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MARINE RESOURCES AND ENVIRONMENT OF VIETNAM, DEVELOPMENT OPPORTUNITIES AND CHALLENGES

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Introduction

The sea area of Vietnam covers a continental shelf of over 1 million km^2, with a coast line over 3,260 km long extending over 13 latitudinal degrees with many river mouths. The coast line of Vietnam is subjected to great impacts of the two large deltas: the Mekong delta in the South covering about 59,000 km^2 and the Red river delta in the North covering 17.000 km^2.

Marine resources of Vietnam are diverse and rich, with over 2000 sea fish species, 300 species of corals and some unidentified animal and plant species; with diverse ecosystems such as coral reefs, mangroves, sea grass covers, tidal flats, estuaries, lagoons, deltas, bays, islands, etc.,; with many kinds of mineral resources such as oil and gas, titanium, ilmenite, construction materials, etc.

Many important socio-economic, national security and defense activities take places in offshore and coastal areas such as fishing, oil and gas exploitation, marine transport, tourism. Economic development activities of 28 coastal provinces and cities with about 1/2 of the whole country's population are closely related with the exploitation and utilization of marine and coastal zone resources.

However, the great potential and value of marine and coastal resources are facing serious risks of degradation. What is the present status of the marine resources and environment? Are the exploitation, utilization and management of the marine resources appropriate? What are the causes of the degradation of the marine resources and environment? What should be done for protection and sustainable exploitation and development of the marine resources? These issues are of very much interest in the management of marine resources and environment.

This paper refers to only the present status of some important marine and coastal resources and proposes measures for protection, exploitation and development of these resources.

I. MARINE AND COASTAL RESOURCES – THEIR VALUES

Mangroves

Mangroves are a special ecosystem in the tropical river mouth and coastal areas. Mangroves are of great effect in restraining erosion, stabilizing the flood plain, detaining wind and waves, providing nutrients to aquatic species, filtering waste water, maintaining ecological balance in the coastal area. This is a suitable environment for aquaculture, fishing and shrimping activities. Mangroves are also the habitat of wild animals such as birds, mammals, reptilians, amphibians. The mangroves products such as wood, charcoal, paper pulp, pharmaceutical materials are of high value.

Mangroves of Vietnam are distributed along the coast all the way from North to South, mainly concentrated in the Mekong river delta. According to the 1982 survey data of the Forest Survey and Planning Institute, mangroves in the whole country cover 250,000 ha. In the recent year, due to the rapid population growth and excessive aquaculture activities, mangroves have been seriously destroyed. The mangrove area in the Mekong river delta has decreased rapidly from 250,000 ha in 1950 to 72,000 ha in 1995.

Coral reefs

Coral reefs are a typical ecosystem in Vietnam. The sea area of Vietnam is one of the sea areas with high diversity of coral reefs in the world, with 277 species of 72 genera of corals in the coastal waters of South Vietnam and 165 species of 52 genera in the coastal waters of South Vietnam (according to Nguyen Huy Yet, 1992).

Table 1 - Quantity percentage of some main coral species in each sea area

Species	South Vietnam	North Vietnam	South Papua New Guinea	Philippine	Okinawa	Amakusa	Tanegashi-ma
Acropora	16.2	15.2	18.4	17.3	19.6	12.2	13.9
Montipora	9.0	7.3	7.8	10.2	8.9	7.1	8.6
Porites	4.3	7.9	5.3	5.8	5.9	1.0	1.3
Goniopora	3.2	3.6	2.5	3.4	3.0	4.1	4.0
Panova	2.9	3.0	2.8	3.2	3.3	3.1	4.6
Fungia	3.2	3.6	3.5	3.6	3.6		0.6
Favia	4.0	6.1	5.0	3.6	4.5	7.1	6.6

Coral reefs are important habitat of many invertebrates, fishes, sea tortoises, sea mammals, are a sensitive ecosystem with high bio-productivity and biodiversity. They are of special importance in absorbing and dissipating storm energy, protecting the coast from erosion, having unique beauty attracting many tourists.

Sea grasses

Sea grasses are a group of sea plants growing on the sandy, muddy, rocky floor in the estuary and coastal areas belonging to tidal zone and the upper part of the sub-tidal zone with the depth up to 3-6m from Quang Ninh to Kien Giang. Although comprehensive researches on sea grasses have not been carried out, 15 species have been discovered 5,583 ha from 1995 to 2001 in 23 locations in 12 coastal provinces.

Table 2 - 10 locations in Vietnam

Locations	Areas (ha)	Location	Area (ha)
Tam Giang lagoon	1.000	Gianh river mouth	300
Phu Quoc island	1.000	Phu Quy island	300
Thuy Trieu lagoon and Cam Ranh bay	800	Cu Mong lagoon	250
Dai river mouth	500	Thi Nai lagoon	200
Van Phong bay	410	Con Dao	200

Source: Nha Trang Institute of Oceanology; Hai Phong Branch Institute of Oceanology, 1995-2001.

Sea grasses are the habitat and spawning ground and shelter for many marine plant and animal species such as, sea weed, zoobenthos, sea fish, and sea reptilians. As an initial step, 125 zoobenthos and 158 sea wed species have been discovered to live in and under sea grass cover, of which many species are of high value such as *Meretrix meretrix, Cyclima sinensis, Chinese sinensis*, Corbicula, crab, shrimp, Holothurian,... Sea grasses are also alimentary source for many invertebrate, reptilian, sea fish, sea mammal species. Owing to their intricate root system deeply growing into the soil, sea grasses have the ability to protect the coast, prevent erosion, reduce the current velocity and stabilize the sea floor.

Fishery resources

The coastal waters of Vietnam to the water depth of 30m accounts for only about 11% of the exclusive economic zone, but the harvest from here accounts for 80% of the total harvest. The fish stock in the whole sea area of Vietnam is estimated about 3.6 million tons, of which 1.7 million tons is in the offshore area. Sea products provide nearly 60% of the total animal nitrogen consumed countrywide. Sea products bring the largest foreign currency revenue and are the third ranking export commodity, using 4% of the labor country wide.

Aquaculture

Aquaculture brings a large benefit for the coastal population and promotes the development of the marine economy. From 1991 to 2001 the total offshore and coastal aquaculture harvest increased by 153%, however the shrimp cultivation area increased only by 94%; this show that the aquaculture productivity per hectare increased.

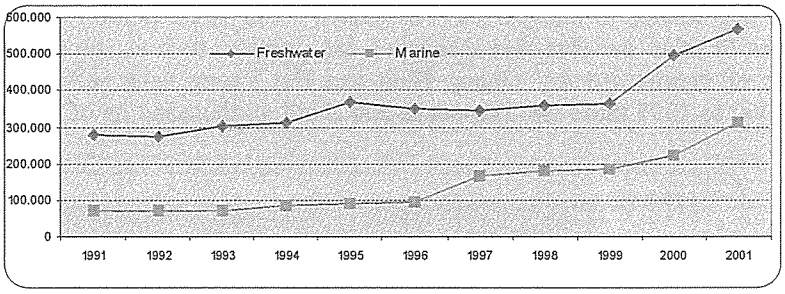

Fig 1: Variation of aquaculture harvest of Vietnam in period 1991-2001 (tons)

Source: Ministry of Fisheries, Master plan of Fisheries Sector, 2000-2010.

Tidal flats

Tidal flats belong to the coastal wetland group, having a very important role in the coastal ecosystem and have been also exploited for many years by the coastal population. Tidal flats are widely distributed all the way from North to South, mainly concentrated in estuarine areas and along the coast of the Red river and Mekong river deltas, with estimated area of over 1.000.000 ha.

Tidal flats are the habitat, the feeding source and the place for preserving the stock of aquatic species (roes, fries, etc.), are buffer zone for protecting the coast from erosion thanks to thick vegetation cover, flat and wide terrain, are sediment traps and are natural filters and collectors of pollutants. In the Northern tidal flats there are 387 benthos species, 106 crustacean species, and 174 mollusk species. 90% of stocks of marine species are present in tidal zone and mainly in the tidal flats. About 95 % of valuable marine species such as *Meretrix meretrix, Cyclima sinensis, Cyrena, Metapenaeus ensis.*

Exploitation of oil and gas and other minerals

In the sea area of Vietnam are known about 35 kinds of minerals with various reserve scales, belonging to several groups: fuel, metal, construction materials, etc. The Gulf of Bac Bo, the Gulf of Thailand, Truong Sa archipelago are areas with animated oil and gas exploitation.

Offshore oil and gas exploitation is increasing from year to year. According to the data from PetroVietnam, the petroleum production of Vietnam is presented in Table 3.

Table 3 - Annual oil production in Vietnam

Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Production (1000 tons)	40	280	678	1.490	2.500	-	-	5.000	7.000	7.700	8.800

Sea transport

Sea transport plays an important role in the national economy. Along the coast of Vietnam there are 60 sea ports, of which 17 are major ports under the management of the State. The major ports handle about 80% of the total amount of cargos, reached 12.5 million tons/year in 1993 and about 24.5 million tons in 1994, of which about 28% were oil products.

Marine tourism

Tourism plays an important role in the economic development in the coastal zone. The tourist economy is growing rather rapidly.

II. CURRENT STATUS OF THE MARINE AND COASTAL RESOURCES – PROBLEMS AND CHALLENGES

Marine resource is of great potential and diversity, but they are facing the risk of serious degradation.

Mangroves are being diminished.

After 5 decades, the mangroves area of Vietnam has decreased by more than 80%. One of the main causes of the mangrove destruction is the shrimp cultivation and salt production. Besides, mention should be made of the change of land use, destruction by the war and cutting of trees for fire wood.

The loss due to the degradation of mangroves is estimated about 10-32 million USD per year, not taking into account the loss of other benefits that mangrove can provide, such as: protection of the coast from erosion, the habitat of marine species. Quang Ninh and Hai Phong have suffered the greatest loss of mangroves, from 1960 to 1995 these two provinces lost about 40 thousand ha of mangroves (there remain only 15,700 ha).

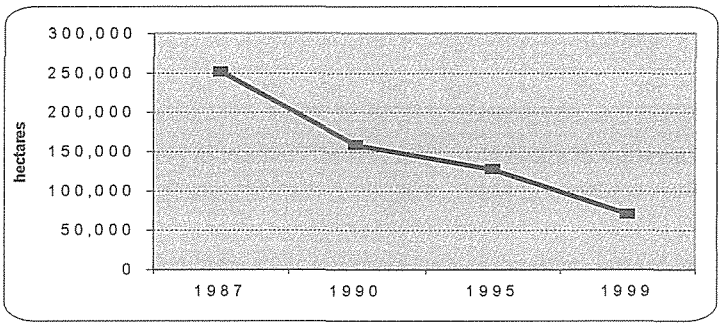

Fig. 2: Variation of mangrove area in Vietnam (ha)

Source: Environmental status of Vietnam, 2000; COMMEMIS project, 1997; Forest inventory and monitoring program of Vietnam in period 1996-2000, FIPI, 2001.

Corals are being at risk. The researches carried out from 1994 to 1997 in 142 areas have led to the conclusion that only 1% of Vietnam's corals are in good condition, 96% are being seriously at risk by human activities, 75% are very seriously at risk.

The use of annihilating method in fishing, excessive fishing, sedimentation and pollution from the mainland sources are the main risks to the coral reefs.

Table 4: Quality of coral reefs of Vietnam.

Classification	Definition	% area
Very good	>75% of corals alive	1
Good	50-75% of corals alive	26
Fair	25-50% of corals alive	41
Poor	<25% of corals alive	31

Source: World Resources Institute, 2002, "Reefs at risk in Southeast Asia".

Sea grasses being degraded.

Sea grasses of Vietnam are being over-exploited, mainly for making fertilizer and animal husbandry. Sea grass covers are seriously degraded due to the human activities such as inappropriate fisheries, aquaculture and pollution due to discharge of wastes. The causes of loss of sea grass covers are also related to the destruction of the watershed forests, whereby the sediments carried from the continent cover the sea grasses.

Coastal erosion increasing due to excessive exploitation of the tidal flat.

From 1937 to 1992 about 14,738 ha of tidal flat were developed into agricultural land in the area of Bach Dang river estuary (Hai Phong). About 60% of tidal flat area was converted to brackish water aquaculture ponds; 40,000ha of salt field were built on tidal flats. The costal population use any means for fishing on the tidal flats. As a consequence, this has disturbed the environment on the tidal flats.

The fisheries stock in the exclusive economic zone of Vietnam is being degraded.

The evidences, though being quantitative, have indicated that the fisheries stock in the exclusive economic zones of Vietnam is being degraded. The main causes are: fishing being concentrated near shore, fishing techniques being of annihilating character due to the use of explosives or small opening fishing nets; fishing being increased, but the management and law enforcement are still poor. During the past 15 years, while the fishing harvest increased, the harvest per fishing area decreased and the size of the fished species also ever decreased.

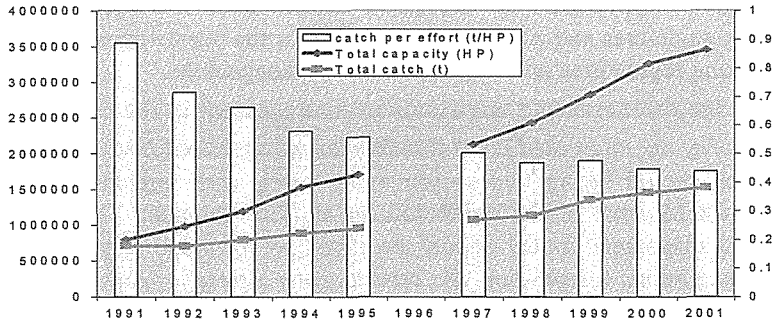

Fig. 3: Fishery harvest of Vietnam 1991-2001

Source: Ministry of Fisheries, Master plan of Fishery Sector, 2000-2010.

Aquaculture production being increased.

From 1991 to 2001 the total offshore and coastal aquaculture production increased by 153%, whereas the aquaculture area increased only by 94%; this means the productivity per ha increased.

The risk of oil spill and oil pollution ever increasing.

Lively and frequent activities in sea ports, domestic and international sea transport, offshore oil and gas exploration and exploitation and utilization of oil products make the risk of oil spill and oil pollution ever increases. The areas with the risk of oil spill include the North - South shipping lanes, oil fields being exploited in the Southern offshore areas such as Dragon, Big Bear. From 1989 to 1996 occurred 14 cases of oil spill, mainly from oil fields being exploited, such as Dragon 300 – 700 tons, Big Bear 15.37 m^3 of oil, etc. The amount of oil spill from oil tankers in the sea in 1994 was 1.700 tons, in 1996 was 72 tons.

Oil pollution also originates from the main land. Oil and oil products flow into the coastal areas through rivers. According to the data from the Marine Environment Survey, Research and Consulting Center, in 1996 was discharged into the sea 2,700 – 3,300 tons of oil via the Dong Nai - Saigon river system, 27,500 – 55,000 tons via the Mekong river and 7,000 – 8,000 tons via the Red river system

Tourist development.

Marine and coastal tourist exploitation must be attached with sustainable development. The number of tourists coming to Vietnam is rapidly increasing, entailing the increase of solid wastes, waste water causing pollution of the coastal waters, degradation of sensitive ecosystems, loss of biodiversity.

III. PROTECTION EXPLOITATION AND SUSTAINABLE DEVELOPMENT OF MARINE RESOURCES

Awareness of the management of marine resources and environment

The excessive and irrational exploitation of marine resources causing degradation of the marine environment as mentioned above are due to many causes. First of all, the understanding about the nature and values of marine resources is still limited. The management of marine resources and environment is still poor; policies and regulations are still inadequate, of low effectiveness and cannot meet the actual requirements. Marine resources exploitation activities are still of unisectoral and spontaneous character, for private interest, without common unity oriented toward sustainable development.

Developed economy will promote marine resources exploitation activities. Diversification of economic activities may increase the pressure on the natural resources and environment, generating conflict between the exploitation and utilization of marine resources and the environmental protection. Without measures to settle these conflicts it is impossible to reach sustainable development.

Integrated management of the coastal zone - a multisectoral and multidiscipline management model with proposal and implementation of policies for efficient and sustainable exploitation of marine resources has been introduced in Vietnam through the project *"National demonstration of integrated coastal zone management of Da Nang city "* (2000-2004) under the PEMSEA program and the Vietnam - Holland project *"Integrated coastal zone management "* (2000-2003). Following the results of a pilot project in Nam Dinh, Hue, Da Nang and Ba Ria – Vung Tau, the Ministry of Natural Resources and Environment is

implementing the project *"Application of integrated coastal zone management model in the coastal localities"*, formulating guidelines and zoning arrangements for the coastal localities, developing databases, proposing and formulating regulations on integrated coastal management.

Principal tasks in marine resources and environment management in the coming period

1. Prompt introduction of the integrated coastal management approach into application in Vietnam. This management approach should be applied at provincial level, with guidance and assistance from the Government through the Ministry of Natural Resources and Environment. The priority in the application of the coastal zone management model should be given to formulating the suitable mechanism and personnel for implementation, formulating the coastal zone strategy, working out the action plan for implementing the strategy, zoning for development, calling for investment in environment through cooperation between the authorities and the private sector, strengthening the capacity for the personnel directly engaged in the integrated management.

2. Formation of marine nature reserves. Marine nature reserves play a primary important and vital role in sustainable development. They not only contain economic and ecological values but have also historic, cultural and aesthetic values. If the marine resources are not protected by maintaining through important ecosystems and marine nature reserves, sustainable exploitation of these natural resources will not be possible.

3. Integrated management of fisheries in the coastal waters. It is necessary to establish a community - based functional management system, whereby to decrease considerably annihilating and excessive fishing activities in the coastal waters.

4. Improvement and development of livelihood for the poor coastal community which are vulnerable to the changes of natural resources. Many communities in the coastal areas are identified as poorest groups in our country. They should be provided sustainable livelihood by improving the infrastructure, creating jobs, protecting the natural resources with participation of the people, strengthening the capacity of the community and local authorities.

5. Prevention and mitigation of marine and coastal hazards. In the marine and coastal areas of Vietnam there are two types of hazards which frequently occur: natural hazards such as typhoon, flood, erosion, sand drift, and environmental incidents such as offshore oil spill. To enhance the capacity of responding to the emergency situation for alleviating economic losses and increasing safety for the coastal community is one of the priority items of environmental management and sustainable development of marine and coastal areas.

6. Strengthening the institutional, organizational, monitoring and managerial capacities of marine and coastal environment management agencies of various levels. This is an overwhelming task for assisting the implementation of other tasks. It includes: consolidation of the legal framework, formation of management mechanism suitable with the marine and coastal environment, strengthening the operation of the national marine environment monitoring system, development of technical instruments to support management, raising the awareness of the stakeholders, etc.

7. Participation in and implementation of sea-related international conventions, international and regional cooperation programs. Participation in international conventions and international cooperation programs related with marine and coastal resources and environment should be given due attention and duly implemented, so as to create the opportunity to concretize and implement the policies for marine and coastal resources management and environment protection.

Basic principles for implementing the policy of sustainable marine and coastal resources development and environmental protection

The two basic principles recommended for implementing the above policy are as follows:

1. Partnership and co-management. Although marine resources and environment are under universal responsibility Ministry of Natural Resources and Environment, their optimal and effective management which could bring maximum benefits to the coastal population and match with the world wide trend should be based on the partnership and co-management principle with sharing of responsibilities. This principle overcomes weaknesses in capacity of specialized agencies of the Government, assists in mobilizing

financial resources, brings into play the advantages of the localities. The opportunity of being successful is high if there is cooperation between basic stake holders, in particular:

- *The Government,* which has the right over the land and natural recourses. The Government develops legal framework, policies, and plays the role of regulating all component activities.
- *Local communities,* who base their lives on natural resources, in the mean time suffer the consequences of decisions on investment and distribution of benefits.
- *International credit institutions,* which provide necessary initial investment.
- *Donors,* who provide technical assistance.
- *The private sector,* which provides fund and expertise, has practical experiences in various fields such as tourism, aquaculture, etc.
- *Non-government organizations (NGO),* which are responsible for transferring information to the community, provide advises and comments, develop relationship among stakeholders and monitor activities.
- *Research institutions,* which provide consulting services, play the role of intermediary to connect stockholders in management, exploitation and utilization of marine and coastal resources and environment.

2. *Implementation by provincial level.* Implementation at the provincial level is suitable with the present legal framework of our country on management and protection of marine resources and environment. The actual implementation of pilot and demonstration projects for integrated coastal zone management in provinces shows that this principle is appropriate and correct.

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SUMMARY

Vietnam is bound by the East sea, with 3,260 km long coast line and 1/2 of the population living in the coastal provinces. The continental shelf of Vietnam covers over 1 million km^2. With diverse and rich natural resources (living resources, non-living resources, positional), the sea of our country plays a very important role in the socio-economic development and vital significance for the natural security, defense and construction.

Socio-economic activities in the offshore and coastal areas such as fishing, oil and gas exploitation, sea transport, marine tourism,... are closely attached with the exploitation and utilization of marine and coastal zone resources. However, exploitation of marine resources is still of unisectoral and spontaneous character, purely for private interest, lacking unity.

The marine and coastal resources with their great potential and value are facing the serious risk of degradation. Some experimental models have been successful in finding the solution for the problem of rational exploitation, utilization and management of the marine resources and environment for the purpose of sustainable development.

This paper addresses the present status of some important marine and coastal resources, proposes measures for protection and exploitation of these resources in the principle of sustainable development.