

1.6 Environmental Management Plan

In accordance with the existing environmental issues in NBR as mentioned in section 1.5 and in view of future socioeconomic development programs in BNR, the Environmental Management Plan will focus on the 3 fields.

1.6.1 Strengthen of Forest Conservation

(1) General

During the recent 10 years, the decreasing tendency of the area of forests has been put under control in NBR. However, it is a topic in the long run as to how to restore the forests. After considering the economic and social situation of NBR, the study team considers that there are two measures to take as follows:

- Take further measures to control the cutting of forests; and,
- Take both the tree planting program and the income of local farmers into consideration, and encourage local farmers to plant trees.

(2) Buffer Zone Program in Phu Phan Mountains

1) Program Concept

The buffer zone program in Phu Phan Mountain aims at providing an area that allows the co-existence between forest and villagers living in the surrounding areas of national parks and using forest resources, in order to avoid the deforestation of national parks.

- a) Villagers living adjacent to the boundaries of national parks are particularly important because they can act as a buffer around the protected area. Within the program area there are several villages surrounding the two proposed National Parks. They are referred to as buffer villages.
- b) Communities of the buffer villages will be entrusted with the responsibility of assisting the Government in reducing the influx of new families into their own villages and into settlements within the protected area with a view to stabilizing population at a sustainable level.
- c) In return for this responsibility, the villagers will be able to utilize specified non-timber forest products within the buffer zone. Preferential opportunities for employment in the national parks and surrounding reserved forests will also be given in certain activities of reforestation programs of the RFD, in forest

protection activities such as forest fire prevention and as village forestry rangers along the protected area boundary.

- d) The program would examine the feasibility for eco-tourism in the national parks, and if appropriate, provide training for villagers as eco-tourism guides. Nature trails will be considered along with nature camps for schools and communities in national park villages.

2) Program Components

- a) Establishment of Buffer Zone

The buffer zones should be designated around the Phu Phan Range, especially around the Phu Phan National Park and the Huai Huat National Park. The area should be designated so as to connect all areas of the national parks to form whole areas as one forest area in Phu Phan Mountain.

Since the establishment of the buffer zones is aimed not only to conserve the existing forests but also to control soil erosion, in terms of terrestrial environmental conservation, slope range should be a first criterion for zoning. Zoning by slope range is employed to protect vulnerable steep areas from significant development activities. Elevation also should be considered as another criterion for protection of the significant natural resources.

Proposed buffer zone areas are shown in Figure 1.9.

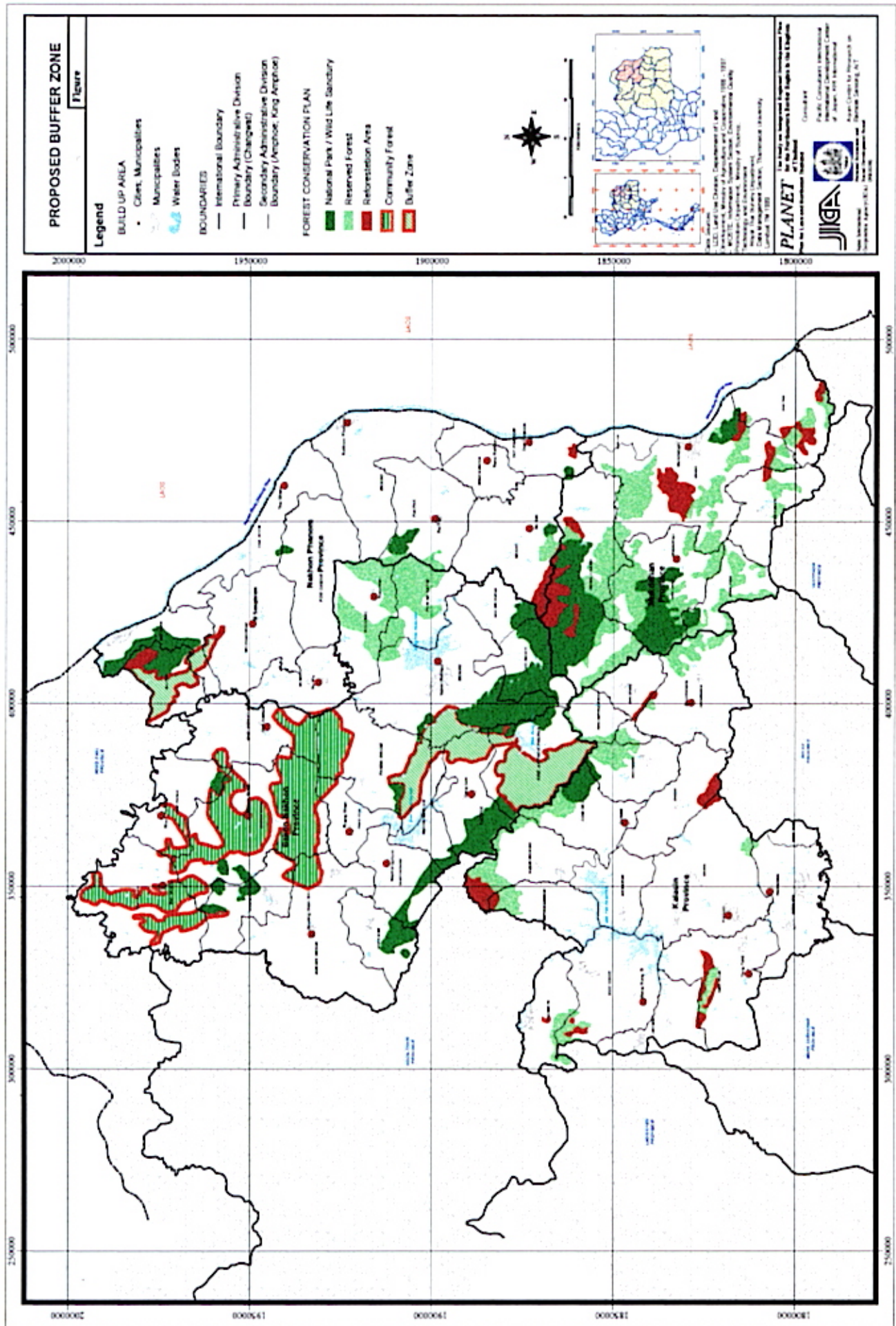


Figure 1.9 Proposed Buffer Zone Areas in Phu Phan Mountain

b) Reforestation Project in the National Parks and Reserved Forests

The RFD will carry out reforestation projects in the deforested areas in national parks and reserved forest areas. Since villagers encroach on forest areas to expand their farmland, aside from cutting down trees to produce local energy, reforestation projects also need to look into ways of increasing the income of farmers to prevent them from engaging in illegal activities. This problem is discussed below.

For the reforestation in the national parks and reserve forests, it is necessary to pay careful attention to selecting a most indigenous species of tree in the area to maintain the original eco-system in the area.

c) Agro-forestry Project in the Buffer Zone Areas

In the buffer zone areas, agro-forestry activities should be encouraged to supplement the income of villagers by introducing forest products, in addition to crop farming, and other job opportunities in relation to the forest such as:

- Development of new products by utilizing forest resources;
- Preferential opportunities for employment in national parks and surrounding reserved forests in certain activities of reforestation programs of the RFD, and in forest protection activities such as forest fire prevention and as village forestry rangers;
- Job opportunities of being eco-tourism guides in the national parks and reserved forests;
- For this purpose, the public sector needs the following integrated activities;
- For the development of new products, agricultural extension office and community development office should discuss to identify most suitable products to be introduced into the villages. Then, the community development office is to support the establishment of women's groups to produce such products and to provide training for these women; and
- The RFD should develop an eco-tourism guide registration system for the national parks and reserved forests. At the same time, the RFD should establish a training course for eco-tourism guides. The course needs the support from TAT and technical colleges.

(3) Community Forest Program in the Hilly Forest Areas

1) Program Concept

Community forest program aims at maintaining forest in the hilly areas. It is of importance to restrain saltation by controlling over-utilization of land and groundwater. The program consists of the following integrated activities:

- Community forest area is designated for the areas, which are degraded or inappropriate for agricultural purposes, and in critical areas, in need of regeneration with community participation. These will be called "village regeneration forest.";
- The community forest is jointly managed by the community. Both local species and multi-use species will be replanted and maintained in such areas by the community; and
- Local species are to be conserved and the multi-use species are to be utilized by the community.

2) Program Components

a) Establishment of community forest group

The RFD, together with the community development office, will promote to establish community forest groups. The community forest group consists of the villagers who participate in activities pertaining to forest maintenance and sustainable forest use.

b) Participatory replanting and forest maintenance

The RFD will provide nursery trees to the community forest group and the group, in turn, replants them and maintains these trees themselves. For the replanting, both indigenous species and the species for wood products will be replanted. The species for wood products are to be used for local energy, charcoal and wood products.

c) Development of new wooden products

The community development office supports the introduction of technology for use in the production of wooden products to the group. The group is to utilize the woods in the multi-use forest for their off-farm business.

1.6.2 Soil Conservation

(1) General

With regard to soil, there exist two problems in NBR, i.e., soil erosion and soil saltation. The soil erosion and soil saltation occur due to natural as well as human and social factors. The problem of soil erosion may be alleviated by implementing forest restoration projects. In order to prevent soil saltation, certain measures should be taken into consideration in accordance with actual situation:

(2) Measures to Improve Drainage and Irrigation

There are many methods to improve irrigation, such as drainage through open ditches, well irrigation and well drainage, and electromechanical drainage.

1) Drainage through Open Ditches

Open ditches are excavated on the ground to drain water and control saltation. This is the most common method. It has a number of advantages, such as smaller investment and better operability. It also has some disadvantages such as excessive occupation of land, and higher costs in maintenance, management, and labor.

2) Well Irrigation and Well Drainage

In areas where groundwater is better in quality, vertical wells may be used to lift water in order to both irrigate farmland and lower groundwater level. This method has advantages, such as high drainage efficiency, and fast and deep drop of groundwater level.

3) Electromechanical Drainage

In closed water-logged salted zones where natural drainage is impossible, this method may be used to make a network of pumping stations, drainage ditches, wells, and irrigation channels, which may drain water in case of water logging and irrigate in case of draught, and thus play a significant role in the amelioration of salted farmland.

(3) Agricultural Improvement Measures

Agricultural improvement measures, such as land preparation, soil amelioration, rational cultivation, and additional application of organic fertilizers, may reduce soil evaporation, prevent the return of salts, and rise crop production. They may also

support the redistribution of salts in the soil, and reduce salt content in the surface to be below the threshold of salt tolerance of crops.

1) Amelioration of Soil by Deep Plowing

Deep plowing is an effective method to control salt content. It may improve soil structure, increase the porosity of soil, leach salts, and minimize saline hazards. Deep plowing combined with intensive cultivation may eliminate weeds, and reduce pests and diseases. Its further combination with additional application of organic fertilizers may remarkably improve the conditions of salted farmland.

2) Additional Application of Organic Fertilizers

Additional application of organic fertilizers to salted farmland may improve the structure and physical properties of its cultivated layer, effectively curb the rise of soil capillary water, and significantly alleviate salt accumulation in the surface.

(4) Biological Improvement Measures

1) Planting Green Manure and Carrying Out Grass-crop Rotation

This method may not only increase the contents of organic matter and fast nutrients, but also may improve the physical properties and cultivation capacity of the soil. It works to prevent the return of salts.

2) Planting Salt-tolerant Crops

Agricultural crops are different in salt tolerance. It is accordingly necessary to select suitable salt-tolerant crops in farmland with different salt content. Good varieties with strong salt resistance should be selected for the salted farmland. Crops with strong salt tolerance include sunflower, sugar beet, red flex, and barley. Meanwhile, it is necessary to develop new varieties during their growth that have strong tolerance to salts.

3) Planting Trees

This method may improve the microclimate of farmland; minimize the return of salts, and lower groundwater. Trees may consume huge amount of water and hence may help to attain the goal of biological drainage. In forest areas, a tree may affect groundwater level within the range of 100 - 125 meters, even 200 - 300 meters. Within this range, in areas closer to the forest zone, the tree may play an even more evident role in lowering groundwater level. Furthermore, trees and bushes growing

on both sides of the channel may reduce water loss and soil erosion, prevent the collapse of slopes and the development of deposits, guarantee project efficiency, and improve drainage results.

1.6.3 Water Quality Management

(1) General

NBR is located in the middle of Mekong River. There are huge areas available where the people live with Mekong River. It is a responsibility for the upstream area to use water properly. In this sense, the NBR needs to pay more careful attention on the water quality management because most of the used water (discharged water) from the NBR flows into the Mekong River. In accordance with more urbanization as well as industrialization in the NBR, environmental burdens on the Mekong River will be drastically increased. In this regards, Nong Ham Reservoir, Lam Pao Reservoir, Songkhram River have a substantial influence on the water quality of Mekong River in the NBR.

In the short term, water quality management should focus on reducing pollutants by countermeasures against the increased amount of waste and waste water under careful monitoring. However, urban growth management will be of great importance to structurally change the city to create “environment-friendly city” in the long term perspective. In this sense, water quality management should be carried out from the following four dimensions:

- Urban growth management;
- Reduction and monitoring of effluents;
- Expansion of wastewater treatment facilities; and
- Public participation for Nong Han Reservoir.

(2) Proposed Actions

1) Urban Growth and Environmental Management Plan

In the long term, urbanization should be well managed from the standpoint of control of environmental burden. In particular, wastewater discharged into the reservoirs and rivers from urban activities and agricultural activities should not be beyond the environmental capacity of the water bodies. Urban growth management plan, which balances urban development and environmental consideration should be formulated. In particular, it is of great importance for Sakon Nakhon. Expansion of urban function

and areas, in particular service sector as well as population increase, might generate more burdens on the Nong Han reservoir in terms of more water in-take and more wastewater discharge. It is the main critical issue for Sakon Nakhon in the future.

2) Reduction and Monitoring of Effluents

a) Management on the Discharge of Effluents and Wastes from Enterprises

The government has to strictly implement the planning for land use, and conduct strict management on the discharge of effluents and wastes from enterprises.

b) Water Quality Monitoring System Development

Although the current water quality of the Nong Han Reservoir the Lam Pao Reservoir, and the Songkhram River are better than the environmental standard, it will be necessary to enforce water quality monitoring activities, following the population growth and expansion of urban economy.

Currently, several agencies examine water quality; however, integrated and continuous water quality monitoring activities have not yet been organized. It is of great necessity to coordinate among the agencies concerned the establishment of a sound monitoring system.

3) Expansion of Wastewater Treatment Facilities

Sakon Nakhon has treated an average of 7,000 m³ of wastewater a day using three treatment facilities. Maximum capacity of the combined facilities is 32,000 m³ a day. However, Sakon Nakhon's sewerage collection system covers only 4 km², which is approximately 10% of the municipal area, or 50% of the CBD. It is necessary to expand the wastewater collection system.

On the other hand, Nakhon Phanom, Mukdahan and Kalasin have no sewerage treatment system yet. They also need to have adequate sewerage treatment system to reduce environmental burdens on the water.

4) Public Participation for Nong Han Reservoir Conservation

Conservation of Nong Han reservoir can be achieved with public participation. Currently, the public health office initiates public participation program for environmental conservation of Nong Han reservoir. This type of activity should be promoted more to reduce environmental loads from households.