

Vietnam Mangrove Forest Ecosystems: Problems and Solutions

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ABSTRACT

Vietnam mangrove forest ecosystem plays an important role in environmental protection. To highlight its significance, we study some major problems as the following:

- *Outlining the ecosystem - the habitat in which we are living*
- *Mangrove forests are among of the most productive and biologically important ecosystems.*
- *Vietnam has large area of mangrove forests with high biodiversity. However, mangrove forests have been declining due to the war, the population increased, and the limitations of the production.*
- *Propose major solutions to protect and develop mangroves to contribute to environmental protection in the face of greenhouse effect and climate change today.*

Keywords: *Mangrove ecosystems, biodiversity, fauna, flora, wetland, Rhizophora apiculata, Avicennia alba, Rhizophora stylosa, Kandelia candel, Aegiceras corniculatum, Sonneratia caseolaris*

CONCEPT OF ECOSYSTEM AND MANGROVE ECOSYSTEMS IN VIETNAM

Scientists in the West have warned humankind of the duty to protect the habitat. To date, many countries in the world have achieved remarkable results in environmental protection. However, due to population growth and the change and development of production, environmental protection is still an urgent task of our age. Vietnam's mission to protect the ecosystem in general and mangrove ecosystems in particular toward the direction of climate change has become a pressing issue.

The ecosystem:

Scientists have raised environmental crisis, such as resource depletion, pollution and lack of clean water, air; biodiversity loss; ozone holes; dangerous diseases, rich-poverty polarization, war; chemical, biological and nuclear weapons; greenhouse effect, sea level rise, etc. It all leads to a local crisis and the entire ecosystem recession risk can occur if humanity does not act promptly to "save the earth" our friendly environment!

In our opinion, ecosystem includes all of the mutual relations, dependencies, and interaction as a combination of factors having the same function in a united system of society and nature (Boong, 2002). Striking features of the ecosystem are metabolic processes, information, energy, and self-correcting dynamic balance. Ecosystems are not only different in scale and nature, but also intertwined, interlocking. Except for close ecosystem, the universe, all ecosystems are open systems, are receiving the material, energy, and information through metabolic processes, self-adjusting, creating dynamic balance status, food chains; process of genetic variation, adaptive process; competitive survival; process of birth, aging, sickness and death, etc. It is the objective movement laws of nature and organisms.

Since the existence of human, the elements of the ecosystem include:

- Producing organisms (autotrophic)
- Creatures consumption (heterotrophic)
- Biological saprophytic (decompose)
- People and society. The inorganic and organic substances necessary for life.

With the development of science and technology, people have an increasingly strong impact on the ecosystem: People - Society and Natural

Although ecosystem changes in history, according to Professor Vo Quy, Director of Center of Environment and Natural Resources, Ha Noi National University, so far scientists have listed 10,484 vascular plants species in Vietnam. As predicted by the botanist, there will be at least 12,000 species, of which about 2,300 species have been used as the source of human's food, and medicine. Vietnam's fauna are very rich. We have found 275 species of mammals, 828 species of birds, 180 species of reptiles, 80 species of amphibians, 471 species of freshwater fish, 2,000 species of sea fish, more than a hundred species of birds and 78 species and subspecies endemic animals. There are many rare species of flora and fauna needed to be protected (Quy, 1995).

Vietnam Mangrove forest ecosystems

Vietnam is located in Southeast Asia. The S-shaped country stretches from northeast to southwest, west of Truong Son Mountain range, turned to the East Sea. Its area is approximately 331,210 km² (127,881 sq mi) with a coastline of

over 3,260 km. Vietnam has a tropical monsoon climate, rich and diverse in natural resources. Vietnam Coast is adjacent to the Gulf of Tonkin, South China Sea and Gulf of Thailand. On average 100 km² of coastline is 1 km inland coast (6 times higher than the rate of the world). Along the coast there are about 3000 kinds of big and small islands, mostly located in the North Bay with an area of approximately 1,700 km², including three islands covering an area of over 100 km², 23 islands covering an area of over 10 km², 82 islands covering an area of over 1 km² and over 1400 no name islands. Vietnam government's claims of internal waters, territorial sea, exclusive economic zone, and continental shelf are nearly 3 times the land area of over 1,000,000 km². The most distant point of land to the coast is less than 50 km². Vietnam's population, according to the General Administration of population and family planning at the anniversary of Vietnam population's Date December 26 rally, will reach 90 million people by 2013.

Mangroves are an integral part of Vietnam forest ecosystems and are part of wetlands. They are located in coastal areas, estuaries and along rivers go further inland in 20 provinces across the country, with an area of 400,000 ha (Maurand, 1943). Mangroves act as production organisms. They are the most biologically productive ecosystem. However, mangroves are also vulnerable, resulting in ecological imbalance, and easily destroyed by human activities, changing of weather and climate.

STATUS AND MAJOR CHARACTERISTICS OF VIETNAM MANGROVE ECOSYSTEMS

According to Professor Phan Nguyen Hong, Vietnam mangrove forests can be divided into four main areas:

- Region 1: Northeast coast Mangrove forest, from Ngoc cape to Do Son cape.
- Region 2: North Delta mangroves, from Do Son cape to Lach Truong
- Region 3: Central coastal mangroves, from Lach Truong to Vung Tau
- Region 4: South Delta mangrove, from Vung Tau and Ha Tien.

Although sharing common characteristics of coastal ecosystems and subtropical, each region has distinct representative kind of plant and animal. In the north (Region 1 +2), Đước vôi (*Rhizophora stylosa*) is from 5 to 7m high with well-developed root system to effectively prevent wave to protect shoreline and land. Followed by Mắm biển (*Acicennia marina*) and Sú (*Aegiceras corniculatum*) from 3-5m high, capable of withstanding low temperatures and frost. *Kandelia candel* are able to live in areas subject to low temperatures.

In the South (region 3 +4) Đước đôi (*Rhizophora apiculata*) is the dominant tree species accounted for 70-80%. Next are Mắm trắng (*Avicennia alba*), Đước vôi (*Rhizophora stylosa*), Trang (*Kandelia candel*), Sú (*Aegiceras corniculatum*), Bần chua (*Sonneratia caseolaris*) ... as appropriate planting trees for restoration and protection of coastal estuaries. "Khanh Hoa mangroves have 68 algae species (Dai, 1992). There are 1969 mollusks in northern mangrove belonging to 51

families, 51 arthropod species of 13 families (Trong, 1992). Vietnam mangroves has 258 fish species belonging to 70 families (Yen, 1992), 17 kinds of mammals (Ha, 1980), 385 species of birds including 73 migratory birds species (Quy, 1984) "(Hong, 1995a)

Thus, the mangroves have created an extremely rich and diverse ecosystems in biosphere. If mangroves lose, the coastal ecosystems will seriously imbalance. Of course, to understand the transformation of mangrove ecosystems, we need to understand human factors, and human-society interactions with mangrove.

The relationship between human and mangroves in the social development

The legend of Lac Long Quan led 50 children to the sea demonstrated that our ancient ancestors did not stick only with the mainland, but also to the sea. Images carved boat on Dong Son bronze drum represents that our nation has long been attached to the water, and has been taking boats as a means of livelihood. Therefore, mangrove had an important role for the Vietnamese people in the past. Until 1945, Vietnam's population was about 25 million people. Meanwhile, the mangroves in Vietnam were 400,000 ha (Maurand, 1943). During the Vietnam War forest were destroyed by toxic chemicals in many areas, especially mangroves. The two places, considered the two most beautiful mangrove of Vietnam, were destroyed: Can Gio (HCM city) 20,000 ha and Ca Mau peninsula with more than 40,000 ha. After the war, the population continues to increase rapidly. After 55 years (1945 to 2000) Vietnam population has increased more than 3 times (77.6309 million people in 2000); along with the development of economic recovery after the war, a segments of the population to move quickly to new economic zones where they explore mangroves. For example, Ngoc Hien district alone (Ca Mau), the population doubles after 10 years the liberation. Population growth means intensify mangrove exploitation are inevitable in the conditions of backward production, especially shrimp farming area associated with reduced mangrove. Only in Minh Hai shrimp farming area rose from 4000ha in 1980 to 80,000 in 1991. Hoang Bo District (Quang Ninh) sea dykes turn 100 hectares of mangrove forest to agriculture and aquaculture. According to the Centre for Research and Community Development (CCRD) "Co Royal tomb had about 100 hectares of mangroves in the last two decades, but now there is remaining only 5 ha poor quality mangrove."

In the South, residents living in coastal areas and mangroves are more dependent on mangroves than in the North. "Ngoc Hien district (Minh Hai) has 80-90% of households engaged in shrimp farming, forestry; Can Gio (HCM city) is 60-65%, while Le Loi commune, Hoang Bo (Quang Ninh) is only 2-5%."(Hong, 1995b) The process of urbanization, industrialization, and coastal tourism development... are still the degraded mangrove risk.

Impact of mangrove degradation, the role of government, and the people.

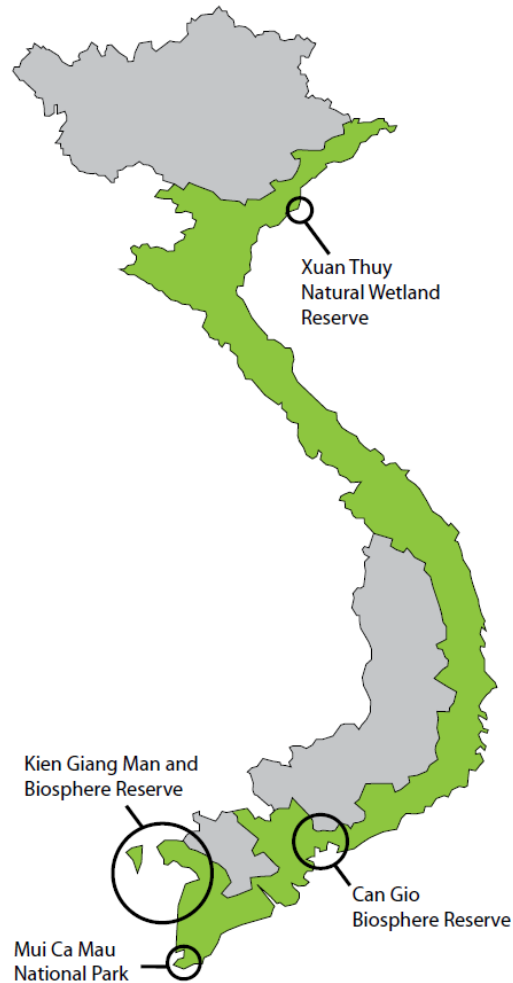
Impact of mangrove degradation in other words is the "revenge" of nature to human is expressed as follows:

- Losing valuable assets that natural gift for man
- Biodiversity decline
- Increasing air pollution
- Limiting climate regulation, storm prevention and tsunami
- Water pollution is increasingly
- Land erosion, landslides, uncultivated, impoverished.

The Vietnam government, which is very concerned to mangroves protection, established for 10 protected areas in wetlands region, which are mostly mangrove in April 1987. They are Ba Be Lake (450 ha) and Nui Coc Reservoir (2,580 ha), Cat Ba Island (26,300 ha) and Xuan Thuy (2,300 ha) in the north and six wetlands in the Mekong Delta: the Tram Chim Crane Reserve at Dong Thap Muoi (9,000 ha), Cai Nuoc (20 ha), Dam Doi (119 ha), the Nam Can Mangrove Reserve (7,547 ha), the Vo Doi *Melaleuca* Protected Forest (3,445 ha) and Con Dao National Park (Duc, 1995). Currently, there are four main protected areas and national parks that contain mangrove including Xuan Thuy Natural Wetland Reserve (12,000 ha), Can Gio Biosphere Reserve (75,740 ha), Mui Ca Mau National Park (41,862 ha) and Kien Giang Man and Biosphere Reserve (1,118,105 ha) (see figure 1).

Vietnam has strategic directions of economic development while protecting the environment. Together Vietnam government has actively participated in the International Convention on the environmental protection, issued environmental legislation. With that effort, so far after Can Gio mangrove and Cat Tien biosphere, another site of Vietnam, Cat Ba Island has been recognized as World Reserve Biosphere. The goal of planting 5 million hectares of forest, with the allocation policy for household management in a number of residential areas in the forest. Thereby, the forest area has been gradually restored. People cut mangrove forests for shrimp farming.

After a period of shrimp illness and the mass death of shrimp, people realized that "Shrimp stick with mangrove." Without forests, the shrimp did not survive. Thus, in some places people initiatively combine planting mangrove and aquaculture.



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- Can Gio Biosphere Reserve, Ho Chi Minh City
 - Xuan Thuy Reserve, Nam Dinh Province (note: Ramsar-designated)
 - Mui Ca Mau National Park, Ca Mau Province
 - Man and the Biosphere Reserve, Kien Giang Province

**Figure 1: Protected mangrove areas in Vietnam
(Richard McNally, 2011)**

Some difficulties in the maintenance and development of mangroves

- The population problem: Vietnam has an average population density of 200 people/km² (more than 2 times higher than China, 5 times higher than Cambodia and 12 times higher than Laos). Population growth rate of 2% per year, particularly for residential coastal mangrove areas is even higher. Although foreign scientists considered Vietnam capable of adapting to high natural environment, the population density is still pressure on the task of protecting mangroves.
- Rich and poor polarization in development process, low quality of human resources, less educated poor population, not trained in remote, wetlands, and mangroves areas. "In Mekong Delta, the labor market was also left open, rural labor is 90% of the unskilled labor"(Hiep, 2009).
- The process of industrialization - modernization must inevitably urbanization; industrial development zones ... makes agricultural land loss along with mangrove is unavoidable. Moreover, hazardous waste handling is not good due to the low level of technology make some canals and rivers severely polluted.
- Awareness and responsibility of every citizen to the task of protecting ecosystems - habitat is not commensurate with the set out requirements. Local people seeing mangrove resource exploitation for their livelihood is inevitable. As urban dwellers, according Dr. Tran Khanh Thanh, Hanoi National University, asked 10 families who building their house "How do they deal with the increasingly hot weather?" they have the same answer: "Just install air conditioning." No one thought of "planting trees, opening for the wind direction, actively protecting the forest and wetlands, not cause more pollution to the environment." According to the HCMC Nong Lam University student group survey results at Ward 12, District 5, Ho Chi Minh City about garbage classification project from households: there are only 25 households of 100 households (25%) making sure the project implementation.
- According to warning of the Asian Development Bank (ADB): "The average loss due to climate change for the four most affected countries including Indonesia, Philippines, Thailand and Vietnam may be equivalent to 6.7% of the total value of their annual GDP in 2100, which is 2 times higher than the international average damage of the world ". UNDP announced that if sea levels rise just by 1 meter, Vietnam would get negatively impact on 5% land, 11% of the total population, 7% of agriculture, 10% decline in GDP. The two most affected sectors are agriculture and forestry. So what we have to do to reduce greenhouse effect, sea level rise, climate change, etc?

SOME SOLUTIONS TO HELP PROTECT VIETNAM MANGROVE ECOSYSTEMS TODAY

Raising awareness about mangrove ecosystems

- Strengthen and disseminate information to improve scientific understanding of every person and society as a whole about mangrove ecosystem and its role in the protecting ecosystems - our habitat. In fact, we need thoroughly understand the rich and diversity of mangrove ecosystem and its impact on human life and society. Considering mangrove ecosystems awareness in particular and the environment in general is an element of modern human evaluation. As Karl Marx and Ph. Anghen confirmed: "All of what motivates human actions, are of course going through their minds" (Angels, 1994). We need to build content, dissemination and education programs consistent to subjects of the society especially for high school students and university students - basic labor force of society.
- For high school student, we need to combine content to subjects such as birth, chemical, physics, literature to provide students an understanding of the ecosystem, a love of nature, man, and society.
- We should put in Humanities Ecology in teaching at university. Currently, in a number of university students have studied the Human Environment. However, the content heavily focuses on impact of natural to humans. Humans - subject of ecosystems has not been noticed at right level. Human ecology will contribute to overcoming such limitations.

Promote mangrove forest ecosystem scientific and technological researches at both micro and macro scales

- Coordinate natural science and social studies to explore the movement rule of mangrove ecosystems
- Find out the interactive relationships of mangrove ecosystem elements, the effects of mangrove ecosystems to the environment and vice versa.
- Search, invent technological models, techniques, and technologies to make the production process, human activities in accordance with the operating rules of the mangrove ecosystem, proceed to "Ecologicalization of the Production." (Boong, 2000).

Strengthening monitoring the implementation of guidelines, strategies and economic-social objectives of sectors and localities

- Implementing the task of combining economic development and mangroves protection.
- There should be sanctions and reasonable measures to handle the violators.

Continue to improve and develop guidelines and strategies to improve the efficiency of the economic and social development, human resources.

- Creating new industries to reduce residents' dependence on mangroves.
- Exploiting associated with natural forest protection and plantation to increase cover to maintain and develop the ecosystem.

CONCLUSION

Vietnam mangrove's areas are large, rich in type, and diverse in species, and are an integral part of the ecosystem - our habitat. Vietnam's mangrove ecosystems are the highest biological productivity. In mangrove ecosystems, human and natural factors are a uniform. "Nature is the inorganic body of man." People - society are conscious subjects in the ecosystem. Protection and development of mangrove ecosystems in general and forests in particular, have a tremendous impact in preventing climate change - the greatest threat to humanity today. People and society should enhance sense of duty, modify work practices, be positive, and act quickly to avoid becoming "The belated repentance."

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