are a vital component of national and global ecosystems, and economies.

Since the ratification of the Ramsar Convention in 1994, there has been a progressive loss and degradation of wetlands in Malaysia. One of the many wise use guidelines for wetland conservation under the Ramsar Convention is the adoption of a holistic approach to land use planning. Although the National Land Code (NLC) in Malaysia is federal legislation, land is legally administered under the respective state governments (MoSTE, 1997). The National Land Codes has no direct bearing on biological diversity conservation, although it provides certainty in use through the land categorization system, and security in tenure in terms of ownership rights. The absence of a single central authority in charge of land administration, given the division of functions between state and federal governments, implies that the maintenance of wetland reserves for biodiversity conservation is dependent upon the decisions of policy makers of individual states. This conflict, in many ways, has resulted in poor implementation of the Ramsar Convention’s goals and objectives in Malaysia.

Malaysia launched its National Biodiversity Policy in 1998. In 1997, the Framework for the National Policy on Wetlands was established, but until today the policy is still in a draft form. It has taken considerable time and lengthy consultation to overcome barriers such as institutional reluctance to change practices in government agencies and elsewhere.

In view of increasing threats to wetlands and their biological diversity, the National Land Council (which is the advisory council of the NLC) needs to integrate the major issues of unsustainable land use practices into its long-term land use planning, in addition to administrating land use laws. Land use patterns and priorities have undergone drastic changes since the 1960s; therefore the Land Codes Classification should be replaced with an integrated and holistic approach to land use planning (MoSTE, 1997).

Like many developing nations, Malaysia’s quest for economic growth has focused government attention on the financial gains of land development, manufacturing, industry, and tourism with considerable regard paid to the environmental costs. The government’s enthusiasm for what it views as the tremendous potential of agriculture and tourism has been somewhat tempered by the present status of its marine resources. The rate of development along the rivers shows that the quality of wetland habitats has declined. The damaging effects generated by the above developments are one of the factors lead in declining wetland quality. Even though the present wetland quality is not very alarming, the environmental degradation of the South China Sea still requires serious mitigation. Given Malaysia’s history of strong environmental regulations, long-time support of agriculture, and overlapping and conflicting jurisdictions between governmental authorities, the problem of environmental degradation in the South China Sea should be considered as a regional problem to be solved. Malaysia should be responsible in the regional solution to the problem because most of the major rivers in Malaysia drained into the South China Sea. Recognition of the problems produced by irresponsible activities can only be solved at best, by good management practices. It can also be viewed as an encouraging preliminary step toward an effective policy of environmentally sustainable development in the wetland areas (Wetlands International-Asia Pacific- Malaysia Programme. 1998).

2. WETLAND TYPES AND DISTRIBUTION

2.1 Site Description

The only national inventory of wetlands in Malaysia was conducted in 1986 by the Malaysia Wetlands Working Group, Department of Wildlife and National Parks. In Malaysia there are 91 wetland sites, of which 55 are in Peninsular Malaysia, and 18 each in Sabah and Sarawak respectively. However, only fourteen sites were chosen in Peninsular Malaysia, four sites in Sabah and 10 in Sarawak for the National Wetland Committee consideration.

Although the data appears to be quite outdated, the recommended sites were each investigated recently. During the data collection, a guideline proposed by Ramsar was used, in accordance to criteria of the Ramsar Convention Criteria for selection of demonstration sites in this project were based on the previously mentioned guidelines, and include: criteria, indicators, data and information required for national reviews. At the second meeting of the National Wetlands Committee on October 29, 2003, 28 sites were endorsed and accepted as candidates for pilot sites. The decision was based on nine criteria (Table 1).
On January 11, 2004, the prioritized data from the sites was presented to the Third National Wetlands Committee for site(s) selection. The Committee agreed to select five sites to propose for the project: South East Pahang swamp forests, Sungai Cherating forest reserve (estuarine), Kuala Rompin estuarine, Rajang delta – mudflats and Klias Peninsula – peat swamp.

Table 1 Wetland Sites Proposed at the Second National Wetlands Committee Meeting.

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Location</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Telong melaleuca swamps</td>
<td>Kelantan</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>Sungai Golok melaleuca</td>
<td>Kelantan</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>Tumpat Lagoon – estuarine</td>
<td>Kelantan</td>
<td>N/A</td>
</tr>
<tr>
<td>4</td>
<td>Melaleuca North of Kuala Terengganu</td>
<td>Terengganu</td>
<td>N/A</td>
</tr>
<tr>
<td>5</td>
<td>Merang peat forest</td>
<td>Terengganu</td>
<td>N/A</td>
</tr>
<tr>
<td>6</td>
<td>Tasek Chini</td>
<td>Pahang</td>
<td>202</td>
</tr>
<tr>
<td>7</td>
<td>Sungai Cherating Forest Reserve – estuarine</td>
<td>Pahang</td>
<td>277</td>
</tr>
<tr>
<td>8</td>
<td>Tanjung Aqas lagoon</td>
<td>Pahang</td>
<td>N/A</td>
</tr>
<tr>
<td>9</td>
<td>South east Pahang swamp forests</td>
<td>Pahang</td>
<td>N/A</td>
</tr>
<tr>
<td>10</td>
<td>Tasek Beru</td>
<td>Pahang</td>
<td>16,500</td>
</tr>
<tr>
<td>11</td>
<td>Kuala Rompin estuarine</td>
<td>Pahang</td>
<td>N/A</td>
</tr>
<tr>
<td>12</td>
<td>Kuala Endau mangrove</td>
<td>Johor</td>
<td>N/A</td>
</tr>
<tr>
<td>13</td>
<td>Sungai Sedili Kechil</td>
<td>Johor</td>
<td>433</td>
</tr>
<tr>
<td>14</td>
<td>Sungai Sedili Besar</td>
<td>Johor</td>
<td>N/A</td>
</tr>
<tr>
<td>15</td>
<td>Klias Peninsula – peat swamp</td>
<td>Sabah</td>
<td>100,000</td>
</tr>
<tr>
<td>16</td>
<td>Kinabatangan floodplain - freshwater</td>
<td>Sabah</td>
<td>280,000</td>
</tr>
<tr>
<td>17</td>
<td>Merintaman Menggalong</td>
<td>Sabah</td>
<td>1,700</td>
</tr>
<tr>
<td>18</td>
<td>Unggah swamp</td>
<td>Sabah</td>
<td>500</td>
</tr>
<tr>
<td>19</td>
<td>Lawas mangrove</td>
<td>Sarawak</td>
<td>227,500</td>
</tr>
<tr>
<td>20</td>
<td>Trusan-Sundar mangrove</td>
<td>Sarawak</td>
<td>6,000</td>
</tr>
<tr>
<td>21</td>
<td>Sandakan-Tambisan – coastal wetlands – freshwater</td>
<td>Sabah</td>
<td>95,000</td>
</tr>
<tr>
<td>22</td>
<td>Sibuti Mangrove– peat swamp</td>
<td>Sarawak</td>
<td>1,213</td>
</tr>
<tr>
<td>23</td>
<td>Rajang Delta – mudflats</td>
<td>Sarawak</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Maludam Swamp Forest</td>
<td>Sarawak</td>
<td>125,000</td>
</tr>
<tr>
<td>25</td>
<td>Limbang mangrove – estuarine</td>
<td>Sarawak</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Sarawak mangrove forest-estuarine</td>
<td>Sarawak</td>
<td>13,098</td>
</tr>
<tr>
<td>27</td>
<td>Sambali mangrove forest – delta</td>
<td>Sarawak</td>
<td>202,500</td>
</tr>
<tr>
<td>28</td>
<td>Sadong swamp forest – peat swamp</td>
<td>Sarawak</td>
<td>427,500</td>
</tr>
</tbody>
</table>

2.2 Natural Wetlands

1) Mangroves
Mangroves are well developed in sheltered estuaries where waters are brackish and waves and tidal conditions are conducive for mud accumulation. Mangroves cover about 3% (641,891 ha) of the total land area in Malaysia with about 57% in Sabah, 26% in Sarawak and the remaining 17% in Peninsular Malaysia (Chan et al., 1996; Wetlands International-Asia Pacific 1996; Management Plan for the Mangroves of Johor 1999) (Table 2). About 70% of the total mangrove area has been recorded as forest reserves with the remainder being state land. The term “mangroves” is a collective name for a group of plants with more than 50 species identified which fall into four main genera: *Avicennia, Rhizophora, Bruguiera and Sonneratia*. The mangrove vegetation in Malaysia is believed to have reached its optimal development.

Table 2 Mangrove Areas in Malaysia.

<table>
<thead>
<tr>
<th>State</th>
<th>Total Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perlis</td>
<td>100</td>
</tr>
<tr>
<td>Kedah</td>
<td>7,949</td>
</tr>
<tr>
<td>Penang</td>
<td>451</td>
</tr>
<tr>
<td>Perak</td>
<td>43,502</td>
</tr>
<tr>
<td>Selangor</td>
<td>23,882</td>
</tr>
<tr>
<td>Negeri Sembilan</td>
<td>1,061</td>
</tr>
<tr>
<td>Melaka</td>
<td>305</td>
</tr>
<tr>
<td>Johor</td>
<td>27,733</td>
</tr>
<tr>
<td>Terengganu</td>
<td>954</td>
</tr>
<tr>
<td>Pahang</td>
<td>2,482</td>
</tr>
<tr>
<td>Kelantan</td>
<td>20</td>
</tr>
<tr>
<td>Sabah</td>
<td>365,460</td>
</tr>
<tr>
<td>Sarawak</td>
<td>167,992</td>
</tr>
</tbody>
</table>
**ii) Peat Swamp**

The tropical climate and high annual rainfall in Malaysia have resulted in the formation of peat swamp forests. Where permanent water logging and anaerobic conditions prevail, partial inhibition of vegetation decay has given rise to peat formation. The peat releases tannin and organic acids into the water. This accounts for the water acidity, with a pH value of between 3 and 4, and the coloration of water, which is almost black in appearance, but is clear when held up against the light. Today, about 2 million ha (Chew 1997, Latiff 1997, Mahadon 1997, Mohd Radhi 1997, Jalil 1997 and Moktar 1997) remain in Malaysia which accounts for about 7.2% of the total land area of Malaysia. Less than 25% of this wetland type is found in the peninsula with another 75% in Sarawak; while the rest is in Sabah. Table 3 shows peat swamp areas in Malaysia.

<table>
<thead>
<tr>
<th>State</th>
<th>Total Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perlis</td>
<td>No significant peat swamp forest</td>
</tr>
<tr>
<td>Kedah</td>
<td>No significant peat swamp forest</td>
</tr>
<tr>
<td>Penang</td>
<td>No significant peat swamp forest</td>
</tr>
<tr>
<td>Perak</td>
<td>96,000</td>
</tr>
<tr>
<td>Selangor</td>
<td>76,134</td>
</tr>
<tr>
<td>Negeri Sembilan</td>
<td>No significant peat swamp forest</td>
</tr>
<tr>
<td>Melaka</td>
<td>No significant peat swamp forest</td>
</tr>
<tr>
<td>Johor</td>
<td>13,346</td>
</tr>
<tr>
<td>Terengganu</td>
<td>13,819</td>
</tr>
<tr>
<td>Pahang</td>
<td>198,866</td>
</tr>
<tr>
<td>Kelantan</td>
<td>No significant peat swamp forest</td>
</tr>
<tr>
<td>Sabah</td>
<td>166,698</td>
</tr>
<tr>
<td>Sarawak</td>
<td>1,500,000</td>
</tr>
</tbody>
</table>

**iii) Freshwater Swamp Forest**

Freshwater swamps occur in areas permanently or seasonally flooded, where the soils contain more than 35% mineral content, normally found along upper reaches of certain rivers. Examples include the freshwater swamp forests in Sg. Sedili in Johor, Tasek Chini and Tasek Bera in Pahang, along Sabah’s east coast and along lower reaches of certain rivers in Sarawak (Chew 1997; Malaysian Wetland Working Group 1987). This type of forest is quite species-rich with a high diversity of understory species including rattan and palm. The swamp forest vegetation of Tasek Chini is dominated by *Eugenia* species (Wetlands International-Asia Pacific – Malaysia Programme, 1998). Table 4 illustrates freshwater swamp forest in Malaysia.

<table>
<thead>
<tr>
<th>State</th>
<th>Total Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perlis</td>
<td>No significant freshwater swamp forest</td>
</tr>
<tr>
<td>Kedah</td>
<td>No significant freshwater swamp forest</td>
</tr>
<tr>
<td>Penang</td>
<td>No significant freshwater swamp forest</td>
</tr>
<tr>
<td>Perak</td>
<td>1,967</td>
</tr>
<tr>
<td>Selangor</td>
<td>Data not available</td>
</tr>
<tr>
<td>Negeri Sembilan</td>
<td>No significant freshwater swamp forest</td>
</tr>
<tr>
<td>Melaka</td>
<td>No significant freshwater swamp forest</td>
</tr>
<tr>
<td>Johor</td>
<td>11,900</td>
</tr>
<tr>
<td>Terengganu</td>
<td>10,433</td>
</tr>
<tr>
<td>Pahang</td>
<td>330,980</td>
</tr>
<tr>
<td>Kelantan</td>
<td>No significant fresh swamp forest</td>
</tr>
<tr>
<td>Sabah</td>
<td>152,702</td>
</tr>
<tr>
<td>Sarawak</td>
<td>28,907</td>
</tr>
</tbody>
</table>

**iv) Nipa Swamp**

Nipa swamps occur in association with mangroves and extend further into brackish water (Table 5). They are normally found surviving in the borderline of brackish and freshwater areas of tidal influence. Comprising mono-specific stands of the palm *Nypa fruticans*, they form huge swamps in tidal reaches of rivers as in the Sarawak Mangrove Reserve (Chew 1997, Malaysian Wetland Working Group 1987).
Table 5  Nipa Swamps in Malaysia.

<table>
<thead>
<tr>
<th>State</th>
<th>Total Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perlis</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Kedah</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Penang</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Perak</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Selangor</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Negeri Sembilan</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Melaka</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Johor</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Terengganu</td>
<td>24,100</td>
</tr>
<tr>
<td>Pahang</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Kelantan</td>
<td>1,020</td>
</tr>
<tr>
<td>Sabah</td>
<td>758,770</td>
</tr>
<tr>
<td>Sarawak</td>
<td>869,700</td>
</tr>
</tbody>
</table>

v)  **Melaleuca Swamp Forest**

*Melaleuca* swamp forests, known locally as “gelam” forests, are actually freshwater swamp forests; however, the vegetation is comprised almost exclusively of *Melaleuca cejeputi* (Table 6). The forests replace the original freshwater swamp forest after it has been burnt since *Melaleuca* are resistant to fire. These forests occupy extensive areas of alluvial flats along the east coast of peninsular Malaysia, mainly in Kelantan and Terengganu (Chew 1997, Malaysian Wetland Working Group 1987).

Table 6  Melaleuca Swamp Forest in Malaysia.

<table>
<thead>
<tr>
<th>State</th>
<th>Total Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perlis</td>
<td>No significant melaleuca swamp forest</td>
</tr>
<tr>
<td>Kedah</td>
<td>No significant melaleuca swamp forest</td>
</tr>
<tr>
<td>Penang</td>
<td>No significant melaleuca swamp forest</td>
</tr>
<tr>
<td>Perak</td>
<td>No significant melaleuca swamp forest</td>
</tr>
<tr>
<td>Selangor</td>
<td>No significant melaleuca swamp forest</td>
</tr>
<tr>
<td>Negeri Sembilan</td>
<td>No significant melaleuca swamp forest</td>
</tr>
<tr>
<td>Melaka</td>
<td>1,400</td>
</tr>
<tr>
<td>Johor</td>
<td>No significant melaleuca swamp forest</td>
</tr>
<tr>
<td>Terengganu</td>
<td>29,100</td>
</tr>
<tr>
<td>Pahang</td>
<td>No significant melaleuca swamp forest</td>
</tr>
<tr>
<td>Kelantan</td>
<td>11,020</td>
</tr>
<tr>
<td>Sabah</td>
<td>No significant melaleuca swamp forest</td>
</tr>
<tr>
<td>Sarawak</td>
<td>No significant melaleuca swamp forest</td>
</tr>
</tbody>
</table>

vi)  **Marshes**

Marshes have a number of specific characteristics. They are usually dominated by reeds, rushes, grasses and sedges that are commonly referred to as emergents since they grow with their stems partly in and partly out of the water. Marshes rely on water sources and include some of the most productive ecosystems in the world. In Malaysia, marshes are normally found in areas where the original freshwater swamp forest has been cleared or burnt (Table 7). They are a stage of ecological succession, and not normally a permanent vegetation type. Dominant plants include species of reeds, reedmace, club rush, sedges and spike rushes. There are relatively few open marsh areas in Malaysia (Malaysian Wetland Working Group, 1987) with the exception of Kota Belud Bird Sanctuary on the Tempasuk Plain in north-western Sabah.

Table 7  Marshes in different states of Malaysia.

<table>
<thead>
<tr>
<th>State</th>
<th>Total Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perlis</td>
<td>No significant marsh areas</td>
</tr>
<tr>
<td>Kedah</td>
<td>No significant marsh areas</td>
</tr>
<tr>
<td>Penang</td>
<td>No significant marsh areas</td>
</tr>
<tr>
<td>Perak</td>
<td>1,967</td>
</tr>
<tr>
<td>Selangor</td>
<td>No significant marsh areas</td>
</tr>
<tr>
<td>Negeri Sembilan</td>
<td>No significant marsh areas</td>
</tr>
<tr>
<td>Melaka</td>
<td>600</td>
</tr>
<tr>
<td>Johor</td>
<td>No significant marsh areas</td>
</tr>
<tr>
<td>Terengganu</td>
<td>No significant marsh areas</td>
</tr>
<tr>
<td>Pahang</td>
<td>20,350</td>
</tr>
<tr>
<td>Kelantan</td>
<td>No significant marsh areas</td>
</tr>
<tr>
<td>Sabah</td>
<td>721,216</td>
</tr>
<tr>
<td>Sarawak</td>
<td>Data Not Available</td>
</tr>
</tbody>
</table>
vii) Mudflats
Intertidal mud and sand flats are extremely important wetland habitats in Malaysia (Table 8). They fringe the majority of Malaysia’s coastlines and in certain places may be several kilometres wide at low tide. Mudflats that are associated with major mangrove forests support a very rich benthic (organisms that are either attached or living within the bottom sediments) population. These areas represent the richest feeding grounds for migratory shorebirds and resident water birds such as herons, egrets and storks. In Malaysia, there are approximately 400,000 ha (MoSTE 1997; Sasekumar, et. al. 1998) of tidal mudflats. This is about 1.9% of the total land area of Malaysia. Yet they are rarely included in reserve areas and are very poorly documented.

<table>
<thead>
<tr>
<th>State</th>
<th>Total Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perlis</td>
<td>0.22</td>
</tr>
<tr>
<td>Kedah</td>
<td>1,483.46</td>
</tr>
<tr>
<td>Penang</td>
<td>4,189.90</td>
</tr>
<tr>
<td>Perak</td>
<td>7,797.64</td>
</tr>
<tr>
<td>Selangor</td>
<td>20,806.14</td>
</tr>
<tr>
<td>Negeri Sembilan</td>
<td>301.62</td>
</tr>
<tr>
<td>Melaka</td>
<td>1,012.85</td>
</tr>
<tr>
<td>Johor</td>
<td>16,586.61</td>
</tr>
<tr>
<td>Terengganu</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Pahang</td>
<td>1,777.00</td>
</tr>
<tr>
<td>Kelantan</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Sabah</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Sarawak</td>
<td>Data Not Available</td>
</tr>
</tbody>
</table>

viii) Sandy Beaches
In Malaysia, sandy beaches occur largely along the East Coast of Peninsular Malaysia, Sabah and Sarawak (Sasekumar et al., 1998). Plants in this habitat have to anchor themselves deeply in shifting sands and find enough freshwater between the loose silica sand grains. Animals are found mostly in the tidal zones, with bivalve molluscs being the most common. Sandy beaches are also important as turtle landing and nesting sites. Beaches are attractive recreational areas for people, hence are often used for tourism. Table 9 shows sandy beaches in Malaysia.

<table>
<thead>
<tr>
<th>State</th>
<th>Total Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perlis</td>
<td>343.00</td>
</tr>
<tr>
<td>Kedah</td>
<td>181.22</td>
</tr>
<tr>
<td>Penang</td>
<td>390.38</td>
</tr>
<tr>
<td>Perak</td>
<td>734.20</td>
</tr>
<tr>
<td>Selangor</td>
<td>4,767.19</td>
</tr>
<tr>
<td>Negeri Sembilan</td>
<td>816.66</td>
</tr>
<tr>
<td>Melaka</td>
<td>318.23</td>
</tr>
<tr>
<td>Johor</td>
<td>285.54</td>
</tr>
<tr>
<td>Terengganu</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Pahang</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Kelantan</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Sabah</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Sarawak</td>
<td>Data Not Available</td>
</tr>
</tbody>
</table>

ix) Rocky Shores
Rocky shores are rare habitats in Malaysia. Isolated rocky headlands and islands occur at places such as Tanjung Tuan, at the many offshore islands along the west and east coast of Peninsular Malaysia (Sasekumar, et al. 1998), and in Sabah and Sarawak (Table 10). Rocky shore ecosystems support animals and plants found nowhere else in Malaysia. Ecological information on this unique habitat is scarce.
Table 10 Rocky Shore Areas in Malaysia.

<table>
<thead>
<tr>
<th>State</th>
<th>Total Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perlis</td>
<td>11.82</td>
</tr>
<tr>
<td>Kedah</td>
<td>195.38</td>
</tr>
<tr>
<td>Penang</td>
<td>58.27</td>
</tr>
<tr>
<td>Perak</td>
<td>86.98</td>
</tr>
<tr>
<td>Selangor</td>
<td>No significant Rocky Shores</td>
</tr>
<tr>
<td>Negeri Sembilan</td>
<td>48.25</td>
</tr>
<tr>
<td>Melaka</td>
<td>1.12</td>
</tr>
<tr>
<td>Johor</td>
<td>33.37</td>
</tr>
<tr>
<td>Terengganu</td>
<td>No significant Rocky Shores</td>
</tr>
<tr>
<td>Pahang</td>
<td>No significant rocky shores</td>
</tr>
<tr>
<td>Kelantan</td>
<td>No significant rocky Shores</td>
</tr>
<tr>
<td>Sabah</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Sarawak</td>
<td>Data Not Available</td>
</tr>
</tbody>
</table>

x) Coral Reefs
A coral reef is assembled of many types of plants and animals, and of which corals form one of the dominant components. Reefs are essentially massive deposits of calcium carbonate that have been produced by corals with major additions from calcareous algae and other organisms that secrete calcium carbonate. Coral reefs are sensitive and easily destroyed because they need specific conditions to grow and survive such as water temperature above 18ºC, water depth shallower than 50 m, low sedimentation rates and sufficient circulation of pollution-free water. Coral reefs are distributed mainly around the offshore islands in three regions: the East and West Coast regions in Peninsular Malaysia, Sabah and Sarawak. Typically, the marine waters of the offshore islands where the corals occur are either protected as Marine Parks or are areas where fishing is prohibited (MoSTE 1997; Jabatan Perancang Bandar & Desa 2001). Marine Parks are protected areas which extend for a distance of two nautical miles seaward from the outermost points of the islands. However, the land areas of these islands are not protected as part of the marine park designation (Table 11).

Table 11 Coral Reefs Areas in Malaysia.

<table>
<thead>
<tr>
<th>State</th>
<th>Total Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perlis</td>
<td>No significant coral reefs</td>
</tr>
<tr>
<td>Kedah</td>
<td>18.700</td>
</tr>
<tr>
<td>Penang</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Perak</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Selangor</td>
<td>No significant coral reefs</td>
</tr>
<tr>
<td>Negeri Sembilan</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Melaka</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Johor</td>
<td>68.151</td>
</tr>
<tr>
<td>Terengganu</td>
<td>53.029</td>
</tr>
<tr>
<td>Pahang</td>
<td>67.661</td>
</tr>
<tr>
<td>Kelantan</td>
<td>No significant coral reefs</td>
</tr>
<tr>
<td>Sabah</td>
<td>20.622</td>
</tr>
<tr>
<td>Sarawak</td>
<td>Data Not Available</td>
</tr>
</tbody>
</table>

xi) Seagrass Beds
Seagrass beds are flowering plants complete with leaves, rhizomes (an underground, usually horizontally oriented stem) and root systems. Seagrass beds are located within the shallow coastal zones, hence they are directly affected by the way we treat the land and what we put into the sea. Most seagrass species are located in soft (silty or sandy) sediments. Seagrass beds play an important role in maintaining nutrient levels in marine ecosystems, providing food for turtles and dugongs, and acting as a nursery, shelter and food source for fish and other invertebrates. In Peninsular Malaysia, seagrass beds are commonly found on the coast of Penang, Port Dickson, South West Johor’s mangroves and mudflats, the East Johor Islands and Langkawi group of islands.
**River Systems**

As rivers meander through the low-lying basins, they form various wetland complexes. The wetlands alongside rivers are also referred to as riparian fringes or riverine habitats. There are 159 rivers in Malaysia: 88 in the Peninsula, 48 in Sarawak and the rest in Sabah. The Rajang river basin is the largest in Malaysia with a catchment area of 51,000 km². In Peninsular Malaysia, most of the rivers originate from the central mountain range. Flowing into the South China Sea, the Pahang river and its tributaries, with a catchment area of 26,800 km², form the largest river basin in the Peninsula. The state and area of the river are hard to discern in Malaysia, as different sections of a river can be under the management of different local governments as rivers are known to flow through many administrative boundaries.

**Natural Lake Systems (including oxbow lakes)**

Lakes are permanent/seasonal bodies of freshwater occupying either large basins or small depressions in the landscape. There are very few natural lakes in Malaysia; good examples are Tasek Bera and Tasek Chini in Pahang and Loagan Bunut (a floodplain lake) in Sarawak. Tasek Bera is Malaysia’s sole Ramsar Site (Wetlands International-Asia Pacific, 1999). The oxbow lakes, which occur mainly in East Malaysia, are found along the meandering lower reaches of major rivers such as the Baram and Liman Rivers in Sarawak, and the Kinabatangan, Sugut and Segama rivers in Sabah. Lakes are primarily known for mitigating floods as well as their importance in providing fish resources for local inhabitants. They are also natural breeding areas for certain fish species, namely the migrating species from inflowing rivers. In addition, lakes have great cultural and spiritual significance to local people. Nature tourism in lake ecosystems is highly popular in Malaysia.

**2.3 Constructed Wetlands**

**i) Reservoirs**

Dams are usually constructed in catchment areas which function in gathering, collecting, storing and transmitting the water provided by rainfall. They are constructed both for water supply (water for domestic use and irrigation) as well as for hydroelectric power generation. Reservoirs are the result of these structures. There are about 54 dams in Malaysia with a total water capacity of 12 billion cubic meters per year. The integrity of a dam depends very much on the surrounding land activities in the catchments; illegal logging and indiscriminate land clearing as a result of human intervention are contributory factors which lead to siltation, and decrease the life span of dams.

**ii) Rice Fields**

Wet rice fields are major, man-made wetland habitats in Malaysia. Rice fields occur chiefly on level terrain in former wetlands, floodplains and swamps. Rice fields are of major importance as they produce Malaysia's largest staple food item. In addition, rice fields are known for their biodiversity value, namely in providing food resources for resident and migrating water birds, and in some cases providing breeding areas for some bird species. They support large numbers of winter visitors and passing migratory birds, such as herons, egrets and waders. There are over 650,000 ha of wet rice fields in Malaysia, of which 450,000 ha occur in the Peninsula, mainly in Krian-Perak, Sekinchan-Selangor, and in the coastal areas of Perlis and Kedah. In Sabah, freshwater swamps have been converted to rice fields while small scale ventures exist in Sarawak (Chew 1997; Malaysian Wetland Working Group, 1987) (Table 12).

<table>
<thead>
<tr>
<th>State</th>
<th>Total Area (km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perlis</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Kedah</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Penang</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Perak</td>
<td>23,100</td>
</tr>
<tr>
<td>Selangor</td>
<td>5,000</td>
</tr>
<tr>
<td>Negeri Sembilan</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Melaka</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Johor</td>
<td>4,000</td>
</tr>
<tr>
<td>Terengganu</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Pahang</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Kelantan</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Sabah</td>
<td>Data Not Available</td>
</tr>
<tr>
<td>Sarawak</td>
<td>70,000</td>
</tr>
</tbody>
</table>
iii) Created and Rehabilitated Wetlands
This category includes created wetlands such as the Putrajaya Wetlands, and rehabilitation carried out in wetlands such as abandoned tin-mining pools and degraded peat swamp forests. Paya Indah Wetland Sanctuary, Kinta Nature Park, Kelana Jaya lakes are examples of rehabilitated wetlands. Most of the wetlands in this category were developed for recreational purposes; however their benefits surpass recreation since these wetlands attract and support significant biodiversity, and can serve as flood control measures. The Putrajaya wetlands, consisting of marsh, swamps and an open water lake system, was created to serve a functional purpose; natural remediation of inflowing river water and storm water. Despite rehabilitation efforts, large abandoned tin-mining areas still occur in the states of Perak and Selangor, and are generally unrecorded. Other man-made wetlands such as constructed lakes and ponds, including aquaculture and oxidation ponds are evident in Malaysia; however, data on them is scarce.

2.4 Function and Values of Wetlands
Wetlands provide tremendous economic benefits, for example: water supply (quantity and quality); fisheries (over two-thirds of the world’s fish harvest is linked to the health of coastal and inland wetland areas); agriculture, through the maintenance of water tables and nutrient retention in floodplains; timber production; energy resources, such as peat and plant matter; wildlife resources; transport; and recreation and tourism opportunities.

In addition, wetlands have special attributes as part of the cultural heritage of humanity: they are related to religious and cosmological beliefs, constitute a source of aesthetic inspiration and form the basis of important local traditions.

These functions, values and attributes can only be maintained if the ecological processes of wetlands are allowed to continue functioning. Unfortunately, and in spite of important progress made in recent decades, the wetlands ecosystem in Malaysia continues to be threatened, mainly due to ongoing drainage, conversion, pollution, and resource exploitation.

The survey identified that the benefits (goods and services) that wetlands provide encompass direct uses, functions and attributes. Direct uses (also termed as goods) imply resources in wetlands of Malaysia that can be harvested directly for use. Wetland functions (also termed as services) are defined as physical, chemical or biological processes occurring within a wetland system such as those related to flood control, and groundwater recharge. Wetland attributes are the characteristics of wetlands which are perceived as valuable to society, for example, cultural and religious values, and biodiversity.

There are many direct uses (also called goods) that lagoons, mudflats, peat swamp and estuaries provide. During the data collection and survey of wetland areas in the states of Kelantan, Terengganu, Pahang, Johor, Sabah and Sarawak, a tremendous amount of direct uses were encountered. As a result of direct uses, the river system was highly degraded and thus, indirectly affected the South China Sea. The direct use activities are very familiar as in other wetlands in the region: most people use the wetlands as fisheries, agriculture sites, and for energy (water, peat, timber).

In the case of functions, it is very important to consider the kinds of services to offer to the people and the states. Wetlands should also be considered as a providers of both inland uses and marine uses. However, the management authority who is responsible for the sites should be aware that wrongly approved activities in the pristine sites (inlands) is proportionally adverse to the marine lives.

The functions include:
- Flood control
- Shoreline stabilization
- Prevention of saltwater intrusion
- Water transport
- Sediment/nutrient retention
- Toxicant removal
- Microclimate stabilization
- Education
- Research
- Tourism
- Recreation.
The attributes include:

- Biological diversity; gene bank
- Unique cultural/heritage
- Life cycle – migration routes, nursery grounds.
- Global carbon sink
- Prevention of the development of acid sulphate soils.

2.5 Threats to Wetlands

Despite the importance of wetlands to Malaysia’s ecological and economic health and vitality, the last century has witnessed their continued loss and degradation. Since 1900, Malaysia’s total wetland areas have been reduced through reclamation, drainage and conversion or loss to other land uses. Significant portions have been seriously degraded or are at imminent risk. The loss and degradation of wetlands continues unabated.

The rapidly increasing population in Malaysia and resulting rate of urbanization puts strong pressure on acquisition of land for development. Wetlands are often converted, or reclaimed as sites for agriculture, including aquaculture; industry, human settlements, and other uses. Holistic land use approaches or guidelines which successfully integrate wetlands into multiple land use planning are inadequate at the moment. This has led to the loss of important wetland benefits. Without the adoption of appropriate land use approaches, wetlands as functional ecosystems providing a variety of benefits will be lost, as will be important contributions to development.

The following are perceived as major threats to wetlands in Malaysia:

i. **Conversion to Agriculture use**

Large wetland areas in Malaysia have been converted to agricultural land. Prior to 1966, approximately 400,000 ha of wetlands were converted to rice production in Peninsular Malaysia. This represents about 20% of the original wetland area and possibly 70% - 80% of the original area of freshwater swamp forest in the Peninsula. Between 1966 and 1974, an additional 110,000 ha of wetlands were converted to agricultural use, including 28,000 ha of rice fields. Rice production places a heavy demand on water resources (irrigation accounts for 82% of water demand in Peninsula Malaysia) and in some states, the acreage under production is decreasing due to a shortage of water. This may be partly due to the clearance of swamps which originally acted as “reservoir” areas.

ii. **Industry and Urbanization**

A number of wetland areas in Malaysia have been filled-in for industrial and urban development. In Kota Kinabalu, Sabah, coastal mudflats have been reclaimed for housing and commercial development. The solar salt factory at Kuala Selangor destroyed a substantial part of the South Banjar Forest Reserve, and undoubtedly affected important adjacent inshore fisheries. The project was a failure due to poor planning. Mangroves and other swamps are also frequently used as sites for dumping rubbish and land fill without due regard for their natural value in water control and fisheries. Many of these actions have been carried out, not because of a shortage of land areas for development, but because of the mistaken view that wetlands are wasteland with no intrinsic values.

iii. **Pollution**

Pollution is a serious threat as pollutants tend to accumulate in wetlands. Pollution arising from solid waste dumping, pesticide and herbicide residues from land and coastal based agricultural activities, untreated effluent or discharges from industries and domestic areas, silt, soil erosion, and oil spills are major threats to wetlands.

Agro-based wastes from palm oil and rubber processing industries at one time were a major source of pollution, but have been brought under control and reduced by up to 95% over the last five years. Pollution from manufacturing industries has been reduced by 60%, but is still causing some problems.

iv) **Changes to wetland hydrology.**

Surface water flows are modified for several reasons including flood control and water supply. Seasonal surface water flows may also be disrupted through the clearance of vegetation from catchment areas. This leads to increased surface flows in the wet season and decreased flows in the dry season. Regulation of flows by weirs and dams results in disrupting natural fluctuations in water supply to wetlands. This affects ecosystem processes and may effect the life cycles of flora and
fauna. In addition, many watercourses in urban areas have been converted to concrete drains and embankments, with loss of in-stream, fringe wetlands and riparian vegetation.

Thus, the biodiversity of wetlands has been affected. Drainage of wetland areas, especially peat swamps, for agriculture purposes has been shown to have adverse effects. The loss of peat swamps results in a loss of water storage capacity and lowering of water tables. Reduced water tables in peat swamps will increase the incidence of peat and forest fires. Severe degradation of peat lands in Malaysia is resulting in a decline in the capacity of these wetlands to serve as carbon sinks, and the resulting carbon emissions are contributing to global climate change.

3. CONCLUSION AND RECOMMENDATIONS

Effective land use planning requires a sound policy basis if it is to successfully incorporate the interests of a wide variety of user groups, maximize the efficiency and profitability of the use of natural resources, while maintaining the long-term viability of the resources.

In their undisturbed state, Malaysia’s wetlands are highly productive, valuable natural resources, which are however, very sensitive to disturbance. In order to achieve the maximum long-term productivity on a sustainable yield basis from Malaysia's wetlands, it is essential that a National Wetland Policy is formulated. This concurs with the philosophy behind the Convention on Wetlands of International. Especially as Waterfowl Habitat which requires contracting parties to the Convention to “formulate and implement their planning so to promote…as far as possible the wise use of wetlands in their territory” (Article 3.1). The First Conference of Contracting Parties recommended that, in order to achieve “wise use”, comprehensive national policies, a nationwide inventory of wetlands and their resources would be necessary.

Remaining areas of mangrove, freshwater and peat swamp forests which are already disturbed should be managed on a sustainable yield basis. This will involve zoning the sites for production, forest protection and preparation of management plans.

Fresh water swamp forests have been virtually destroyed in Malaysia through conversion to agricultural uses. The wetland forest types – mangroves and peat swamp are generally unsuitable for agriculture and are best managed for their natural forestry products; together with fisheries, flood prevention, water supply and purification values.
REFERENCES


NATIONAL REPORT

on

Wetlands in South China Sea

PHILIPPINES

Ms. Marlynn M. Mendoza
Focal Point for Wetlands
Protected Areas and Wildlife Bureau
NAPWNC Compound, North Avenue, Diliman
Quezon City, Philippines 1101
# Table of Contents

1. **INTRODUCTION** ............................................................................................................................. 1

2. **WETLANDS IN THE PHILIPPINES** .................................................................................................. 1
   2.1 **WETLAND ECOSYSTEMS** .................................................................................................................. 1
   2.2 **PHILIPPINE WETLANDS OF INTERNATIONAL IMPORTANCE** .......................................................... 2

2. **SITES PRIORITIZATION** .................................................................................................................. 3
   2.1 **IDENTIFICATION PROCESS OF INITIAL LONG LIST** ................................................................. 3
   2.2 **SELECTION OF PRIORITY AREAS BASED ON THE TYPE OF REVERSING ACTIVITIES** ............... 5
      2.2.1 **Restoration Activities** .................................................................................................................. 6
      2.2.2 **Protection and/or Maintenance Activities** .................................................................................... 6
      2.2.3 **Final Site Selection for Investment** ............................................................................................. 6

3. **THREATS TO WETLANDS IN THE PHILIPPINES** ......................................................................... 6
   3.1 **DIRECT CAUSES OF LOSS OF WETLANDS** .................................................................................. 6
   3.2 **INDIRECT CAUSES OF LOSS OF WETLANDS** .............................................................................. 7

4. **LEGISLATION, INSTITUTIONAL AND ADMINISTRATIVE ARRANGEMENTS** ................................. 7
   4.1 **LEGAL PROVISIONS WITH DIRECT IMPACT ON WETLANDS** ....................................................... 8
   4.2 **ACCESS TO THE RESOURCES** .......................................................................................................... 8
   4.3 **MANAGEMENT AND CONSERVATION JURISDICTION** .................................................................... 9
   4.4 **ENFORCEMENT PROBLEMS** ........................................................................................................... 9
   4.5 **OTHER GENERAL LAWS THAT MAY APPLY TO WETLANDS** ........................................................ 10
   4.6 **LOCAL POLICIES** ........................................................................................................................... 10
   4.7 **STRATEGIES IN REDUCTION OF DEGRADATION FACTORS** ....................................................... 11

REFERENCES ........................................................................................................................................ 13

---

**List of Figure**

**Figure 1** Map of Wetlands Connected to the South China Sea
1. INTRODUCTION

The Philippines, the second largest archipelago in the world after Indonesia, is comprised of more than 7,100 islands that cover an estimated land area of 300,000km² and an estimated 2.2 million km² of archipelagic waters. The Philippines Archipelago extends from latitudes 04°23' and 21°25'N and between longitudes 116°00 and 127°E. It is divided into three major island groupings, namely Luzon, Visayas, and Mindanao. It is bounded in the north by the Bashi Channel, in the east by the Pacific Ocean, in the south by the Celebes Sea and in the west by the South China Sea.

The Philippines is part of the “Pacific Ring of Fire”, a region of frequent volcanic activity; it also lies in the Western Pacific earthquake belt, a region of frequent land movements (Scott, 1989). Recent geological studies had shown that the Philippines is of volcanic origin and had been separated from its neighbors by deep-sea channels for millions of years (Hall, 1998). Its biodiversity has evolved distinctly and separately from its neighbors, resulting from very limited colonization from Mainland Asia in the northwest, from Taiwan in the north, and from Borneo and Sulawesi to the south. Thus, it is considered a separate biological region in its own right (Mallari et al., 2001). These partly explain the rich biodiversity in the country, including its unique patterns and assemblages.

2. WETLANDS IN THE PHILIPPINES

With its rich biodiversity, the Philippines is included as one of the 17-megadiversity countries, that between themselves contain 75% of global biodiversity. However, it is also considered as one of 25 global biodiversity hotspots, wherein to qualify, an area should have lost more than 75% of its original habitats, (Myers, et al., 2000; Heaney et al., 1999). The Philippines has less than seven percent of its primary forest left (ESSC, 1999). This is translated into the loss of more than 14 million hectares of primary forests in the last fifty years of the 20th century, which is much more than the 12 million hectares of forests lost during the combined 400 years of Colonial rule (Ong, 2004). During the same period, the marine environment suffered a similar fate, wherein less than 24% of the country’s mangroves remain and between 30% and 50% of seagrass beds were lost (Calumpong, 1994; Fortes, 1994. The Philippines was also identified as the top marine biodiversity hotspot based on the diversity of coral reefs and its threatened condition (Gomez et al., 1994; Roberts et al., 2002).

In light of these findings about the dire situation of the Philippine’s biodiversity, the Philippines, through the PAWB-DENR, Biodiversity Conservation Program of the University of the Philippines’ Center for Integrative and Development Studies and Conservation International-Philippines, implemented and completed the Philippine Biodiversity Conservation Priority-setting Program (PBCPP) (Ong et al., 2002). This was the second iteration of the country’s National Biodiversity Strategy and Action Plan (NBSAP) in 2002. The PBCPP updated the first iteration of the NBSAP, which was completed and published in 1997 by the DENR.

The PBCPP identified a total of 206 priority areas: 170 terrestrial and inland waters priority areas and 36 marine priority areas. Five strategic actions needed for implementation in the chosen priority areas were also identified, if these priority areas are to be conserved for future generations. For wetlands, the Inland Waters Working Group of the PBCPP reviewed a total of 211 lakes, 18 major rivers, and 22 marshes, swamps and reservoirs, of which 34 priority areas for research and conservation were identified (Santos-Borja, 2002).

2.1 Wetland Ecosystems

The Philippines is endowed with extensive wetland areas that range from lakes, rivers, ponds, inland and coastal marshes and swamps, estuaries and mangrove swamps. The total area of Philippine wetlands is broken down as follows: a) freshwater lakes are estimated to be about 1,140km²; (b) swamps and estuaries at about 5,270km²; (c) brackish ponds at about 1,760km²; and (d) manmade reservoirs at 1,300km² (Scott, 1989; Davies et al, 1990). Despite these impressive numbers, there have been very few studies about the biodiversity of Philippine wetlands and their functions compared to those available for forest and marine ecosystems, consequently very limited information about Philippine wetlands is available.
The total biodiversity of Philippine wetlands is comprised of 1,616 species of aquatic plants and 3,675 species of aquatic fauna (DENR, 1997). But these numbers include those species that originate in marine and brackish waters. The amount and extent of biological data available for inland waters are not commensurate to the physical extent of inland waters, and where available, there is uneven representation of data (e.g., some areas are more studied than others are). Most information about Philippine wetlands consists of inventories with very limited ecological assessments and analysis (Santos-Borja, 2002). Figure 1 shows Map of Wetlands Connected to the South China Sea.

2.2 Philippine Wetlands of International Importance

Four Philippine wetlands of international importance are recognized under the Ramsar Convention. These are the Tubbataha Reef Marine National Park in Palawan, Olango Island Wildlife Sanctuary in Cebu, Naujan Lake National Park in Oriental Mindoro, and, Agusan Marsh Wildlife Sanctuary in Northeastern Mindanao. Additionally, there are several peat swamps, or more accurately freshwater swamps with peat, found in the Sab-a basin in southern Leyte, in Liguasan Marsh and Agusan Marsh in Mindanao. Unfortunately, none of these are linked to the South China Sea.
2. SITES PRIORITIZATION

Based on a review of past, current and continuing projects, studies on economic valuation, legislation, institutional and administrative arrangements and the GIS database and other information, it appears that a lot of information resources are available. However, the quality and reliability of this information remains to be validated. Some of the information is old (e.g., directory of Philippine wetlands from 1990) while some is simply absent (e.g., data on half of the wetlands in the directory are not available). In the initial listing of Philippine wetlands, 63 sites were identified, of which 11 sites were directly or indirectly connected to the South China Sea. The most recent validated data would be from the PBCPP (Ong et al. 2002) where the 28 sites were identified. This was supplemented by information from Key Conservation Areas identified by Mallari et al. (2001), where threatened birds occupy wetlands connected to the South China Sea, and by Scott (1989), Davies et al., (1990) and Talaue-McManus (2000).

Furthermore, as discussed earlier regarding the level and quality of information on Philippine wetlands; as exemplified by most recent data on Manila Bay where it is at least six-years-old and referred to wetland types other than those that are of immediate concern to the South China Sea project. This is a recurring theme throughout the search for data on the three wetland habitats and ecosystems. Thus the subsequent discussions are still based mainly on the biodiversity of coral reefs, mangroves, seagrass and seaweeds.

2.1 Identification Process of Initial Long List

The Philippines implemented the Philippine Biodiversity Conservation Priority-setting Program (PBCPP), a priority-setting process that identified 170 integrated terrestrial and inland waters and 36 integrated marine priority areas for biodiversity conservation (Ong et al. 2002). On top of this, another 206 sites were identified by the thematic working groups, which later formed the basis of the integrated priority areas. This was a second iteration of the country’s National Biodiversity Strategy and Action Plan (NBSAP). The Protected Areas and Wildlife Bureau of the Department of Environment and Natural Resources (PAWB-DENR) spearheaded the PBCPP, with technical assistance from the Biodiversity Conservation Program of the UP Center for Integrative and Development Studies (BCP-UPCIDS) and the Philippine Program of Conservation International (CI Phil).

The consensus building process of the PBCPP began in January 2000 and culminated in December 2000 during an international workshop attended by more than 200 local and international natural and social scientists from more than 100 institutions. The results of this workshop were further refined and the output released to the public in September 2002. The PBCPP used published information and experts’ opinion to determine priority areas according to taxa (plants, arthropods, fishes, amphibians, reptiles, birds and mammals) and themes (inland waters, marine and socio-economic). A total of 206 thematic and taxa-based priority areas were identified. These thematic and taxa-based priority areas were then overlaid to produce polygons of areas that encompassed themes and taxa, thereby producing the 206 national level priority areas (170 terrestrial and inland waters and 36 marine priority areas). Detailed information about the methodology used in setting the priorities is available at Ong et al. 2002.

Twenty-eight of these priority areas were initially identified as meeting the requirements of being a Philippine wetland and at the same time directly linked to the South China Sea (SCS). This initial list was further supplemented by information about additional areas identified in the Key Conservation Sites by Haribon Philippines and Birdlife International (Mallari et al. 2001), the Transboundary Diagnostic Analysis (Talaue-MacManus 2000) and the Directory of Philippine Wetlands prepared by the Davies et al. (1990) and Scott (1989), bringing the list to a total number to 33 areas as part of the initial I list. From the 33 areas short-listed for consideration as an investment priority by the South China Sea project; these were grouped based on their regional locations. Nine regional groupings, with the number of specific sites indicated in parenthesis, were identified:

1) Northern Philippines (4) - Batanes and Babuyanes Group of Islands, Buguey Wetlands, Palui Island and Kalbario Patapat National Park
2) Northwestern Philippines (2) - Agno River-Pangasinan Wetlands-Lingayen Gulf, Bataan Natural Park - Subic Bay Forest Reserve
3) Northwest Manila Bay (3) - Candaba Swamp, Mariveles Mountains, Manila Bay
4) Southwest Manila Bay (1) - Laguna Lake
5) Taal Lake-Pansipit River-Balayan Bay-Batangas Bay (2) - Taal Lake-Pansipit River and Balayan Bay-Calatagan Peninsula
6) Northern and Western Mindoro (5) - Mt. Calavite, Mt. Iglit-Baco, Mt. Halcon-Sablayan, Malpalon, Mt. Hinunduang,
7) Calamianes Group of Islands (3) - Caluit Island, Busuanga Island and Culion
8) Mainland Palawan (7) - Bacuit Bay-El Nido, Malampaya Sound, San Vicente-Taytay-Roxas forests, Puerto Princesa Subterranean River National Park, Ulugan Bay, Anapalan-Victoria Ranges, Mt. Mantalingahan
9) Balabac Group of Islands (1) - Balabac

In the process of selecting the areas for consideration as an investment area for the next phase of the South China Sea project, the following steps were undertaken to narrow down the priority areas. The first step was to go back to the title of the project, “Reversing Environmental Degradation of the South China Sea and the Gulf of Thailand,” to guide the selection process. The National Wetlands Committee agreed that reversing environmental degradation trends include:

1. Maintenance and protection of remaining pristine environment, which encompass on-site interventions to protect existing biodiversity.
2. Restoration of degraded environment, which encompasses on-site interventions to restore lost biodiversity. Restoration activities refer to activities that will lead to the recovery and rehabilitation of degraded areas and the delisting of threatened species from the threatened category because their population level has increased to a level that ensures their survival.
3. Prevention of degradation by removing and reducing the cause of degradation that encompass off-site interventions to remove/reduce cause of loss of biodiversity to maintain the good condition of the site. Prevention activities remove factors that threaten the population of priority species. Prevention activities involve off-site activities, dealing with factors outside of the areas and species being protected.

It was also agreed that based on the above definitions, prevention activities should form part and parcel of any restoration or protection and maintenance activities, since investments made in restoration or protection and maintenance will be negated if no prevention activities are undertaken simultaneously, i.e. factors that contribute to the degradation of good sites, and those that further degrade degraded areas are not removed.

Furthermore, the National Wetland Committee also agreed that environmental degradation is measured in terms of:

1. Loss of biodiversity
2. Pollution
3. Decrease in fish productivity

For this element of the selection, loss of biodiversity is the primary determinant in the selection of an area while the pollution and decrease in fish productivity were secondary considerations. Loss of biodiversity includes the loss of habitat in terms of the area of such habitats (quantity), the status of the habitat (quality), the number of threatened species found in the said areas (quantity), and the level of diversity of species found in the said areas, particularly of endemic species (quality). Philippine wetlands that qualify under the South China Sea project are those wetlands that that directly contribute to the environmental degradation of the South China Sea. Areas that are recipient of South China Sea effects were excluded in the selection process.

Once the National Wetland Committee agreed upon these parameters, the 33 short-listed areas were reviewed again. Immediately, the Buguey wetlands, Palaui Island and the Batanes and Babuyan Islands in Northern Luzon were dropped off the list as they were determined to be affected by the South China Sea rather than contributing to the environmental degradation of the South China Sea. The fourth area, the Kalbario-Patapat National Park was more an offsite source of degradation and its relationship to the South China Sea was several steps removed. This had the effect of removing the Northern Philippines as a region for consideration.
The six sites from Northern and Western Mindoro were also removed from the list, as five were forests on mountains and several steps removed from the South China Sea. This also had the effect of removing Mindoro from the next level of analysis.

The forests in the mountains of mainland Palawan (San Vicente-Taytay-Roxas, the Anapalan-Victoria Ranges and Mount Mantalingahan) were also excluded from the next level of selection as these were more onsite sources of degradation and their relationship to the South China Sea was several steps removed.

Balabac was also excluded from the next level of selection as very little information is available about the site compared to the other candidate sites, thus more energy would be required before a decision can be made regarding Balabac.

The remaining areas in the six regions were then classified if they require restoration activities, protection, and/or maintenance activities.

**Restoration:**
1. Northwest Manila Bay
   - Candaba Swamp-Pampanga River-Mariveles Mountains-Manila Bay
2. Southwest Manila Bay:
   - Laguna Lake-Pasig River-Manila Bay-Northwest Cavite
3. Northwestern Philippines
   - Pangasinan Wetlands-Lingayen Gulf-Agno River
4. Mainland Palawan
   - Malampaya Sound

**Maintenance:**
1) Northwestern Philippines
   - Zambales Coast-Subic Bay-Bataan National Park
2) Taal Lake-Pansipit River-Balayan Bay-Batangas Bay
3) Calamianes
4) Mainland Palawan
   - El Nido
   - PPSRNP/Ulugan Bay

**Prevention:**
1) Northwestern Philippines
   - Amburayan-Abra Rivers draining into the Ilocos Coast
   - Pangasinan Wetlands-Lingayen Gulf-Agno River
   - Zambales Coast-Subic Bay-Bataan National Park
2) Northwest Manila Bay
   - Candaba Swamp-Pampanga River-Mariveles Mountains-Manila Bay
3) Southwest Manila Bay:
   - Laguna Lake-Pasig River-Manila Bay-Northwest Cavite
4) Taal Lake-Pansipit River-Balayan Bay-Batangas Bay
5) Calamianes
6) Mainland Palawan Areas
   - El Nido
   - Puerto Princesa Subterranean River National Park/Ulugan Bay
   - Malampaya Sound

**2.2 Selection of Priority Areas Based on the Type of Reversing Activities**

The rationale for the grouping was to make the selection fairer by comparing apples with apples, i.e., by comparing areas that require similar primary activities whether restoration, or for protection and maintenance.
2.2.1 Restoration Activities

From the medium list of six regions, four were identified as priority for restoration, of which two areas were selected as priority areas for investment for different reasons. One is the Southwest Manila Bay while the other is the Malampaya Sound. Southwest Manila Bay was selected as a model problem area. From a biodiversity point of view, Manila Bay would seem dead if its current biodiversity status were assessed. However, it is an important biodiversity area historically and data from the PEMSEA and MBEMP-TWG-RRA (2004) report indicates that Manila Bay still contains remarkable biodiversity and performs critical environmental services. It is also the type locality for the Olive Ridley Turtle. It is a model problem area because of the onslaught of unplanned development, the multitude of stakeholders with competing vested interests in the sub-region and the scale of the area that needs to be covered, among others.

Furthermore, the National Wetland Committee firmly believes that if Manila Bay can be successfully restored, then there is no place else in the South China Sea and the Gulf of Thailand where restoration work cannot be done. Lessons learned from the restoration efforts in Manila Bay could be invaluable to the rest of the South China Sea and the Gulf of Thailand where similar conditions exist.

On the other hand, comparatively speaking, Malampaya Sound is in the early stages of degradation and thus it would take less effort and resources to restore it back to good condition, than Manila Bay. Hence it is considered to be a model demonstration site since the size of the area under consideration is manageable, the level of awareness and participation of stakeholders involved are comparatively high than in other areas.

2.2.2 Protection and/or Maintenance Activities

From the medium list of six sub-regions, four were identified as priority for protection and/or maintenance activities, of which three areas were selected as priority areas for investment, again for different reasons. These areas are: 1) Taal Lake-Pansipit River-Balayan Bay-Batangas Bay, 2) Calamianes, and, 3) PPSRNP-Ulugan Bay.

Taal Lake-Pansipit River-Balayan Bay-Batangas Bay was selected as a priority for protection and maintenance activities because if present degradation trends continue, then it is likely to go the way of Manila Bay. Hence intervention is urgently needed to ensure that the degradation trends are reversed as soon as possible.

On the other hand, the biodiversity of the Puerto Princesa Subterranean River National Park (PPSRNP)/Ulugan Bay, and the Calamianes in Palawan are in better shape than the other regions, and thus would require less effort and resources to maintain in their current condition. Between the PPSRNP/Ulugan Bay and the Calamianes, PPSRNP has the advantage of being declared a World Heritage Site, and Ulugan Bay is proposed to be included as part of expanded PPSRNP, and consequently as part of the World Heritage Site.

2.2.3 Final Site Selection for Investment

In the final selection of sites for the development of investment proposals, the choices were narrowed down to two areas, the Malampaya Sound for restoration, and the Taal Lake-Pansipit River-Balayan Bay-Batangas Bay was selected as a priority for protection and maintenance. Other factors such as local government unit interest and local community participation were taken into consideration in the final selection.

3. Threats to Wetlands in the Philippines

3.1 Direct Causes of Loss of Wetlands

With this framework as a guide, the different factors identified in previous assessments undertaken about the threats to wetlands and causes of wetlands loss, were reformulated as the major direct causes of wetland loss in the Philippines (DENR, 1997; Santos-Borja, 2002; Ong et al., 2002). However, these are again a broad identification and not specific to the three type of habitats and ecosystems in the South China Sea context:
1) Habitat Loss and Deterioration  
a) Conversion of wetlands into other land uses with perceived higher economic value such as aquaculture farms, resorts and reclamation areas, among others. The operations of these economic activities further exacerbate the destruction of wetlands by ensuring that the process becomes irreversible when this leads to further pollution due to the indiscriminate use of artificial feeds and overstocking.

b) Diversion of rivers for irrigation and the construction of dams that leads to -
   i. Detrimental impacts on the movement of migratory fish species  
   ii. Drying up of riverbeds  
   iii. Modification of the habitat of the riverine flora and fauna  

2) Resource Use and Exploitation  
a) Over fishing  
b) Over harvesting of forest products  
c) Over harvesting of freshwater products  

3) Pollution and Climate Change  
a) Pollution from domestic, industrial and agricultural sources that in turn lead to water quality problems like massive algal blooms and oxygen depletion.  

4) Introduction of exotic species and disease  
a) Leads to the displacement if not extinction of endemic and native species through  
   i. Predation  
   ii. Competition for food and other resources  
   iii. Proliferation due to lack of natural predators.  

3.2 Indirect Causes of Loss of Wetlands  
In turn, these direct causes have underlying causes as well. Some of these underlying causes are:

   1) Socio-economic pressures  
      a) Poverty  
      b) Illiteracy  
      c) Population  
      d) National and local politics  

   2) Environmental Policy and Regulations  
      a) Limited if not lack of enforcement  
      b) Where present, it is biased towards development at all cost  
      c) Subsidies provided to some economic activities such as the promotion of aquaculture in the 1970s and 1980s which led to the wholesale conversion of mangroves into fishponds.

4. LEGISLATION, INSTITUTIONAL AND ADMINISTRATIVE ARRANGEMENTS  
Laws that directly apply to wetlands are few and are more frequently encountered in other general laws that regulate access to natural resources, jurisdictions over territory and management, and prohibition of certain acts. Examples are:

   1. Resource access provisions of the Philippine Constitution,  
   2. Congressional acts dealing with water bodies that comprise wetlands,  
   3. Regulations granting tenure  
   4. Water code  
   5. Foreshore regulations  
   6. A myriad of environmental regulations that affect wetlands by licensing or restricting actions that eventually impact many ecosystems as well but without referring to wetlands specifically.

Any one or more of these regulations address broader issues with wide-ranging implications on the use of resources including in these areas, such as the water code. Examples are laws requiring environmental impact assessments, building permits, sanitation code, wildlife act, cave act and many other environmental laws.
4.1 Legal provisions with direct impact on wetlands

Legal provisions by themselves may not have an impact on wetlands unless implemented. These are a potential backbone for any advocacy to protect and conserve wetlands. Due to their breadth of scope and lack of enforcement, however, enforcement agencies have had a great deal of discretion in choosing which areas and which acts to enforce. This exercise of discretion can be seen in two ways - agencies can strategize to make maximum use of their enforcement resources, or they can act only on the basis of complaints or personal preferences. As such, the identification of gaps may be difficult since there are many laws that remain unenforced but do not quite constitute a gap in the legislation. What needs to be studied is whether these laws do, indeed, constitute gaps simply because they are impossible to fully implement. It is not, therefore, sufficient to say that there are laws and implementation is lacking, when the very deliberation of the law itself did not consider the realistic capacity to enforce.

4.2 Access to the resources

Ownership of wetlands is necessarily the primary factor in assessing whether degradation can be arrested. The Philippine Constitution and the Water Code of the Philippines are both clear in declaring wetlands as part of the public domain and incapable of alienation, except for wetlands that are part of ancestral waters, which became susceptible to open access and the tragedy of the commons. Lakes and rivers were especially vulnerable as accelerated population growth put pressure on the drainage and sewerage systems built for much lower numbers, and rivers began to double as sewer systems in highly urbanized areas.

The problem of open access was dealt with by a provision that large-scale exploitation of all natural resources in the public domain will only be undertaken by the State directly or in joint venture, production sharing and co-production while small-scale utilization by Filipino citizens could still be allowed by Congress through law. This small-scale utilization specifically included "cooperative fish farming, with priority to subsistence fishermen and fish workers in rivers, lakes, bays and lagoons". Such provision requiring democratization of access and equity in resource distribution was directly relevant to the utilization of wetlands.

Among such laws that can be used to give flesh to this mandate of the Constitution are the Local Government Code and the Philippine Fisheries Code of 1998. The Local Government Code allows the local council, or Sangguniang Bayan, to grant fishery privileges to erect fish corrals, oyster, mussels or other aquatic beds or bangus fry areas, within a definite zone of the municipal waters, as determined by it. The Philippine Fisheries Code of 1998 also prioritizes qualified fishing cooperatives and/or associations as well as small and medium enterprises as defined under Republic Act No. 8289, in the section governing the disposition of lands for fishery purposes.

Other legislation that has great impact on wetlands, specifically tidal flats, is the Public Land Act that provides for foreshore leases. The foreshore includes tidal flats and estuaries, which shall be disposed of to private parties only by lease and not otherwise and only upon a declaration by the President, upon recommendation by the Secretary of the Department of Environment and Natural Resources, that such foreshore land is not necessary for public service. The lease contract must contain a provision that easements reserved by existing law or by laws enacted shall be respected.

The Civil Code of the Philippines provides for easements of five meters from the high water line on coasts of agricultural lands and twenty meters on coasts of forestlands that must be respected. Foreshore areas are also dealt with in the Water Code and the Forestry Decree of 1975. Apart from regulating the use and disposition of foreshore areas, the Water Code also has wide-ranging implications if religiously enforced. It identifies state ownership of rivers and their natural beds, continuous or intermittent waters of springs and brooks running in their natural beds, and the beds themselves; natural lakes, lagoons and seawater.

From this enumeration, virtually all wetlands are already covered. All uses of these state properties would require a water permit to be legal with very few exceptions that refer to domestic, small-scale usage. However, the law was not accompanied by the resources needed to undertake such massive regulatory infrastructure, especially considering a very long and broken up coastline as that of the Philippines.
The recently passed Clean Water Act may also be of use in wetland protection. Specifically the provisions that prohibit dumping of waste in, and the provisions directing the establishment of water quality management areas, a national sewerage and septic waste management program, and the imposition of wastewater discharge charges.

4.3 Management and conservation jurisdiction

The Philippine Fisheries Code defines municipal waters to include wetlands but exempts areas falling under the National Integrated Protected Areas System (NIPAS) from the definition. As such, wetlands of the public domain may either be municipal waters or protected areas. Inland waters and tidal flats that are not NIPAS areas are municipal waters under the first part of the definition while lagoons fall under the second part, whether the lagoon be part of a NIPAS area or not. For NIPAS areas that are inland waters or tidal flats, jurisdiction over management is vested in the Protected Area Management Board with specific mandates to the DENR. Both local government authorities who retain jurisdiction over them in the exercise of their general welfare functions, and the Protected Area Management Boards (PAMBs) who are responsible for biodiversity conservation and sustainable development, can be seen to have different jurisdictional coverage over the same territory.

Due to lack of appropriation for the implementation of the NIPAS Act, however, many PAMBs of wetland areas are hardly equipped with the technical and financial capacity for hard-nosed management. Under the Clean Water Act, a four-person body called a governing board is mandated to be established for designated Water Quality Management Areas. Apart from these, self-reporting, permitting and other monitoring requirements can be used to pinpoint urgent problems with respect to important wetlands. Certain government agencies are vested with jurisdiction over wetlands, but by the nature of their function, view them not in terms of habitat and biodiversity, but in terms of their value as real estate and economic commodity. These are the Public Estates Authority that have jurisdiction over all reclamation projects, and as such has disposition of these prime properties, and the Philippine Port Authority, which by its nature operates facilities in tidal flats. These are both attached agencies of the Department of Public Works and Highways, which is accountable for these jurisdictions in terms of environmental impact only in the Environmental Impact Assessment process. Management and conservation by municipal authorities range from very good management to neglectful, unregulated and permissive exploitation. Because of the demonstration of hugely successful local government management in many areas, the likelihood of successful management of wetlands may lie in local government units hands, particularly since these areas are not contiguous and should be seen as integral to the entire territory of the local government units rather than isolated patches of water bodies.

Other agencies have specialized jurisdictions over wetlands. Those involved in scientific research include the Philippine Council for Aquatic and Marine Resources Development - Department of Science and Technology and the state universities. On the other hand, agencies involved in enforcement include the Philippine National Police (PNP) Maritime Command -Department of Interior and Local Government that took over the police functions of the Philippine Coast Guard over municipal waters; and, the Philippine Coast Guard, which enforces fisheries laws in the high seas, ensures maritime safety, and marine pollution laws. Agencies involved in institutional coordination on aspects relating to fisheries and coastal resources management include the Presidential Commission on Anti-Illegal Fishing and Marine Conservation, the Inter-Agency Task Force on Coastal Environment Protection, and the Marine and Ocean Affairs- Department of Foreign Affairs.

4.4 Enforcement Problems

Public interest lawyers, local governments and other concerned citizens and groups may use existing and applicable laws to protect specific wetlands that are deemed important, but their total enforcement to protect most wetlands as habitats is limited. This is not only due to lack of resources but a failure in the lawmaking process to identify prohibitions that are realistic and which will remain in the books. Nevertheless, the Civil Code does state that laws are only repealed by subsequent ones, and their violation or non-observance shall not be excused by disuse, or custom or practice to the contrary. As such, while it is frustrating to hear about unimplemented laws, the opportunity they present is much better than not having them at all.
The Civil Code enumerates all the officers and agencies that the law deputizes to enforce it along with other fishery regulations. Other competent government officials and employees, barangay leaders and officers and members of fishing associations who have undergone training on law enforcement may be designated in writing by the Department of Agriculture as deputy fish wardens in the enforcement of this Code and other fishery laws, rules and regulations. Furthermore, the law mandates that the Department of Justice embark on a program to strengthen the prosecution and conviction aspects of fishery law enforcement though augmentation of the current complement of state prosecutors and through their continuous training and reorientation on fishery laws, rules and regulations.

Enforcement depends on a strong awareness among enforcers as to what the law provides along with a strong belief that it is a law that will be beneficial to people. Due to the many different overlaps in jurisdiction, inconsistencies and the necessity to harmonize many different laws governing the same resources, enforcement agencies have not been updated on the latest legal interpretation.

4.5 Other General Laws that may apply to wetlands

Seen from the perspective of reducing the degradation factors of wetlands, a great deal of attention needs to be paid to land based causes of degradation. As such, the forestry code, the Philippine Mining Act of 1995, easement provisions under various laws including the Civil Code, the Ecological Solid Waste Management Act and the Environmental Impact Assessment System are only a few that effect n wetlands. These effects are felt especially where solid waste, effluents and tailings are allowed to collect and damage tidal flats, estuaries, and lagoons. These are laws useful to local implementers and managers, but the processes involved in the licensing, permitting and planning in each area and project are tedious to use on a countrywide scale to protect wetlands. Also, a general enforcement of good laws such as the Ecological Solid Waste Management Act will no doubt have an incidental, but nevertheless gargantuan, impact on wetlands. Those wetlands to which urbanized and populated areas drain into including tidal flats, which, by the nature of wind and wave patterns tend to gather more solid waste, will necessarily benefit from a strict implementation of the law.

4.6 Local Policies

The Manila Bay, Laguna Lake and the Pasig River are three bodies of water that have been under several local policies and policy disputes, and the variety of their experiences is instructive of what can work. The major problems confronting these connected wetlands are drainage, run-off and sewerage from the surrounding areas, notably the Metropolitan Manila area. The Laguna Lake Development Authority has a basin-wide mandate for it to exercise the functions required to affect the lake. It has full authority to issue permits for the use of the lake and for developments in the whole catchment area of the lake. Its multiple uses had already been subjected to economic valuation studies and innovative policies such as user fee systems and permits for the release of effluents have been initiated with favorable results. The Pasig River and Manila Bay continue to act as the sewerage system of metro Manila, and the projects for clean up, have failed to take this major contributing factor into consideration. A closed season for commercial fisheries was declared in the entire Manila Bay in the 1990s and fully lapsed after five years without having been enforced. Despite the state of its waters, though, other uses such as recreational, navigational and fishing still remain.

The Lingayen Gulf Coastal Area Management Program is a program that operated over a period of six (6) years and covered twenty (20) municipalities. It generated a database for planning, with data on fisheries, and attempted to establish regulations based on catch per unit effort and maximum sustainable yields. The program later directed efforts towards education and the generation of local political will when the first plans proved too difficult. The National Economic Development Authority uses the Lingayen Gulf Coastal Area management Program experience as a model since it created an institutional arrangement to coordinate planning and implementation resulting in policy directives to reduce and eliminate commercial fishing within the Gulf, improved law enforcement and reduced levels of illegal fishing, a detailed integrated management plan for the municipal waters and coastal resources of Bolinao, guidelines for improved aquaculture development and mangrove reforestation projects.
As a result of being a prime diving destination, Balayan Bay has had several marine sanctuaries declared in the municipalities of Bauan, Mabini and Tingloy. While the sanctuaries themselves cover areas further at sea than the tidal flats, regulations usually also affect the tidal flat. Some of these sanctuaries are covered by private and non-governmental agreements among resource users. These agreements serve as the management regime and regulatory scheme for the sites. Some such examples are the resource management agreement under the sanctuary ordinance granted to peoples’ organizations, clam stewardship agreements between non-governmental organizations seeding giant clams and the resort owners, and other such private initiatives. To date, no user fee system has been established for the lucrative diving industry as the dive sites are scattered over several municipalities and the resorts are concentrated on the mainland, thereby risking an unequal benefit for sanctuary managers in outlying islands. A more integrated approach, however, is crucial at this stage when rapid industrialization is taking place on the other side of the bay from the sanctuaries. It would seem that massive development of heavy industries such as cement plants, power plants and other manufacturing factories are slated to be constructed facing the bay. The lack of coordination between the small fishermen on the western side and those employed by the diving industry and the resorts on the eastern side might result in long-term degradation of the resource base. Batangas province has an integrated Fisheries and Aquatic Resources Management Council created in pursuit of the Fisheries Code, but no other bay-wide entity has the mandate or authority to specifically address these problems.

The degradation of resources in Taal Lake galvanized local community action in pressing for more regulation. The early 90s saw the enactment of Provincial Ordinance No. 4 that regulates fishing on the lake as well as other uses such as fishcage development and the dismantling of fishpens on the Pansipit River in 1997 and 2001. These dismantlings were also in consonance with the Master Plan for Development prepared for the lake by the defunct Presidential Commission on Tagaytay-Taal. The management plan, therefore, has no official imprimatur. The lake area was proclaimed a protected landscape in 1997. Currently, management jurisdiction rests with the PAMB with the province retaining ordinance and local taxation power to promote its general welfare. The nine towns and two cities also create similar ordinances, such as the garbage ordinance and the ordinance prohibiting jet skis.

Palawan is the ideal example of delegation of management powers over wetlands to the local government. In 1993, the DENR entered into a Memorandum of Agreement with the City of Puerto Princesa over what was then 3,900 hectares of the Puerto Princesa Subterranean River National Park (PPSRNP). The agreement worked, with the City underwriting a third of the cost of park operations while park revenues covered the rest. This is a good example of national government support for local management that has resulted in conservation. The PPSRNP has also increased considerably in size from 3,900 hectares to approximately 22,000 hectares. Most of the area of expansion is already covered by Certificates of Ancestral Domain Claims (CADC) where Ancestral Domain Management Plans have been approved by the DENR, recognized by the City and are in full force and effect. Here, then, is a situation where management is apportioned among the City for the most part, the indigenous peoples, and the DENR for enforcement in the expansion areas not covered by CADC. The clarity and consensus among the groups as to the jurisdiction and authority of each and the representativeness of community, local government and national government stakeholders in the management seems to be working.

4.7 Strategies in reduction of degradation factors

Considering a long history of distrust of the law and the legal system among those primarily dependent on wetland resources, there is a need for creative, appropriate and practicable policies as well as strategic application of existing law. As can be seen from the above analyses, the applicable laws are either too broad to be practicably enforced or too strict to be implemented. Community initiatives and meta-legal strategies are important so that other laws with indirect impact can be used whenever a wetland area is threatened by particular activities, such as the industrial development proposals. Apart from communities, composite teams have been proven to work in proper implementation of fishery laws in marine areas. Based on the experience and general capacity to enforce, there are many available options for the protection of wetlands and the reduction of degrading factors thereon. Projects that threaten wetlands directly can be questioned under any number of regulatory laws from the Environmental Impact Assessment System to the water code, local government requirements and many other laws.
The Philippines is a Contracting Party to the Ramsar Convention, Convention on Biological Diversity, the Basel Convention, and the Convention on Migratory Species, among the many international agreements the country has entered into. In line with the country’s obligations under the RAMSAR Convention, four sites have been designated as wetlands of international importance, with two of these having a peripheral impact at best on the South China Sea, particularly Lake Naujan in Mindoro and Tubattaha Reefs in Palawan.

Pursuant to Department Administrative Order 97-17 prescribing the criteria for selection of wetlands critical to biodiversity, 133 sites have been selected. As with any government agency, the PAWB-DENR has limited resources to spread out to as many as 133 sites, despite their importance. As such, it may be well to prioritize those sites to determine interventions that would be strategic and highly selective. An example, for waterbirds, would be to assess topographical maps for potential nesting and roosting sites and mark off only a small part of some wetlands for on-the-ground protection activities. Without substantial infusions of funding, the designation of these sites critical to biodiversity is in danger of remaining paper declarations. These identified habitats can then be endorsed to local governments or even local volunteer groups with merely the guidance of the national level agencies as to their importance and means of protection.

In general, management of many wetlands still seems to be tied up with management of the associated ecosystems for tidal flats, and for lakes and rivers, in integrated ways such as Fisheries and Aquatic Resource Management Councils, or integrated local ordinances of the towns with territory on the coasts of the lakes or lagoons. With rivers, catchment area management seems to be the most effective management solution so that the policies that have general application can be applied not only with respect to the wetland itself but to activities in the catchment area affecting the wetland. One prime example is the catchment area management of the Puerto Princesa Subterranean National Park.

In all these instances, it bears noting that the best policies can only see proper implementation with a management structure: (a) that is locally based but nationally endorsed; (b) that understands the flexibility required in policy application thereby having the ability to focus on certain regulations with the greatest impact, and, (c) that has a consensus building mechanism and participation processes among the multiple users of the resource.

Another important part of a workable implementation strategy would be to send a message that breaking the law would no longer be tolerated and would be met with punishment. Choosing a solid law, fully enforcing it and sustaining enforcement would focus efforts of the multi-sectoral teams instead of dissipate energies on the breadth of regulations. In choosing the law to fully implement, one must be reminded that the implementation should be fair and consistent, that observance of the law should bear visible results, and that it is realistic. Implementation of this one law could serve as the lynch pin for other violations and destructive activities. In the country, one such law that sees consistent implementation and observance is the vehicle registration requirements. In the way that smoke-belching regulation was tied up with this requirement, the government hopes to use the registration process to arrest smoke belching. If boat licensing would be implemented the same way, and boats can be checked while near shore or docked, a good number of fishery violations could be prevented. It may well be that such a lynch pin law would be the provisions of the water code which make the obstruction of waterways a criminal act. The same obstruction is also penalized in the Fisheries Code.

A National Wetlands Policy will surely help rationalize laws and policies on access to wetland resources, management jurisdictions and enforcement, but it should also consider a menu of options for institutions as close to the ground as possible, which can be used appropriately and in a timely manner; in order to protect specific wetland areas and their associated ecosystems.

A National Wetlands Action Plan had been developed by PAWB-DENR, however this has not been subjected to a wider stakeholder consultation, thus had remained unimplemented in general. This will be part of the work of the newly created National Wetlands Committee that the South China Sea project has established.
REFERENCES


NATIONAL REPORT

on

Wetlands in South China Sea

THAILAND

Mr. Narong Veeravaitaya
Focal Point for Wetlands
Department of Fisheries Biology
Faculty of Fisheries, Kasetsart University
50 Paholyothin Road, Bangkhen
Bangkok 10900, Thailand
Table of Contents

1. INTRODUCTION.............................................................................................................................1

2. STATUS OF WETLANDS IN THE GULF OF THAILAND .............................................................1
   2.1 CHARACTERISTICS AND TYPES OF WETLANDS IN THE GULF OF THAILAND.....................1
   2.2 MAJOR THREATS TO WETLANDS.................................................................................................3

3. LEGAL ASPECTS AND INSTITUTIONAL FRAMEWORK REGARDING COASTAL WETLANDS IN THAILAND ............................................................................................................5
   3.1 REVIEW AND ANALYSIS OF LEGAL ASPECTS RELEVANT TO WETLAND MANAGEMENT.........6
   3.2 INTERNATIONAL AGREEMENTS RELEVANT TO WETLAND MANAGEMENT.................................9
   3.3 REVIEW OF POLICIES AND CABINET RESOLUTIONS ON WETLAND MANAGEMENT IN THAILAND..........................................................9
       3.3.1 Policy Framework..........................................................................................................9
       3.3.2 Cabinet Resolutions Relevant to Coastal Wetland Management...........................................9
   3.4 REVIEW AND ANALYSIS OF INSTITUTIONAL FRAMEWORK .....................................................10
       3.4.1 Government Line Agencies.................................................................................................10
       3.4.2 Local Government Organization .........................................................................................13

4. BIODIVERSITY IN NOTABLE WETLANDS OF THE GULF OF THAILAND .............................14

5. ECONOMIC VALUATION OF WETLANDS......................................................................................21
   5.1 ECONOMIC VALUATION OF WETLANDS ......................................................................................21
   5.2 POTENTIAL ECONOMIC USE OF WETLANDS UNDER THE PROJECT AREA .............................21

6. PROPOSED STRATEGIC PLAN FOR WETLAND MANAGEMENT IN THE GULF OF THAILAND ....................................................................................................................................22
   6.1 VISION ....................................................................................................................................22
   6.2 MISSIONS................................................................................................................................22
   6.3 STRATEGIC GOALS.......................................................................................................................22
   6.4 OBJECTIVES.................................................................................................................................22
   6.5 STRATEGIES AND MEASURES.....................................................................................................22
   6.6 INDICATORS OF SUCCESS ........................................................................................................24
   6.7 PROCESSES FOR ENSURING SUCCESSFUL ADOPTION OF THE PROPOSED ACTION PLAN ....25

REFERENCES......................................................................................................................................25

List of Tables and Figures

Table 1 Types, Numbers and Areas of Wetlands in Each Region of Thailand
Table 2 Number of Flora and Fauna Found in each of the 13 Wetlands Identified
Table 3 Number of Flora and Fauna Found in 13 Wetlands and Identified as Globally Threatened under IUCN Red List
Table 4 Types of Bird Species Found in 13 Wetland sites Identified
Table 5 Percentage of 13 Wetlands Classified by Type and Direct Use Value

Figure 1 Extent of Thai Wetland Sub-component under South China Sea Project
1. INTRODUCTION

Thailand is a South eastern Asian country located between latitude 5°45' and 20°30' N and longitude 97°30' and 105°45' E, covering a total area of approximately 513,115 square kilometres. A joint study by the Royal Forest Department and IUCN (World Conservation Union) in 1989 found that Thailand possessed 42 wetlands of international importance, particularly as habitats for migratory species, accounting for 25,100 square kilometres, or roughly 4.9 percent of the total area of the country. These sites include well known mangrove forests, swamp forests, rivers, seas and freshwater ponds like Kwan Phayao of Phayao Province, Nong Han of Sakon Nakhon Province, Bung Borapet of Nakhon Sawan Province, Songkhla Lake of Songkhla Province, Sam Roi Yot National Park in Prachuap Khirikhan Province and Thale Noi Wildlife Non-hunting Area in Phatthalung Province. The study also documented several other wetlands which, although not of international importance, were found to exhibit long and close relationships with generations of local inhabitants.

2. STATUS OF WETLANDS IN THE GULF OF THAILAND

2.1 Characteristics and Types of Wetlands in the Gulf of Thailand

The inventory was conducted to compile, list and classify wetlands nationwide. The project which was implemented during the period 1996-1999, found at least 42,653 wetlands, covering a total area of no less than 36,616.16 square kilometres or 7.5 percent of the country. Freshwater wetlands accounted for 44.8 percent of all wetlands in the country whereas coastal wetlands covered 55.12 percent. Riparian systems, such as rivers, canals and creeks were identified as the most common types of wetlands and accounted for at least 25,008 sites, followed by static reservoirs such as lakes and ponds, with no less than 14,128 sites. North eastern Thailand was found to accommodate the highest number of wetlands with 14,750, while the southern region was found to have the largest total area of wetlands with 28,465.88 square kilometres (as detailed in Table 1). The inventory also listed at least 61 wetlands of international importance, 108 sites of national importance and 42,396 locally important wetlands (OEPP3, 1999).

Table 1 Types, Numbers and Areas of Wetlands in Each Region of Thailand.

<table>
<thead>
<tr>
<th>System /Region</th>
<th>North Number of sites</th>
<th>Area (km²)</th>
<th>Northeast Number of sites</th>
<th>Area (km²)</th>
<th>Central and East Number of sites</th>
<th>Area (km²)</th>
<th>South Number of sites</th>
<th>Area (km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sea, coastal areas &amp; estuaries</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>387</td>
<td>670.89</td>
<td>869</td>
<td>19,513.545</td>
</tr>
<tr>
<td>Rivers, canals, creeks &amp; flood plains</td>
<td>5,461</td>
<td>1,116.74</td>
<td>8,053</td>
<td>1,091.54</td>
<td>8,380</td>
<td>163.56</td>
<td>3,114</td>
<td>393.067</td>
</tr>
<tr>
<td>Lakes, ponds &amp; reservoirs</td>
<td>4,573</td>
<td>1,678.46</td>
<td>6,168</td>
<td>836</td>
<td>2,228</td>
<td>2,352.86</td>
<td>1,159</td>
<td>3,643.173</td>
</tr>
<tr>
<td>Swamps or marshes</td>
<td>539</td>
<td>26.05</td>
<td>368</td>
<td>49.79</td>
<td>750</td>
<td>142.19</td>
<td>336</td>
<td>4,916.097</td>
</tr>
<tr>
<td>Unidentified</td>
<td>-</td>
<td>161</td>
<td>21.8</td>
<td>7</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>&gt; 1,000</td>
</tr>
<tr>
<td>Total</td>
<td>10,573</td>
<td>2,821.25</td>
<td>14,750</td>
<td>1,991.13</td>
<td>11,752</td>
<td>3,329.50</td>
<td>5,578</td>
<td>28,465.88</td>
</tr>
</tbody>
</table>

Note: excluding paddy fields. Sources: OEPP, 1999.

Central region: This region is characterized by lower plains with some undulated areas. The lower half of the region stretches towards the Gulf of Thailand and is dominated by river deltas, particularly that formed in the estuary of Chaopraya River (Bangkok Plain Accumulation of river sediment in the deltas has long enriched the areas with nutrients, making them the most important areas for rice cultivation. The four major rivers of the region that discharge into the Gulf of Thailand are the Bang Prakong, Chaopraya, Tachin and Mae Klong Rivers.

Eastern region: Topography of the Eastern region is dominated by coastal mountain ranges and hills. Notable ranges include Chantaburi Range in the centre of the region where a number of short rivers that discharge into the Gulf of Thailand originate; Bunthad Range which is a natural border between Thailand and Cambodia; and San Kumpang Range which separates the region from the neighboring countries.

Office of Environment Policy and Planning.
Central region. Coastal plains in the regions were mostly formed by river sedimentation along estuaries. Mangrove forests are commonly found in these plains, especially along coastlines of Chanthaburi and Trat Provinces. Coastal areas in other provinces, however, largely consist of beaches. Many islands can be found offshore, with Chang, Kud and Lan islands among the most notable.

Southern region: The region is a peninsular with the Gulf of Thailand on the East Coast and Andaman Sea on the West Coast. The East Coast can be characterized by the elevation of the land, creating relatively even coastlines with many beautiful beaches. Songkhla Lake is the largest and most notable lagoon of the region, accommodating a mixture of freshwater and marine ecosystems that support significant biodiversity. On the other hand, the West Coast was formed by the sinking of landmass, resulting in uneven coastlines and many islands along the shorelines. Series of mountain ranges act as a topographic backbone of the region. These include the Phuket Range that stretches from the Chumphon to Phangnga province, followed by the Nakhon Si Thummarat Range in the central section and the San Kala Kiri Range which acts as a natural border between Thailand and Malaysia.

The project sites are located in 18 provinces. These areas are mostly elevated land connected to coastlines by slopes and located in 11 major basins, including the Bang Prakong, Chao Praya, Tachin, Mae Klong, Phetchaburi, Tapi and Pattani river basins as well as the Songkhla Lake Basin. Fifteen major rivers discharge into the Gulf of Thailand. These include the Trat, Welu, Chanthaburi, Pang Lard, Prasair, Rayong, Bang Prakong, Chaopraya, Tachin, Mae Klong, Pranburi, Chumphon, Tapi, Tark Bai and Sai Buri rivers. Twenty-seven natural sites were identified worthy of conservation by the Cabinet Decision of 1990. These sites are Oak Taru Mountain, Ratchada Pisak beach (Sai Mor Beach), Sai Ree beach, Chao Samrarn beach, Jomtien beach, Pattaya beach, Bang San beach, Sri Chang island, Sai Kaew beach (Samet island). Mae Rumperng beach. Nara Thut beach, Kung Vimarn beach, Mae Pim peninsula, Kung Kra Ban peninsula, Tarn Ku bay, Ngue (Snake) mountain, Chao Lai mountain, Wang mountain, Hua Hin beach, Tao (Turtle) beach, Don Hoi Lot, Singa peninsula, Thale Nai (lagoon) in the Ang Thong islands, Chei Wong beach, Thale Noi, Songkhla lake and Kukut Waterfowl park.

The national inventory of wetlands conducted between 1996-1999 found that the total area of wetlands was highest in Southern Thailand with 28,465.88 square kilometres. Further compilation of information on wetlands adjacent to the Gulf of Thailand under the project focused on four groups of wetlands: coastal areas (including rocky shores, sand beaches and mudflats), swamp forests, estuaries; and freshwater reservoirs, such as lakes and ponds. The compilation, which excluded mangrove forests, coral reefs and seagrass beds, found that wetlands in the Gulf of Thailand cover a total area of no less than 2,909.70 square kilometres and could extend to another 12,477.37 square kilometres if areas up to a depth of 10 meters along the shoreline are taken into account. Wetlands included in the compilation are also those found inland outside the boundaries of saline barrier lines, originally established by Land Development Department to identify suitable sites for shrimp farming. The project areas cover 4 square kilometres of estuaries, 443.5552 square kilometres of mudflats and 388.0464 square kilometres of sandy beaches. Furthermore, approximately 9,188.2432 square kilometres of lands outside the saline barriers (Figure 1)
2.2 Major Threats to Wetlands

Most of the wetlands in Thailand are safeguarded and maintained by a protected area system, which includes national parks, wildlife sanctuaries and wildlife non-hunting areas. Despite being officially identified as public lands, several important wetlands remain a vital part of daily life of Thais, particularly those in rural areas who have relied on wetland services and resources for generations. By not being included in the protected area system, these wetlands have been vulnerable to encroachment and other development activities. For example, freshwater ecosystems in the floodplains of northern and central Thailand have been adversely affected by greater demand for agricultural land use; mangrove forests along the coastlines and estuaries of the Gulf of Thailand, and on both shorelines of southern Thailand have been severely damaged by aquacultural operations; while swamp forests and marshlands in north eastern and southern Thailand are now facing degradation due to some development projects.

Despite the value and benefits derived from wetlands, the ecosystem continues to be directly and indirectly destroyed at an alarming rate. Wetlands of international importance are constantly under serious threats, despite all the protective measures that have been put in place. The Asian Wetland Directory indicates that 47 percent of the 42 listed wetlands in Thailand are under moderate to seriously high threat, 8 percent are under some form of protection, while only 2 percent are...
adequately protected. There has not yet been any quantitative assessment of wetlands nationwide, however numerous evidence suggests a significant reduction in the number and size of natural wetlands. This include the decline in the total area of mangrove forests from 3,680 square kilometres in 1961 to only 1,680 square kilometres in 1996 (OEPP, 2002b), while the number of man-made reservoirs has been increasing.

Surveys and monitoring of qualitative changes occurring in the wetlands also remain inadequate. There is, however, a trend indicating deterioration in water quality and biodiversity among wetlands throughout the country. The main causes for loss of wetlands in Thailand can be summarized as follows:

1) Increase in the population: Modern socioeconomic development has significantly increased the exploitation of wetland resources and generated larger demand for conversion of the ecosystem for development activities.

2) Inefficient use of wetlands: Inappropriate use of wetlands, particularly conversion of natural wetlands for farming, marine aquaculture, industry, urban expansion and infrastructure development, have all adversely affected the wetland hydrology, by disrupting the water flow in and out of the ecosystem. Both civil engineering projects such as road construction, and commercial development, such as tourism, can seriously impact ecological functions of wetlands and locals whose daily life depends on such functions, if due attention is not paid to preservation of such ecosystems.

3) Wetland management problems: Despite the value and benefits derived from wetlands, the society at large, including public and private organizations and general public in both urban and rural areas, do not have adequate and accurate knowledge and understanding of wetland ecosystems. This results in the lack of due appreciation and recognition of the true function, value and benefits of wetlands and eventually, in inappropriate use of the ecosystem. Coordination between public agencies in managing wetlands is often inadequate, while relevant laws and regulations are usually ineffective in enforcement and, in many cases; do not facilitate sustainable management of wetlands.

Under this project, significant continuation in the loss of wetlands in the Gulf of Thailand was observed. A most notable example is swamp forests which have been documented as covering a total area of 640 square kilometres, with scattered communities in the eastern region (Trat province) and large communities in southern Thailand, particularly in Narathiwat province where the swamp forests accounted for nearly 453.36 square kilometres. A survey of swamp forests in Narathiwat province in 1985 reported that Phru To Daeng forest in Tak Bia, Su Ngai Patee and Su Ngai Golok districts was the only remaining large patch of swamp forest in the province and covered an area of no more than 80 square kilometres. A later survey by Santisuk (1991) found that Phru To Daeng further shrank to mere 16 square kilometres or less. Another example was provided in the 2001 Annual Report on Status of Environmental Quality, where mangrove forests were reduced from 3,680 square kilometres in 1961, to only 1,680 square kilometres in 1996 (OEPP, 2002b). Major problems that have threatened the long-term existence of wetlands in the Gulf of Thailand can be summarized as follows:

**Continuous loss of wetlands:** Loss of wetlands generally results from their conversion for development activities such as cultivation, housing and tourism. Activities outside the wetlands such as infrastructure and industrial development, particularly dam and reservoir construction, often disrupted the replenishment of wetlands, made the ecosystem more accessible for cultivation and hence, indirectly encouraged more encroachment by landless locals. This pattern was frequently found in several mangrove forests including those at Welu River Estuary (Chanthaburi province), Pak Phanang bay (Nakhon Si Thammarat province), Pattani bay (Pattani province) and Ban Don bay (Surat Thani province) as well as in swamp forests in Thale Noi Wildlife Non-hunting Area (Phatthalung province), Phru Kan Tulee (Surat Thanipprovince) and Phru To Daeng (Narathiwat province).

**Biodiversity loss:** Thailand is rich in genetic, species and ecosystem diversity. Such diversity is especially evident in wetlands where pools of genetic diversity have long played an integral role in supporting local livelihoods for generations. The numbers of wetland species and their populations have recently been on the decline, particularly among aquatic animals, due to inappropriate harvesting. Use of illegal and destructive fishing tools, driven by economic demand for greater
production, has effectively depleted fishery stocks in wetlands, while introduction of invasive alien species, like giant mimosa, golden apple snails and exotic fish, further contributed to the reduction of native plants and indigenous fish species. Illegal hunting also has adverse effects on wildlife of wetlands and has caused local extinction of some species.

Ecological degradation of wetlands: Several wetlands are now under threat from eutrophication with rapid growth in vegetation and increased sedimentation from runoff. The ecological viability of wetlands has also been seriously affected by logging, particularly in mangrove and swamp forests, and more frequent forest fires, which result in reduction of native plants and deterioration of their ecology. Pollution has become more severe with the expansion of urban areas and tourism. These activities generate a vast amount of solid waste and wastewater, which are often discharged into wetlands without any effective treatment. Agricultural land use in adjacent areas has further compounded this problem with the use of pesticides and fertilizers. In addition to contamination of both surface and underground water with toxic chemicals, these agricultural agents increase nutrient concentration in water which induces rapid growth of micro-flora (algae bloom), significantly reducing the dissolved oxygen and disrupts animal and plant food chains in the wetlands. Irrigation projects, such as dam and reservoir construction, have affected wetlands by restricting the natural flow of water into the reservoirs; while factories, power-plants and oil tanks along the riverbanks and shorelines continue to contaminate estuaries and coastal areas with wastewater, toxicants, hazardous waste, petroleum substances and high temperature discharges.

Lack of coordination between partners and stakeholders: With ever increasing demand for the exploitation of wetland resources by local communities, utilization of the resources without due regard to biodiversity value, and the need for conservation and sustainable use, frequently results in conflicts between users. Any activity in wetlands, therefore, requires comprehensive participation of central and local authorities, including both conservation and development agencies, private sector, local administration and communities to decide ways and means for resource utilization that best meet the carrying capacity of the ecosystems. Area based management is a critical component in realizing such processes, while revising work plans in accordance to changing circumstances could prevent more conflicts and enable greater equity in sharing the benefits of the resources.

Lack of adequate knowledge on wetland management: Ecosystem diversity of wetlands with inclusion of freshwater and brackish water, reservoirs, riparian systems, coastal areas, swamp forests and mangrove forests, has made the comprehension of the concepts of wetlands, its value, including biodiversity, rather difficult among the general public. Therefore managing wetlands must be carried out in an integrated manner where equal attention is paid to ecological protection and socio-economic demands. This can only be achieved effectively with databases and networking which are the backbone of informed decision making, and a basis in disseminating knowledge to every stakeholder.

Lack of human resources and competent authorities: To ensure more efficient and productive management of wetlands, the ever increasing diversity of problems and obstructions, multi-level coordination from the international community (i.e. the Ramsar Convention) to local communities has to be adequately addressed and effectively dealt with. Despite appointment of the National Committee on Wetland Management by the National Environment Board (with ONEP as the secretariat) in 1993, the amount and complexity of wetland problems has been gradually overwhelming the capacity of the Committee. Institutional restructuring, including improvement of personnel responsible for wetlands at central and local levels, should be carried out not only to enhance effectiveness in problem resolution, but also to promote local communities to become more responsible for the management of their wetland resources.

3. LEGAL ASPECTS AND INSTITUTIONAL FRAMEWORK REGARDING COASTAL WETLANDS IN THAILAND

Currently, there is no specific and comprehensive legislation governing wetlands in Thailand. However, laws relevant to wetland conservation and sustainable utilization are scattered throughout the body of legislation. This has resulted in little or no coordination between various governmental agencies responsible for wetland management.

The control of natural resources in wetlands is presently the responsibility of numerous governmental agencies. Apart from that, the structure of governmental organization in Thailand is divided as the central government, provincial governments, and local governments. The present Thai Constitution
1997 provides comprehensive decentralization to local governments and local communities for natural resources and environment conservation. Furthermore, the charter also provides the right and liberty for the public to participate in decision-making process of natural resources management.

The government decided to reform the bureaucratic system in October 2002. This is considered the first stage of the reform process because there are still many problems in the structure of government organizations. Current reforms have created more overlap of responsibilities and authorities for several agencies. It is anticipated that the reform process could be completed in two to five years.

It is believed that sustainable resource management could be achieved given an effective legal and institutional framework. This chapter reviews and analyzes the legal framework relevant to coastal wetland management in Thailand. It also reviews the policy of the government towards coastal wetland conservation and utilization. In addition, the institutional framework for coastal wetland management in Thailand is also examined.

3.1 Review and Analysis of Legal Aspects Relevant to Wetland Management

There are many pieces of law concerning wetland management and conservation in Thailand. These laws directly or indirectly govern wetland management. They include:

1. **Constitution, B.E. 2540 (1997)**
   Thailand’s Parliament endorsed a new constitution on Saturday, September 27, 1997, in a combined House and Senate vote of 578 to 16 (with 55 abstentions). Among the main features, the new constitution gives people additional rights and freedoms, and defines and limits the role of the government more clearly. The new constitution will radically change the political landscape of Thailand. It aims to eliminate or at least minimize unnecessary political influence on administration, and enhance transparency, accountability, responsibility, and fairness. It provides for an independent election commission, citizen’s access to an anti-corruption body to oversee politicians elected to office, proportional representation for a portion of seats, a stipulation that senators and provincial village chiefs be elected instead of appointed, and a requirement that cabinet ministers resign from their parliamentary seats. There is a clear stipulation to accelerate the process of administrative decentralization to empower people; this would necessitate the establishment of many new acts. The new constitution pays greater attention to social sectors including emphasis on education, with a goal to make 12 years of education compulsory. It also obliges the government to pay sufficient attention to social welfare and environmental conservation.

2. **Fisheries Act, B.E. 2490 (1947)**
   This law was enacted in 1947 and has been revised twice in 1953 and 1985. This act is executed by the Minister of Agriculture and Cooperatives through the director-general of the Department of Fisheries. This act directly governs fishing activities in the coastal areas. The act classifies fisheries by using an area approach into four categories; (1) Preservation fisheries, (2) Concession fisheries, (3) Reserved fisheries, and (4) Public fisheries.

   In relation to wetland management, the Fisheries Act generally protects both coastal and inland wetlands from fishing activities and environmental degradation activities. Apart from that, this act also prevents the illegal occupation of wetlands, illegal destruction of wetlands, and so on by establishing protected areas, both coastal and inland, as preservation fisheries, and does not allow any fishing activities. The act also protects endangered species, which have habitats in wetlands. However, law enforcement is the main difficulty in implementation, which leads to constant wetlands loss.

This act repealed and replaced the old Wildlife Reservation and Protection Act, B.E. 2503 (1960). Only the Royal Forest Department (RFD) was responsible for the old Wildlife Law. However, both RFD and the Department of Fisheries (DOF) are responsible for the current Wildlife Reservation and Protection Act, B.E. 2535 (1992). This is because the definition of wildlife in this act includes aquatic animals, and the DOF is responsible for aquatic animals and crocodiles, whereas the RFD is responsible for terrestrial animals and birds.

This act creates two lists of endangered species: (i) the list of reserved species notified by royal decree, and (ii) the list of protected species notified by ministerial regulation. The act prohibits hunting, possessing, breeding, trading, importing and exporting any species on these two lists. However, if some species can be bred in captivity until the second generation of offspring animals; trade, possession, export and import of such species shall be allowed pursuant to CITES regulations. Therefore, this act also creates another list of captive breeding species notified by ministerial regulation. Examples of endangered species bred in captivity include crocodiles, pythons, Asian bony tongue fish, etc.


This act has been revised and replaced the old act of 1975. The Ministry of Science, Technology and Environment (MOSTE) is responsible for this law. Upon the enactment of this law in 1992, MOSTE was also restructured by dividing environmental agencies into three agencies: (i) Office of Environmental Policy and Planning (OEPP), (ii) Pollution Control Department (PCD), and (iii) Department of Environmental Quality Promotion (DEQP).

The Ministerial Regulations of Article 55 of this act sets quality standards for discharged industrial waste water, but does not include waste water discharged from aquaculture. This act requires environmental impact assessment (EIA) for large-scale projects. Furthermore, Articles 43, 44 and 45 of this act empower the minister of MOSTE to proclaim ministerial regulations determining “environmentally protected areas” and “pollution control areas” in addition to regulating the activities in such areas. However, it lacks enforcement because MOSTE has inadequate staff in the provinces. Normally, provincial police and various provincial government offices are relied upon for enforcement.

This act could serve as a legal instrument to protect wetlands by designating wetlands as “environmentally protected areas” whether private wetlands or public wetlands. The “environmentally protected areas” can be established by ministerial regulation. Furthermore, restricted activities within “the environmentally protected area” can also be proclaimed by ministerial regulation as well. It can be concluded that these provisions are more flexible and applicable to wetland management and conservation in comparison to other legal instruments. However, the enforcement of this act relies on competent officers of other governmental line agencies such as the Police Department, Royal Forest Department, Department of Fisheries, Royal Thai Navy, Harbour Department, etc.

5. **Navigation in the Thai Waters Act, 2456 (1913 revised in 1992)**

This was enacted in 1913 but it has been revised several times, and the latest is No. 14 in 1992. The Department of Harbour, Ministry of Transportation and Communication is responsible for this act. The main objectives of the act are to regulate navigation and water transportation in the Thai waters, regulate the construction of vessels, including fishing vessels, register all vessels, and issue licenses to vessel officers. In addition, it also prohibits the disposal of wastes into the watercourse either from the vessels or from land-based sources.

Article 117 prohibits the construction of anything over the water or under the water without prior permission from the Harbour Department. The construction of commercial ports, fishing ports, marinas, piers must be done only after obtaining permission from the Harbour Department.

In relation to coastal aquaculture, the Department of Fisheries must seek approval from the Department of Harbour before granting permission for reserved fisheries, for coastal stationary fishing gear, cage culture and shellfish culture. Likewise, the Department of Harbour must seek approval from the Department of Fisheries before granting permission for the construction in water courses or action which may cause alternation of water courses.
In relation to wetland management, this act regulates the construction or encroachment of public wetlands both inland and coastal. Moreover, the act also prohibits the disposal of waste into wetlands in order to prevent pollution and contamination.

6. The National Reserved Forest Act, B.E. 2507 (1964)
This act aims to protect reserved forests and natural resources within reserved forests. Previously, an intensive survey was carried out over a very long period of time, to identify the area of intended reserved forest before a Ministerial Regulation was proclaimed designating a national reserved forest. The enactment of National Reserved Forest Act in 1964 aimed to change such procedures by requiring advanced notification of designation of areas intended as reserved forest. Any person who is not satisfied, is entitled to challenge by petition to the Head of District Office within 90 days from the effective date of the Ministerial regulation. In practice, however, there are many villagers who occupy and utilize areas of reserved forests. In this regard, this act recognizes the preoccupation right and utilization right only to persons who have land title deeds issued by the Department of Lands pursuant to the Land Code, B.E. 2497 such as Chanode, N.S.3, S.K.1, etc.,. These procedures also applied to mangrove reserved forests. Therefore, there are several villagers who still have preoccupation and utilization rights in the mangrove reserved forests, which they can use to legally exploit mangrove forests depending on the mangrove zones classified by cabinet resolutions.

This act aims to protect natural resources and environment within national park areas similar to that of the National Reserved Forest Act. However, national park is supposedly more protected than national reserved forest because the National Park Act does not allow any utilization within national park areas. The main objective of the act is to maintain the natural resources within National Parks intact for education and aesthetic interests of the public. Marine national parks and national parks along the coasts automatically protect mangrove forests. Presently, there are many marine and coastal national parks along the coasts of Thailand. Although strictly speaking, they are legally protected, there are still many illegal encroachments and utilization in national parks. Examples include several illegal shrimp farms in Khao Sam Roi Yot National Park, in Prachuap-khirikhan province.

Wetlands situated within national parks are automatically protected. The national park can be established by royal decree. Currently, Thailand has established 102 national parks, which include 81 terrestrial national parks and 21 marine parks covering an area of 52,149.12 square kilometres equivalent to 9.82 percent of the total land area of the country. The government is preparing to establish another additional 36 national parks covering an area of 18,150.543 square kilometres (Royal Forest Department, 2001).

8. Town Planning Act, B.E. 2518 (1975)
This act has been revised three times, the third time in 1992. This act empowers a competent authority namely the Town and Country Planning Department, Ministry of the Interior, to classify an area as an industrial zone, commercial zone, residential zone, agricultural zone and so on. However, it should be noted that such zoning is based on environmental concerns and purposes.

Before designating town and country planning in any area, a public hearing shall be organized according to Article 19 of the act. All stakeholders in that area will attend the public hearing. In addition, every five years there will be an evaluation of such proclamation of town and country zoning for public evaluation pursuant to Article 26.

In coastal areas, the provincial authority can proclaim town and country planning within its territory. The provincial public works officer and the local government are the competent officials of this act.

The Minister of Interior executes this act. The act empowers the local government to be the competent officer of this act. The local government includes the Provincial Administrative Organization, Municipality, Tambol Administrative Organization, Bangkok Metropolitan, and Pattaya.

The Minister of Interior proclaims the ministerial regulation in any locality and the local government issues the by-law for its own purposes pursuant to the ministerial regulation. This act can be a useful legal instrument to control building in coastal areas.
This act is also executed by the Ministry of Interior. The main objective of this act is to decentralize the administration to the sub-district level (Tambol). The Tambol Administrative Organization (TAO) committee is comprised of elected local people. The TAO has the duty and responsibility to conserve the natural resources within its territory, and also has the duty to formulate its annual development plan and issue regulations to direct activities within its territory.

The TAO is financed from two sources (i) collecting taxes from activities within its territory, and (ii) annual budget provisions from the central government. The act stipulates that the fisheries tax, and other taxes generated from the utilization of natural resources within its territory will be given to the TAO. For example, the Department of Fisheries currently collects a fisheries tax and gives such tax to the TAO. Likewise, Royal Forest Department collects entrance fees for national parks and gives such fees to the TAO.

In relation to wetland management, the TAO could conserve wetlands by establishing local committees to manage wetlands located in its territory. In addition, the TAO can also collect taxes from the utilization of such wetlands. The TAO also can play an important role in community-based management of wetlands and other natural resources.

After the enactment of the Tambol Administrative Organization Act, B.E. 2537 (1994), the Provincial Administrative Organization Act, B.E. 2540 (1997) was enacted to be compatible. This Act empowers the Provincial Administrative Organization (PAO) to formulate provincial development plans, coordinate and cooperate with TAOs, allocate budgets to TAOs, and to protect and conserve natural resources and environment in its territory.

The PAO can help conserve wetlands in coastal areas based on its development plans. As mentioned earlier, the Provincial Administrative Organization is authorized as the competent official of several laws such as the Building Control Act, B.E. 2522 (1979).

3.2 **International Agreements Relevant to Wetland Management**

Thailand is a contracting party to many international agreements relevant to wetland management such as the Ramsar Convention, CITES, Convention on Biological Diversity (CBD), World Heritage Convention. The details of them can be shown as follow:

- The Convention on Wetlands of International Importance, Especially as Waterfowl Habitat;
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);
- The Convention Concerning the Protection of the World Cultural and Natural Heritage;
- The Convention on the Conservation of Migratory Species of Wild Animals;
- The UN Convention on the Law of the Sea, 1982 (UNCLOS);

3.3 **Review of Policies and Cabinet Resolutions on Wetland Management in Thailand**

3.3.1 **Policy Framework**
- National Economic and Social Development Plan No.9 (2002-2006);
- Wetland Policy and National Sub-Committee on Wetland Management (NCWM);
- Policies, Measures and Plans on Wetland Management for 1998-2002;
- Strategic Measures on Conservation of Wetlands of National and International Importance (Cabinet Resolution in August 1, 2000);

3.3.2 **Cabinet Resolutions Relevant to Coastal Wetland Management**

There are many Cabinet Resolutions relevant to wetland management (focused on coastal area, mangrove and beaches) including:

3.3.2.1 On June 27, 1979, the Cabinet passed the resolution “the Recommendations of the National Mangrove Resources Committee on the Protection and Conservation of Mangrove Resources.”
3.3.2.2 On August 19, 1980, the Cabinet passed the resolution “the Measures for Mangrove Exploitation”.

3.3.2.3 On June 29, 1982, the Cabinet passed the resolution “the Measures for the Use of Mangrove Area by the Government Sector”.

3.3.2.4 On May 1, 1984, the Cabinet passed the resolution “the Recommendations from the 4th Seminar on Mangrove Ecosystems”. The resolution includes three recommendations. The Cabinet has also empowered the Ministry of Agriculture and Cooperatives.

3.3.2.5 On December 15, 1987, the Cabinet passed the resolution “the Classification of Mangrove Area Utilization in Thailand”.

The Cabinet has agreed to adopt the resolution proposed by the Ministry of Agriculture and Cooperatives concerning the classification of mangrove area utilization in Thailand. The mangrove area utilization in Thailand will be grouped as conservation and economic zone. Mangrove Economic Zone covers a total area of 3,297.70 square kilometres which is divided into two categories as zone A and B. Thus the classification of mangrove area utilization will be as (i) mangrove conservation zone (ii) mangrove economic zone A, and (iii) mangrove economic zone B.

3.3.2.6 On August 1, 1989, the Cabinet passed the resolution “the Reservation and Protection for Mangrove Areas in Surattani Province and Nakhon Si Thammarat province”

3.3.2.7 On February 6, 1990, the cabinet passed the resolution “Resolving the Mangrove Encroachment in Eastern Thailand”.

3.3.2.8 On February 27, 1990, the Cabinet passed the resolution “the Recommendation From the 6th Seminar on Mangrove Ecosystem”.

3.3.2.9 On June 4, 1991, the cabinet passed the resolution “the Urgent Measures for Coastal Resources Concerning Mangrove and Corals”

3.3.2.10 On July 23, 1991, the Cabinet passed the resolution “the Study Report on the Present Situation of Mangrove and Coral in Thailand”.

3.3.2.11 On February 17, 1992, the Cabinet passed the resolution “the Resolution of the National Environment Board on the Policy, Measure and Working Plan for Coastal Resources and Environment Management of Thailand”.

3.4 Review and Analysis of Institutional Framework

3.4.1 Government Line Agencies

According to the Constitution of 1997, the system of Thai government is organized at two levels as the central government and local government. The central government is the largest public sector body. Previously, the Thai government was made up of 15 Ministries. Recently, the Parliament has passed two bills, namely the Public Administration Act, B.E. 2545 (2002) and the Restructuring Governmental Ministries, Offices and Departments Act, B.E. 2545 (2002) which came into force on October 3, 2002. This has resulted in a restructuring of the government into 20 Ministries:


The policy of restructuring the government is to group the organizations with similar work functions into the same Ministry. However, many government organizations still want to retain authority, manpower and budget. Therefore, they retain some work functions. This has created duplication of work and overlapping power with the newly established government organization. It will take time to resolve these issues.
Apart from the duplication of work and power among government agencies, there are also the legal problems. The government has to review and revise many laws that are implemented by the government agencies.

There are several Ministries involved in wetland management. They are:

**3.4.1.1 Ministry of Natural Resources and Environment**

The Ministry of Natural Resources and Environment (MONRE) was established by combining various departments of the Ministry of Agriculture and Cooperatives (MOAC) and Ministry of Science, Technology and Environment (MOSTE). The Ministry of Natural Resources and Environment is comprised of several departments that deal with wetlands. The core agencies are as follows:

**Department of National Park, Wildlife and Flora**

This Department is divided from former Royal Forest Department (RFD). It takes around 70 percent of the work from the former Royal Forest Department. This Department enforces two pieces of legislation, namely the Wildlife Reservation and Protection Act, B.E. 2535 (1992) and the National Park Act, B.E. 2504 (1961). All wetlands situated within protected areas such as national parks, wildlife sanctuary areas and non-hunting areas are under the responsibility of this department. This department is also responsible for all marine national parks. The Director General of the National Park, Wildlife and Flora Department is responsible for the protection and management of wetlands in protected and conservation areas, the protection of wetland flora and fauna and the principal training of wetland managers and rangers.

**Department of Marine and Coastal Resources**

This department was established by transferring some work dealing with marine and coastal resources from the Department of Fisheries, Department of Land Development, and Royal Forest Department. This department enforces several pieces of legislation such as the Fisheries Act, B.E. 2490 (1947), the Wildlife Reservation and Protection Act, B.E. 2535 (1992), the National Reserved Forest Act, B.E. 2507 (1964). All wetlands within mangrove forests and beaches are the responsibility of this department.

**Office of Natural Resources and Environment Policy and Planning**

This office was formerly called the Office of Environmental Policy and Planning (OEPP). Under the new ministry, it has been renamed the Office of Natural Resources and Environment Policy and Planning (ONEP). Its tasks are the coordination and cooperation with numerous governmental and non-governmental agencies. This office is also responsible for the formulation of wetland policy and planning, both inland and coastal, the coordination of regulations, guidance, monitoring and evaluation of reports on the implementation of national policy on the management of wetlands. In addition, it also holds responsibility for the training programmes on wetlands management, the establishment of "environmentally protected areas", and the focal point for the Ramsar Convention in Thailand.

**Department of Pollution Control**

This department was transferred from the Ministry of Science, Technology and Environment. It is responsible for controlling pollution from all sources including inland and coastal. This department enforces the National Environmental Quality Promotion and Preservation Act, B.E. 2535 (1992). This department is also responsible for the determination of water quality standards for both freshwater and coastal water, establishing “pollution control areas”, and monitoring, control and surveillance of water quality.

**Department of Water Resources**

This Agency (formerly called the Office of Rural Development) was transferred from the Ministry of the Interior and combined with some units of the Royal Irrigation Department and Office of the National Water Resources Policy Committee. This agency will have overall responsibility for inland reservoir, wetlands and 25 river basins in Thailand.
3.4.1.2 Ministry of Agriculture and Cooperatives

Many tasks of the Ministry of Agriculture and Cooperatives have been transferred to the Ministry of Natural Resources and Environment especially natural resources and environment aspects. However, this transformation is not yet complete. This can be observed by the duplication of work and overlap of power between several agencies. It requires time to readjust. Currently, several agencies within the Ministry of Agriculture and Cooperatives still retain the work and legal power with regard to wetland management. The core agencies dealing with wetland management include the following:

**Royal Forest Department**
The Royal Forest Department (RFD) has transferred 70 percent of its work to the Department of National Park, Wildlife and Flora and 10 percent of its work on mangrove to the Department of Marine and Coastal Resources. Currently, it retains around 20 percent of work mainly outside protected areas. This department is responsible for production forests and their influence on wetlands systems, and enforcement of the Forest Act, B.E. 2484 (1941) and the National Reserved Forest Act, B.E. 2507 (1964).

By the end of 2003, the government had proclaimed the Royal Decree to transfer RFD to the Ministry of Natural Resources and Environment. Currently, the Ministry of Natural Resources and Environment is working to resolve the overlap and duplication of authority, manpower and budget allocations between the Department of National Park, Wildlife and Flora and the Royal Forest Department.

**Department of Fisheries**
The Department of Fisheries (DOF) has the responsibility for aquatic species conservation and wetlands (as fish habitats) protection. It has transferred some work on marine and coastal resources to the Department of Marine and Coastal Resources. However, it still retains the same work on marine and coastal resources with it. Thus, there is a duplication of work and overlapping of legal power with the Department of Marine and Coastal Resources. This department enforces the Fisheries Act, B.E. 2490 (1947).

**Department of Land Development**
The Department of Land Development has the responsibility for technical guidance in the management of wetlands and the use of soil associated with the use of water. It provides the technical information on management of coastal wetlands.

**Royal Irrigation Department**
The Royal Irrigation Department has the responsibility to regulate the water utilization, to provide water support to farmers and other water users and to construct the irrigation infrastructure.

3.4.1.3 Ministry of the Interior

This ministry has the responsibility for the coordination and guidance for provincial government and local government, which is responsible for activities related to planning, implementation and control of the wetland management at provincial and local levels. However, there is one agency dealing directly with the implementation of wetland management.

**Department of Land**
The Department of Land enforces the Land Code, B.E. 2497 which is responsible for directing the allocation of land for each individual according to the national and regional land use plans and legal requirements. The issuance of land title deeds in coastal areas must be controlled.

3.4.1.4 Office of the Prime Minister

**National Economic and Social Development Office**
This office is responsible for coordinating and planning government programmes and finance concerned with the management of the wetlands and their resources.
3.4.1.5 Ministry of Tourism and Sport

Tourism Authority of Thailand (TAT)
This office is responsible for developing tourism in wetlands, including coastal wetlands such as mangrove forests, beaches, etc. It also formulates the National Tourism Plan, promotes tourism in coastal areas, enhances eco-tourism for coastal areas.

3.4.1.6 Ministry of Public Health

This ministry is responsible for establishing the standards of public hygiene closely associated with water quality and waste disposal. Also responsible for the raw materials, including water, their processing and quality control procedures used for manufacturing medicine.

3.4.1.7 Ministry of Industries

This ministry is responsible for providing information on quality standards of raw materials and regulating the water discharged from the industries to wetland resources.

3.4.1.8 Ministry of Transportation

Marine Department
This department is established by the combination of the Harbour Department and the Office of Mercantile Marine. This department enforces the Navigation in Thai Waters Act, B.E. 2456. It is responsible for regulating navigation in Thai waters and protecting the watercourses. Therefore, by virtue of the act this department also regulates construction in coastal areas, and controls the disposal of waste into coastal area.

3.4.2 Local Government Organization

The local administrative system of Thailand can be classified as (I) Provincial Administrative Organization (PAO), and (ii) Tambol Administrative Organization (TAO).

3.4.2.1 Provincial Administrative Organization (PAO)

The Provincial Administrative Organization (PAO) is established by the Provincial Administrative Organization Act, B.E. 2540. Every province has one Provincial Administrative Organization that has the responsibilities to coordinate with other governmental organization and other local administrative organization such as Tambol Administrative Organization (TAO). PAO also has the duty to protect and conserve natural resources and environment in its territory. In this respect, PAO is also responsible for protecting and conserving wetlands in its territory.

3.4.2.2 Tambol Administrative Organization (TAO)

The Tambol Administrative Organization (TAO) is established by the Tambol Administrative Organization Act, B.E. 2537. It is also responsible for wetland management in its territory. Currently, TAO plays an essential role in protecting and conserving wetlands because the people residing in the village usually utilize wetlands for their livelihood. Therefore, the loss of wetlands would have a direct effect on their quality of life.

Weaknesses
Within its legal framework, Thailand has many pieces of legislation protecting wetlands. The legal mechanism for protecting wetlands could be more effectively applied by establishing protected areas such as National Parks, wildlife sanctuary areas, non-hunting areas, aquatic sanctuary areas, and environmentally protected areas according to the management plan and relevant legislation. Thailand has adequate laws in place for establishing protected areas. Furthermore, many pieces of law also protect endangered species within wetlands and protected areas. And, the laws restrict some activities which may cause degradation to wetlands.

The constraints of legal protection, however, arise from fragmented laws, overlapping jurisdiction in some areas, ineffective law enforcement, lack of compliance, and centralized power. Although wetlands within the protected area system are considered well protected and remain in good
Within its institutional framework, the policy of the present government to reform governmental agencies came into effect on October 3, 2002. However, there are still many problems among various ministries, especially ministries involved in natural resources and environment. The two core Ministries are the Ministry of Natural Resources and Environment and the Ministry of Agriculture and Cooperatives. Several departments under these two ministries still duplicate work, have unclear duties and authority, overlapping authorities, and lack of coordination and cooperation. In fact, the old ministries and departments have tendency to retain their powers and budget, and do not want to transfer them to other ministries. Therefore, there is an urgent need for the government to consider additional changes in its institutional framework.

**Suggestions**

Within the legal framework, the government should speed up its review and make any necessary changes in the legal framework to accommodate the implementation of wetland management and law enforcement by various government agencies. While the process of amending laws in Thailand usually takes long time, this particular legal review should take priority. With regard to wetland conservation, there will be a strong link to institutional arrangement of governmental organization. Therefore, the mandate and responsibilities of government agencies should be made clear first. Then, the legal framework can be reviewed and revised accordingly. Furthermore, the manpower and budget could be more effectively allocated with a clear mandate. The fragmentation of laws is not harmful as long as the laws are not contradictory. Likewise, overlapping duties and power of various governmental agencies can tolerated if there is good inter-agency coordination and cooperation.

Constitutionally, the management of coastal wetlands is the responsibility of the government and should be governed by laws and regulations of various governmental agencies. Basically, wetlands within the protected area system are protected by laws and managed by government. However, wetlands outside protected areas are normally managed by communities or private enterprises. In this connection, Tambol Administrative Organization (TAO) could play an essential role in strengthening local community participation in managing and conserving coastal wetlands. Moreover, the establishment of community-based management also could contribute to the effective coastal wetland management. In this respect, TAO can issue regulations compatible with its needs. Apart from that, local communities can also set the rules as part of the social order within its locality to manage and conserve coastal wetlands.

**4. BIODIVERSITY IN NOTABLE WETLANDS OF THE GULF OF THAILAND**

Literature reviews were carried out for 13 notable wetlands in the Gulf of Thailand. The review further confirmed these 13 wetlands as important habitat for wildlife, particularly globally threatened species as identified by the IUCN Red List. Of the total 48 threatened species (that include 34 species of birds, 7 species of mammals, 3 species of fish and 4 species of vascular plants) of flora and fauna found in these wetlands, three species were classified as critically endangered, 5 species was listed as endangered, 16 species were categorized as vulnerable while 24 species were classified as near threatened.

One wetland site was found to support threatened species of all four IUCN Red List categories and the highest number of threatened species. This was Pak Panang Bay with 19 threatened species of Flora and Fauna (three critically endangered, one endangered, seven vulnerable and eight near threatened species). Khao Sam Roi Yot National Park was found to contain no critically endangered species but, nevertheless, supports 18 other threatened species (two endangered, eight vulnerable and eight near threatened species), and Thale Noi Wildlife Non-hunting Area, where Thailand’s first Ramsar site is located, was found to contain no critically endangered species and endangered species but, nevertheless, supports 16 other threatened species (5 vulnerable and 11 near threatened species).

In addition to accommodating threatened species, these 13 wetlands were found to play an important role in providing shelters and feeding sites for many migratory birds. Up to only 178 migratory bird species were recorded in the wetlands.
The largest number of migratory bird species were recorded in Khao Sam Roi Yot National Park, with 154 species. In addition, 144 species of resident birds and 17 species of birds with both residential and migratory populations, were also found in the national park. Common migratory birds found in the 13 wetlands include Common Kingfisher (*Alcedo atthis*), Barn Swallow (*Hirundo rustica*), Common Sandpiper (*Actitis hypoleucos*) and Chinese Pond Heron (*Ardeola bacchus*). Phru To Daeng Wildlife Sanctuary was identified as the site with the highest number of resident bird species (at least 164 species). Therefore, it could be concluded that each wetland is important for different groups of animal and plant species.

### 4.1.1 Birds

Of the approximately 978 species of birds found in Thailand (Bird Conservation Society, 2004), no less than 486 species were recorded in the 13 wetlands, accounting for 49.69 percent of the total. These include 178 migratory species, 289 resident species and 19 species of partially migrating birds.

Of 486 bird species, 34 species were identified under IUCN Red List. 3 endangered species were identified, which are, Greater Adjutant (*Leptoptilos dubius*) of Khao Sam Roi Yot National Park, Nordmann's Greenshank (*Tringa guttifer*) of Khao Sam Roi Yot National Park, Thale Sap Wildlife Non-hunting Area and Pattani Bay and Black-faced Spoonbill (*Platalea minor*) of Pattani Bay.

Seven species of birds were found distributed in 12 of the 13 wetlands. Five of them, which are Greater Coucal (*Centropus sinensis*), Spotted Dove (*Streptopelia chinensis*), Scarlet-backed Flowerpecker (*Dicaeum cruentatum*), Common Myna (*Acridotheres tristis*) and Large-billed Crow (*Corvus macrorhynchos*) were recorded at every site except Don Hoi Lot, while another two species, Collared Kingfisher (*Halcyon chloris*) and Brahminy Kite (*Haliastur indus*), were documented in all the sites except Phru Kan Tulee.

### 4.1.2 Mammals

Of the approximately 292 mammal species found in the country (OEPP, 2002b), at least 100 species were documented in the wetlands, accounting for 34.24 percent.

Otter Civet (*Cynogale bennetti*) of the Phru To Daeng Wildlife Sanctuary was the only endangered species found, while four other species were identified as vulnerable. These species are Pig-tailed Macaque (*Macaca nemestrina*) which was found in the Phru To Daeng Wildlife Sanctuary, Thung Kha-Savi Bay, Pak Phanang Bay and Phru Kan Tulee; Smooth-coated Otter (*Lutrogale perspicillata*) which was documented at the Thale Noi Wildlife Non-hunting Area, Phru To Daeng Wildlife Sanctuary and Pak Phanang Bay; Stump-tail Macaque (*Macaca arctoides*) of the Mu Koh Chang National Park and Fishing Cat (*Prionailurus viverrinus*) of the Thale Noi Wildlife Non-hunting Area. Two near threatened species were also identified.

From a study of nine sites (Thale Noi Wildlife Non-hunting Area, Mu Koh Chang, Khao Sam Roi Yot National Park, Phru To Daeng Wildlife Sanctuary, Mu Koh Ang Thong National Park, Welu Estuary, Thung Kha-Savi Bay, Pak Phanang Bay and Phru Kan Tulee), Crab-eating Macaque (*Macaca fascicularis*) was identified as the most common found to be present in eight sites with the Mu Koh Chang National Park as the exception.

### 4.1.3 Reptiles

Of the approximately 318 reptile species found in the country (OEPP, 2002b), at least 101 species were documented in the wetlands, accounting for 31.76 percent.

At present, the status of reptiles in Thailand is categorized at national level according to OEPP (1997). 2 endangered species were recorded in the wetlands, including the Green Turtle (*Chelonia mydas*) and Hawksbill turtle (*Eretmochelys imbricata*) which were found in the Mu Koh Ang Thong National Park.

### 4.1.4 Amphibians

Of the approximately 122 amphibian species found in the country (OEPP, 2002b), at least 44 species were documented in the wetlands, accounting for 36.06 percent from a study of nine sites.

At present, the status of amphibians in Thailand is categorized at national level according to the OEPP (1997). Two vulnerable species were recorded in the wetlands.
4.1.5 Fish

Of the approximately 2,279 species of fish found in the country (OEPP, 1997), at least 454 species were documented in the wetlands, accounting for 19.92 percent.

A couple of vulnerable species were recorded in the wetlands, including Zebra Shark (Stegostoma fasciatum) found in the Thung Kha Bay-Savi Bay and Seahorse (Hippocampus kuda) in the Welu River Estuary. Near threatened species include Bluespotted Ribbontail Ray (Taeniura lymana) found in the Mu Koh Ang Thong National Park. Species richness was found to be highest at the Pattani Bay with 215 species.

4.1.6 Plants

Of the approximately 10,000-15,000 vascular plant species (Tree, mangrove plant, aquatic plant) found in the country (Pengklai, 2003), at least 517 species were documented in the wetlands.

All three critically endangered species, Dipterocarpus grandiflorus, Parashorea stellata, Shorea farinosa and one vulnerable species, Shorea leprosula were found in the Pak Phanang Bay whereas the species richness was found to be highest at the Thale Noi Wildlife Non-hunting Area with 260 species.

4.1.7 Seaweed and Seagrasses

Of the approximately 63 species of marine algae found in the country (Lewmanomont and Ogawa, 1995), at least nine species were documented in the wetlands, accounting for 14.28 percent and out of the 12 species of seagrasses found in the country, five species were documented in the Pattani Bay, accounting for 41.66 percent.

4.1.8 Plankton

At least 266 phytoplankton species were recorded in the wetlands including the Welu River Estuary, Ban Don Bay, Khao Sam Roi Yot National Park, Thale Noi Wildlife Non-hunting Area, Phru To Daeng Wildlife Sanctuary, Thung Kha-Savi Bay, Pattani Bay and Pak Phanang Bay. 94 zooplankton species were documented in the Thale Noi Wildlife Non-hunting Area, Pattani, Phru To Daeng Wildlife Sanctuary, Thung Kha-Savi Bay and Pak Phanang Bay.

Phytoplanktons were categorized in seven families which were Cyanophyceae (26 species), Chlorophyceae (83 species), Chrysophyceae (four species), Dictyochophyceae (two species), Euglenophyceae (six species), Bacillariophyceae (120 species), and Dinophyceae (25 species). Species richness of phytoplanktons was found to be highest at the Welu River Estuary with 103 species.

Zooplanktons were classified in 14 phylum which were Protozoa (18 species), Rotifera (13 species), Cnidaria (one species), Ctenophora (one species), Chaetognatha (one species), Bryozoa (one species), Platyzelmintes (one species), Nematoda (one species), Annelida (two species), Arthropoda (36 species), Mollusca (two species), Cirripedia (two species), Echinodermata (three species), and Chordata (three species). Species richness of zooplanktons was found to be highest at the Pak Phanang Bay with 69 species.

4.1.9 Insects

Of the approximately 3,867 insect species found in the country (Hutacharern and Tubtim, 1995), at least 74 species were documented in the wetlands, accounting for 1.91 percent. Species richness of insects was found to be highest at the Thung Kha-Savi Bay with 37 species while the lowest was recorded at the Thale Noi Wildlife Non-hunting Area with 21 species.

Other groups of organisms

Of the approximately 861 decapod (shrimp, lobster and crab) species found in the country (Naiyanetr, 1998), at least 133 species were documented in the wetlands, accounting for 7.66 percent. Species richness of decapods was found to be highest at the Thung Kha-Savi Bay with 78 species.
Of the approximately 534 mollusc (shellfish and squid or cuttlefish) species found in the country (Suvatti, 1938), at least 36 species were documented in the wetlands, accounting for 6.74 percent. Species richness of mollusc was found to be highest at the Pattani Bay with 14 species.

At least 173 benthos species were documented in the wetlands of Pattani Bay, Phru To Daeng Wildlife Sanctuary and at Pak Phanang Bay. Species richness of benthos was found to be highest at the Pattani Bay with 149 species.

At least 61 species of invertebrates were documented in only three wetlands: Don Hoi Lot, Thung Kha-Savi Bay and Pattani Bay. Species richness of benthos was found to be highest at the Pattani Bay with 50 species.

Table 2 illustrates Number of Flora and Fauna Found in each of the 13 Wetlands Identified; Table 3 shows Number of Flora and Fauna Found in 13 Wetlands and Identified as Globally Threatened under IUCN Red List.

Table 4 shows types of Bird Species Found in 13 Wetland sites Identified.
## Table 2
Number of Flora and Fauna Found in each of the 13 Wetlands Identified.

<table>
<thead>
<tr>
<th>No.</th>
<th>Groups</th>
<th>No. of Flora and Fauna</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wetlu River Estuary</td>
<td>74, 36</td>
</tr>
<tr>
<td>1</td>
<td>Birds</td>
<td>18°, 4°</td>
</tr>
<tr>
<td></td>
<td>Ban Don Bay</td>
<td>72°, 46°</td>
</tr>
<tr>
<td></td>
<td>Koh Chang National Park</td>
<td>315°</td>
</tr>
<tr>
<td></td>
<td>Thale Noi Wildlife Non-hunting Area</td>
<td>202°</td>
</tr>
<tr>
<td></td>
<td>Thale sap Wildlife Non-hunting Area</td>
<td>143°</td>
</tr>
<tr>
<td></td>
<td>Prue To Daeng Wildlife Sanctuary</td>
<td>194°</td>
</tr>
<tr>
<td></td>
<td>Mu Koh Ang Thong National Park</td>
<td>53°</td>
</tr>
<tr>
<td></td>
<td>Thung Kha Bia-Sai Bay</td>
<td>115°, 33°</td>
</tr>
<tr>
<td></td>
<td>Pattani Bay</td>
<td>93°</td>
</tr>
<tr>
<td></td>
<td>Pak Phangan Bay</td>
<td>226°, 33°</td>
</tr>
<tr>
<td></td>
<td>Prue Ku Tulee</td>
<td>47°, 486°</td>
</tr>
<tr>
<td>2</td>
<td>Mammal</td>
<td>8°, 1°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>22°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>7°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>14°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>5°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>3°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>3°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>32°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>5°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>3°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>6°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>6°</td>
</tr>
<tr>
<td>3</td>
<td>Reptiles</td>
<td>1°, 1°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>3°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>25°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>29°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>29°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>29°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>29°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>29°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>29°</td>
</tr>
<tr>
<td>4</td>
<td>Amphibians</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>12°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>12°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>12°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>12°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>12°</td>
</tr>
<tr>
<td>5</td>
<td>Fishes</td>
<td>52°, 11°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>3°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>3°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>3°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>3°</td>
</tr>
<tr>
<td>6</td>
<td>Plants</td>
<td>6°, 11°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>39°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>13°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>13°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>13°</td>
</tr>
<tr>
<td>7</td>
<td>Seaweeds and Seagrasses</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Zooplankton</td>
<td>103°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>6°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>6°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>6°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>6°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>6°</td>
</tr>
<tr>
<td>9</td>
<td>Insects</td>
<td>1°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>Decapods (Shrimp, Lobster and Crab)</td>
<td>25°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>12°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>9°</td>
</tr>
<tr>
<td>11</td>
<td>-</td>
<td>20°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>2°</td>
</tr>
<tr>
<td>12</td>
<td>Moluscas (Shellfish and Squids)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>1°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>2°</td>
</tr>
<tr>
<td>13</td>
<td>Benthos</td>
<td>3°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>14</td>
<td>Invertebrates</td>
<td>5°</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Sources of Data:
1. OEPP (1999a)
2. OEPP (1999b)
3. Haochareon et al. (1997)
4. Leangtuwapraneet et al. (1999a)
7. Tancharanukit and Wongrat (1990)
10. OEPP (1999a)
11. OEPP (2000)
13. OEPP (1996b)
14. Leangtuwapraneet et al. (1999a)
15. Leangtuwapraneet et al. (1999b)
17. Atanmas and Jitpukdee (1987)
20. La-onjinsinwong et al. (1997)
22. Akawat (1983)
23. Royal Irrigation Department (1996)
24. Kaeawongtri and Bumruangrat (1997)
25. OEPP (2002a)
26. OEPP (2002a)
### Table 3: Number of Flora and Fauna Found in 13 Wetlands and Identified as Globally Threatened under IUCN Red List.

<table>
<thead>
<tr>
<th>Wetlands</th>
<th>Birds</th>
<th>Mammals</th>
<th>Fish</th>
<th>Plant</th>
<th>Subtotal</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CE</td>
<td>EN</td>
<td>VU</td>
<td>NT</td>
<td>CE</td>
<td>EN</td>
</tr>
<tr>
<td>Welu River Estuary</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Don Hoi Lot</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wetlands in Mu Koh Chang National Park</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ban Don Bay</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wetlands in Khao Sam Roi Yot National Park</td>
<td>-</td>
<td>2</td>
<td>7</td>
<td>8</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Wetlands in Thale Noi Wildlife Non-hunting Area</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Wetlands in Thale Sap Wildlife Non-hunting Area</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Phru To Daeng Wildlife Sanctuary</td>
<td>-</td>
<td>2</td>
<td>7</td>
<td>-</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Wetlands in Mu Koh Ang Thong National Park</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Thung Kha Bay-Savi Bay</td>
<td>-</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Pattani Bay</td>
<td>-</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pak Phanang Bay</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>6</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Phru Kan Tulee</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total of Flora and Fauna for each Group</td>
<td>-</td>
<td>3</td>
<td>10</td>
<td>21</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Total Grand</td>
<td>34</td>
<td>7</td>
<td>3</td>
<td>4</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>

**Remark:**
- CE = Critically Endangered
- EN = Endangered
- VU = Vulnerable
- NT = Near Threatened

Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand
Table 4  Types of Bird Species Found in 13 Wetland sites Identified.

<table>
<thead>
<tr>
<th>Wetlands</th>
<th>Migratory bird (species)</th>
<th>Resident bird (species)</th>
<th>Migratory and Resident bird (species)</th>
<th>Total of Bird species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welu River Estuary</td>
<td>21</td>
<td>48</td>
<td>5</td>
<td>74</td>
</tr>
<tr>
<td>Wetlands in Thale Noi Wildlife Non-hunting Area</td>
<td>60</td>
<td>128</td>
<td>14</td>
<td>202</td>
</tr>
<tr>
<td>Don Hoi Lot</td>
<td>12</td>
<td>6</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>Wetlands in Khao Sam Roi Yot National Park</td>
<td>154</td>
<td>144</td>
<td>17</td>
<td>315</td>
</tr>
<tr>
<td>Wetlands in Mu Koh Chang National Park</td>
<td>10</td>
<td>56</td>
<td>6</td>
<td>72</td>
</tr>
<tr>
<td>Pattani Bay</td>
<td>43</td>
<td>46</td>
<td>4</td>
<td>93</td>
</tr>
<tr>
<td>Wetlands in Thale sap Wildlife Non-hunting Area</td>
<td>63</td>
<td>72</td>
<td>8</td>
<td>143</td>
</tr>
<tr>
<td>Phru To Daeng Wildlife Sanctuary</td>
<td>21</td>
<td>164</td>
<td>9</td>
<td>194</td>
</tr>
<tr>
<td>Wetlands in Mu Koh Ang Thong National Park</td>
<td>13</td>
<td>40</td>
<td>0</td>
<td>53</td>
</tr>
<tr>
<td>Ban Don Bay</td>
<td>12</td>
<td>32</td>
<td>2</td>
<td>46</td>
</tr>
<tr>
<td>Thung Kha Bay-Savi Bay</td>
<td>33</td>
<td>74</td>
<td>8</td>
<td>115</td>
</tr>
<tr>
<td>Pak Phanang Bay</td>
<td>84</td>
<td>127</td>
<td>15</td>
<td>226</td>
</tr>
<tr>
<td>Phru Kan Tulee</td>
<td>6</td>
<td>37</td>
<td>4</td>
<td>47</td>
</tr>
</tbody>
</table>
5. Economic Valuation of Wetlands

5.1 Economic Valuation of Wetlands

The identified wetlands under the UNEP-GEF project area are 13 sites (Table 5). They are Wetlands in Thale Noi Wildlife Non-hunting Area, Don Hoi Lot, Wetland in Khao Sam Roi Yot National Park, Wetland in Mu Koh Chang National Park, Pattani Bay, Wetland in Thale Sap Non-hunting Area, Saiaburi River, Wetland in Phru To Daeng Wildlife Sanctuary, Wetland in Mu Koh Ang Thong National Park, Ban Don Bay, Welu River Estuary, Thung Kha Bay-Savi Bay, Pak Phanang Bay and Phru Kan Tulee.

The main direct use of wetland type “lagoon” is for fishery, aquaculture, agriculture, aquatic plant, water supply, transportation, recreational and tourism purposes, as well as education and research (8% each).

Table 5 Percentage of 13 Wetlands Classified by Type and Direct Use Value.

<table>
<thead>
<tr>
<th>Wetland Type</th>
<th>Fishery</th>
<th>Aquaculture</th>
<th>Agriculture</th>
<th>Aquatic Plant</th>
<th>Fuel wood and Timber</th>
<th>Herbal medicine</th>
<th>Water supply</th>
<th>Transportation</th>
<th>Recreation/Tourism</th>
<th>Education/Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site %</td>
<td>Site %</td>
<td>Site %</td>
<td>Site %</td>
<td>Site %</td>
<td>Site %</td>
<td>Site %</td>
<td>Site %</td>
<td>Site %</td>
<td>Site %</td>
<td>Site %</td>
</tr>
<tr>
<td>Lagoon</td>
<td>1 7.69</td>
<td>1 7.69</td>
<td>1 7.69</td>
<td>1 7.69</td>
<td>0 0</td>
<td>1 7.69</td>
<td>1 7.69</td>
<td>1 7.69</td>
<td>1 7.69</td>
<td>1 7.69</td>
</tr>
<tr>
<td>Tidal Flat</td>
<td>7 53.85</td>
<td>6 46.15</td>
<td>6 46.15</td>
<td>3 23.07</td>
<td>8 61.54</td>
<td>1 7.69</td>
<td>5 38.46</td>
<td>4 30.77</td>
<td>8 61.54</td>
<td>7 53.85</td>
</tr>
<tr>
<td>Peat and swamp</td>
<td>3 23.07</td>
<td>2 15.38</td>
<td>3 23.07</td>
<td>2 15.38</td>
<td>3 23.07</td>
<td>2 15.38</td>
<td>3 23.07</td>
<td>1 0</td>
<td>3 23.07</td>
<td>3 23.07</td>
</tr>
<tr>
<td>Estuary</td>
<td>5 38.46</td>
<td>6 46.15</td>
<td>6 46.15</td>
<td>3 23.07</td>
<td>6 46.15</td>
<td>0 0</td>
<td>5 38.46</td>
<td>4 30.77</td>
<td>6 46.15</td>
<td>6 46.15</td>
</tr>
<tr>
<td>Mangrove</td>
<td>6 46.15</td>
<td>5 38.46</td>
<td>6 46.15</td>
<td>3 23.07</td>
<td>7 53.85</td>
<td>1 7.69</td>
<td>5 38.46</td>
<td>3 23.07</td>
<td>7 53.85</td>
<td>7 53.85</td>
</tr>
<tr>
<td>Others</td>
<td>2 15.38</td>
<td>2 15.38</td>
<td>2 15.38</td>
<td>2 15.38</td>
<td>2 15.38</td>
<td>1 7.69</td>
<td>2 15.38</td>
<td>1 7.69</td>
<td>2 15.38</td>
<td>2 15.38</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>22</td>
<td>24</td>
<td>14</td>
<td>26</td>
<td>5</td>
<td>21</td>
<td>14</td>
<td>27</td>
<td>26</td>
</tr>
</tbody>
</table>

Note: percentage calculated from 13 Wetlands

The main direct use of wetland type “tidal flat” is for recreation and tourism (62%), fuel wood and timber (62%), followed by fishery (54%) as well as education and research (54%), agriculture (46%), water supply (38%), transportation (31%) and aquatic (23%) respectively.

The main direct use of wetland type “peat and swamp” is for fishery, agriculture, fuel wood and timber, water supply, recreation and tourism as well as education and research (23% each).

The main direct use of wetland type “estuary” is for aquaculture, agriculture, fuel wood and timber, recreation and tourism as well as education and research (46% each) followed by fishery and water supply (38% each).

When considering the indirect use of the selected wetlands under the UNEP-GEF, it is found that all wetlands under the project area provide the indirect use value of flood control. The other indirect use values are nutrient retention (85%), groundwater recharge (85%), shoreline stabilization (69%), and salt water intrusion (46%).

5.2 Potential Economic Use of Wetlands under the Project Area

The past and current status of the use of wetlands would be useful to estimate the future potential use on those pieces of wetlands. Based on the available secondary data, a summary of impact causes and effects are formulated. When looking into the impact effects occurred from the use of wetlands, the main effect is the impact to the environment. The past use of wetlands has affected the deterioration of environment and ecosystems. In addition, damage to wildlife and plants were found. Reduction of species of birds and fish were also reported. Forestland degradation was also noticed.

Ecotourism is reported as a future potential use of some wetlands such as wetland in Thale Noi Wildlife Non-hunting Area. Fishery, aquaculture and agricultural activities are found to have future potential utilization in many wetlands such as wetlands in Phru To Daeng Wildlife Sanctuary (Phru To Daeng Swamp Forest). However, the benefits from the economic use of wetlands need to be quantified in order to compete with the alternative options. Pearce and Turner (1990) stated that
given the general, on-going loss of wetlands and the uncertainties surrounding the precise magnitude and significance of wetland services and functions, a comparison between the development benefits for the use of wetlands and the preservation benefits derived from wetland conservation is required. A safe minimum standard rule for this comparison is available.

In conclusion, the past and current use of wetlands in the Gulf of Thailand has produced environmental degradation. Hence, policy related to environmental improvement is required not only for the conservation but also for the preservation of future use. Nevertheless, according to the on-going development projects in this area, a wise or sustainable use of wetlands under the project area must be encouraged.

6. PROPOSED STRATEGIC PLAN FOR WETLAND MANAGEMENT IN THE GULF OF THAILAND

To solve these problems, proposed strategic plan which is consisted of vision, missions, strategic goals, objectives, strategies and measures are needed to be set up as follows;

6.1 Vision

“Wetlands in the Gulf of Thailand were preserved, conserved and rehabilitated by integrated wetland management with participation of all stakeholders, in order to enable sustainable use of the ecosystem”.

6.2 Missions
1. Preserving, conserving and rehabilitating natural resources and environments of wetlands in the Gulf of Thailand.
2. Enabling sustainable utilization of natural resources of wetlands in the Gulf of Thailand in accordance to their carrying capacities.
3. Promoting the responsible agencies in order to reduce conflicts derived from utilization of natural resources in wetlands among stakeholders.

6.3 Strategic goals
1. Formulation of a plan on integrated management of important wetlands with participatory processes.
2. Establishment of responsible agencies and community networks for wetland conservation.
3. Study and Prioritization of wetlands in the Gulf of Thailand in accordance to their potential and conditions.

6.4 Objectives
1. To develop programs to strengthen knowledge and understanding of central and local administration as well as communities on conservation and wise use of wetlands.
2. To promote public participation in planning for preservation, conservation and sustainable utilization of wetlands.
3. To support establishment of responsible agencies and community networks for wetland conservation and utilization.
4. To develop and promote establishment of wetland information center in pilot area to demonstrate, provide training on, and exchange knowledge on wetland management to relevant personnel for further adoption in the field.
5. To revise, assess and re-prioritize different types of wetlands in the Gulf of Thailand, in order to obtain baseline information for administering wetland management.
6. To develop systems for participatory monitoring and assessment of wetland management, with mechanisms for information dissemination.

6.5 Strategies and measures

The above objectives are to be realized with the following 5 strategies.
Strategy 1: Preservation, Conservation and Rehabilitation of Wetland Ecosystem with participation process, consisting of the following measures.

1.1 Formulation of management plans for wetlands of different significance in order to enable effective conservation and wise use: Pilot sites are to be selected to represent each type of wetland in undertaking management actions. These include identification of their actual boundaries and buffer zones, appropriate land–use zoning in the wetlands and adjacent areas and regulating certain potentially problematic activities, like ecotourism, with community participation.

1.2 Promoting traditional management, conservation, rehabilitation and sustainable use of freshwater wetland ecosystems of local communities: Swamp forests have continued to be lost through conversion of the forests into farmlands, sedimentation, and forest fire during dry seasons. To rectify this situation, community operated pilot projects on traditional wetland management would reveal effective and practical means for conservation of the freshwater wetlands. Activities that generate income from appropriate use of wetland resources, are also to be promoted.

1.3 Promoting traditional management, conservation and rehabilitation of coastal wetland ecosystems of local communities: Coastal wetlands, including rocky shores, beaches, mudflats and saltwater lakes, have deteriorated due to the increase in tourists’ waste and wastewater discharge from upstream areas. Development of community operated pilot projects on wetland management and promotion of environmentally sound utilization of wetland resources among coastal communities, are to be implemented to solve this problem.

1.4 Participatory monitoring and inspection of wetland utilization: Wetland protection volunteers are to be organized to monitor, inspect and assess whether wetland conservation is carried out in accordance to the existing policies, measures and plans. The volunteers also will be responsible for coordinating management as well as conducting monitoring and surveillance of potentially harmful activities in the wetlands.

Strategy 2: Building Awareness on Importance and Values of Wetlands. Enhancing knowledge and awareness of the general public and those involved in wetland management from both public and private sector at national and local levels, on value and importance of wetlands is urgently needed. This can be achieved with the following measures.

2.1 Campaigning for better awareness and wider understanding of value and importance of wetlands and necessity of their sustainable use: The campaign is to be conducted with continuous public relations activities at national and local levels. These activities would include publication of newsletters, pamphlets, posters and other user-friendly documents; organizing exhibitions, radio/television programs; producing documentaries and delivering updated news and information through the Internet. Additional campaigning activities are to be organized for the youth, such as slogans, painting and photo competitions and youth camps.

2.2 Establishing natural study centres and providing non-formal education at importance wetlands: Natural study centres, are to be established at a number of important wetlands to enhance capacity in information dissemination to students and interested public. The centres are to be capable of producing their own publications and equipped with several learning facilities such as natural trails, training rooms and exhibition halls. It is also expected that the centres could produce their own experts and conduct public relations activities with local communities.

Strategy 3: Strengthening capacity of institutions and their personnel on conservation and sustainable use of wetlands. With the current involvement on wetland management by various groups including public officials at central and local levels, academics, local communities and NGOs, strengthening of their capacity, including enhancing multi-discipline knowledge on wetlands, is crucial to ensure a common understanding and to reduce conflicts in management. This can be realized with the following measures.
3.1 Promoting creation of networks for exchanging knowledge, news and information between public agencies and communities and between communities themselves: This is to be achieved by informing the public of the government’s policies and plans at both regional and local levels, and through their participation in review and assessment of wetland conservation. Networks for exchanging knowledge on conservation and sustainable use of wetlands among community leaders between those in the same province and between provinces are also to be organized.

3.2 Organizing training courses, meetings and seminars on wetland conservation and regulations related to wetlands: Training is to be provided for public servants at central and local levels, those from private sector and communities, focusing initially on wetlands of international and national importance.

3.3 Develop curricula on wetland management: This includes development of curricula on wetland management for local schools, with the primary aim of enhancing awareness on importance of wetlands. Other associated activities are to be consisted of organizing training and field trips for personnel to build their skills in providing formal and non-formal education on wetlands and in working with public and private organizations (from both central and local level) on wetland management activities. Student and teacher handbooks on wetland conservation are also to be published.

Strategy 4: Building better databases for wetland management with research and studies, consisting of the following measures.

4.1 Promoting and supporting surveys, studies and research on status and utilization of wetlands: These research and studies are aimed to classify and formulate management plans for wetlands in the Gulf of Thailand as well as to prioritize, revise and reorganize geographical information systems (GISs) of the wetlands.

4.2 Gathering ecological and natural resources information of important wetlands in each category: This action, including waterfowl surveys in important wetlands, assessment of fish status, inventories of plant and animal species in important swamp forests and studies of invasive alien species, is to be conducted to review the conservation of each wetland site.

4.3 Conducting feasibility studies on possible revision of existing laws and regulations related to wetland management plans: These studies could reveal more effective means for wetland protection under the exiting administrative frameworks.

4.4 Supporting economic valuation of wetlands: Determination of actual value is to be conducted for wetlands at all levels.

4.5 Promoting establishment of networks among wetland researchers. Networks are to be created to enable exchange of information between organizations involved in wetland management, domestically and internationally. A centre for coordinating database networks may also be established to facilitate information exchange between networks.

Strategy 5: Promoting international cooperation on conservation and sustainable use of wetlands, with the following measures.

5.1 Promoting cooperation with international organizations: This includes exchanging news, information and experience on conservation and sustainable use of wetlands through networks and web sites among groups of countries such as those in South China Sea and Mekong River.

5.2 Promoting national profile on wetland conservation in global forums: National profile on conservation can be enhanced by organizing international seminars, participating in international meetings and arranging field trips overseas.

6.6 Indicators of Success

1. Formulation of conservation and sustainable use plans for at least 5 important wetlands.
2. Substantial dissemination of technical information on wetlands, including inclusion of wetland contents in school curricula.
3. Establishment of at least 5 community networks for conservation and sustainable use of wetlands.
4. Establishment of at least one wetland information center in order to provide systems for monitoring and assessing wetlands in the Gulf of Thailand.
5. Completion of survey, review and assessment of wetlands situation in the Gulf of Thailand
6. Prioritization of wetlands in the Gulf of Thailand and a list of potential inductees in the Ramsar Convention's list of wetlands of international importance (Ramsar site).

6.7 Processes for ensuring successful adoption of the proposed action plan
1. Creating understanding about work plans, measures and projects of the action plan among relevant organisations.
2. Supporting participation of local administrations, such as provincial committees, in implementing activities with communities.
3. The National Committee on Wetland Management, under the National Environment Board, becoming a focal point in making policies on preservation, conservation and utilization of natural resources and environments in wetlands.

REFERENCES
Atanmas, C. and Y. Jitpukdee. n.d. Aquatic Plants in Kookud. Department of Biology. Faculty of Science. Prince of Songkla University. (in Thai)


NATIONAL REPORT

on

Wetlands in South China Sea

VIET NAM

Dr. Mai Trong Nhuan
Focal Point for Wetlands
Viet Nam National University, Hanoi
144, Xuan Thuy road, Cau Giay district
Hanoi, Viet Nam
Table of Contents

1 INTRODUCTION ...............................................................................................................................1

2 COASTAL WETLANDS AND DISTRIBUTION..............................................................................1

  2.1 ESTUARIES ................................................................................................................................1
  2.2 INTER-TIDAL FORESTED WETLANDS .............................................................................................2
  2.3 COASTAL BRACKISH/SALINE LAGOONS ........................................................................................3

3. ECONOMIC EVALUATION OF COASTAL WETLAND SITES ......................................................6

4. THREATS TO COASTAL WETLANDS IN VIET NAM ...................................................................9

  4.1 POPULATION PRESSURE AND POVERTY .......................................................................................9
  4.2 IMPORTS OF ALIEN PLANT VARIETIES AND CONSEQUENCES .........................................................10

5. WETLAND MANAGEMENT ..........................................................................................................11

  5.1 OVERVIEW ON THE WETLAND MANAGEMENT IN VIET NAM ...........................................................11
    5.1.1 Current status of wetland management in Viet Nam ..................................................................11
    5.1.2 Suggestions to enhance wetland management ......................................................................20
  5.2 OVERVIEW OF LEGISLATION SYSTEM FOR WETLAND, MANAGEMENT, UTILIZATION AND CONSERVATION IN VIET NAM .................................................................23
    5.2.1 Evaluation of achievement and limitation of the national legislation system ..................23
    5.2.2 Some general comments on enhancement of the legislation systems for wetland management, utilization and conservation in Viet Nam .........................................................29

REFERENCES ......................................................................................................................................30

List of Tables and Figures

| Table 1 | Area of some estuaries in Viet Nam |
| Table 2 | Surface potentialities of muddy sand flats in Inter-tidal zone (unit:ha) |
| Table 3 | Surface and size of coastal lagoons in Trung Bo |
| Table 4 | Economic evaluation wetland of Bach Dang Estuary |
| Table 5 | Economic evaluation wetland of Van Uc Estuary |
| Table 6 | Economic evaluation wetland of Balat Estuary |
| Table 7 | Economic evaluation wetland of Day Estuary (Kim Son Tidal Flat) |
| Table 8 | Economic evaluation wetland of Tam Giang – Cau Hai Lagoon |
| Table 9 | Economic evaluation wetland of Thi Nai Lagoon |
| Table 10 | Economic evaluation wetland of Tien Estuary |
| Table 11 | Economic evaluation wetland of Southwest Ca Mau Tidal Flat |
| Table 12 | Inventory, assessment of threats to agricultural land in coastal regions and north-eastern islands in Viet Nam |
| Table 13 | Prediction of potential consequences when agricultural land is lost or replaced |

| Figure 1 | Area and distribution of coastal lagoons in the central Viet Nam |
| Figure 2 | Institutional framework of Viet Nam wetland management |
1 INTRODUCTION

Viet Nam is situated in a central position within the Southeast Asia region. Mainland Viet Nam is located between the latitudes of 23°22’N in the Dong Van Highlands (Lung Cu Commune, Ha Giang Province) and 8°37’30” N in the Ca Mau Cape; longitudinally from 102°10’E at Mount Pulasan (A Pa Chai Commune, Lai Chau Province) and 109°24’E at the Hon Gom Peninsula (Khanh Hoa Province). The coastal coordinates have not been precisely determined because there still have been no officially agreed and ratified agreements between the countries lying around the East Sea (South China Sea). The mainland surface area is approximately 330,991km², while the territorial waters and economic executive zones cover an area of approximately 1,000,000km².

2 COASTAL WETLANDS AND DISTRIBUTION

2.1 Estuaries

Estuarine areas are widely distributed throughout the coastline of Viet Nam from the north to the south, and include more than 100 large river estuaries. On average, for every 20km of coastline there is an estuary (Table 1). They are dynamic entities, continually changing and differing from one another in their nature and evolutionary pathways.

The characteristics distinguishing estuarine areas from coastal zones are the prevailing geomorphologic processes at work. The formation of estuarine areas relies upon interaction between sea and river activities. The hydrologic system and the water quality change seasonally, correlating with the volume of river water. The geographical limits which determine the extent and size of the estuary are determined by a variety of criteria, the two most important are: The upper limit of the estuarine area, which correlates to the highest monthly average tide level in the year; The lower limit, defined as that part of the continental shelf which during the lowest tide is submerged to a depth no greater than 6m (according to the salinity the width is greater, but the depth is also 6m).

Table 1 Area of some estuaries in Viet Nam.

<table>
<thead>
<tr>
<th>Zone</th>
<th>Name of estuary</th>
<th>Area</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast Bac Bo</td>
<td>Bach Dang Estuary</td>
<td>80.358 ha</td>
<td>(Nguyen Duc Cu, 1996)</td>
</tr>
<tr>
<td></td>
<td>Tien Yen - Ba Che Estuary</td>
<td>31.268 ha</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dam Ha - Ha Coi Estuary</td>
<td>42.971 ha</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ha Long Estuary</td>
<td>10.707 ha</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total square of river mouths</td>
<td>197.238 ha</td>
<td></td>
</tr>
<tr>
<td>Bac Bo Delta Plain</td>
<td>Thai Binh River mouth</td>
<td>17.000 ha</td>
<td>(Le Dien Duc,1998)</td>
</tr>
<tr>
<td></td>
<td>Red River mouth</td>
<td>100.000 ha</td>
<td></td>
</tr>
<tr>
<td>Estuary in coastal Trung Bo region</td>
<td></td>
<td>125.000 ha</td>
<td>(Nguyen Chi Thanh, 2003)</td>
</tr>
<tr>
<td>Dong Nai Estuary</td>
<td>10.000 – tidal flat;</td>
<td>75.000 ha -</td>
<td>(Nguyen Chi Thanh,</td>
</tr>
<tr>
<td></td>
<td>coastal tidal flat</td>
<td>coastal tidal flat</td>
<td>2003)</td>
</tr>
<tr>
<td>West Nam Bo regions</td>
<td></td>
<td>899.251 ha</td>
<td></td>
</tr>
</tbody>
</table>

Estuarine areas and coastal tidal flats of the Red River system extend from Do Son to Lach Truong for about 145km. This width of the system identified from the national dyke to the line of mean sea level can reach 15km at Ba Lat, but 500m at the Van Ly Shore. The total area of the tidal flat is 452,000ha, of which there are 188,000ha (41.6%) of the high tidal flats and a further 264,000ha (58,4%) of low tidal flats (Nguyen Chu Hoi et al., 1996).

Estuarine areas and coastal tidal flats of the Mekong System: The estuary of the Mekong River is the largest deltaic estuary in the country. It extends along the coast from the Dong River Estuary to the Long Phu area; a distance of is about 200km. The total area of the natural tidal zone is about 600,000–800,000ha, of which 70 – 80% are high tidal flats, with the remainder low tidal flats.

An important feature of the Mekong Estuarine area is its natural development despite the absence of a sea dyke separating the rice fields from the sea. During the rainy season the estuarine area extends its area 40 – 60km², across the rice plains, flooding the area for 4 - 5 months/year and for 7 - 8 months/year, 20 - 30km².
Estuarine areas and coastal tidal flats of central Viet Nam are a section of coast line characterised by short and steep river systems, and lies within the shore zone influenced by tectonic uplifting. As a result, the surface areas of deltas are small. The Ma River and Ca River Estuaries have rather high tidal amplitude of 2.8 - 3.6m, and a non-uniform daily tidal system that forms a rather large tidal flat. The surface area of the Ma River estuarine tidal flat is about 2,000 – 3,000ha, and for the Ca River about 1,000 – 2,000ha.

Funnel-shaped estuarine areas
These areas are funnel-shaped in morphology and develop contrary to the processes of accumulation-erosion to form deltaic estuarine types. Funnel-shaped estuarine areas tend to encroach toward the mainland. Throughout Viet Nam the following typical funnel-shaped estuarine areas can be found.

East Bac Bo funnel-shaped estuarine area and coastal tidal flats include small estuarine and tidal zones that extend from Mong Cai to Yen Lap along the East Bac Bo coast (Cua Luc, Tien Yen, Ha Coi and Ka Long). The total area of high tidal flats occupies approximately 40,000ha and well-developed mangrove forests found there are believed to be the best intact examples in the North coast. The total surface of the low tidal flats is about 20,000ha.

Funnel-shaped estuarine area and coastal tidal flats of the Bach Dang River lies to the north of the Red River Deltaic Estuary, extending from Do Son Township to Yen Lap and including Pha Lai - Ben Trieu. The submerged shore zone extends from the basic shoreline to a depth of 10m and runs from seaward of Hon Dau Island to southwest of Cat Ba Island.

The Thai Binh River system flows into an area that includes both the Lach Tray and Cua Cam Estuaries. The total area of this estuary is approximately 95,000ha including high tidal flat with mangrove forest, low tidal flat without mangrove forest and the submerged tidal zone.

Funnel-shaped estuarine area and coastal tidal flats of the Dong Nai River (East Nam Bo Region) is the largest funnel-shaped estuarine area in the country, having a total estuarine area of about 120,000ha. Of this area, 75,000ha consist of high tidal flat with mangrove forest, low tidal flat without mangrove forest and the remaining 35,000ha, is a dense tidal channel network.

Estuarine areas in lagoons
The tidal estuarine areas between the cities of Hue and Nha Trang influence considerably the ecological environment of coastal lagoons. The size of the estuarine tidal flats depends on the height of water within the lagoon when it is closed or upon the tidal amplitude of the sea when it is open.

2.2 Inter-tidal forested wetlands
These wetlands are distributed in almost all lowland areas of the Mekong River plain (and, before 1940, within small marshlands of the Red River delta), and in a small number of other locations. According to national surveys up to the year 2001, the area of mangrove forest in Viet Nam is only 155,200ha. Statistical data in 1995 showed that the Province of West Nam Bo has the highest potential area of muddy sand flats in inter-tidal zone (Table 2).

In his Doctoral Thesis of Phan Nguyen Hong (1995) divided the mangrove forests in Viet Nam into 4 main regions:

- Northeast Coast (from Mong Cai to Do Son Cape). Formerly, along this section of coast the mangrove forests were rather well developed, especially in the north where there were large tracts of land with a variety of mangrove species, including: Mangrove (Rhizophora stylosa), Bruguiera (Bruguiera gymnorhira), Candelia candel, and Aegyceras (Aegyceras corniculatum). At present, the mangrove forest has been severely degraded by excessive exploitation and in some places only small trees or shrubs still exist. In some locations, the mangrove forest has been replanted; but recently it has been destroyed for construction of shrimp-culture lakes.

- Coastal area of the Bac Bo Plain (from Do Son Cape to Lach Truong). Mangrove forests have only occurred in estuaries (Kien Thuy, Tien Lang - Hai Phong) with brackish-water trees, such as Cypress (Sonneratia casuarinensis). In this region exclusively mangrove forests have been planted to protect sea dykes (Thai Thuy, Tien Hai - Thai Binh and Xuan Thuy - Nam Dinh). During recent years, much forest area has been destroyed for the construction of aquaculture lakes.
Table 2  Surface potentialities of muddy sand flats in Inter-tidal zone (unit:ha).

<table>
<thead>
<tr>
<th>No</th>
<th>Locality</th>
<th>Potential</th>
<th>Potential square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bac Bo Provinces</td>
<td>84.502</td>
<td>49.100</td>
</tr>
<tr>
<td>2</td>
<td>Quang Ninh</td>
<td>28.000</td>
<td>20.00</td>
</tr>
<tr>
<td>3</td>
<td>Hai Phong</td>
<td>13.000</td>
<td>11.400</td>
</tr>
<tr>
<td>4</td>
<td>Thai Binh</td>
<td>15.252</td>
<td>6.270</td>
</tr>
<tr>
<td>5</td>
<td>Nam Ha</td>
<td>22.650</td>
<td>8.570</td>
</tr>
<tr>
<td>6</td>
<td>Ninh Binh</td>
<td>5.600</td>
<td>2.860</td>
</tr>
<tr>
<td>7</td>
<td>Trung Bo Provinces</td>
<td>33.155</td>
<td>19.714</td>
</tr>
<tr>
<td>8</td>
<td>Thanh Hoa</td>
<td>11.996</td>
<td>7.990</td>
</tr>
<tr>
<td>9</td>
<td>Nghe An</td>
<td>3.974</td>
<td>1.974</td>
</tr>
<tr>
<td>10</td>
<td>Ha Tinh</td>
<td>9.000</td>
<td>6.337</td>
</tr>
<tr>
<td>11</td>
<td>Thai Binh</td>
<td>15.252</td>
<td>6.270</td>
</tr>
<tr>
<td>12</td>
<td>Nam Ha</td>
<td>22.650</td>
<td>8.570</td>
</tr>
<tr>
<td>13</td>
<td>Ninh Binh</td>
<td>5.600</td>
<td>2.860</td>
</tr>
<tr>
<td>14</td>
<td>Trung Bo Provinces</td>
<td>33.155</td>
<td>19.714</td>
</tr>
<tr>
<td>15</td>
<td>Thanh Hoa</td>
<td>11.996</td>
<td>7.990</td>
</tr>
<tr>
<td>16</td>
<td>Nghe An</td>
<td>3.974</td>
<td>1.974</td>
</tr>
<tr>
<td>17</td>
<td>Ha Tinh</td>
<td>9.000</td>
<td>6.337</td>
</tr>
<tr>
<td>18</td>
<td>Thai Binh</td>
<td>15.252</td>
<td>6.270</td>
</tr>
<tr>
<td>19</td>
<td>Nam Ha</td>
<td>22.650</td>
<td>8.570</td>
</tr>
<tr>
<td>20</td>
<td>Ninh Binh</td>
<td>5.600</td>
<td>2.860</td>
</tr>
<tr>
<td>21</td>
<td>Trung Bo Provinces</td>
<td>33.155</td>
<td>19.714</td>
</tr>
<tr>
<td>22</td>
<td>Thanh Hoa</td>
<td>11.996</td>
<td>7.990</td>
</tr>
<tr>
<td>23</td>
<td>Nghe An</td>
<td>3.974</td>
<td>1.974</td>
</tr>
<tr>
<td>24</td>
<td>Ha Tinh</td>
<td>9.000</td>
<td>6.337</td>
</tr>
<tr>
<td>25</td>
<td>Thai Binh</td>
<td>15.252</td>
<td>6.270</td>
</tr>
<tr>
<td>26</td>
<td>Nam Ha</td>
<td>22.650</td>
<td>8.570</td>
</tr>
<tr>
<td>27</td>
<td>Ninh Binh</td>
<td>5.600</td>
<td>2.860</td>
</tr>
<tr>
<td>28</td>
<td>Trung Bo Provinces</td>
<td>33.155</td>
<td>19.714</td>
</tr>
</tbody>
</table>

Coastal area of central Viet Nam (from Lach Truong to Vung Tau). In general, natural conditions here are unfavourable for the development of mangrove forests. Along the coast there are no mangrove forests, other than within estuarine areas, on some peninsulas (Cam Ranh, Quy Nhon) or on some salt-water lakes, such as Lang Co and others.

Nam Bo Coast (from Vung Tau to Ha Tien). In this region the mangrove forests are well developed with an abundant variety of species and large tree sizes (some of which reach 30 - 40 m high). Previous exploitation of this area has been at a tolerable level. Almost all mangrove species of South East Asia exist here with the most widespread being: Bruguiera (*Bruguiera cylindrica*), Mangrove (*Rhizophora apiculata*), White Avicenne (*Avicennia alba*), Avicenne (*A. officinalis*), White cypress (*Sonneratia alba*), Cypress (*S. ovata*), closer to the mainland Sour cypress (*S. caseolaris*), Nipa (*Nypa fruticans*) and other species of brackish-water environments. In some places Nipas grow or are planted in large fields.

### 2.3 Coastal brackish/saline lagoons

A lagoon is a body of water separated from the sea by a barrier (sand bar or coral reef) and opened to the sea by one or more entrances.

In Viet Nam, typical coastal lagoons are concentrated along the coastline of central Viet Nam and extend from Thua Thien Hue to Ninh Thuan. This stretch of coastline includes 12 lagoons, resulting in a density of one lagoon per 50 km of shoreline.

Lagoon and wetland types are of a variety of different sizes (Table 3), depending on the prevailing hydrologic system, regional geography and geology. The Tam Giang - Cau Hai Lagoon system constitutes an area of approximately 216 km², the smallest is the Nuoc Man Lagoon at Quang Ngai Province (2.8 km²), and the remainder have an average area of between 15 - 30 km² (Table 3). If one excludes the sand barriers located on the outside of lagoons, the total area of the 12 coastal lagoons of central Viet Nam coast is about 447.7 km² (Figure 1).
Table 3  Surface and size of coastal lagoons in Trung Bo.

<table>
<thead>
<tr>
<th>Lagoon</th>
<th>Geographic coordination</th>
<th>Square (km²)</th>
<th>Size (km)</th>
<th>Shape (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Length</td>
<td>Width</td>
</tr>
<tr>
<td>Tam Giang - Cau Hai</td>
<td>16°16' - 16°43' N 107°19' - 107°55' E</td>
<td>216</td>
<td>68</td>
<td>2-10</td>
</tr>
<tr>
<td>Lang Co</td>
<td>16°12' - 16°16' N 108°01' - 108°3 E</td>
<td>16</td>
<td>6,1</td>
<td>4</td>
</tr>
<tr>
<td>Truong Giang</td>
<td>15°25' - 15°33' N 108°01' - 108°05' E</td>
<td>36,9</td>
<td>14,7</td>
<td>4</td>
</tr>
<tr>
<td>An Khe</td>
<td>14°42' - 14°44' N 109°03' - 109°00' E</td>
<td>3,5</td>
<td>2,9</td>
<td>1,1</td>
</tr>
<tr>
<td>Nuoc Man</td>
<td>14°17' - 14°42' N 109°03' - 109°12' E</td>
<td>2,8</td>
<td>2,3</td>
<td>1,2</td>
</tr>
<tr>
<td>Tra O</td>
<td>14°17' - 14°14' N 109°14' - 109°08' E</td>
<td>14,4</td>
<td>6,2</td>
<td>2,1</td>
</tr>
<tr>
<td>Nuoc Ngot</td>
<td>14°10' - 14°14' N 109°09' - 109°12' E</td>
<td>26,5</td>
<td>8,5</td>
<td>3,1</td>
</tr>
<tr>
<td>Thi Nai</td>
<td>13°44' - 13°55' N 109°12' - 109°19' E</td>
<td>50</td>
<td>15,6</td>
<td>3,9</td>
</tr>
<tr>
<td>Cu Mong</td>
<td>13°13' - 13°38' N 109°12' - 109°19' E</td>
<td>30,2</td>
<td>17,6</td>
<td>2,2</td>
</tr>
<tr>
<td>O Loan</td>
<td>13°13' - 13°38' N 109°15' - 109°23' E</td>
<td>18</td>
<td>9,3</td>
<td>1,9</td>
</tr>
<tr>
<td>Thuy Trieu</td>
<td>12°41' - 12°47' N 109°19' - 109°23' E</td>
<td>25,5</td>
<td>17,5</td>
<td>3</td>
</tr>
<tr>
<td>Nai</td>
<td>12°16' - 12°27' N 109°09' - 109°17' E</td>
<td>8</td>
<td>6</td>
<td>3,5</td>
</tr>
</tbody>
</table>

Source: Dang Trung Thuan (2000) – Study on the Tra O Swamp wetland area with the aim to restore the aquatic product resource and sustainable development of the area around lagoon.
Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand
3. ECONOMIC EVALUATION OF COASTAL WETLAND SITES

The methods used for economic evaluation of certain Viet Nam coastal sites were selected based on an assessment of site characteristics and considering global practice. This is the first time that this approach has been used in Viet Nam for economic evaluation on selected wetland sites (Bach Dang Estuary - Table 4; Van Uc Estuary - Table 5; Ba Lat Estuary - Table 6; Kim Son Tidal Flat - Table 7; Tam Giang - Cau Hai Lagoon - Table 8; Thi Nai Lagoon - Table 9; Tien Estuary - Table 10; Southeast Ca Mau Tidal Flat - Table 11) in Viet Nam. The economic evaluation results for each demonstrated site are presented in the tables below:

Table 4  Economic evaluation wetland of Bach Dang Estuary.

<table>
<thead>
<tr>
<th>Direct value</th>
<th>Low value</th>
<th>High value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated value (VND)</td>
<td>Estimated value (VND)</td>
</tr>
<tr>
<td>Timber</td>
<td>65,840</td>
<td>74,500</td>
</tr>
<tr>
<td>Fuelwood</td>
<td>28,000</td>
<td>32,500</td>
</tr>
<tr>
<td>Indirect value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquaculture</td>
<td>5,625,000</td>
<td>6,432,000</td>
</tr>
<tr>
<td>Marine product collection**</td>
<td>850,000</td>
<td>1,150,000</td>
</tr>
<tr>
<td>Medicinal plants</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Tourism</td>
<td>12,400</td>
<td>15,600</td>
</tr>
<tr>
<td>Environmental value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stabilizing micro-climate, improving air quality, water quality, preventing the site from storm surge, etc.</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Total Economic Value (+) (per ha)</td>
<td>6,581,240</td>
<td>7,704,600</td>
</tr>
</tbody>
</table>

Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand
Table 5  Economic evaluation wetland of Van Uc Estuary.

<table>
<thead>
<tr>
<th></th>
<th>Low value</th>
<th></th>
<th>High value</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated value (VND)</td>
<td>Estimated value (VND)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>in USD*</td>
<td>Estimated value (VND)</td>
<td>in USD*</td>
<td></td>
</tr>
<tr>
<td>Timber</td>
<td>85,250</td>
<td>5.57</td>
<td>92,450</td>
<td>6.04</td>
</tr>
<tr>
<td>Fuelwood</td>
<td>46,500</td>
<td>3.04</td>
<td>52,400</td>
<td>3.42</td>
</tr>
<tr>
<td>Indirect value</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquaculture</td>
<td>8,530,000</td>
<td>557.52</td>
<td>9,520,000</td>
<td>622.22</td>
</tr>
<tr>
<td>Marine product collection**</td>
<td>1,564,000</td>
<td>102.22</td>
<td>1,645,000</td>
<td>107.52</td>
</tr>
<tr>
<td>Medicinal plants</td>
<td>14,200</td>
<td>0.93</td>
<td>15,600</td>
<td>1.02</td>
</tr>
<tr>
<td>Tourism</td>
<td>9,800</td>
<td>0.64</td>
<td>11,200</td>
<td>0.73</td>
</tr>
<tr>
<td>Environmental value</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stabilizing micro-climate, improving air quality, water quality, preventing the site from storm surge, etc.</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Total Economic Value (+) (per ha)</td>
<td>10,249,750</td>
<td>669.92</td>
<td>11,336,650</td>
<td>740.96</td>
</tr>
</tbody>
</table>

Table 6  Economic evaluation wetland of Balat Estuary.

<table>
<thead>
<tr>
<th></th>
<th>Low value</th>
<th></th>
<th>High value</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated value (VND)</td>
<td>Estimated value (VND)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>in USD*</td>
<td>Estimated value (VND)</td>
<td>in USD*</td>
<td></td>
</tr>
<tr>
<td>Timber</td>
<td>103,620</td>
<td>6.77</td>
<td>108,200</td>
<td>7.07</td>
</tr>
<tr>
<td>Fuelwood</td>
<td>82,500</td>
<td>5.39</td>
<td>86,400</td>
<td>5.65</td>
</tr>
<tr>
<td>Indirect value</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquaculture</td>
<td>13,500,000</td>
<td>882.35</td>
<td>15,000,000</td>
<td>980.39</td>
</tr>
<tr>
<td>Marine product collection**</td>
<td>2,640,000</td>
<td>172.55</td>
<td>2,860,000</td>
<td>186.93</td>
</tr>
<tr>
<td>Honey</td>
<td>112,000</td>
<td>7.32</td>
<td>132,000</td>
<td>8.63</td>
</tr>
<tr>
<td>Medicinal plants</td>
<td>15,600</td>
<td>1.02</td>
<td>18,500</td>
<td>1.21</td>
</tr>
<tr>
<td>Tourism</td>
<td>12,000</td>
<td>0.78</td>
<td>15,000</td>
<td>0.98</td>
</tr>
<tr>
<td>Environmental value</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stabilizing micro-climate, improving air quality, water quality, preventing the site from storm surge, etc.</td>
<td>15,100,000</td>
<td>986.93</td>
<td>16,400,000</td>
<td>1,071.90</td>
</tr>
<tr>
<td>Total Economic Value (+) (per ha)</td>
<td>31,565,720</td>
<td>2,063.12</td>
<td>34,620,100</td>
<td>2,262.75</td>
</tr>
</tbody>
</table>

Table 7  Economic evaluation wetland of Day Estuary (Kim Son Tidal Flat).

<table>
<thead>
<tr>
<th></th>
<th>Low value</th>
<th></th>
<th>High value</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated value (VND)</td>
<td>Estimated value (VND)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>in USD*</td>
<td>Estimated value (VND)</td>
<td>in USD*</td>
<td></td>
</tr>
<tr>
<td>Timber</td>
<td>105,200</td>
<td>6.88</td>
<td>112,400</td>
<td>7.35</td>
</tr>
<tr>
<td>Fuelwood</td>
<td>74,500</td>
<td>4.87</td>
<td>80,420</td>
<td>5.26</td>
</tr>
<tr>
<td>Indirect value</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquaculture</td>
<td>10,560,000</td>
<td>690.20</td>
<td>11,260,000</td>
<td>735.95</td>
</tr>
<tr>
<td>Marine product collection**</td>
<td>1,256,000</td>
<td>82.09</td>
<td>1,450,000</td>
<td>94.77</td>
</tr>
<tr>
<td>Medicinal plants</td>
<td>12,500</td>
<td>0.82</td>
<td>13,500</td>
<td>0.88</td>
</tr>
<tr>
<td>Tourism</td>
<td>14,500</td>
<td>0.95</td>
<td>16,400</td>
<td>1.07</td>
</tr>
<tr>
<td>Environmental value</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stabilizing micro-climate improving air quality, water quality, preventing the site from storm surge, etc.</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Total Economic Value (+) (per ha)</td>
<td>12,022,700</td>
<td>785.80</td>
<td>12,932,720</td>
<td>845.28</td>
</tr>
</tbody>
</table>
### Table 8 Economic evaluation wetland of Tam Giang – Cau Hai Lagoon.

<table>
<thead>
<tr>
<th>Direct value</th>
<th>Low value</th>
<th>High value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated value (VND)</td>
<td>Estimated value (VND)</td>
</tr>
<tr>
<td></td>
<td>in USD*</td>
<td>in USD*</td>
</tr>
<tr>
<td>Timber</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Fuelwood</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Indirect value</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquaculture</td>
<td>16,850,000</td>
<td>1,101.31</td>
</tr>
<tr>
<td>Fishing</td>
<td>14,260,000</td>
<td>932.03</td>
</tr>
<tr>
<td>Marine product collection**</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Tourism</td>
<td>15,200</td>
<td>0.99</td>
</tr>
<tr>
<td><strong>Environmental value</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stabilizing micro-climate, improving air quality, water quality, preventing the site from storm surge, etc.</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Total Economic Value (+) (per ha)</strong></td>
<td>31,125,200</td>
<td>2,034.33</td>
</tr>
<tr>
<td>Estimated TEV</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

### Table 9 Economic evaluation wetland of Thi Nai Lagoon.

<table>
<thead>
<tr>
<th>Direct value</th>
<th>Low value</th>
<th>High value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated value (VND)</td>
<td>Estimated value (VND)</td>
</tr>
<tr>
<td></td>
<td>in USD*</td>
<td>in USD*</td>
</tr>
<tr>
<td>Timber</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Fuelwood</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Indirect value</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquaculture</td>
<td>8,452,000</td>
<td>552.42</td>
</tr>
<tr>
<td>Organized Fishing</td>
<td>5,200,000</td>
<td>339.87</td>
</tr>
<tr>
<td>Marine product collection**</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Tourism</td>
<td>16,450</td>
<td>1.08</td>
</tr>
<tr>
<td><strong>Environmental value</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stabilizing micro-climate, improving air quality, water quality, preventing the site from storm surge, etc.</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Total Economic Value (+) (per ha)</strong></td>
<td>13,668,450</td>
<td>893.36</td>
</tr>
<tr>
<td>Estimated TEV</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

### Table 10 Economic evaluation wetland of Tien Estuary.

<table>
<thead>
<tr>
<th>Direct value</th>
<th>Low value</th>
<th>High value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated value (VND)</td>
<td>Estimated value (VND)</td>
</tr>
<tr>
<td></td>
<td>in USD*</td>
<td>in USD*</td>
</tr>
<tr>
<td>Timber</td>
<td>145,600</td>
<td>9.52</td>
</tr>
<tr>
<td>Fuelwood</td>
<td>86,500</td>
<td>5.65</td>
</tr>
<tr>
<td>Coal</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Indirect value</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquaculture</td>
<td>21,450,000</td>
<td>1,401.96</td>
</tr>
<tr>
<td>Organized fishing</td>
<td>16,500,000</td>
<td>1,078.43</td>
</tr>
<tr>
<td>Marine product collection**</td>
<td>4,850,000</td>
<td>316.99</td>
</tr>
<tr>
<td>Tourism</td>
<td>160,000</td>
<td>10.46</td>
</tr>
<tr>
<td><strong>Environmental value</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stabilizing micro-climate, improving air quality, water quality, preventing the site from storm surge, etc.</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Total Economic Value (+) (per ha basis)</strong></td>
<td>43,192,100</td>
<td>2,823.01</td>
</tr>
</tbody>
</table>
Table 11  Economic evaluation wetland of Southwest Ca Mau Tidal Flat.

<table>
<thead>
<tr>
<th></th>
<th>Low value</th>
<th></th>
<th>High value</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated</td>
<td>in USD*</td>
<td>Estimated</td>
<td>in USD*</td>
</tr>
<tr>
<td>Direct value</td>
<td>value (VND)</td>
<td></td>
<td>value (VND)</td>
<td></td>
</tr>
<tr>
<td>Timber</td>
<td>123,500</td>
<td>8.07</td>
<td>138,800</td>
<td>9.07</td>
</tr>
<tr>
<td>Fuelwood</td>
<td>124,300</td>
<td>8.12</td>
<td>145,000</td>
<td>9.48</td>
</tr>
<tr>
<td>Coal</td>
<td>56,200</td>
<td>3.67</td>
<td>75,000</td>
<td>4.90</td>
</tr>
<tr>
<td>Indirect value</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquaculture</td>
<td>19,394,000</td>
<td>1,267.58</td>
<td>22,459,000</td>
<td>1,467.91</td>
</tr>
<tr>
<td>Organized fishing</td>
<td>28,485,000</td>
<td>1,861.76</td>
<td>32,031,000</td>
<td>2,093.53</td>
</tr>
<tr>
<td>Marine product collection**</td>
<td>9,495,000</td>
<td>620.59</td>
<td>12,677,000</td>
<td>828.56</td>
</tr>
<tr>
<td>Tourism</td>
<td>2,456,000</td>
<td>160.52</td>
<td>2,761,000</td>
<td>180.46</td>
</tr>
<tr>
<td>Environmental value</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Source: Adapted from Dang Trung Tan (2000).

Note: * unorganised fishing and marine product collection conducted by household members occasionally or seasonally.
(+*) TEV is estimated on the basis of total area of the identified wetland site.
n/a: not available.

4. THREATS TO COASTAL WETLANDS IN VIET NAM

4.1 Population pressure and poverty

Population growth creates increasing pressure on natural resources, both in the Red River and Mekong Deltas, and in some delta wetland areas suitable for agriculture.

A growing population demands increased production and processing of resources, which discharge a great volume of wastes, including toxic substances, into the environment.

The impact of population growth on natural resources is also reflected in the process of product consumption that results in the disposal of many artificial materials such as packages, cans, waste food, broken appliances, and so on, into the environment.

Interaction between humans and the natural environment is also evident in the process of distribution and circulation of products. In addition to environmental pollution at the production and consumption locations, the environment is also gravely threatened with degradation by the circulation, transport and distribution processes of materials collected from the natural environment.

The population in Nghia Hung District, Nam Dinh Province continues to grow and is causing increasing pressure on marine resources. The average agrarian land area per labourer for communes in Nghia Hung District is 25.3sq.m. This area is sufficient to sustain food production, but not for economic development. Another adverse trend is that farmland is shrinking due to rapid population growth and changes in the use of land, so that people cannot rely on agriculture to improve their life.

Since the moved towards a market economy, coastal economic regions have found that aquaculture and aquatic products can be successfully exploited for export. There has been widespread strong development of shrimp culture swamps since the late 80s, plus the spreading of enclosing nets along the coastal regions in the Red River Delta since the middle of the 1990s. Thousands of hectares of mangrove-forest have been destroyed and hundreds of hectares of tidal flats dug up, and contaminated, with disastrous effect on the natural processes of the mangrove forest ecosystem. Especially, irregular land sales, have given rise to fractious disputes over ownership so that resources management becomes even more complex.
Aquaculture and fishing activities are highly attractive because the market demand for marine products is growing. According to one survey, the average income for a labourer from aquaculture and natural resources exploitation is the highest amongst occupations in the locality (income is VND30,000-50,000/capita/day). At present, a large and growing number of people in a district participate in aquaculture, resources development and other relevant activities (such as procurement, transport and constructing swamps service).

Hence, the demographics as expressed through the economic system range of activities (natural resources development, production, processing the materials into products, then distribution, consumption) affect the environment greatly. In each stage of the production cycle, people dispose wastes into the environment. Waste disposal becomes an environmental problem, especially as toxicity increases along with the industrialization process.

4.2 Imports of alien plant varieties and consequences

Up until 2002, 114 alien aquatic species have been imported into Viet Nam, of which ten were brackish fishes, five were shrimps and sea crustaceans, four molluscs, 15 salt water algae. In general, this has increased Viet Nam's aquatic product output, but there are negative effects on local gene fund preservation.

Polygamy leads to a decrease in pure bred local animal communities
- Import of animals is likely to introduce some diseases
- Import of many new varieties may threaten local varieties already at risk.
- Invasion by alien botanical species may threaten local fauna and flora communities. For instance, in the Mekong delta plain, penetration by *Eichhornia crassipes* forms thick mats on the water surface, preventing light from penetrating underwater, competing with most other aquatic plants, and choking rivers and canals.

In 1980s, *Mimosa pigra* seeds were carried by the Mekong from Thailand to Viet Nam where they dispersed broadly in agricultural land areas and became a danger because they could stand long flood conditions, they developed strongly, overcoming common crops and the natural weed food of some rare wild animals, and also inhibited the water supply systems of the agricultural land areas. Yellow snails *Pomacea sp.*, shortly after being imported into Viet Nam, created a plague, causing serious destruction of paddy fields in many agrarian places, including brackish areas.

*Lack of knowledge and awareness of people*

Although Viet Nam’s government issued Decree no. 109/2003/ND dated 23/9/2003 regarding preservation and sustainability of agricultural land, in reality, competent agencies do not have sufficient resources to implement the decree, and few people are aware of the new decree’s content. Thus agricultural land in general, and coastal, riverside agricultural land in particular, remain under much economic, and population pressure and are exposed to potential threats.

Based on survey, statistics, and assessments of major threats to coastal tidal agricultural land, Nguyen Duc Cu (1997) has ranged of the level of threats in a raking from 1 to 15 and determined the influence of the threats for each study area (Table 12). In addition, the war effect (toxic chemicals and bombs) is still also considered as one of the main threats to the coastal wetland.

### Table 12 Inventory, assessment of threats to agricultural land in coastal regions and north-eastern islands in Viet Nam.

<table>
<thead>
<tr>
<th>No</th>
<th>Region</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bach Dang</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Ha Long Bay</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Cua Luc Bay</td>
<td></td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Tien Yen-Ba Che</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Dam Ha-Ha Coi</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Ka Long</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on different sources it has been summarized an assessment of some major impacts of natural agricultural land change to other natural resource types. The findings apply not only to the present, but are predicted to continue unless an effective remedy can be found (Table 13).

Table 13 Prediction of potential consequences when agricultural land is lost or replaced.

<table>
<thead>
<tr>
<th>The change of wetland type</th>
<th>Natural resource</th>
<th>Status of Resource</th>
<th>Current</th>
<th>Future (non-improving)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal wetland</td>
<td>Land</td>
<td>Serious erosion in coastal zone</td>
<td>Increasing the area of depleted land, salinized land</td>
<td>Continue to be eroded</td>
</tr>
<tr>
<td></td>
<td>Quality of water</td>
<td>Salinization</td>
<td></td>
<td>Polluted by chemical waste (source from agriculture, industry)</td>
</tr>
<tr>
<td></td>
<td>Biodiversity of mangrove ecosystem</td>
<td>Bio-degradation in coastal zone</td>
<td></td>
<td>High potential trend to further degradation.</td>
</tr>
<tr>
<td></td>
<td>Bio-diversity characteristic of inland and marine ecosystem</td>
<td>Degradation</td>
<td></td>
<td>Degradation trends Non-existence of various land based and aquatic species.</td>
</tr>
</tbody>
</table>

Natural disasters such as storms, floods, erosion, drought, and sea level rise threaten both the coastal wetlands and local people.

A prolonged drought in late 2003 and early 2004 dried up reservoirs, ponds, rivers, and underground water, so that not only ten thousands of hectares of winter-spring and spring-summer crops lacked water but salinity penetration also increased. In the Go Cong coastal district, salty water intruded into fields 30-40 days earlier than in 2003. Over 80% of the people in communes along West Vam Co River suffer serious shortage of water for production and daily activities. According to a notice from the metrological service, in Ben Tre, the highest salinity measured in Giao Hoa - An Hoa is 3-4g/l, in Ham Luong River (in Phu Khanh) 5-7g/l; and in Co Chien River (in Huong My) 8-10g/l). The salinity situation is predicted to be even more serious in March 2004.

Ten thousand shrimp cultivation swamps along the shore also lack fresh water to flush salinity from their waters.

The existence of many fresh water animals is threatened and some protective Sonneratia caseolaris forests along the Tra Vinh, Ben Tre, Kien Giang coastlines are beginning to die due to excessive salt.

Results of research under Viet Nam - Netherlands Program "Assessment of the coastal vulnerability" warn that if the present deforestation continues, the sea level will rise by 1m and about 40,000km² of the Vietnamese coastal zone will be entirely flooded, of which 90% is in the Mekong Delta Provinces.

5. WETLAND MANAGEMENT

5.1 Overview on the wetland management in Viet Nam

5.1.1 Current status of wetland management in Viet Nam

System of state management bodies at central level

The basic for identifying the competence and responsibilities of the government in management and conservation of wetland is stipulated under Article 9, Provision 7 (stating the implementation of policies on protecting, improving, reproducing and effectively utilizing resources) and Article 10, Provision 5 of the Law on Governmental Organization (No 32/2002/QH-10, dated 25/12/2001) which was promulgated pursuant to the State President's Decree No 04/2002/L-CTN dated 7/1/2002. Accordingly, government “shall determine the concrete policies on environmental protection, improvement and conservation; centrally steer the resolution of environmental degradation in focal areas; monitor pollution; provide rescue and remedies in case of environmental incidents".
Ministries and Ministry-level bodies affiliated with the government are responsible for exercising governmental functions in specified areas. Under Article 2 of the Prime Ministerial Decision No 845/TTg, dated 22/12/1995 on the adoption of the Action Plan for Biodiversity, central-level bodies are responsible for wetland management as follows: The Ministry of Natural Resources and Environment (formerly, the Ministry of Science, Technology and Environment) acts as a linking body, holding major responsibilities in wetland management; the Ministry of Plans and Investment is responsible for capital investment in the wetland management; the Ministry of Agriculture and Rural Development, the Ministry of Fisheries, National Centre of Natural Sciences and Technology, the Ministry of Education and Training and State Committee of Mountainous areas and Ethnic Minorities.

Article 38 of the Law on Environmental Protection sets out the administrative system for managing the environment in general and the wetlands in particular:

"The Government shall exercise unified State management of environmental protection throughout the country. The Ministry of Natural Resources and Environment shall be responsible to the Government for exercising the function of State management of environmental protection. All ministries, ministry-level agencies and other Government bodies shall, within the scope of their respective functions, powers and responsibilities, cooperate with the Ministry of Science, Technology and Environment in carrying out environmental protection within their sectors and in establishments under their direct supervision. The People's Committees of provinces and cities directly under the Central Government shall exercise their State management function for environmental protection at the local level. The Provincial Department of Natural Resources and Environment shall be responsible to the People's Committees of provinces and cities directly under the Central Government, for environmental protection in their localities."

The Law on Environmental Protection thus is the legal authority for Viet Nam’s system of environmental and wetland management at both central and local levels, and is the source mandating collaboration among these bodies (Figure 2).

The establishment of a ministry with focal authority in natural resources and environment reflects both the Viet Nam Communist Party and the national Government viewpoints towards the sustainable development of natural resources and environmental protection. On the other hand, this demonstrates to the implement the Polit bureau’s Directive No 36/CT-TW, dated 25/6/1998 on intensifying environmental protection activities in the period of industrialization and modernization. It’s a fact that government currently attaches due attention to enhancing wetland management through the functions of ministries and ministry-level agencies.
Ministries and Ministry-level agencies

The Ministry of Natural Resources and Environment (MONRE) is the central body with primary responsibility for wetland management.

Under the Governmental Decree No 91/2002/ND-CP, dated 11/11/2002 (hereafter, “Decree No 91/2002”), on functions, liabilities, competence and organization of MONRE, the Ministry acts as a governmental body exercising the state function in management of land, water, mineral resources,
environment, hydrographic meteorology, land map and survey throughout the country; state management of public services and represents the ownership of state shares in enterprises operating in the field of land, water, mineral resources, environment, hydrographic meteorology, land map and survey in accordance with the applicable laws.

The MONRE has reorganized and consolidated its structure in accordance with Decree No 91/ND-CP as follows: Department of Land, Department of Land Registration and Statistics, Department of Environment, Department of Environmental Impacts Evaluation; Department of Hydrographic Meteorology, Department of Law Enforcement, Office of Environmental Protection, Office of Water Resource Management and other departments, offices, centres, institutes.

The MONRE's responsibilities and the authority include:

1. Submitting regulations and legal and policy opinions in respect of Ministry functions such as land, water, mineral resources, environment, hydrographic meteorology, land map and survey; Promulgating legally normative documents within the scope of the Ministry's functions and mandated authority;
2. Organizing and steering the implementation of the adopted documents, projects and strategies;
3. Promoting international cooperation in the areas of management functions;
4. Conducting and supporting scientific research;
5. Exercising state management over the operation of non-governmental organizations and associations within mandated functions;
6. Discharging other duties for which it is responsible in specified areas of land, water, mineral resources, environment, hydrographic meteorology, land map and survey.

This comprehensive list, abstracted from the regulations promulgated pursuant to Decree No 91/2002, clearly constitutes sufficient legal authority for the MONRE to discharge its responsibility for wetland management. It replaces the regulations of Governmental Decree No 22/CP, dated 22/5/1993 (hereafter, “Decree No 22/CP, 1993”), on the liabilities, competence and structural organization of the Ministry of Science, Technology and Environment (authority for wetland management over the last ten years), with regulations that more clearly and specifically describe the MONRE’s natural resource and environment management MONRE responsibility and authority. It is a more transparent legal ground for the establishment of a management system to effectively organize and manage wetland areas. As discussed above, the MONRE is responsible for state wetlands management. However, the MONRE is a newly-born organization and is still in the process of structural consolidation, so wetlands management has for the last ten years has been entrusted to the Ministry of Science, Technology and Environment (MSTE) and the Environment Department. Pursuant to the Decree No 22/CP, 1993, the MSTE is responsible for environmental protection, specifically including:

1. Formulating and drafting environmental policies, legal documents, and standards, and submitting them to the government for enactment;
2. Organizing the implementation of national projects on environment and sustainable development approved by the government;
3. Monitoring the adherence of major socio-economic development projects to environmental protection requirements before submission to the government for approval;
4. Providing local agencies with guidelines on skills for environmental management and protection.

The Environment Department (now, the Viet Nam Environmental Protection Agency (VEPA)) is responsible for the following wetland management functions:

1. Studying projects, policies and laws applicable to wetlands environmental protection;
2. Studying, listing and mapping wetland areas;
3. Establishing, developing and managing the wetlands surveying system;
4. Conducting training and education to enhance the awareness of protection and intelligent utilization of wetland;
5. Developing international relations in the field of wetland conservation.
The Environment Office has a vice-chairman responsible for wetland management and conservation issues, using human resources from the Natural Conservation Office and related organizations. In 2001, the Environment Office in collaboration with agencies such as the Forest Control Office and FIPi of the Ministry of Agriculture and Rural Development, and supported by IUCN, published "Wetlands of high value of biodiversity and environment in Viet Nam" including 68 wetlands sites with information about current management information on them.

Listing, locating and identifying objects to be conserved is the first step in the process of major wetlands planning at national level. There remain numerous wetlands yet to be listed. It is necessary to position these wetlands on maps, draft statutory management authority applicable to them, and submit "The system of wetlands" to the Government for approval.

Over the past years, the MSTE has, through the Environment Department, effectively discharged its responsibility as a national linking body in implementing the Convention on Biodiversity and the Ramsar Convention. The MOSTE had major responsibilities for wetland management and has actively coordinated actions with other ministries and agencies, such as the Ministry of Agriculture and Rural Development; the Ministry of Fisheries; the General Department of Land Survey (now part of MONRE) and provincial Departments of Science, Technology and Environment (now Administrative MONRE).

**Ministry of Agriculture and Rural Development** (MARD) is a governmental body responsible for state management of agriculture, forestry, irrigation and rural development. This includes drafting legal documents on forest management and protection (including wetland nature reserves parks), drafting plans for the development and management of nature reserves and national parks for government’s approval or ratifying such projects submitted by localities; managing scientific research, and the applying technological advances to protecting conservation parks' ecology. These examples make it clear that many wetlands (or parts of wetlands) have been planned and classified pursuant to or consistent with laws on forest protection and improvement and that the MARD has had a considerable role in wetland conservation. This is especially so in respect of mangrove forest ecology and certain species of birds. In MARD’s management structure, the Forestry Control and Forestry Development Departments are involved in wetlands planning, consulting policies on forest protection and development, flora and fauna conservation, and overseeing the wetland natural conservation parks planned as part of the “particular-purposed forest system”, which was submitted by MARD to the Government and approved in 1997. It includes some wetland conservation parks such as Xuan Thuy and Tien Hai. Integrated in the Forestry Control Department's structure, the Environmental and Natural Conservation Division is responsible for assisting the department to exercise its forest biodiversity management and conservation function.

**Ministry of Fisheries** (MOFI) is charged with managing fisheries, a mandate which includes aquaculture, and the exploitation, processing, protection and development of fishery resources (under the Decree 50/CP, dated 21/6/1994). MOFI is responsible for drafting legal documents, policies and projects on fishery development and protection, including wetlands (because applicable laws define wetlands as places which ‘have water surface available for aquaculture’), for the Government approval. The function of MOFI in protecting and developing fishery resources also involves many other wetland- conservation organizations concerned with biodiversity because MOFI development policies typically have impacts on the biodiversity of wetlands and, in particular, changes to the living environment of water birds. Over-exploitation of fishery resources leads to the pollution and degradation of wetlands and the diminution of water bird food sources. MOFI’s functions involve the management of wetland exploitation and use, rather than their conservation. At present, MOFI entrusts the management and protection of fishery resources to the Department of Fishery Resources Management and Protection.

**Ministry of Culture and Information** (MOCI) manages culture and information involving the conservation and preservation of historic, cultural and environmental relics. (Decree 81/CP, dated 8/11/1993). Under the Decision dated 08/2001, the Prime Minister charged MOCI with “directly managing and organizing the establishment of nationally-classified and internationally-recognized cultural, historical and environmental forests”. MOCI entrusts the Department of Conservation and Museums with assisting the Minister in this function. Currently, Viet Nam possesses about 33 cultural-historical-environmental relics, primarily cultural-historical ones. In practice, some wetlands, like Ho Lac (Dac Lak), are placed under the management of Forest Management Board.
General Department of Tourism (GDT) exercises state management over tourist activities nationwide (Decree 20/CP, dated 27/12/1992). Among its functions, GDT is responsible for providing guidelines on hotel skills, planning for tourism development, particularly ecotourism, which closely involves the management of wetlands. On 22/6/1993, the Government issued the Resolution No 45/CP on renovating the management and developing tourism industry. In line with this resolution, Prime Ministerial Decision No 307/TTg dated 24/5/1995 approved the master plans for tourism development from 1995 to 2000. In addition, ordinances on tourism passed by National Assembly’s Standing Committee have improved the party and state’s policy and legal framework in management of tourism. Actually, the party and state have taken the sound approach of combining tourism development and environmental protection in an eco-tourism program, thereby introducing opportunities to tap into wetlands potentials. However, it is essential that GDT work closely with MONRE to set forth appropriate management policies over wetlands, and to avoid their over-exploitation and degradation.

Ministry of Planning and Investment (MPI) (pursuant to Decree 175/CP, dated 1/11/1995) is a governmental body, which acts as a general advisor on national strategy and socio-economic development planning, exercises state government management of domestic and foreign investment, and assists the government to coordinate and regulate major national economic development objectives. The functions of MPI include domestic and foreign investment project evaluation; serving as a linking body in coordinating, managing and utilizing ODA (Official Development Assistance); and cooperating with the Ministry of Finance to draft and submit for Government approval plans to allocate the state budget and revenue to ministries, ministry-level agencies and localities. MPI also is responsible for wetlands investment projects. In essence, it is the responsibility of MPI to integrate national policies on wetlands development into the general national strategy of socio-economic development, so that wetlands are utilized in the most “intelligent” manner, contributing to national development.

Ministry of Finance is a governmental body responsible for exercising unified state management over finance, accountancy and state budget throughout the country (Decree 178/CP, dated 28/10/1994). The Ministry of Finance responsibilities include the guidelines pursuant to which provincial People’s Committees estimate annual state budgets; cooperating with the Ministry of Planning and Investment to establish financial plans, socio-economic development projects and annual infrastructure building projects; exercising unified management and steering over tax and fees collection for state budgets; organizing the allocation of expenditures from state budget; distributing investment capital for infrastructure building and granting preferential credits for state development projects; unifying management of state-owned capital assets and resources; inspecting real assets of all public institutions and financial partners of the State; and drafting legally normative financial documents. The Ministry of Finance is jointly responsible with the Ministry of Planning and Investment for reviewing investment projects and budgeting for wetland development. The General Department of Taxation, the State Treasury, and the State Financial Inspection are bodies integrated into the Ministry of Finance’s structure, and maintain close professional relations with wetland conservation commissions.

Other Ministries: The decision of Prime Minister No 845TTg of December 22, 1994 on the biodiversity action plan has expressly made several other ministries responsible for certain aspects of wetlands management as follows:

“ Ministries of Education and Training, of Labour-War Invalids and Social Welfare, of Health, Committee for Ethnic Minorities & Mountainous Areas, in their socio-economic programs, must give much priorities to fields and areas in connection with bio-diversity protection, as well as take the initiative to work with Ministry of Natural Resources and Environment and Ministry of Planning and Investment on mutually concerned issues”. In practice, many ministries have co-ordinated their biodiversity protection efforts, and have designated wetlands as a specific field. As one major example, the Ministry of Education and Training, which has extended environmental education programs to schools and tailored them to different grade levels, is an excellent example. Nevertheless, there are few Ministerial programs specifically emphasizing wetlands. For example, neither the Ministry of Communication nor Transport (responsible for managing the utilization of waterways and wetlands in river and coastal areas), nor the Ministry of Industry (which, through the Corporation of Electricity and Power manages “hydroelectric lakes”, which are artificial wetland lakes) offers such a program.
It is remarkable that the responsibility for management of wetlands areas viewed as special natural resources—us fragmented among a multitude of governmental organizations, with each body concerned only with an ambiguous aspect of this resource. For example, the Ministry of Agriculture & Rural Development is responsible for forest management in wetland areas, pursuant to the Law on Forest Protection and Development. Yet, the Ordinance on Aquatic Resources Protection and Development makes the Ministry of Fisheries responsible for managing aquatic resources in wetland areas. Thus, each lawfully could act on the same wetland area. Likewise, “salty wetlands” are administered by the Ministry of Agriculture and Rural Development, while other ministries are responsible for wetland areas such as ponds and lakes. In sum, ministerial spheres of authority and responsibility in respect of wetland management are indistinct, a major issue.

The system of local management bodies

The local executive function is reposed in People’s Committees at different levels. Under the Law on the Organization of People’s Council and People’s Committee, the People’s Council, the local state power body, is organized into three administration units of different levels: province, district and commune. The People’s Committee is elected by the People’s Council, and is its executive body.

The duties of the People’s Committee include building the plan for socio-economic development, the budget, and the reserved fund for the localities to be presented and approved by the People’s Council; promulgating procedures to implement the Resolution of the People’s Council on socio-economic development and issuing proposals to re-construct a proper organization of local bureau, including demarcation of local administration borders. Those duties are prioritised pursuant to People’s Committees principles.

In sum, the provincial People’s Committee is the local management body with authority over wetlands, and it supplies guidance to the Department of Natural Resources and Environment, Department of Agriculture & Rural Development, Department of Aquatic Products, Department of Planning & Investment, and to the People’s Committee at different levels (district and commune).

The provincial People’s Committee is assigned the following missions: Designing the programs to manage and conserve local wetlands, in accordance with the local strategy for socio-economic development; promulgating policies and regulations on wetland management in conformity with local socio-economic conditions, to promote the wise use of wetlands; planning and managing wetlands within the province and delegating certain authority to agencies directly under the province; managing vital wetland areas as ratified and authorized by the government; co-ordinating with People’s Committee of provinces contiguous to wetland areas under its authority; Working with specific wetland management agencies, such as the Ministry of Natural Resources & Environment, the Ministry of Agriculture & Rural Development, and the Ministry of Fisheries; conducting inquiries and inspections concerned with the protection and conservation of wetlands in local territory.

Provincial People’s Committees are responsible for wetland conservation, for conducting scientific research, and for funding these efforts from the local budget, but may work with a “Wetland Management Board”, an advisory organization directly under the authority of the provinces. In many provinces, wetland planning is being co-ordinated with forest planning, Management Boards are being established to assist in such efforts, and in designing “green tourism” wetland development projects.

The most significant and predictable problems on the provincial path to managing and cultivating wetlands are money: the limited provincial budgets typically can’t afford any significant investment in the region.

“Provincial Concerned Services” are specialized agencies, which implement the state management mission within the province. They are the right hand of both the District and the Commune People’s Committees in wetland management. The Department of Natural Resources & Environment (formerly, the Department of Science, Technology & Environment) is responsible for wetland environmental quality and natural resources; the Department of Agriculture & Rural Development/Agency for Forest Control is responsible for forest management in natural sanctuaries (it has statutory authority and responsible for particular-purposed forests); Service of Fisheries is in charge of aquatic cultivation and commercial fishing (in a few provinces and cities which are the primary responsibility of Service of Agriculture & Rural Development); Service of Culture and Information is charged with managing
historical and cultural monuments and the environment, including wetland areas; Service of Land & Land Survey (currently part of Service of Natural Resources & Environment) deals with land management, of which wetland is an important component; Service of Planning & Investment and Service of Finance are concerned with investment and budgets for wetland management and conservation activities; and district level and communal People’s Committees.

Department of Natural Resources & Environment (formerly The Department of Science, Technology & Environment): Documents stipulating DONRE function and duties are written in general terms and emphasize provincial environment management, but they do not adequately detail that Department’s wetland management and conservation mission. The Law on Environmental Protection makes the DONRE responsible to the Provincial People’s Committee for environmental protection within the province. In fact, DONRE activities are far more extensive and include the following wetland management programs:

1. Joint responsibility with the Departments of Agriculture, Fisheries and Land as consultants to provincial People’s Committees in the promulgation of documents dealing with wetland management (such as reviewing local wetland projects, and particularly the adequacy of coastal wetlands environmental protection);
2. Plan for managing and protecting the wetland environment and natural resources.
3. Use funds from the Department’s budget to conduct or commission basic research on and surveys of the environment (including land, water, flora and fauna), to acquire data useful in sanctuary planning and the management, protection, conservation and sustainable development of wetland areas;
4. Enforce provincial wetland sanctuary conservation laws.

The DMRE’s Department of Land Administration, currently a component of Department of Natural Resources and Environment) is concerned with land use planning and investment for wetland nature reserves. It drafts the procedures for land registration, silviculture land allocation, and grants the silviculture land-right certifications for Board of Particular-purposed Forest Management (wetland areas). The Department of Land Administration has in fact emphasized general land management, and thus silviculture land management usually reverts by default to the Agency for Forest Protection.

The Department of Agriculture & Rural Development/Agency for Forest Control is the authorized agency at the local level with responsibility for aiding the provincial People’s Committee with agriculture & rural development matters, including managing, protecting and developing wetland sanctuary forests (Circular 94-2001/TT-BNN-TCCB). The Agency for Forest Protection is assigned the following wetland management tasks: Enforce forestry law; create and implement plans, policies and proposals to protect local forests; manage the development of forest resources as well as silviculture land use; provide concrete and professional guidance to the Wetland Board of Management and the Division of Forest Protection directly under the Board, pursuant to the statutory mandate for particular-purposed forest management. In some provinces, the Agency for Forest Protection directly manages wetland sanctuaries or national parks located in wetland areas. In such circumstances, this agency creates different Management Boards to execute the mission.

The Department of Planning & Investment has helped to appraise projects investing in provincial wetland areas, to manage the distribution of fundamental construction capital, and co-ordinating with the Service of Finance to allocate the planned budget among various on-going activities and programs in wetland areas.

The Department of Finance, in co-ordination with Department of Planning & Investment, presides over the allocation of budget spent for ongoing programs of wetland sanctuaries; follows up and manages capital of all kinds (including assets and national natural resources within such sanctuaries); jointly appraises investment projects, and has primary financial management responsibility for wetland sanctuaries. In addition, The Service of Finance specializes on financial inspection within wetland nature reserves.

Other provincial-specific department tend to fulfil tasks concerning local wetland management tasks assigned by provincial People’s Committees or, under certain forms of international cooperation, participate as a direct partner in a project.
Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand

State management body at district level

The District People’s Committee has legal responsibility for the following tasks: Create an in-district wetland management and development plan; develop lists of proposed wetland sanctuaries and present them to the Provincial People’s Committee for approval; Communal People’s Committees in respect of wetland protection and development schemes and plans; allot land (based on specific functions of the wetlands) under the decision authority for the district level; form Boards of Management to work on in-district nature reserves, ranked for particular-purposed forests and buffer zones.

District levels appear weak in respect of their function as national scientific-technological & environmental agencies responsible for wetland management. In most localities, these functions, though important, are allocated among different local specific branches. Thus, at the local levels, the national wetland management function is mainly assumed by two district-level People’s Committee’s assistants: the Office for Agriculture & Rural Development (assisting district-level People’s Committees with the national forest management function) and the Office for Land Survey (assisting district-level People’s Committees with the state management function in land, including silviculture land). Personnel organization problems in the two offices have inhibited their effectiveness in assisting district-level People’s Committee to discharge their national wetland management responsibilities.

State management agencies at communal levels

At present, the communal People’s Committee’s responsibilities in wetland management include: managing and planning for communal wetland protection and development; setting up projects of land-allocation for households in buffer zones, managing buffer zone exploitation, raising awareness and guidance of wetland protection for local people on wetland sanctuaries; identifying forest and silviculture land areas; keeping records of wetland development; co-ordinating with Forestry Control and other relevant organisations to protect the wetlands; educating, mobilizing and instructing people; and imposing financial penalties on law violators.

In fact, the above missions, although mandated by law, are beyond communal authorities’ capabilities. Communes in regions possessing wetland sanctuaries historically have taken sound measures to protect the wetlands (in the way of forest protection), but most of the communal cadres have a pay roll and significant difficulties are still related to personnel. Most of the cadres, whose professional competence is not quite satisfactory, are under the People’s Council and Committee’s tenure.

The salient features of the national wetland

To sum up, the system of state management bodies supervising wetland, though organized from centre down to local levels, is still mutating as experience suggests more efficient approaches to management structure, functions, and duties, and the development of managerial competence. The salient features of the national wetland management system in Viet Nam can be summarized as follows:

Several ministries and agencies at the central and local levels responsible for wetland management discharge their functions without integrating coastal and wetland areas. There is at present no effective contact or cooperation between ministries and agencies in wetland management. This leads to two major questions in current wetland management situation: 1) Is it wise to establish a body taking responsibility for wetland management, protection and conservation or, 2) Would developing a suitable system between indicated agencies and departments in wetland joint management, exploitation, protection and conservation be preferable?

National wetland management systems in Viet Nam are decentralized. In the north of Viet Nam, the national wetland management system is organized in 3 levels: ministerial, provincial, and district. In the south, Viet Nam aqua-silvicultural farms belonging to the Ministry of Agriculture and Rural Development are allocated to local farmers, who individually use and manage wetlands and coastal forests.
Viet Nam uses a “top down” approach to management. Most of decisions concerning policies, strategies are imposed by the central government on local government. Moreover, there is no community participation in implementing decisions that sometimes are inefficient and inappropriate. Community-based management is an approach that has just recently emerged and is not yet firmly established. It expands local roles in wetland management, an urgent need. However, there is not yet efficient cooperation between central and local government or among local governments. Although there are a number of community-managed wetlands (such as lakes, lagoons, and estuaries) managed by communities, despite this experience communities have been effective only in managing exploitation, but in not raising public awareness of the need for wetland protection and conservation.

Viet Nam’s national system of Viet Nam land, water, and coastal forest management has helped to order land use systematically; however, it still suffers from manager and stakeholder ignorance of wetland functions and importance. This has led to poor wetland planning and use decisions and ineffective strategy. Moreover, decentralization of management is unclear, because decisions on interest and responsibility of management levels are ambiguous and overlapping. This causes overlap of different plans by different authorities on some wetland areas and inadequate attention to others. Transferring management responsibility also has caused adverse effects, such as a puzzling loss of natural resources; for example, the Dam Doi wetland. It was transferred through five services between 1975 and 1985 and each transfer was accompanied by the loss of more natural resources. Lack of planning or inconsistent planning in wetland use is also a reason for the low effectiveness in wetland management, besides leading to environment conflicts over wetland utilization and resulting in the loss of natural resources. Insufficient planning may result from insufficient regard to and adjustment for regional conditions (natural, social and economical). Wetland management planning sometimes creates a conflict with local demands. Ineffective cooperation between different organizations charged with wetland management may result decisions based on incomplete information, as well as overlap in wetland planning. There are few experienced experts and officers, and no research and management team available to link community with wetland managers, and so benefit from their indigenous knowledge which could supplement the world’s scientific and technical advances and experiences. Top-down approach to wetland management does not meet communities’ expectations. In the traditional top-down approach to wetland management, senior managers tend to impose their decision on junior management levels without understanding communities’ expectation. This method does offer the advantage of quick decision making and clear lines of authority and responsibility, but a bottom-up approach or community-based management is preferred. The new management direction is combining the top-down, bottom up, and sectoral approaches. This results in decisions based on Vietnamese laws and according to the expectations of all management levels, from central government to stakeholders. In general, management systems have paid inadequate attention to facilities and human resources and to the people who work with wetlands and their conservation.

An overall assessment of Viet Nam’s management and sustainable use of its wetlands Viet Nam indicates several shortcomings; specifically, Viet Nam needs:

1. An empowered competent and capable agency to manage wetland and implementing Ramsar Convention;
2. A management mechanism to coordinate overlapping organizational functions (e.g., ministries, agencies, provincial people’s committees and other levels of local authorities and professional bodies);
3. A strategy for wetland management protection and sustainable development;
4. Systematically trained, qualified, capable personnel in management and implementation of works relating to wetland;
5. More effective communication of wetland issues.

5.1.2 Suggestions to enhance wetland management

National strategies, plans and action programs should be established and implemented

It is essential to build national strategies, action plans and action programs on wetlands for the basis of the following principles: Those strategies and plans must guarantee the targets of conservation and sustainable development for the sake of national interest and local people’s livelihood. They must be designed for the whole nation, together with local-level policies and plans in conformity with practical situation in each locality and consistent with the national-level ones. They must be comprehensive
enough to cover all kinds of wetlands and wetland areas in Viet Nam, including coastal wetlands, inland wetlands, natural and man-made wetlands and the wetlands in Red River delta, Mekong delta and highland region. It is important to integrate the professional management policies of governmental bodies in different fields (such as Ministry of Natural Resources & Environment, Ministry of Agriculture & Rural Development, Ministry of Fishery, General Department of Tourism) in the national wetland strategies, action plans and programs for management, conservation, utilization, rehabilitation and development of wetlands towards a unified national policy. Great emphasis must be laid on constructing a law based on sustainable economic activities (eco-tourism, eco-agriculture, and eco-aquaculture) in line with wetland protection and conservation. Above all, a sound supporting mechanism, particularly a financial one, a clear roadmap for the effective implementation of such strategies, plans and programs.

Enhancement and enforcement of the wetland management institutions

Wetland management institutions must be enhanced and enforced in the following ways: Legal institutions regulating wetland management system developed synchronously at all levels, including responsibilities and rights of state bodies. It is necessary to establish a National Steering Committee (or a National Steering Council) on wetlands that should be run under the Prime Minister’s direction and headed by a Vice Prime Minister. There should be established a Regulation Management Committee, an inter-sector agency whose responsibility is collaboration and co-ordination for wetland management with participation by related line ministries such as Ministry of Natural Resources and Environment (a Vice-Minister should be Vice-chairman), MARD, Ministry of Fishery, Ministry of Culture and Information, Ministry of Investment and Planning, Ministry of Finance, Ministry of Justice, Ministry of Education and Training and other agencies. A team of specialists should be established to help the committee.

The competence of wetland management agencies should be increased through development of a framework. Specialized wetland management units from the Ministry of Natural Resources and Environment, other ministries, and relevant central government bodies should be assigned clear authority and responsibility. It is particularly important to strengthen district level agencies and committees, which participate in direct management of wetland areas. Increased emphasis on education and training will assist progress toward these objectives. Careful planning is an essential part of managing a system of wetland reserves. Finally, it is strongly recommended that a management model for wetland reserves corresponding to actual Viet Nam conditions be created.

Implementation of wetland management supporting measures

The following wetland management supporting measures are recommended: Dissemination of information intended to educate the average citizen about wetland functions, values, conservation techniques and sustainable use; strengthening incentives and support policies to better local peoples’ quality of life and to facilitate the community’s participation in effective wetland management and sustainable use under the Ramsar Convention; providing financial support for sustainable wetland uses; establishing a wetland conservation fund; Seeking financial support from agricultural taxes, profits from tourism, and other services.

Strengthening wetland management conservation and utilization measures

Consolidation of wetland management, conservation and utilization measures must be accomplished in different ways, such as establishing a management and action system for conservation of the high-valued wetland areas which have been confirmed by the Viet Nam Environment Protection Agency (VEPA); following-up on policy implementation and activities concerned with wetland protection and sustainable use (this responsibility should be assigned to local agencies); developing plans for wetland rehabilitation and providing incentives, technical support, and preferential loans for fresh water sources protection and improvement; encouraging development of ecological models and environment-friendly use for coastal and marine sea-aquaculture; enforcing strict compliance with wetland conservation and sustainable use laws, including prosecution of criminal acts to the full extent of the law.
Conservation, sustainable use planning coastal bio-diversity

Generally, a socio-economic master plan for the management of coastal ecosystems is necessary to promote biodiversity conservation and sustainable utilization. It should individually consider development activities such as agriculture, salt marsh, waterway traffic, tourism, especially aquaculture, and fishery planning, so as to methodically promote management objectives such as the natural recovery capability of each type of aquatic or land resource. Conservation and sustainable use of bio-diversity should be the objectives and the community-based, ecological approach method should be used. It will be necessary to develop and implement models of sustainable utilization of coastal biodiversity.

The planning and development of aquaculture models are based on following principles: Keeping ecological balance within the area (the ratio of aquaculture area and area of natural coastal wetland should be optimal); ensuring conservation and improvement of important functions and values of coastal wetland; ensuring sustainable use of wetland resources and a sustainable livelihood for local people.

When developing planning for wetland management areas, natural reserves, and artificial breeding flats: Natural reserves include zones prohibiting all exploitation, or limiting exploitation. They often are created where aquatic species concentrate for delivery, immature animals congregate year round, or at certain periods in certain places; for instance, oyster breeding ground, natural crab, shrimp enclosures. Construction of such reserves has great significance for the protection and sustainable development of aquatic resources in particular and in general as a management approach to estuarine and coastal wetlands.

Developing and implementing resources management statute

The enactment of the Decree-law on aquatic resources protection is of crucial, strategic significance in coastal wetland area wetlands management. It authorizes regulation of the working relationship between responsible administrative bodies, State budget expenditures for aquatic and wetland resource management, and registering piscicultural activities (including fisheries, aquaculture, aquatic resource research) with the provincial Aquatic Resources Protection Division. Piscicultural data such as species identification and habitat, swamp number and location, and culturing activities assist administrative authorities with information helpful to making numerous decisions, including adjusting commercial trade activity, introducing or transferring environment-based aquaculture models and management methods of wetland areas, and striving for environmental protection consistent with producing a high and stable income.

Finally, effectively enforcing laws prohibiting destructive fishing practices (such as using electrical pulses, dynamite, chemical substances, and small-mesh fishing nets) is a matter of utmost urgency. That work will be carried out best with active participation of relevant agencies, departments and local authorities and communities.

Gradually transferring rights to water surface use and marine development

Instruction No.64 of the government on agricultural land allocation sets out legal rights and duties in respect of water rights and marine development transfer. The transfer of water surface use right to organizations and individuals for aquatic products exploitation, culture, protection and development can provide important benefits to society. The transfer of water surface use rights to local fishermen raises unique issues which require distinctive points. Farmers can cultivate their land entirely interdependently, while fishermen harvest and culture on wetland areas that lack clear borders. At present, allocating rights to use surface water is done only for piscicultural households and on a small scale. Much more comprehensive surface water rights allocations are likely in the future, however, so it is necessary to urgently develop planning and transfer of water surface use rights in wetland areas for aquatic resources.

In sum, the wise, proper, and well-managed use of wetlands, with the community's participation in wetland conservation, is vital task to the success of the management objectives for Viet Nam's wetland areas. The existing legal framework, to be augmented by the national action plans, programs on conservation and sustainable development of wetland areas, Viet Nam will further facilitate this process.
5.2 Overview of legislation system for wetland, management, utilization and conservation in Viet Nam

5.2.1 Evaluation of achievement and limitation of the national legislation system

Before acceding to the Ramsar Convention, wetlands resource law was mostly integrated into the legal framework on conservation of natural resources in general. That was and is inadequate there remains no distinct and complete legal document or policy on wetlands.

Since Viet Nam became a member of the Ramsar Convention, the number of legal documents on conservation of natural resources and wetlands has increased and the regulatory scheme has become more comprehensive.

In the Convention as legal documents currently in force, the notion "wetland" is only referred to but no definition is given. In most legal documents currently in force, "wetland" is defined variously as "land with water surface for aquaculture", "national park", "nature reserve", "mangrove forest", "alluvial plain", "coastal flood plain". According to Decree of Vietnamese government No 109/2003 ND-CP, wetland is determined as areas with water, endowed with typical ecosystems, high biodiversity and functions to maintain water cycles and ecological balance and are of international and national importance (article 1).

Thus, Vietnamese legislation, so far, has met the requirement in respect to the management, utilization and conservation of wetland areas in particular as well as ecosystems and biodiversity in general

Review of some legislative documents concerning wetland

Among the legal documents currently in force in Viet Nam, some already use the notion of wetland such as decisions, directives of the Prime Minister, the Council of Ministers on establishment of nature reserves covered by wetland areas, especially areas with diversified ecosystems (such as Tram Chim, U Minh Thuong, Thanh Phu, Lung Ngoc Hoang wetland nature reserves). (Directive No 167/CT dated 18 August 1992 of the Council of Ministers, Decision No 253/1998QD/TTg dated 29 December 1998). These documents also have articles stipulating the obligation to preserve the wetland nature reserve areas, especially for organizations and individuals carrying out activities inside and around these nature reserve areas.

- The 1992 Constitution

The 1992 Constitution is a basic law, a legal document of highest legislative importance in Viet Nam. It stipulates the basic general principles, is a legal framework to guide the development and implementation of the whole legal system in general and the legislation on wetland in particular.

The 1992 Constitution has established that government (state) own the wetland areas and the bio-resources of the wetland ecosystems. This is an important legal basis for protection wetland areas in general and for development of legislation on wetland in particular. This is shown by the advantages of the State when it issues the Decisions on establishment of national nature reserves. Only the State, acting on behalf of the “people” (the sole owners), has the legal authority to manage wetland areas comprehensively and to use them in a sustainable manner. The law confers upon the state an unrestricted right to use and to dispose of land; thus, a decision by the state to establish a nature reserve may not be challenged by other landowners. And the state will compensate legal user for taking the land without involving the landowner.

- The 1993 Law on Environmental Protection and related documents

The Law on Environmental Protection ("LEP") is a general legal document on the environment, including the management and conservation of wetland areas. "Wetland" is defined in this document as the "land covered with water for aquaculture", "agriculture land", "water resources".

The provisions governing the exploitation, utilization and conservation of wetland ecosystems are set out in Articles 12, 13, 14 of this law and in other related laws. This collection forms the essence of Vietnamese wetland protection law and includes some expressly imposing organizational and individual duties to protect various wild plant and animal species, biodiversity, and the forest and sea ecosystems.
Article 19 of the LEP also stipulates the right of the state to control the import and export of wetland plant and animal species, and genetic and microbiological resources related to environmental protection.

Besides its scattered provisions specifically addressed to management of wetlands and wetland ecosystem components, the LEP includes a separate chapter (Chapter IV) which authorizes State management of the environment, including inspection and monitoring activities, and prosecution of violators.

Decree 175/CP (18 October 1994), supplemented by periodically issued Ministry of Science, Technology and Environment circulars, detail and guide implementation of the LEP. The LEP has created a legal framework for the management and sustainable utilization of natural resources, including many provisions applicable to wetlands, and is the fundamental law applicable to wetland management and sustainable utilization. It provides a fairly comprehensive authority for the government and relevant ministries and sectors to promulgate more detailed and concrete regulatory documents.

However, the LEP and documents issued pursuant to its authority set forth only general provisions on environment (including the components of wetland), and have not addressed the specific characteristics of wetland areas. In this law there is still no reference to the notion of "wetland" and still not considered an element of the environmental system in Viet Nam.

- The 1996 Civil Code and related documents
The Civil Code is a legal document of great legislative importance that contains provisions guaranteeing the intellectual property rights of organizations and individuals who have made inventions, utility solutions during the process of exploitation and utilization of wetlands. Although it is not a document stipulating directly issues of wetland protection, the provisions of the 1996 Civil Code are partly related to wetland biodiversity, in particular the protection of inventions and utility solutions.

- The Ordinance on protection and development of aquatic resources and related regulatory documents
This system of documents consists of: the Ordinance on protection and development of aquatic resources (25 April 1989), Decree 195/HDBT (2 June 1990) guiding the implementation of the Ordinance on protection and development of aquatic resources; Circular 04 (30 August 1990) guiding the implementation of the above Ordinance and Decree.

As wetland is a specific resource, the area of wetland used for aquaculture is very large. And since aquatic resources are large, their aggregate exploitation and cultivation economic value is high, and is crucial to living standards, especially of those people residing in areas with wetlands. The term "wetland" is defined in this document as "the land with water surface for aquaculture ", "water logged land". The Ordinance on protection and development of aquatic resources is an important legal document; it serves as a legal basis for protection of the wetland, especially the biodiversity, components of the wetland. Wetland is the main habitat of aquatic species and the protection of aquatic resources is crucial to protecting their habitat. This is stipulated in detail in Article 2 of this Ordinance which authorizes organizations and individuals to exploit aquatic resources, but strictly prohibits all actions injurious to the aquatic resources (including habitat of aquatic species, and mangrove and upstream forest destruction). However, the system of these documents is still dispersed; many provisions still have not high effect. The provisions of this Ordinance and its related documents govern mainly the economic aspects of wetland.

Some of Viet Nam’s current legislative documents of use directly the concept of wetlands. Examples include decisions, instructions of Prime Minister and the Minister Council on establishment of reserves, wetland areas, especially those with diversified ecosystems such as Tram Chim, U Minh Thuong, Thanh Phu, Lung Ngoc Hoang natural reserves...” (Instruction No. 169/CP, dated 18/8/1992, of Minister Council, Decision No. 253/1998/QD/TTD, dated 29/12/1998). The documents also have provisions imposing a duty of wetland areas protection, in particular, for organizations and individuals operating in and around those reserves.
Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand

-Government decree No. 109/2003/ND-CP, dated September 23, 2003 on the conservation and sustainable development of wetland is the first legal document addressed exclusively to wetlands. The decree includes six chapters, 27 articles, including: general provision, inventory, planning of the conservation and sustainable development of wetlands, awards and handling violation and implementation provision. In Articles 5, 6, 7 and other provisions, the decree specifies as follows:

Article 5: The Governance of the conservation and sustainable development of wetlands

1. The Governance activities of the conservation and sustainable development of wetlands shall include:

   - Research and inventories of wetlands;
   - Development of relevant mechanisms, policies and legislation to support the conservation and sustainable development of wetlands;
   - Planning of use of wetlands for the purposes of conservation and socio-economic developments;
   - Management of wetlands that have been localized for the purposes of protection;
   - Management of sectoral activities to harvest resources and potentials of wetlands by agriculture, fisheries, tourism, transportation, irrigation, hydropower and other sectors relating to the conservation and sustainable development of wetlands;
   - Inspection, surveillance, and dealing with any violations against the conservation and sustainable development of wetlands;
   - Encouragement and facilitation of the participation of local communities, particularly local people living within wetlands in the protection of their ecosystems, biodiversity resources and environment;
   - Extension of international cooperation in the field of conservation and sustainable development of wetlands.

2. The Government shall uniformly exercise its governance of the conservation and sustainable development of wetlands.

The Ministry of Natural Resources and Environment shall exercise its governance of the conservation and sustainable development of wetlands national wide.

Article 6: Activities to be encouraged

The State shall encourage organisations, individuals and human communities in carrying to the following activities:

   - To protect ecosystems, valuable and endangered genera and species of flora and fauna, especially migratory species of birds and wetland environment.
   - To rehabilitate degraded and/or over-harvested wetland ecosystems.
   - To participate in the surveillance of any activities to harvest wetlands by any organizations and individuals; and;
   - To detect and timely notify the functional agencies of any acts against regulations on the conservation and sustainable development of wetlands.

Article 7: Acts to be prohibited

The following acts against wetlands shall be strictly prohibited:

   - Logging and destruction of mangrove forests, and any operations which can alter the nature of wetlands, destroy or damage their regionally characteristic ecosystems, and cause pollution and degradation to wetlands;
   - Fishing of inland freshwater and marine species of fauna and others in egg-laying and brood feeding grounds;
   - Exploiting of natural resources or construction of works on alluvial plain where mangrove forests are being naturally regenerated;
   - Application of destructive fishing practices, namely electrical pulse, dynamites, chemicals, toxic substances, and fishing nets with the mesh size against fisheries regulations within wetlands;
   - Introduction of alien species of fauna and flora into wetlands environments causing unbalanced ecology and modified genetics of indigenous species of fauna and flora;
- Dumping of solid wastes and discharges of industrial wastewater and other substances containing toxic chemicals without or with treatment but not meeting the national environment standards;
- Disposal of wastes and construction of waste landfills within wetlands; and
- Other actions those are likely to do harm to the benefits and living conditions of human communities living within wetlands and their neighbourhoods.

**Article 8. Contents of wetlands inventory and research**

Contents of wetlands inventory and research shall include:

- Investigation and research of functions of surface and underground water regulation, and economic, ecological, cultural and social values as well as benefits of biodiversity that wetlands provide;
- Inventory and research of genera and species of fauna and flora inhabiting, living and growing within wetlands, especially highly endangered and migratory species;
- Investigation and assessment of the current state of the conservation and development of wetlands;
- Sociological survey and research of human communities whose livelihood relies on resources provided by wetlands;
- Establishment of wetlands database to serve as grounds on which wetlands use plans and planning would be developed for the purpose of the conservation and sustainable development thereof;
- Periodical inventories of the national capital stock of wetlands by regions and categories for their better management.

**Article 9. Responsibility division and authority decentralisation for wetlands investigation and research**

The Ministry of Natural Resources and Environment shall develop a master plan on baseline investigation and environmental assessment of wetlands nationwide; and be primarily responsible for the investigation and research of wetlands of national or international important that are within the jurisdiction of many sectors and provinces.

The Ministry of Agriculture and Rural Development and the Ministry of Fisheries shall be responsible for their sectoral investigation and research of wetlands of international or national importance that are within the jurisdiction of many provinces.

Department of Natural Resources and Environment of provinces and cities directly under the central Government shall be primarily responsible for the investigation and research of wetlands other than those stated in Clause 1 and Clause 2 of this Article.

**Article 10. Grounds and contents of wetlands planning**

The planning of wetlands must be based on the following grounds:

- Socio-economic development master planning as well as land use planning and plans already approved by the competent State agencies;
- Demand for the conservation and sustainable development of wetlands;
- The Ramsar Convention;
- Functions of wetlands to maintain ecological balance regulate water cycles and biodiversity as well as economic potentials and advantages that they provide.
- Contents of wetlands conservation and sustainable development planning include:
- Identification of directions and objectives of the conservation and sustainable development of wetlands;
- Identification of the scope and acreage of wetlands;
- Definition of contents of the conservation and sustainable development of wetlands;
- Identification of major measures for the conservation and sustainable development of wetlands;
- Prediction of and early warning of environmental incidents as well as developing and undertaking of relevant measures to prevent and reduce adverse impacts on the environment.
Article 11. Planning responsibilities and approval power

The Ministry of Natural Resources and Environment shall be primarily responsible for planning the conservation and sustainable development of wetlands prescribed in Clause 1, Article 9 of this Decree and submitting them to the Prime Minister for approval.

The Ministry of Agriculture and Rural Development and the Ministry of Fisheries shall be primarily responsible for planning their sectoral conservation and sustainable exploitation of wetlands prescribed in Clause, Article 9 of this Decree and submitting them to the Prime Minister for approval.

The provincial/municipal Departments of Natural Resources and Environment shall assume the prime responsibility for planning the conservation and sustainable exploitation of wetlands prescribed in Clause 3, Article 9 of this Decree and submitting them to the People’s Committees of provinces and cities directly under the Central Government for approval.

In general, Viet Nam laws partly meet the requirements of management, utilization and conservation of wetland in particular and bio-diversity in general. However, in practice, this legislative system still shows some weak points relating to rights, duties, and responsibilities of organizations and individuals in management, utilization and conservation of wetland area.

The achievement of the national legislative system for wetland management, utilization and conservation

As a participant in Ramsar Convention and other international agreements concerned with environmental protection (e.g., Biodiversity Convention, CITES, and UNCLOS) Viet Nam has devoted considerable effort to building a legal and policies wetland management framework.

The Communist Party of Viet Nam has developed a strategic ideological base laid down in a number of the Party’s Resolutions during the renovation period from 1986. These include Directive 36/CT-TW, dated 25 June 1998, by Politburo on strengthening environmental protection during the period of the country’s industrialization and modernization from 1996. It is addressed generally to increasing environmental protection and has become the strategic guideline and de facto model for the legal, policy and institutional framework being constructed to protect the environment in all fields, including those indirectly related to wetland conservation and management. A key provision, “Reasonable exploitation and use of the natural resources, protection of biodiversity and nature”, has become a basis for developing and improving policies, relevant to management, conservation, wise use and recovery of wetland.

Limitation of the national legislative system for wetland management, utilization and conservation

Viet Nam’s recently-constructed legal and policy framework broadly incorporates law and policy considerations into an approach to wetlands management, but it has certain inherent limitations, as described below:

The legal provisions are inadequate. Most do not directly regulate wetland management and conservation and many of them are concentrated on special-use forest management through which wetlands can be managed. Those provisions directly regulating wetland management and conservation are mainly issued by ministries or the competent bodies at local level but high central bodies such as National Assembly. Among them there are some legal documents issued by the former Council of Ministers or the Prime Minister. Effective wetland management and conservation requires legal authority entitled to the highest respect, at least in the form of a Government Decree.

Besides, the government’s Decree No 109 - the first legal document on wetland management and conservation, the legal provisions on wetland management and conservation are scattered among many laws and regulations, such as the Law on Forest Protection and Development, the Land Law, the Ordinance on Aquatic Resources Protection and Development, the Law on Fishery Resources and many other sub-legal regulations such as decree guiding the implementation of laws or ordinances. In fact, many regulations embodied in different legal documents are overlapping or too general, making their practical implementation difficult.
The existing legal provisions (including those directly or indirectly relating to wetlands) do not regulate all the issues concerning the wetland conservation and management. Even the Land Law, an important legal document stipulating land grades and land use has no provision on wetland. Thus, wetland utilization and protection are regulated by provisions on forestland, agriculture land or special-use land.

Most wetland use and exploitation law (including that applicable to the components of wetland ecosystem) are concerned with economic aspects (for example the provisions laid down in the Ordinance on Aquatic Resources Protection and Development or legal documents issued by local authorities), with protection measures such as administrative fines for wrongful acts, and with conservation (especially conservation of waterfowls whose habitats are wetlands). Some wetland conservation laws prohibit certain extreme fishing methods, and there are a few provisions on wetland recovery.

The laws directly applicable to wetlands protection mainly are decisions or instructions of the Prime Minister regulating land grade and management devolving for wetlands (such as national parks or wetland nature reserves), in which there are some provisions on wetland, fauna and flora conservation. In fact, however, laws directly regulating particular aspects of wetland management and conservation do not include penalties for their violation. Moreover, many socio-economic considerations were omitted from the drafting process. As a result, these legal documents have not been effective; for example, those providing measures against alien species or those regulating exploitation and protection of aquatic resources in lagoons or ponds where farmers’ income is based mainly on fishing.

The legal documents issued by local Peoples Committees have not met enough requirements of wetland management and conservation. In the fact, most of them are considered as detailed implementing documents for higher effective legal documents promulgated by the government and ministries. They have not counted the socio-economic conditions of the province itself. Furthermore, those documents usually contain administrative measures and they do not achieve the specific measures to attract public participation in conservation and management of wetland and its biodiversity.

There are insufficient provisions laid down in the legal documents issued by both central and local authorities intended to regulate wetland planning and promote the wise use of protected areas and their buffer zones. The most symbolic problem is that no master-plan of wetlands management has been approved yet by the government. Such a master plan is essential to effective national wetlands management. The government should issue these necessary rules for management of Wetlands Nature Reserves System.

At present time, there is no unified and clear policy to protect, to expand or to narrow wetland areas. For many reasons, the importance and value of wetlands have been not been popularly understood, so wetlands—and especially estuarine and coastal wetlands—have in many cases been considered bare lands, easily adapted to different uses; for example, converting coastal wetlands to agricultural land. The policies upon which land use change have been based clearly favour economic development over wetland conservation. Finally, the legal requirements for wetland planning are inadequate. For all of the above-mentioned reasons, wetlands continue to suffer pollution, degradation and decreasing wetland area.

Although competent authorities have issued policies and legal documents on wetland protection, a series of wetlands of high value are not well or effectively protected, managed and conserved. According to the newest statistics of National Environmental Agency (NEA) in “Wetlands of high value for biodiversity and environment” published in 2001, many wetlands such as lake Chu (Phu Tho Province), Thai Binh Estuary (Tien Lang District- Hai Phong City), Cau Hai Lagoon (Thua Thien-Hue), Thi Nai pond (Binh Dinh Province) have suffered from inadequate management and conservation measures.

As matters of fact, a number of legal terms and notions relevant to wetlands have not been applied in unified way in legal documents and policies. This makes more difficult for governmental bodies, individuals and organizations to perform provisions for wetland management, exploitation, utilization, recovery and development.
Though Viet Nam has paid much attention to the implementation of commitments arising from international treaties (Ramsar Convention and others) and has taken into account these international obligations in drafting and enacting legal documents, these efforts have been of marginal effectiveness in wetlands conservation.

Despite the broad system of legal documents stipulating sanctions for wrong acts (including compensations, fines, administrative fines and penalties), the sanctions for violations of biodiversity conservation legal rules remain inadequate. The fines are low in the context of improved current economic and social conditions. Deforestation and rare aquatic species exploitation causes damages to environment in general and biodiversity in particular. These ecological losses may be irreversible, or take years to recover. Low fines are unlikely to effectively change the behaviour of violators who easily can afford to pay them.

Viet Nam has developed a system of legal documents and policies to implement the international obligations laid down in the Ramsar Convention and similar agreements concerned with wetland protection. However, these documents do not meet the Ramsar Convention "wise use" requirement. One of the effectiveness of the implementation of the international obligations arising from these international treaties has also evaluated through building and performance of legal documents and policies on wetland management and conservation.

So far, highly effective normative legal documents of such as laws, decree-laws, decrees of Vietnamese government lack specific, separate regulations demonstrating uniform state management of wetland targeting socio-economic development, environment protection, creating specific legal framework to manage and exploit wetland's potentials properly, serving the purpose of wetland's sustainable development.

5.2.2 Some general comments on enhancement of the legislation systems for wetland management, utilization and conservation in Viet Nam

In order to enhance efficiency as well as overcome the shortcomings of wetland management, utilization and conservation, it is necessary to revise and amend Viet Nam's legal framework on wetlands as follows:

- Developing and strengthening the legislated system for wetland management, utilization and conservation
  - A legislative system should be developed in systematic, scientific, precise and feasible manner. It is important to collect statistics and documents on legislation concerning wetland as well as to evaluate the existing legislation documents in order to reject provisions that do not correspond to the facts, and to fully evaluate the feasibility of each provision and document. To increase legal designation effectiveness concepts such as "wetland" and "wise use" must be clarified, taking account to existing shortcomings. Another urgent task is promoting of the participation of community and local authorities to enhance and develop new wetland regulatory standards based on scientific and economic criteria, and developing an institutional system for their administration. International cooperation regarding Vietnamese wetland, and conformity of Viet Nam's legal framework with international standards should be assessed. International cooperation will be an important basis helping Viet Nam complete laws on wetland.
  - Legalize the concepts of wetlands for consistency and to promote the practical and even-handed application of the laws. The concepts should be officially used in documents, with clear interpretation.
  - In wetland-related documents, it remains necessary to include other regulations that clearly define the functions, values of wetland and combine wetland management, utilization and conservation with professional management.
  - It is high time that the government issues a decree, or at least an ordinance on wetland that clearly stipulates the system, organization and authorized state body for wetland management and utilization. Wetland can’t implicitly be seen and thus managed as part of farming or silviculture land.
Both central and local level management bodies must initiate appropriate policies to encourage and help reduce risks of dealing with wetlands. On the one hand, this would surely encourage people to intensify production activities on the wetland areas, and on the other hand, restrict the adverse impacts on wetlands, thus reducing risks.

If tax policy on farm land (for rice and vegetable growing) is applied to wetlands available for aquaculture, there are two possibilities: One is the failure to encourage aquaculture farmers to use the water-face to develop fishery; two is the loss of revenue for state budget as the use value of land with water-face available for aquaculture may be higher than that of farm land. Therefore, it is most rational to separate the management of land with water-face from that of farming land.

REFERENCES


