MANGROVE FOREST CONSERVATION AND DEVELOPMENT PLANNING IN NGHE AN – VIETNAM

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ABSTRACT

Mangrove forest is an important ecosystem in tropical coastal areas as living places, nursery areas of fish species, water birds, migrating birds and some other. It supplies many kinds of valuable forest product. Mangrove forests helping to remove air pollution, limit coastal erosion, and protection from saline water intrusion, storms. Mangrove forest areas can be used for aquaculture development, which brings a high economic return and a valuable exporting resource. However, mangroves are a sensitive ecosystem and are easily disturbed by human activities and natural impacts.

Before the situation of mangrove forest areas deteriorate Nghe An province has put much effort into restoring the forest in these areas. One of these studies is "Mangrove forest conservation and development planning in Nghe An province", carried out by the VIE/97/030 Project and Nghe An Fisheries Department.

The results of the study are: Nghe An has total 819.6 ha of mangrove forest, accordingly, by district are Quynh Luu 343.8 ha, Dien Chau 260 ha, Nghi Loc 160 ha and Vinh 55.8 ha. Newly planned planting areas encompass 254.4 ha. There is a very high species diversity in the mangrove forests of Nghe An, with 39 species belonging to 19 different families being identified. In general, mangrove species distribution is Rhizophora stylosa, Kandelia candel, Bruguiera gymnorhiza, Avicennia marina and Sonneratia caseolaris. The application of Remote Sensing and GIS in data collection, data analyzing and constructing planning maps brought excellent results. Current maps and planning maps were built with the scale of 1:10,000. The project also developed planning implementation, conservation and development guidelines to accord suitably with local conditions.

1. BACKGROUND

Mangrove forest is an important ecosystem in tropical coastal areas as living places, nursery areas of fish species, water birds, migrating birds and some kinds of land animals such as monkeys, crocodiles, forest pigs and weasels. It supplies many kinds of valuable forest product. In addition, mangrove forests helping to remove air pollution, limit coastal erosion, and protection from saline water intrusion, storms. There is a close relationship between humans and mangrove forest because 90% of fisheries products come from there. Mangrove forest areas can be used for aquaculture development, which brings a high economic return and a valuable exporting resource. However, mangroves are a sensitive ecosystem and are easily disturbed by human activities and natural impacts.

Before the situation of mangrove forest areas deteriorate, authorities, organizations and local people have put much effort into restoring the forest in these areas. One of these projects is "Mangrove forest conservation and development planning in Nghe An province", carried out by the VIE/97/030 Project and Nghe An Fisheries Department.

2. OBJECTIVES

General objectives of the study are to support for conservation and plantation mangrove forests planning in Nghe An province. This can be defined as the followed specific objectives:

- To assess the status of mangrove forest in Nghe An
- To identify the suitable place for mangrove forest rehabilitation and plantation
- To built implementation and management framework for planned areas

The scope of the study is planning for mangrove forests rehabilitation and plantation the coastal districts of Nghe An provinces that includes Quynh Luu, Dien Chau, Nghi Loc districts and Vinh city

3. METHODS

3.1. GIS and Remote sensing application

GPS receiver was used in field survey; status of mangrove forests was record as well as potential areas. The data after then were updated to the map and digitized on digital based map. Data collection including paper maps, tabular data from Department of Natural Resource and Environment (DONRE), field trip diary and GPS database, satellite image Landsat TM September 2000 and aquaculture development planning digital maps from SUMA project.

MapInfo 6.0, AutoCAD Map 2000, ENVI 3.5 software were used. Data from GPS have been put in to computer, display on the digital maps and satellite image. Error of the digital map and satellite image have corrected by GPS data. Planning map has to identify two main areas: current mangrove areas and rehabilitation planned areas. Attribute data of the planning map including area, planted species, soil type, water quality parameters, etc. There are total five maps have produced: One overall planning map with the scale of 1:50,000 cover all of the mangrove areas of the province, four planning maps of Quynh Luu, Dien Chau, Nghi Loc districts and Vinh city with the scale of 1:10,000

3.2. Other applied methods

Social research has been applied with rapid rural appraisal and interviewing questionnaires.

Historical review was carried out to collect and analyze natural and socio-economic data of Nghe An Province. To analyze mangrove rehabilitation and management related reports. To review laws and regulation related to mangrove rehabilitation and management.

Transect line survey using boat running along the river to collect samples of mangrove species, reflection of the biodiversity of mangrove species and distribution. Using standard square plot survey identifies botany species density.

Mangrove species classification using the following documents: Common Seen Plants in Vietnam (Ke et al, 1969 – 1976); Vietnamese Plants (Ho 1991 – 1993). Botany species name lists were organized by alphabet systematic as Brummitt 1992 and modified follow international botany classification laws 1994 (so called Tokyo laws).

Water quality analysis method come from “Standard methods for examination of water and waste water” American Health Association 1985, the 16th publisher; “Water Quality Analysis Guide” Meteorology Department, 1979.

4. RESULTS AND DISCUSION

4.1. Current status of Mangrove forest at study area

The survey was carried out with 37 coastal communes of Nghe An province. Mangrove areas were recorded by GPS. Together with digital maps, satellite image and secondary data, current status of land use has built. Table 1 showing current land use status in Nghe An province.

Table 1: Status of land use in Nghe An province (ha)

Land use type	Quynh Luu	Dien Chau	Nghi Loc	Vinh	H. Nguyen
Mangrove	343.8	260	160	55.8	0
Agriculture	5734.9	1621.5	690.3	815.8	296
Residential	1690.3	461.8	131.3	182.5	17.6
Aquaculture	803.5	187.9	104.5	93.15	110
Potential Area	186.2	29.7	20	16	2.7
Other	17771	830.4	9707	562.3	340.4
Total (ha)	26529.7	3391.3	10813.1	1725.7	766.7

Nghe An province has 819.63 ha mangrove forest. It distributed mainly on both sites the rivers flowing through six estuaries (Mai Giang, Hoang Mai, Thai, Bung, Lam River and Le Dynasty Channel).

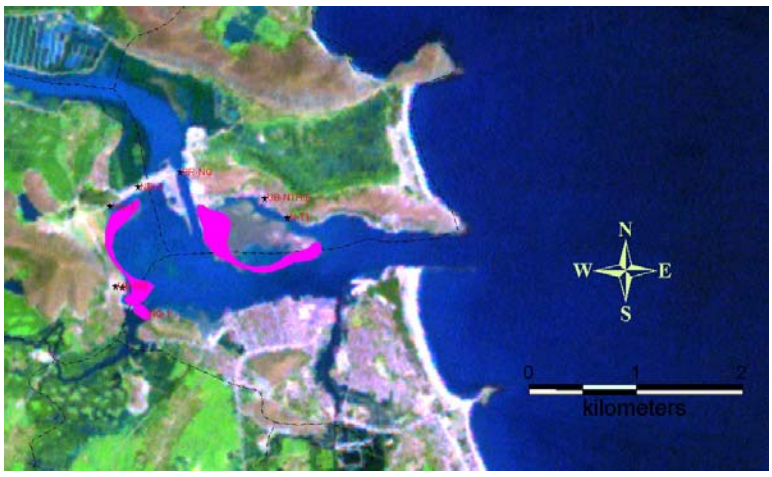

Figure 1: Mangrove distribution and planning in Nghi Loc district

On the deposition sites of estuaries *Avicenniaceae* is dominant because suitable salinity (25 – 30‰), and sand ratio is high as well. In the inter-tidal lands, the rich organic clays mangrove species are more diverse: *Rhizophora stylosa, Bruguiera gymnorhiza, Kandelia candel*. In some areas, there are species of *Aegiceras corniculatum* or *Acanthus ilicifolius*. Upper tidal areas are dominated by *Ipomaea pes-carpae* creating a fresh carpet along the coast. In the higher areas such as the areas closed to mountains or dykes dominance species are *Acrosstichum aureum, Clerodendron inerme, Pandanus tectorius, Pluchea indica, Caesalpinia bonduc* and other botanical carpets.

In the high tidal range areas *Bruguiera gymnorhiza* is dominantly seen with mangrove tree up to 3.5 m high and the bush is 5 m wide in diameter. Root systems is strongly developed, it is the winner in the competition with other species and become purebred. In the high tidal areas, the mangrove community includes the following species: *Excoecaria*

agallocha, *Cynodon dactylon*, and *Cyperus malaccensis*. In the acid soil areas, salinity is about 5 - 15‰ like Hung Hoa, Quynh Dien the dominance species is *Sonneratia caseolaris* the height of tree is about 8 m and this is the indicator species of brackish water areas.

4.2. Institutional mechanism for rehabilitation and management

To identify the area and distribution of new planted mangrove, following aspects should be well considered: 1) natural conditions, 2) local management capacity and other stakeholders; 3) current and future trend of land use.

4.2.1. Development policies

Mangrove conservation and reforestation is one of government policies. Other government policies have been also issued for poverty alleviation and rural development affecting mangrove forest management. For example, development sea products export policy initialize mangrove forest cutting down to build shrimp ponds. There is a need to classify cross-cutting issue development policies to ensure the sustainable development.

4.2.2. Laws system improvement and enforcement

Based on laws of forest protection, environmental and natural resource conservation, many decisions and regulations are issued by the government. However, those issues documents are so general and have been applied differently by locals. There is a need to issue more papers that are suitable to the current status of the specific area. Laws, decision and regulation need to disseminate to local authorities and the farmers as soon as possible. The importance of mangrove forests ecosystem should be aware by local people. Punishment should be done strictly when individuals or groups violate the regulations.

4.2.3. Management mechanism

There are many questions associating to the mechanism of mangrove forest management should be answers. They mainly are why mangrove management fails in Vietnam? The answers would be: rights and responsibilities are not clearly defined on land use. For example, what are responsibilities of involved parties in mangrove planning process if the plan failed to be implemented? Or how resource in the forest should be exploited and who have the right? What sanction will be applied for the individuals who violate the forest protection regulation? Problems would be solved if mangrove is managed by local authorities. Farmers, mainly people who live in mangrove forest areas and their living depend on the forest such as fishing men; shrimp farmers will be given task of mangrove management. Rights and interests to those people are resource exploitation such as fish, firewood, and wood. Each area wills has proper regulation that is suitable to specific conditions.

4.2.4. Management capacity

One reason of unsuccessful in mangrove forest management is the management ability/skills of all authority administrative levels. So in order to get the harmonious development of all economic sectors in coastal areas there is a need to have qualified managers. The managers need to have a synthetic knowledge they should understand the development of one economic sector not harm to the others. The management ability is not easy to upgrade in the short time, so there is a need to have suitable education strategy or training

4.2.5. Local people awareness

There are some recommended solutions in order to improve local people awareness that are to disseminate promotion broachers to local people the importance of mangrove forest and mangrove ecosystem with their living conditions. Training courses are needed in order to

promote the important of mangrove forest and mangrove ecosystem to local people. Integrate the environment protection, mangrove forest conservation and rational natural resource uses education in to school. To mobilize mangrove forest protection plans in youths, student's community. In the mangrove forest planning, it is need to have a fund to manage, promote and develop the mangrove area.

4.2.6. Incomes from shrimp farming

There is attractive income from shrimp farming. However, lessons come from other countries having higher development in shrimp farming other than Vietnam. In Taiwan, shrimp farming has breakdown in 1987. In Thailand, Indonesia and the Philippine there were disease bloom in the early of the 90s, and its serious accompanied crop loosing. Because of this damage the government of these countries has new views on shrimp industry; many shrimp ponds were left abundance for a long time in order to restore soil.

4.2.7. Recommended mangrove management framework

From the above discussion and analyzing, the outputs come up with management framework for mangrove forest in Nghe An province, it displayed as figure 2 below.

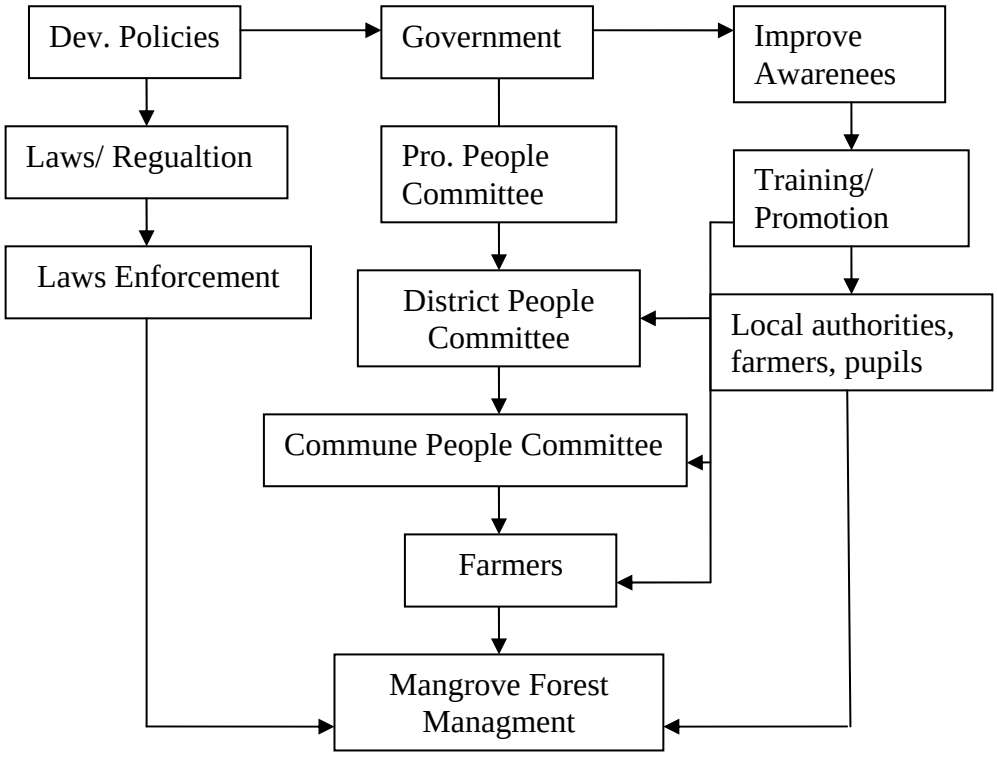

Figure 2: Recommended mangrove management framework

4.3. Proposal for mangrove rehabilitation

Based on the potential tidal areas and the biological characteristics as well as institutional factors discussed above, the potential of 254.8 ha mangrove can be rehabilitated, which is allocated and planned in table 2 and table 3. Beside, 819.6 ha of mangrove forest available should be conserve and managed in continuation.

Table 2: New planted areas of mangrove forest

No	District	Area (ha)
1	Quynh Luu	186,4
2	Dien Chau	29,7
3	Nghi Loc	20,0
4	Vinh	16,0
5	H. Nguyen	2,7
	Total	254,8

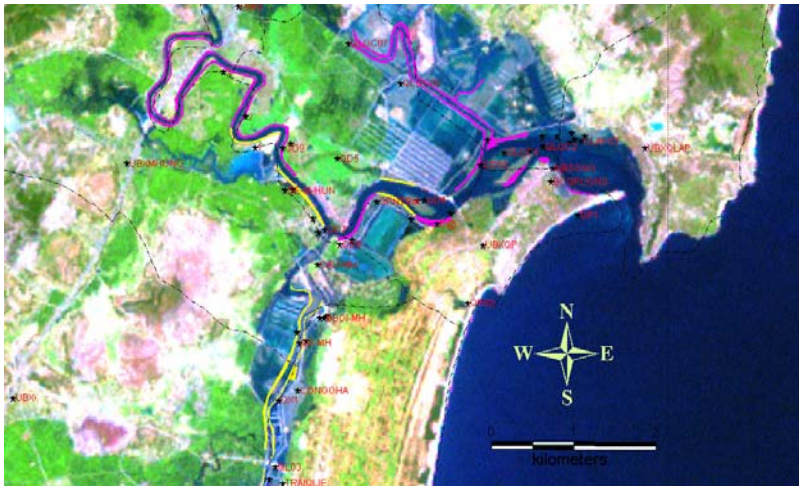

Figure 3: Mangrove distribution and planning in Quynh Loc, Quynh Phuong communes

5. CONCLUSION

The results can be summarized as: Nghe An has total 819.6 ha of mangrove forest, accordingly, by district are Quynh Luu 343.8 ha, Dien Chau 260 ha, Nghi Loc 160 ha and Vinh 55.8 ha. Newly planned planting areas encompass 254.4 ha. There is a very high species diversity in the mangrove forests of Nghe An, with 39 species belonging to 19 different families being identified. In general, mangrove species distribution is *Rhizophora stylosa, Kandelia candel, Bruguiera gymnorhiza, Avicennia marina* and *Sonneratia caseolaris*. The application of Remote Sensing and GIS in data collection, data analyzing and constructing planning maps brought excellent results. Current maps and planning maps were built with the scale of 1:10,000. The project also developed planning implementation, conservation and development guidelines based on the local conditions.

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