

III. RESOURCE MANAGEMENT AND ENVIRONMENT

CHAPTER III

RESOURCE MANAGEMENT AND ENVIRONMENT

III-1 OVERVIEW

III-1.1 Introduction

1) Forestry and Resource Management

The official area of the Savannakhet and Khammouan Region (SKR) is 3.808 million hectares; i.e., 1.668 million hectares in Khammouan and 2.140 million hectares in Savannakhet.¹ The various forest types in this region occupy 85% of the land. However, only about 50% of the land area (1.9 million ha.) is covered by high forest, the remaining 35% fall under various categories such as bamboo, poorly stocked areas, shifting cultivation, savannah and scrub. These forests serve a multitude of purposes including:

- watershed protection;
- flora and fauna conservation;
- erosion control and soil protection;
- ideal habitats for recreation and tourism;
- production of wood and non-wood products;
- provision of browse and pasture for domestic and wild animals; and
- a 'global environmental' store of organic carbon in woody biomass and forest soils.

The forests also serve as a source of agricultural land, both permanent and temporary. Over the past 18 years, permanent agricultural land has increased from 6% to 11% and shifting cultivation from 1% to 2% of the land area. This amounts to a conversion of about 208,000 hectares of forest land to arable agriculture during this time period. Again, grasslands have expanded by an estimated 14,000 ha. and about 40,000 ha. have been cleared for infrastructural

¹ Measurements from satellite imagery give a combined total area of 3.808 million hectares (1.668 million ha. in Khammouan and 2.140 million ha. in Savannakhet) with an error plus or minus 0.03 mill. ha. In this study the measurements from the satellite imagery will be used.

and anticipated hydropower development. In addition, because of poor management, inappropriate and wasteful logging practices and over-exploitation of “commercial” tree species, there has been a general decline of the woody growing stock, especially in more accessible areas.

Over the next 20 years, it is the policy of the government to increase the standard of living of the people, while at the same time eliminate the practice of shifting cultivation. A better and more appropriate use of all resources, especially forest resources and services could help in these goals and where necessary, the reforestation of some of the degraded areas. However, over the next 20 years, the population of SKR is anticipated to increase by nearly 60% from 1.1 million to 1.7 million. Agricultural productivity has been increasing at a slower rate than population increase, if this trend continues then another 200,000 to 250,000 hectares of forest land could be converted to arable farming, to say nothing of the pasture land expansion required to feed a growing animal population. In addition, if shifting cultivation is not replaced by more sustainable upland farming practices, then about 90,000 hectares of forest could be cleared, assuming the farming period is two years on a cleared area.² Thus, it is imperative if deforestation is to decline, that substantial efforts be made to further increase agricultural productivity and to introduce more sustainable forms of upland agriculture.

Besides forests, SKR has five major, two medium and several minor water catchment areas all of which feed into the Mekong river. Water from these river systems is used for irrigation and hydropower with considerable potential yet to be realized. Also, the rivers are an important source of animal protein. Therefore, it is vital that these water resources are protected so that they can be used in perpetuity.

Similarly, SKR is rich in mineral resources, particularly limestone and gypsum. Much of the limestone is in a conservation area, but development of the limestone industry could be a key as an input for cement and mortar manufacture amongst other industrial applications. Applying lime or limestone to many soils decreases their acidity and releases phosphate, an essential mineral for plant growth. The timely and planned expansion of such mineral resources might be promoted, bearing in mind various environmental safeguards and concerns, especially with gold/copper production.

² In shifting cultivation an area of forest is cleared and farmed for a period of 1 to 3 years until the soil is exhausted. Then it is allowed to recover over a period of about 10 years. Assuming a two-year cycle, the sum of new land cleared each year over the 18-year period 1982 to 2000 amounts to about 90,000 ha.

The overall forestry and resource management strategy is to protect biodiversity, watersheds and conservation areas, to plan for land use changes, to promote more sustainable agro-forestry systems in place of shifting cultivation, to improve agricultural and silvicultural productivity, to enhance the management of all the forest resources and to use renewable resources to their fullest. In addition, mineral and other non-renewable resources should be exploited where a comparative advantage exists and where they can assist in increasing productivity. This will not be achieved without the full cooperation and participation of the local people. Indeed, these people have to be viewed as a resource, rather than a problem when planning for sustainable development of SKR.

2) Environmental Management

In SKR, there are seven National Biodiversity Conservation Areas (NBCA) covering over one million ha., more than one quarter of the SKR area. Several of the watersheds are in NBCA's, but in addition, another quarter of a million ha. are in catchment areas that are officially protected or are in the process of being protected. There are also Provincial Reserves that may have dual protection/production functions. Thus, over one-third of SKR is under some form of legal environmental protection. Because these areas are rich in flora and fauna, traditionally the local people have used many of their resources. Also, they have been commercially exploited for logs, wild animals, animal protein and several other forest products.

In many instances, the boundaries of NBCAs are only on paper as they have not been verified on the ground, nor have all been agreed to by the local people, many of whom claim usufruct rights to areas within protection zones. Most if not all these areas are of global importance and therefore, it is incumbent on the international community as a whole to assist the government through the local people in protecting these areas for posterity. The thrust of environmental management should be proactive. Boundaries should be agreed to with the local people and clearly defined. The kinds and quantity of products that can be harvested from the defined areas have to be codified and the tourist/recreation potential developed so that it is in the interest of all the interested parties, especially the local villagers, to protect these assets rather than converting them to other forms of land use.

Environmental management should not be confined to NBCAs and other protected areas, but it has to be applied to all land used whether rural or urban and in all sectors. Over the next 20 years the urban population in SKR is anticipated to double to nearly one-quarter of a million people. This raises

concerns about several types of urban pollution and the disposal and treatment of waste. Similarly, infrastructure and industry is going to expand. This expansion should be planned so as to minimize environmental damage. There are also important wetlands in the area: these should be protected. Finally, the use of renewable resources should be undertaken in a sustainable and environmentally benign way. For all these activities, environmental management must be part of the process.

3) Land Use Planning

SKR has a large forest area and a variety of land use. For analysis of the changes in land use types in the past and for planning of recommendable future land use, as well as for resource management, watershed management, spatial development planning and agricultural development planning, satellite imagery has been mapped by means of GIS survey. In the course of this Study, the latest land use map has been prepared (JICA/Sida-NAFRI Survey, 2000) in the same classification and criteria as mapped in 1989-1990 (Lao-Swedish Forestry Survey, 1990), and they have been comparatively analyzed. Besides, the land use map prepared by the National Reconnaissance Survey (NRS) in 1982 has been referred to for analysis of the land use changes for three specific periods, i.e., 1982, 1990 and 2000. The historical land use changes are summarized in the table below.

Table III-1 Land Use Changes in 1982, 1990 and 2000

(units: 000 ha.)

| Land use/ vegetation type | 1982 | 1990 | 2000 | Change | |
|-----------------------------------|--------------|--------------|--------------|--------------|--------------|
| | | | | 82-00 | 90-00 |
| Dry dipterocarp | 645 | 697 | 714 | + 69 | + 17 |
| Lower dry evergreen | 52 | 5 | 5 | - 47 | + 0 |
| Lower mixed deciduous | 344 | 244 | 136 | - 208 | - 108 |
| Upper dry evergreen | 200 | 298 | 237 | + 37 | - 61 |
| Upper mixed deciduous | 912 | 782 | 712 | - 200 | - 70 |
| Gallery forest | 15 | 10 | 4 | - 11 | - 6 |
| Mixed Coniferous/broadleaves | 76 | 75 | 82 | + 6 | + 7 |
| Coniferous | 7 | 7 | 1 | - 6 | - 6 |
| Plantations | 0 | 0 | 2 | + 2 | + 2 |
| Total high forest | 2,251 | 2,118 | 1,893 | - 358 | - 225 |
| Bamboo | 102 | 65 | 11 | - 91 | - 54 |
| Unstocked/poorly stocked | 582 | 834 | 993 | + 411 | + 159 |
| Shifting cultivation (ray) | 52 | 46 | 69 | + 17 | + 23 |
| Total potential forest | 736 | 945 | 1,073 | + 337 | + 128 |
| Savannah/ Open woodland | 207 | 20 | 44 | - 163 | + 24 |
| Heath & scrub forest | 233 | 95 | 95 | - 138 | + 0 |
| Total other wooded areas | 440 | 115 | 139 | - 301 | + 24 |
| Sub-total all forest areas | 3,427 | 3,178 | 3,105 | - 322 | - 73 |
| Rice paddy | 225 | 357 | 423 | + 132 | + 66 |
| Agricultural plantation | 1 | 0 | 0 | - 1 | + 0 |
| Other agricultural land | 1 | 0 | 4 | + 3 | + 4 |
| Grassland | 25 | 21 | 12 | - 13 | - 9 |
| Agricultural land | 252 | 378 | 439 | + 187 | + 61 |
| Urban and infrastructure | 17 | 4 | 4 | - 13 | + 0 |
| Barren land/rock | 75 | 201 | 200 | + 125 | - 1 |
| Swamp (dry season) | 5 | 22 | 32 | + 27 | + 10 |
| Water | 32 | 25 | 28 | - 4 | + 3 |
| Total other land | 129 | 252 | 264 | - 135 | + 12 |
| Total all land | 3,808 | 3,808 | 3,808 | + 0 | + 0 |

Source: 1982: National Reconnaissance Survey
1990 & 2000: JICA/Sida-NAFRI GIS Survey

For land use planning, as well as for social and economic development of SKR, the un-exploded ordnance (UXO) is an impediment. Four areas impacted by UXO are defined for Savannakhet province (e.g. Xegon, Vilabuly, and Nong), and the roads used by the traffic along the Ho Chi Minh Trail are affected seriously. The level of UXO contamination and impact varies widely from one district to another.

III-1.2 Present Condition

1) Environmental Features

The SKR area covers 3.808 million hectares, with mountain ranges along the eastern border with Vietnam. The highest peaks are above 2,000 meters. In Khammouan there are limestone escarpments running halfway down the center of the province from the north and 60% of this province is classified as mountainous. In contrast, 75% of Savannakhet has land below 250 meters with the remainder hilly and mountainous. Most of the mountain ranges are covered with forests, but

some upland areas have heath and grassland flora. The limestone escarpments are often exposed, but some are covered with trees and shrubs. Thus, there is a rich, varied and abundant flora and fauna on and in these different land types.

National Biodiversity Conservation Areas (NBCA). Two mammals have recently been discovered in the forests of SKR, namely the Saola (*Pseudoryx nghetinhensis*) and the Giant Muntjac (*Megamuntiacus muntjak*). Recognizing the importance of these areas, the government has established several NBCAs. There are three large NBCAs in Khammouan and a small part of a fourth one that is mainly in Borikhamsay province to the north. Also, the northern part of Nakay Nam Theun butts into Borikhamsay. The area of NBCAs in Khammouan is 648,700 hectares. There are three NBCAs in Savannakhet, with the southern part of Xe Bang Nouan continuing into Saravan province. These 3 NBCAs in Savannakhet occupy 363,600 hectares of land. In addition, two more NBCA migration corridors of 65,000 hectares have been proposed between the existing NBCAs in Khammouan and it is suggested to extend the Phou Sang Hai NBCA in Savannakhet by about 7,000 hectares. All these NBCAs are in the watersheds of several principal rivers. The existing and proposed NBCA extensions are listed on the following page.

Table III-2 National Biodiversity Conservation Areas in SKR

| Khammouan | Area in Province (ha.) | Total area (ha.) |
|---|------------------------|------------------|
| < NBCA approved> | | |
| Nam Khading | 7,400 (zero) | 169,000 |
| Nakai-Nam Theun | 315,900 (total given) | 353,200 |
| Khammouan limestone (Phouhinpoun) | 238,100 (150,000) | 238,100 |
| Hin Namnor | 87,300 (82,000) | 87,300 |
| SUB-TOTAL FOR KHAMMOUAN | 648,700 | 847,600 |
| < NBCA requested> | | |
| Khammouan-Nam Theun corridor | 60,000 | 60,000 |
| Nam Theun-Hin Namnor corridor | 5,000 | 5,000 |
| Total for Khammouan | 713,700 | 912,600 |
| Savannakhet | Area (ha.) | Total area (ha.) |
| Se Bang Nouane | 45,200 (40,000) | 150,000 |
| Phou Sang Hai | 114,300 (109,900) | 114,300 |
| Dong (forest) Phou Vieng | 204,100 (197,000) | 204,100 |
| Sub-total for Savannakhet | 363,600 | 468,400 |
| Proposed extension Phou Sang Hai | 7,000 | 7,000 |
| Total for Savannakhet | 370,600 | 475,400 |
| Total existing NBCAs in SKR | 1,012,300 | 1,316,000 |
| Existing & proposed NBC's in SKR | 1,084,300 | 1,388,000 |

Note. The figures in brackets are the official NBCA areas. The other areas are the GIS measurements.

Source: National Environmental Action Plan. Oct. 2000. Science, Technology and Environmental Agency.

JICA/SIDA NAFRI. November 2000. GIS Survey of Khammouan and Savannakhet.

Resource Management and Environment

The existing and proposed NBCAs cover 43% of the area of Khammouan and 17% of Savannakhet, an average of 28% for SKR. There is some discrepancy between the official areas of NBCAs and the measured areas according to the GIS survey. Also, part of Nam Khading is not listed officially as being in Khammouan. The greatest discrepancy is in Phouhinpoun. This has an official area of 150,000 hectares and a measured area of 238,100 hectares, a difference of 88,100 hectares. In total, there are additional 117,500 hectares of land in the NBCAs in SKR. In addition, there are two watershed areas in Khammouan of about 50,000 hectares each and a District Conservation Area of 7,000 hectares that should have some protection.

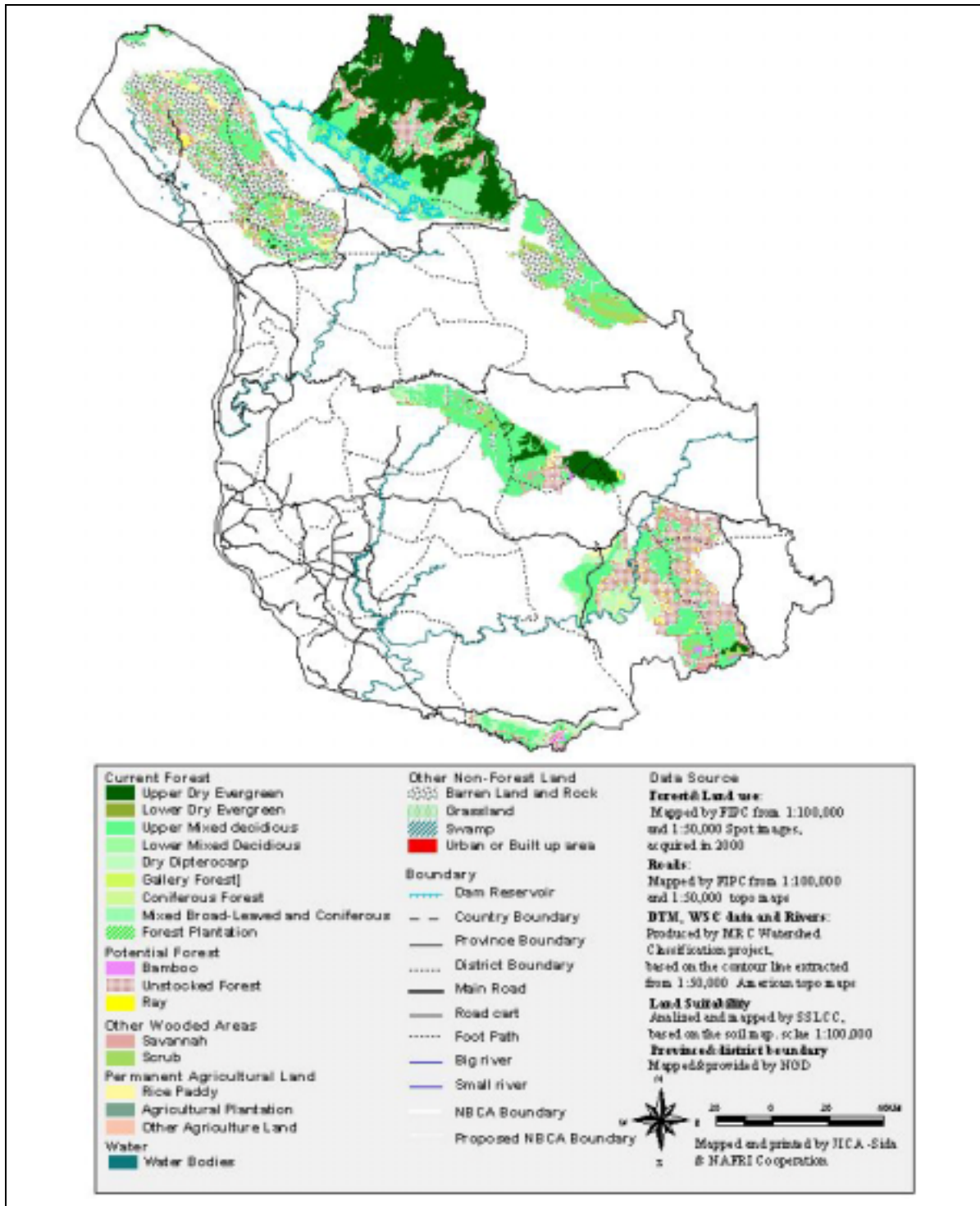


Figure III1-1 NBCA and Protection Forest in SKR

National Protection Forests. There are five National Protection Forests in Savannakhet mainly in watershed areas (covering 110,510 hectares) and six Provincial Reservations (covering 185,500 hectares). Thus, just over 1.4 million hectares of land in SKR, occupying 38% of the area is or should be under some form of protection.

Watersheds. In SKR, the Mekong river forms the western border between Lao PDR and Thailand, stretching over a distance of about 350 km. It is fed by several rivers rising in two provinces. The major catchment areas in Khammouan are the Nam Theun, the Xe Bangfay and the Nam Hinboun. The first two river systems rise on the border with Vietnam and run from east to west before entering the Mekong river. The Nam Hinboun rises in the northern part of the Khammouan limestone area. The Nam Don is a short river and its catchment covers part of the west Khammouan limestone area.

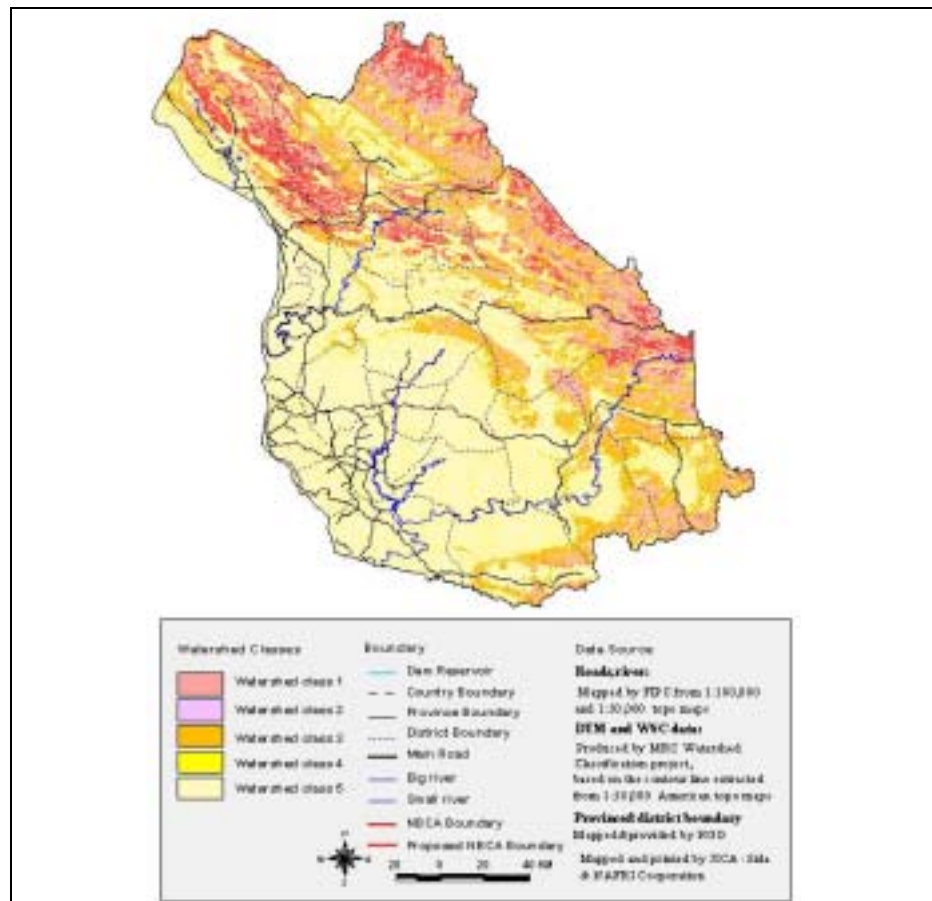


Figure III1-2 Watershed Classification in SKR

In Savannakhet, there are two major catchment areas, the Nam Xenoy, which joins the Xe Bangfay bordering Khammouan, and the Nam Bang Heing. Three other major rivers, the Champhone, Xangxoy and Bang Nong plus many other tributaries join this latter river. It is a huge catchment of nearly 1.7 million hectares, - three-quarters of the provincial area. As will be discussed later, a gold mining operation is proposed near one of the tributaries of the Xe Bang Heing. Contamination of this river by heavy metals associated with gold ore or used in the extraction process could have a devastating effect on much of this river system. It is vital that stringent environmental safeguards be put in place and adhered to.

As in Khammouan, many of the Savannakhet river systems rise on the border with Vietnam, but others such as Xe Champhone start in the Phou Sang Hai NBCA. Similarly the Xe Bang Nouane forms the border with Saravane Province and rises in the Xe Bang Nouane NBCA. Finally, the Nam Thahao is only about 40 km in length, rising in Outhoumphone district of Savannakhet. The areas of the above watersheds in each province are tabulated below.

Table III-3 Watersheds in SKR

| Khammouan | | Savannakhet | |
|---------------|----------------|---|----------------|
| Name of River | Watershed area | Name of River | Watershed area |
| Nam Theun | 350, 000 ha. | Nam Thahao | 80,000 ha. |
| Xe Don | 62,000 ha. | Xe Bang Nouane | 65,300 ha. |
| Nam Hinboun | 292, 000 ha. | Xe Bang Heing (Xe Champhone Xe Xangxoy Xe Bang Nong) | 1,698,400 ha. |
| Xe Bangfay | 950,000 ha. | Xe Bangfay (Nam Xenoy) | 174,200 ha. |
| Total area | 1,654,000 ha. | | 2,017,700 ha. |

Source: FIPC Watershed Conservation Unit. Khammouan Province. A Preliminary Environmental Inventory IUCN 1997.

Wetlands. In Khammouan, there are seasonal wetlands along the Mekong river at a distance of up to 15 km from it. These cover an area of about 14,000 hectares in the wet season, drying out to less than 1,000 hectares in the dry season. There is another wetland on the Nakay plain, which covers about 5,000 hectares in the wet season, drying out to just over 1,000 hectares, but this will be submerged when the Nam Theun II dam is constructed.

Savannakhet has permanent wetlands in proximity to the rivers Champhone and Xe Xangxoy. They cover about 3,000 hectares and expand to about 7,000

hectares during the wet season. As in Khammouan there are seasonal wetlands within 10 to 15 km of the Mekong river. The wet season area of these wetlands is approximately 6,000 hectares receding to less than 300 hectares in the dry season.

2) Existing Forests

The existing forests in SKR can be divided by their type and their accessibility. They can also be separated into forests that are principally for protection and conservation and those that are for production or potentially available for other uses, particularly agriculture. The current forest areas according to these categories are listed below.

Table III-4 Existing Forest Area in SKR (2000)

(units: 000 ha.)

| Forest type | Protection/ Conservation | Production/Potential production | Total |
|-------------------------------|-----------------------------|------------------------------------|-----------------------|
| Easily accessible forest land | | | |
| High forest | 0 | 922 | 922 59% |
| Degraded etc. | 65 | 502 | 567 36% |
| Other wooded | 0 | 75 | 75 5% |
| Sub-total | 65 4% | 1,499 96% | 1,564 100% |
| Less accessible forest land | | | |
| High forest | 791 | 179 | 970 59% |
| Degraded etc. | 151 | 346 | 497 30% |
| Other wooded | 138 | 51 | 189 11% |
| Sub-total | 1,080 69% | 576 31% | 1,656 100% |
| All forest land | | | |
| High forest | 791 | 1,101 | 1,892 59% |
| Degraded | 216 | 848 | 1,064 33% |
| Other wooded | 138 | 126 | 264 8% |
| Total | 1,145 36% | 2,075 64% | 3,220 100% 85% |
| <i>Other land use</i> | 60 | 528 | 588 15% |
| Total all land | 1,205 32% | 2,603 68% | 3,808 100% |

Note: High forest types include: dry evergreen, mixed deciduous, conifers, mixed conifers/broadleaves, dry dipterocarps, gallery forests and plantations. Degraded forests include: bamboo areas, poorly stocked areas and shifting cultivation areas. Other wooded areas include: open woodlands, savannah, scrub forest and heathland.

Source: GIS Survey for Khammouan and Savannakhet 2000. (JICA/Sida-NAFRI November 2000).

The existing forest area in SKR is estimated to be 3,220,000 hectares with an error factor of plus or minus 38,500 hectares. 59% of the area is classified as high forest, one third as degraded forest with the remainder classified as other wooded areas.

Just under half of these forests are easily accessible, and the proportion of forest types between easily accessible and less accessible is quite similar. As is to be expected most of the protection forests are in less accessible areas. Just over 1.1 million hectares (36%) are classified as protection forests (NBCA and Watershed

etc.) with just under 2.1 million hectares (64%) as production forests or potentially production areas. The protection areas contain a higher proportion of high forests in the forest-type mix when compared to production areas. They also have a greater stocking of wood per unit area.

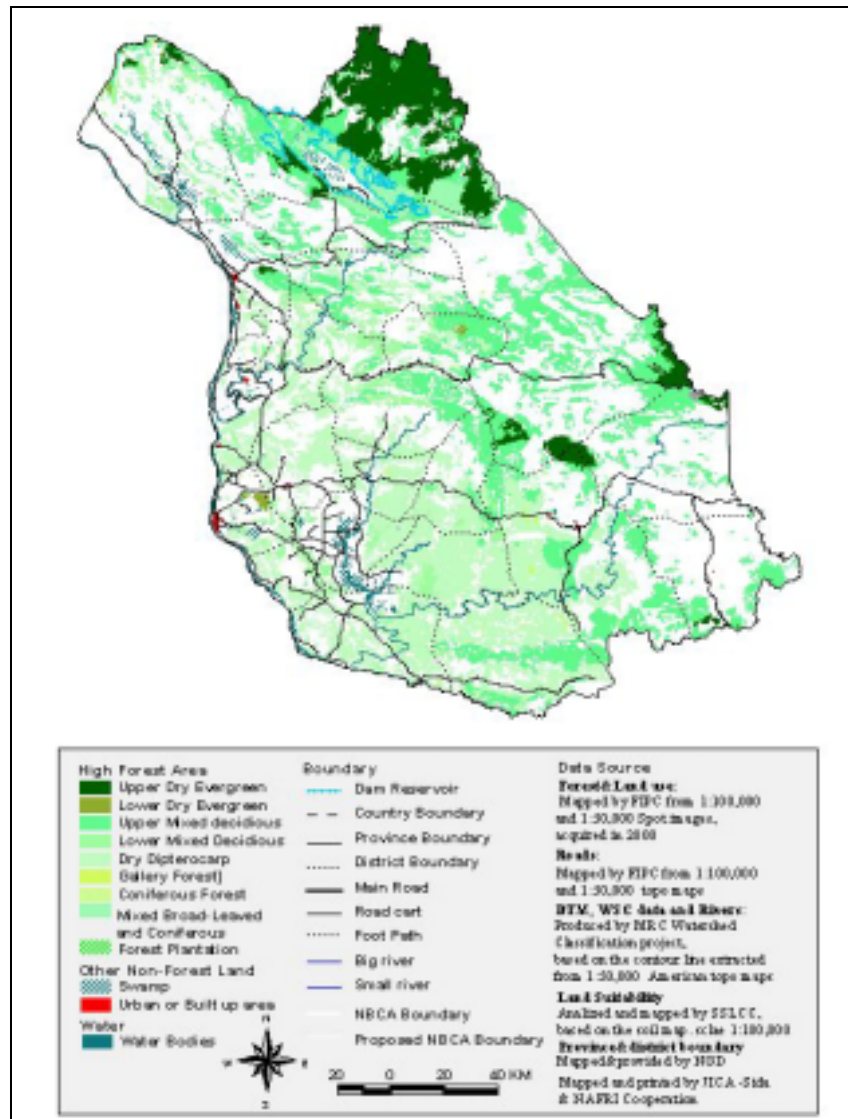


Figure III-3 High forest Area in SKR

Over the last 18 years there has been a gradual loss of forest types and a general decline in the stocking density. However, because of the presence of un-exploded ordnance (UXO) in some areas and since the promulgation of the National Biodiversity Conservation Areas, there has been an improvement in stocking density in a few areas.

For SKR as a whole, there has been a loss of “richer” forest types and a consequential gain of poorly stocked areas in terms of quality and quantity of tree and bamboo species. Also there has been an overall loss in forest area. Judging from the land use changes in 1982, 1990 and 2000 (see Table III1-1), several conclusions can be derived. Namely, over the period from 1982 to 2000:

- High forests have declined by 16%, from 2.25 to 1.89 million ha., a loss of 359,000 ha.
- Mixed deciduous forests have declined the most, 20% of the 1982 high forest area, or 460,000 ha.
- Poorly stocked forests including savannah/open woodlands have increased by 30%, from 789,000 ha. to 1,0238,000 hectares, a gain of 239,000 ha.
- There has been an overall decrease in forest area of 6% or 207,000 hectares.

The lowland forests have seen the largest decline, (about 250,000 ha.) with the principal cause being conversion to arable agriculture. Some of these forests have moved into forest types with lower stocking densities. On the positive side, plantations have increased from a negligible amount to about an estimated 2,000 hectares, mainly from land formerly classified as poorly stocked.

The largest loss was in lower and upper mixed deciduous forests (460,000 ha.). Part of this loss was through clearing land for the proposed Nam Theun II dam (34,000 ha.), with still another 6,000 hectares to clear.³ However, excessive logging, agricultural conversion and shifting cultivation could be the principal reasons for the demise of these forests. About 190,000 hectares of land has been converted to rice land. On the other hand, upland dry evergreen forest types have increased by 37,000 hectares.

There has been a considerable decline in the area under bamboo, an estimated loss of over 90,000 hectares. Undoubtedly, some of this area loss has been through conversion to shifting cultivation as it is easier to convert than high forest. But another explanation could be that some of the bamboo species have re-seeded. Once this occurs, the parent bamboo dies and it takes some time before the bamboo area is restored through regeneration. Poor management and over-exploitation could be other reasons.

³ The proposed Nam Theun II dam will flood an area of about 47,000 ha., 12,000 ha. of which are in the NBCA. The breakdown of the current land use for the 47,000 ha. is as follows. Grass/swamp 5,000 ha., permanent agriculture 2,000 ha., harvested forest area 34,000 ha. of which 8,000 ha. is in the NBCA, mixed conifer/broadleaf area 6,000 ha. of which 4,000 ha. is in the NBCA. It is envisaged that the 2,000 ha. of agricultural land will be replaced by converting an equal amount of potential forest land to agriculture and the 5,000 ha. of grassland will be replaced by converting 5,000 ha. of dipterocarp forest to grassland.

Poorly stocked areas have registered the largest gains – over 400,000 hectares. As indicated above, clearing land for shifting cultivation could be one reason. Another reason could be over-exploitation of industrial species of commercial value. Other wooded areas have shown a decline of 163,000 hectares over the 18-year period. Clearing for agriculture could be one cause and interpretation of forest types another cause. The distinction between poorly stocked and open woodlands is difficult to determine at times and ground verification should be undertaken.

Despite the reduction in the forest area and the decline in stocking density, SKR still has a considerable store of wood in its forests. This is one of the reasons why there are many wood industries in the region and why logging is a principal activity. The estimated standing stock of stem wood, over 10 cm in diameter is over 350 million m³. Most of this wood is in protection areas and/or is difficult to access. Therefore, only a fraction of this is available for industrial harvesting. Just considering the production forests of 0.6 million hectares, an estimated standing stem volume of 43 million m³ of commercial wood is growing on this area. The following table gives an estimate of standing stock and yield on all land-use types in SKR.

Table III1-5 Above-ground Volume and Yield by Land-use Type

(Units: million m³)

| Land-use/forest type | Area million ha. | Standing stock (stem volume > 10 cm. diameter) | | | Estimated yield stem wood. (80 year nominal rotation) | | | Total volume all species | |
|-------------------------------|------------------------|---|-------------------|---------------|--|-------------------|-------------|-----------------------------|--------------|
| | | Com. species | Non-C. Species | Total | Com. species | Non-C. species | Total | Stock | Yield |
| Protection areas | 1163 | 125.00 | 92.74 | 217.74 | 3.11 | 2.32 | 5.43 | 451.85 | 13.81 |
| Production areas | 601 | 42.86 | 24.69 | 67.55 | 1.08 | 0.61 | 1.69 | 132.52 | 3.64 |
| Potential forest areas | 1456 | 49.04 | 19.91 | 68.95 | 1.23 | 0.49 | 1.72 | 129.17 | 8.89 |
| <i>Sub-total forest areas</i> | <i>3220</i> | <i>216.90</i> | <i>137.34</i> | <i>354.24</i> | <i>5.42</i> | <i>3.42</i> | <i>8.84</i> | <i>713.54</i> | <i>26.34</i> |
| Other land areas | 480 | 1.38 | 0.89 | 2.27 | 0.03 | 0.03 | 0.06 | 6.29 | 1.22 |
| Total all land areas | 3700 | 218.28 | 138.23 | 356.51 | 5.45 | 3.45 | 8.90 | 719.83 | 27.56 |

Note: The protection and production areas contain degraded forests and the potential forest area contains high forest species. Thus, Tables 1.4 & 1.5 are not comparable. A breakdown by categories and land use is given in Annex II.

There are an estimated 72,000 ha. of rocks and 36,000 ha. of water bodies, rivers and swamps. The total area is therefore 3,808,000 ha. Greater detail by province and accessibility is given in Annex II. 3, II. 4 and II. 5.

Com. = commercial. Non-C. = non-commercial. The yield of small diameter wood was estimated assuming shorter nominal rotations for non-high forest species ranging from 10 to 20 years.

Source: GIS survey. Forest Inventory for Khammouan and Savannakhet. SKR Team estimation.

The forests in NBCAs and the watersheds cover about one-third of the land area, but contain about two-thirds of the growing stock. One important task is the

protection of these areas, because they serve many vital functions. There will be considerable pressure put on local and district bodies as well as the government to allow exploitation of the wood and other resources in these 'Protection Forests.' Perhaps controlled use of certain areas by the local people may be the best solution.

These conservation areas are not only important locally, but significant globally. They are some of the last remaining large areas of forests in the Greater Mekong Sub-region (GMS). They contain a considerable variety and quantity of flora and fauna, some of it unique, they regulate the flow of water into the Mekong river and are a vast store of organic carbon in the wood biomass and the forest soils, somewhere in the order of 450 to 500 million tons of carbon. The international community has recognized their importance and should be willing to contribute to their preservation.

Production forests cover about 16% of the area and contain 20 % of the volume. Two-thirds of the trees are classified as (internationally) commercial species and one-third non-commercial. However, several of these latter species are used locally for timber. Also, as the quantity and size of commercial species diminishes, logging companies are reassessing the value of the 'non-commercial' species. There is a considerable store of wood in degraded forests and open woodlands. But much of this is of small diameter or scattered and of little interest to logging companies. Nevertheless, it is of potential value for small-scale producers, particularly at the small town or village level. Excluding the conservation areas, over 50% of commercial species are in these forest types. To ensure a sustainable supply of wood for the existing logging and timber industries, it may be necessary to harvest these areas and use more species while at the same time reducing logging and sawmill waste as well as adapting sawmills to process smaller sized logs.

The yield of 8.9 million m³ has been assessed by assuming a nominal rotation of 80 years. This is the time it takes for the average tree to reach merchantable dimensions of between 30 cm and 60 cm at breast height. If the nominal rotation is 100 years, then the estimated yield with the same growing stock will be 7.1 million m³. This growing stock contains a variety of age classes and from measurements undertaken in Khammouan, 50% of the volume is in trees between 10 cm and 30 cm. Therefore, at maturity, the volume should be double the average. The yield is determined by doubling the average growing stock and dividing by the nominal rotation age. The stem wood yield of commercial species from non-conservation areas is estimated to be nearly 2.4 million m³ of which over 1 million m³ are from production areas. This yield figure is higher than the annual

allowable cut stated in the Tropical Action Plan or in the Global Fibre Supply Model (FAO 1999).⁴ But the annual yield figure is in line with net primary production measurements (NPP) on various tropical sites. These give NPP for total above ground biomass production on natural sites in the tropics of 5 to 10 dry tons of biomass in areas where the rainfall is between 1500 mm and 2500 mm per year. In forest situations, at least half the biomass production should be woody. Therefore, in volume terms, the annual production of woody biomass should be between 5 m³ and 10 m³ per year.

While the stem volume is estimated to be 357 million m³, the total above ground woody biomass is twice this amount. This includes small diameter trees, branches, twigs, shrubs, bamboo and other woody biomass. This small diameter wood, especially dead wood is the most important source of fuel in Lao PDR in quantity terms. It accounts for about 80% to 90% of energy consumption and 90% of domestic wood consumption. Fuelwood is gathered from all types of land formations, especially those near houses. Fuelwood and charcoal are important traded fuels and the source of energy for many rural industries and the service sector.

The estimated woodfuel demand for the 1.1 million people living in SKR is about 2.4 million m³, that for poles about 0.1 million m³ with a similar amount for sawlogs. Thus, the overall demand for small diameter wood is about 2.5 million m³. The estimated sustainable yield of wood excluding stem volume of trees above 10-cm in diameter is 18 million m³. Therefore, there is no shortage of wood for fuel and poles and using wood for fuel leads to little if any deterioration of forest resources.

Yet some in the government and a few others in the international community still cite the high demand for woodfuel as a cause for deforestation. In the Lao Government's Strategy Vision for the Agricultural Sector (December 1999), fuelwood demand is stated as contributing to deforestation. It is wrongly assumed that fuelwood only comes from production forests and is mainly obtained by cutting down trees. The recent Asian Development Bank's Report on the Environment in Countries along the Mekong River makes the same assertions,

⁴ The Global Fibre Supply Model estimates that in all of Laos (not just SKR) there is 1 million m³ of commercial wood available annually from nearly 2.5 million hectares of accessible forest areas. It also estimates that a total available supply of stem wood from this area is nearly 1.25 million m³. Translating these figures into rotation ages gives a nominal rotation of 467 years for commercial species and 770 years for non-commercial species: these are extremely long. Assuming an average rotation age of 80 years, commercial species would give an annual yield of 5.7 million m³ and the total yield would be 8.2 million m³ for this 2.5 million hectares of forest deemed to be accessible to commercial loggers. For a nominal rotation of 100 years, the yield of commercial species would be 4.5 & total yield 6.5 million m³.

(ADB 2000)⁵. Fuelwood comes from all land formations and dead wood is the preferred kind of wood. Without doing a proper supply and demand analysis, erroneous conclusions may be drawn, which could hinder rather than help development. It is recommended that surveys be undertaken to determine if and how the surplus of small diameter wood can be used to expand small (rural) industrial development, such as lime and brick burning, pottery and tile manufacture and agricultural processing.

Where imbalances for roundwood occur is related to the demand for large diameter logs. Over-cutting of selected large diameter species in accessible high forests and wasteful logging practices has led to a decline in the variety of species and an imbalance in the age class structure. The 1995 inventory in Khammouan found that over 50% of the trees (in volume terms) were between 10 cm and 30 cm in diameter, whereas the normal distribution in an uneven-aged forest should be between 20% and 30 %.

The official logging quota for SKR, based on 1999 information, is an estimated 376,000 m³, principally for the export market. Of this, 130,000 m³ are exported as logs and 246,000 m³ are processed into sawwood, veneer and plywood. In addition, local demand for sawlogs, some of which are handsawn, or processed in small sawmills, using a variety of species including 'non-commercial' ones, is about 110,000 m³ (roundwood). This gives a total demand for sawlogs of 486,000 m³. The unofficial export estimate from SKR is 660,000 m³. If local demand is added to this figure, then the demand for logs could be about 770,000 m³.

Comparing demand with supply, there appears to be a surplus of the sustainable supply of commercial species – an estimated 1.08 million m³ from production areas assuming a nominal rotation of 80 years or 860,000 m³ for a 100-year nominal rotation. However, the reality of the situation is somewhat different. Sawmills and logging companies only pay for what is removed from the forest and not what is felled. This practice leads to removing only the best logs from a felled tree. And in order to cut down logging costs, going to the areas where the desirable trees are the densest and removing all or practically all of the largest trees without leaving any seed trees. Thus, half or more of the stem volume of a tree may be left behind in the forest. Also, the recorded volume may be under-assessed by a diameter class. A 60-cm diameter log may be classified as a 50-cm log; this could lead to a 40% under-estimation in log volume. Bearing the above points in mind, the actually felling of stem wood for SKR could be between 1.5 and 2.3 million m³. This figure is line with the sawmill/plymill capacity of 676,000 m³ for

⁵ ADB 2000. Environments in Transition: Cambodia, Lao PDR, Thailand, Viet Nam. ADB Manila.

Khammouan as reported in the MPG Report on salvage logging in the proposed Nam Theun II dam site area⁶. Thus, actual fellings of commercial species may be 40% to 130% more than sustainable supply of 'commercial' stem wood from production areas.

In part, some of this volume comes from salvage logging when construction sites are cleared or when land is cleared for agricultural expansion. Over the last 10 years, an average of 10,000 hectares have been converted from forest to agriculture. This could supply up to about 300,000 m³ per year in salvaged logs. Similarly, 34,000 hectares of forest have been cleared in the proposed Nam Theun II dam site area, with another 6,000 hectares still to be cleared. An estimated 1.6 million m³ of commercial wood was or is being realized from this salvage operation: the estimated total stem volume is 2.2 million m³. However, such supply sources are limited.

A rational policy has to be worked out with the interested parties, including the government, the provinces, villagers, the logging companies, sawmills and wood manufacturing industries to ensure the integrity of the existing forests and to try and meet the demands of the wood processing and logging industries. It does not help to severely restrict the supply of saw logs and justify it on the grounds of Annual Allowable Cut⁷. There are always ways round such rules, especially when

⁶ Margules, Groome, Poyry 1996. Nam Theun II Hydro-power Project: Forestry Report, Vientiane.

⁷ Annual Allowable Cut (AAC) is supposed to be determined based on annual growth. According to the FAO Global Fibre Supply Model (GFSM) this should be about 2.5 m³/ha for commercial species based on a nominal rotation of 80 years or 2.0 m³/ha for 100-year rotation. Using Net Primary Production figures it could range from 2.0 to 4.0 m³/ha. Other factors are considered, such as stocking density and damage caused by extraction of trees. For example, if stocking density is low or there is a preponderance of young trees, the AAC is fixed at a rate lower than annual growth in order to allow for a build up of stock and/or larger diameter trees. Allowance for logging damage varies from 6% to 11% in the FOMACOP Village Forestry Association Schedule (VFA). However, there is no evidence that extraction damage is permanent. Most young trees that are killed during the extraction process would have died naturally because of competition and trees whose branches have been broken in the extraction process soon recover their productive capacity by producing new branches and leaves. The 1982 Tropical Forestry Action Plan fixed the AAC for the whole of Laos at 282,600 m³. If this is compared to the estimated growing stock of commercial stem wood of 249 million m³ as given in the FAO/GFSM, the assumed annual growth is 0.1% per m³, or 0.113 m³/ha for the 2,495,000 ha. of accessible forests. These are unrealistically low figures. Even allowing for 45% to 68% of the annual growth kept in reserve to build up stock as in the VFA schedule, it would only mean a maximum annual growth of 0.353 m³/ha. This gives a nominal rotation of 565 years for commercial species. The basis for this assumption is unrealistic. The VFA model gives an annual growth of live commercial trees of 1 m³/ha for a stock of 120 m³. This gives a nominal rotation age of 240 years. Yet the actual harvest is fixed at 0.49 m³/ha/year and at least one-third of this is from dead wood or dying trees. Thus, in the TFAP and other publications, the AAC seems to be fixed at an arbitrary low level, with little, if any, scientific backing and then this low level is used to justify over-cutting.

the government is dependent on foreign exchange earning from the sale of wood and the provinces don't want to close sawmills and put people out of work. There may be enough wood to meet current demand if more species are utilized, logging waste is drastically reduced by charging for what is felled rather than what is removed and more non-conservation areas are logged. This latter can be achieved by small-scale loggers and villagers using low cost techniques and undertaking partial processing in the forest.

The estimated sustainable supply of wood in SKR from non-conservation areas is about 2.4 million m³ of commercial species, assuming an 80-year nominal rotation. The total supply of stem wood is about 3.5 million m³ from all species. In order to build up the stock of wood in degraded areas, plantations could be established and enrichment planting undertaken. Rewards for carrying out such activities must be based on seedling survival and not seedlings planted as has been done in the past. Otherwise, if things continue as they have done, about 12,000 to 15,000 hectares of forest will be degraded each year, and more and more uncontrolled logging will occur in conservation and watershed area.

3) Agriculture

The principal cause of deforestation as opposed to forest degradation has been through the conversion of forest land to agriculture mainly for rice production. Over the period 1982 to 2000 it is estimated that 191,000 hectares of forest land were cleared for arable agriculture, and 14,000 hectares converted to grassland/pasture. According to the GIS survey, over 410,000 hectares are under rice production for SKR. This contrasts to official figures, which puts the area under rice as 154,500 hectares for SKR. This latter figure is less than 40% of the measured figure, a large discrepancy. If the GIS figure is near the actual area of land under rice, then the recorded yield figures of paddy of 3.8 t./ha. is also put in question. Clearly surveys are required to determine the areas of land under different agricultural crops and the production from these areas.

Most rice is produced under rainfed conditions and only one crop is grown per year, but an estimated 32,000 hectares or 20% of the officially recorded area is double cropped through irrigation. Little outside inputs are applied to the land. Dung is composted with rice straw and applied to the field. This is the main form of fertilizer application. Little if any lime or artificial NPK is applied to the land. For lowland paddy areas lime application may not be necessary, but it could assist in upland areas. From an environmental viewpoint this practice is good, but ways must be found to increase productivity on existing land if deforestation is to be curtailed. The population of the SKR region will grow by about 610,000 between

2000 and 2020. Based on past trends, the additional lowland area required for rice production, with little increase in productivity, may be about 50,000 hectares. About 400,000 hectares of unstocked forest could be converted to pasture. This is why it is paramount to improve productivity on existing farm land.

Growing nitrogen-fixing crops in rotation on farm land could boost productivity as the application of lime on acid soils could. Also the encouragement of natural pesticides and helpful predators could increase harvested yields. Increasing irrigation areas will allow more double cropping. While some additional forest land will be converted to agriculture over the next 20 years, the amount could be reduced significantly through these various efforts in the agricultural sector.

In upland areas, the traditional practice is shifting cultivation. Cleared secondary forest areas are farmed for two to three years until the soil is exhausted and then the land is abandoned and left to restore itself for about 12 years, when it is again cleared and farmed. Therefore, a farmer with one hectare of cropland has about another twelve hectares of secondary woodland in various stages of recuperation. Because of population pressure, the cycle is being reduced and the production of rice declines as the fertility has not been restored to its previous level.

It is the policy of the government to replace shifting cultivation with more sustainable systems. Agro-forestry could be one such system. Here nitrogen fixing trees on short rotations of one to two years are mixed with the agricultural crops and the leaves from the trees are mulched into the soil. Using such a system can increase output by 50% or more while at the same time providing stick wood. It takes about 3 years to build up the fertility to a satisfactory level, then production can be maintained on the same piece of land for a substantial period. Thus, the amount of farming land is reduced considerably and the former woodland area in the shifting cultivation cycle can be left to restore itself or part could be converted say to mulberry tree production for silk worm cultivation. Such agro-forestry systems need to be demonstrated throughout the SKR upland areas in order to convince the hill farmers that there are viable alternatives to the present system.

4) Water Bodies and Floods

There are four major rivers in SKR feeding into the Mekong. Watershed protection for these river systems is critical not only for the local people, but for the whole lower-Mekong area. Any major pollution such as heavy metals from mining activities could affect the whole region as it did the River Danube and the Black Sea earlier this year. Slurry from gold mining operations in Romania escaped into a tributary of the Danube killing the fish in the tributary and the lower Danube. The slurry suspension covered the flatlands next to the river with heavy metal deposits,

thus making them unsuitable for grazing and crop production. The environmental damage is assessed in the billions of dollars and the livelihood of many people has been seriously affected not to mention the effect on the flora and fauna. This could happen in Savannakhet as a gold mining operation is proposed near the river Bang Heing. Only 5 grams of gold will be extracted per ton of rock. The rock will be crushed and the gold extracted with (arsenic) cyanide. The heavy metals associated with gold such as mercury will be dumped in areas that could be subject to leaching. The arsenic in the rock and in the slurry is also subject to leaching. Therefore, unless strict precautions are taken a major environmental disaster could occur. At present, the government has little recourse to obtain appropriate damages from mining companies. The present maximum fine for violating the mining regulations is US\$ 637⁸.

There are permanent wetlands in SKR on the Nakay plains and in proximity to the rivers Champhone and Xangxoy. These cover about 4,000 hectares in the dry season. The wetland on the Nakay plain of about 1,000 hectares will be submerged when the proposed Nam Theun dam is operational. The wetlands around the river Champhone are subject to reclamation for rice cultivation. This should be critically examined as these wetlands act as a filter and a habitat for flora and fauna, especially birds and fish.

Seasonal floods occur along the Mekong river up to a distance of about 15 km. They cover over 21,000 hectares in the wet season drying out to about 1,000 hectares in the dry season. The flooded area receives nutrients and silt from water, but at the same time it can affect agricultural activities adversely. Flooding mainly affects rice cultivation.

5) Unexploded Ordnance (UXO)

There is a Lao national program dealing with UXO left over from the Vietnam war. This ordnance has sterilized considerable areas of land in eastern Laos, especially along the former Ho Chi Minh trail and still results in the loss of limbs and life when the ordnance is accidentally set off. At present the removal of UXO is dependent on requests received by the Program and the amount of funds available. SKR regional development plan can assist the Program by pinpointing areas where development is proposed and highlighting other areas that are of less importance from a development viewpoint, but important from a conservation aspect.

⁸ National Environmental Action Plan page 104, October 2000. Science and Technology Agency.

III-1.3 Government Policies

1) Forestry

With JICA support, the Forestry Department has published in August 2000 a summary of laws, decrees, and other orders relating to forestry (JICA/Forestry Department 2000). This ranges from forest laws (dated October 1996) to the latest harvesting decree (an addendum dated October 2000). Part 1 of the report covers general subjects such as forest laws and their implementation to the management of forests. Part 2 deals with land, land taxation and land utilization. Part 3 concerns the cutting and sale of trees and the restoration of harvested areas. Part 4 is a technical chapter on wood measurement and log marking (hammering). Part 5 covers reserved forests, watershed protection and conservation of wildlife. Part 6 is concerned with village forestry. Part 7 deals with the transfer of forest land, and Part 8 is about afforestation and enrichment planting. Part 9 is concerned with wood processing and the movement of logs in order to prevent illegal processing and smuggling. Finally, Part 10 covers administration. This last part covers the roles of the Ministry of Agriculture and Forestry, the provinces, the districts and the special zone. It details the roles of forestry staff at various levels down to the village.

Thus there are many rules and regulations on the statute book. These rules and regulations could be carried out in practice if there are skilled and well-trained forest officers to supervise in the field. Unfortunately, however, there is an acute shortage of such officers and forestry staff. Now that the laws, decrees and other orders are made transparent, the management aspects of the forestry regulations should be discussed widely.

The large state-owned logging enterprises are under the jurisdiction of the Ministry of Defense, but much logging is done by sub-contractors. There is little evidence whether the statute book is followed strictly by the logging enterprises and their sub-contractors. Logging companies are supposed to undertake replanting or pay for the replanting of logged areas, but even if they do, no provision is made to check on the planting to ensure that it has been successful and if not take the steps to ensure success.

There is a concern in some circles about illegal and illicit logging. What is not legally permitted is for villagers to salvage logging waste as officially this is the job of logging companies. This, is a waste of a valuable asset and some villagers have circumvented this rule and salvaged the log illicitly: this is a rational if somewhat illegal decision. The Prime Ministers Office has recognized that much of the fallen trees are left in the forest and now the latest order states that this

waste must be utilized before new logging concessions are granted. However, lack of trained personnel on the ground may prevent such orders being carried out in practice.

The government recognizes that decision making should be mutually arrived at by all interested parties. This should be the guiding principle concerning the management of the forest resources whether for production, conservation or protection or a combination of various functions. The rules should be simple and transparent so the every party knows the rewards and penalties. Unless this is realized, forests will be mined rather than managed as a sustainable and valuable resource.

2) Environmental Action Plan

The National Environmental Action Plan 2000 (NEAP) was published in July and the latest version was issued in October 2000. This covers the purpose and focus of the NEAP and outlines the key environmental issues. The plan describes the legal framework for environmental management and the institutional framework for environmental management. The objectives of NEAP are then stated and sectorial actions are discussed. These cover actions for:

- Forest Resource Management.
- Biodiversity Conservation.
- Land Resource Management.
- Water Resource Management.
- Road Development, and
- Industrial Development and Mining.

The immediate priorities are then listed. Amongst other things, these cover the adoption and implementation of:

- General and Sectorial Environmental Regulations and Standards.
- The Formation of an Environmental Coordination Committee.
- The Identification of further worthy NBCA's including Wetlands.
- The Formation of Regional Wetland Associations.
- The Preparation of Management Plans for Existing NBCA's.
- The Implementation of Forestry and Land-use Decrees.
- The Implementation of Community Based Resource & Land Management Associations.
- The Adoption of a Decree to use Modern Technology for Wood Processing.
- The Implementation of Environmental Assessments for New Industries, and

- The Improvement of Environmental Data Collection.

NEAP is strong on land and water resource management and biodiversity conservation. But it needs strengthening in the industrial and mining sectors. Also, STEA has a limited number of trained personnel to carry out an ambitious program to manage NBCAs and to undertake all the various functions outline in the plan. Here assistance from the donor community is badly needed.

3) Environmental Protection Law

The General Environmental Impact Regulations have been passed and issued (STEA June 2000), but the Sectorial ones are still in the process of being formulated. The regulations cover:

- General Environmental Impact Assessment (EIA) guidelines.
- General rules.
- Procedures and EIA methods in Lao PDR: general rules; EIA steps; project owner's responsibilities
- Financial responsibilities for EIA.
- EIA procedures and connections during project cycle.
- Public involvement.
- EIA procedures and methods for project presentation.
- Environmental analysis.
- Screening.
- Preliminary review and discussions.
- Scoping.
- Contents and layout of full environmental report.
- Full review and discussions of EIA report.
- Environmental management plan.
- Environmental monitoring.
- Measures against violators and rewards for enlightened behaviour.
- Definitions.
- Initial Environmental Evaluation (IEE).
- IEE letter.
- Requests for comments on IEE.
- Full EIA report contents.
- Requests for comments on EIA.
- Procedures for projects with little environmental impacts.
- Procedures for projects with environmental impacts.
- Environmental management plan (EMP) formulation.

Resource Management and Environment

As stated above these are general guidelines; sectorial guidelines are being formulated. Until the sectorial guidelines are issued the above guidelines will be followed.

III-2 FOREST RESOURCE MANAGEMENT

III-2.1 Current Situation

Resource management is dependent on the type of forest or land use, the availability of trained personnel and the accessible resources. Six broad categories of forests or land use types are recognized and management objectives vary according to these broad types. These categories are:

Conservation Forests. Principally, these forests are within NBCAs although there may be small islands of forests that should be conserved because of their religious, historic or amenity value.

Protection forests. Many of these are in watershed areas and again some are already within conservation areas. There are small pockets of lowland mixed deciduous forests, rich in flora. Some of these forest are close to urban centers and therefore, they should be protected both for their amenity value and their biodiversity.

Production forests. The principal goal in these forests is to manage them for wood production, but also non-wood products may be important.

Plantations and woodlots. These are generally managed for wood production, but some may be managed for non-wood products such as rubber or tannin while others could act as buffer zones round protection or conservation areas. Generally excluded from this classification are fruit and nut trees, tea and coffee areas.

Degraded forest types. These are generally former forests and woodlands in transition, principally to other forms of land use but occasionally back to forests; these may be classified separately as *Rehabilitated Forests*. Included in this category are shifting cultivation areas, bamboo stands, shrubs and heaths, open woodland and savannah areas.

Trees outside the Forest. Most of these trees are on or close to fields in single or scattered formations, but they can be found in grassland/pasture land, round houses, in urban areas and along paths or roads.

Conservation Areas. In conservation areas, the principal goal is to ensure that there is little disturbance to the habitat. Thus, the management objective is to keep human activity to a minimum. Some production, principally of fuelwood, poles and non-wood products may be allowed in certain areas and eco-tourism and recreation could be encouraged. But timber harvesting should be discouraged. Conservation areas usually are in watersheds of principal rivers and therefore, watershed protection is a priority.

The current situation in conservation areas is that the boundaries were drawn on a map without prior field reconnaissance. In most if not all conservation areas, there are villages totally inside the area, villages that straggle the area and villages that, although outside the area, rely on it for some goods and services. Unless the boundaries and the goals of conservation are agreed to by the local villagers, there may be constant disputes between the managers of the conservation areas and the people living in proximity to them. Only through mutually agreed objectives through an ongoing participatory process will there be a lasting solution to keeping these areas as intact as possible. Management plans are being drawn up for NBCAs, but because of lack of funds, vehicles and equipment and trained personnel, the progress is slow.

There are over 1 million hectares of protected areas in seven NBCAs in SKR with three extensions proposed of another 72,000 hectares (see Table III-2). To produce realistic and workable management plans for these areas will require a considerable effort. These areas are of national, regional and global importance from many aspects. The Lao government has insufficient number of trained personnel, and shortage of funds and equipment to carry out quickly the task of securing the boundaries and producing acceptable management plans. Because these areas are rich in biological resources they could be prime targets for commercial forest production if they are not protected.

Protection Areas. These areas are similar to conservation areas in management goals, but the prime objective is usually watershed protection. Harvesting of wood and other non-wood products may be allowed to a certain extent. As outlined in Section III-1.2, SKR is an important source of water, with five main river systems, three medium ones and several small ones. In Khammouan these cover the rivers Hinboun, Don, Theun, Oula, Bangfay and Noy. An estimated 100,000 hectares of protection forests is required outside NBCAs to protect the headwaters of these rivers. Also the banks of these rivers should be protected with trees and/or grass.

In Savannakhet, various protection forests are listed, namely Houay Bark, Nam Kok, Nam Sang, Houay na Khouang and Xe Bang Hieng. These cover an area of 110,500 hectares. Other rivers that may need protection include the rivers Thahao, Pong, Tanouan, Lanong and Pon. An additional 30,000 hectares of forest may need to be included in this protection category in order to protect the headwaters of these river systems. As with NBCAs, these protection areas are mainly on paper with little management occurring. Steps need to be taken to secure the boundaries and draw up management plans for these areas, again with the help and consent of the local people.

All these rivers flow into the lower Mekong and are an essential component of the Lower Mekong river system. Therefore, like NBCAs these protection areas are of international, if not global importance. Help should be given to the government and SKR to quickly delineate these areas on the ground and compile management plans.

Production Forests. There are an estimated 199,300 hectares of production forests in Khammouan including 1,000 hectares of plantations. This is 24% of the high forest area and 14% of the total forest area. In Savannakhet, the production forest area is estimated to be 402,200 hectares, including 1,000 hectares of plantations, accounting for 37% of the high forest area and 23% of the total forest area. The main goal in these forests is the production of saw and veneer log size timber. Management plans should be drawn up for each production forest governing the area to be cut each year, the trees to be cut, the felling and logging methods, the extraction of the logs and their marking. Felling cycles are fixed ranging from 40 to 60 years. Depending on the length of these cycles, the forest should be divided into 40 to 60 coupes, one coupe being felled each year. Enrichment planting should be undertaken by the entity undertaking the felling and extraction, but payment can be made for the planting to be done by other people. All these steps are or should be governed by the laws and decrees issued by the government.

In practice, the above rules are rarely followed. Logging concessions are allocated each year through a quota system. There are no long-term concessions, so it is not in the interest of the company to leave 'marginal' merchantable trees standing for regeneration purposes or to fell during the next cycle, because if they do not fell the trees, someone else will. Also, logging may take place outside production areas or in un-allocated production forests. Logging companies, the largest of which are government controlled, scout for the best areas and then log these areas. Little attention is paid to damage prevention or extraction techniques to lessen adverse impacts.

For the forestry management, some new systems have been tried, the most successful ones are those involving the local villagers in the management of the forest resources in their areas. Two such programs have shown considerable success in the pilot phase. These are the Lao- Swedish Forestry Programme (LSFP) and World Bank/Finnish Aid supported Forest Conservation and Management Project (FOMACOP). Basically, villagers draw up simple management plans with technical assistance being provided by the project. Merchantable trees are recorded and a plan is drawn up with rules governing which trees can be felled and which trees have to be left for seeding. In place of

having long felling cycles shorter ones of between five and ten years are substituted. In return, only a proportion of the 40 to 60 year cycle wood is removed at any one time. Low impact logging is also practiced and because the villagers have long term interests in preserving the forest, extra attention is paid to regeneration and enrichment planting. Wood is not the only product from these managed areas, as the villagers use these forests to extract non-timber products for their own use and for sale.

While the pilot systems have been successful, they require a continuing and long term effort, and unfortunately the FOMACOP program has finished. It is essential that the production forests be brought under proper and transparent management systems with sustainability as the over-riding goal.

In cooperation with interested parties from government agencies at all levels, through the villagers to loggers and the wood-using industries, production areas should be codified and an assessment made of their stock and potential yield. Simple management plans, based on the experiences of the Village Management Initiatives, should be compiled and long-term concessions awarded to companies and villagers. Payments should be made for the standing tree and not what is removed from the forest.

It must be recognized that large diameter trees will have to be replaced by smaller diameter trees. Thus, sawmilling practices should change to accommodate smaller sized logs. Through judicious forest management, it is possible to increase production with a reduced capital stock. Thus rotations of more than 80 years should not be pursued in production forests. At the same time, planting of degraded forests could be encouraged by various means.

Plantations/Woodlots. To date, plantation development is meager in SKR. There are only about 2,000 hectares of successfully established areas, although up to three times this amount could have been planted. There is little experience on plantation establishment and management and little interest to plant trees as there has been ample supply of wood from the natural forest. With likely increasing shortages of sawlog sized wood and expanded opportunities for wood fiber from small sized trees, there is renewed interest in plantation development. Also, there is ample degraded forest land that could be reclaimed. There is a joint Lao/ADB financed program to promote plantations and woodlots throughout the country. One joint venture company (The government and New Zealand) has started planting Eucalyptus and Acacia in Khammouan with the intention of planting 50,000 hectares over a period of about 10 years. The wood from this plantation area is intended for pulp and paper production.

There are other opportunities, not only for wood fiber, poles and fuel, but for non-wood products such as mulberry leaves for sericulture, plant oil from tree species for soap making and bark production for tannin extraction. Also, plantations can be used to demarcate conservation and protection areas and for soil stabilization in erosion prone areas such as along river banks. Such plantations would mainly have a protection function and it is possible that they could qualify as a carbon store under the various international protocols that are being worked out at present.

Therefore, there is considerable opportunity for a greatly expanded plantation initiative. Market development is as important as plantation management if this opportunity is to be realized.

Potential Forest Areas. In SKR, 45% of the forest area is in this category. Not all forests in this category are degraded, for they contain scattered areas of evergreen and mixed deciduous forests and considerable areas of dry dipterocarps. Similarly, protection and production areas contain small amounts of degraded forests including shifting cultivation. This latter is common in the Doung Phou Vieng NBCA in Phine District of Savannakhet. However, unless something is done to improve forest management then more forest areas will degrade into this category. Large areas of shifting cultivation fall into this category, although as mentioned above they can be found in production and protection areas. If permanent and sustainable farming systems could be substituted for shifting cultivation, then up to 350,000 hectares of forest land could be left to regenerate into high forest. If little is done to curtail this practice, more forest areas will be devoted to shifting cultivation in line with the expansion of the population in upland areas.

As mentioned above, these areas are a source of land for plantation development. The local people also manage these areas for the many goods and services they require especially fuelwood and poles. Some areas are also commercially exploited for sawlogs.

Trees outside the Forest. These are an important source of wood and non-wood products and are usually intensively managed by farmers. When land is cleared for agriculture, selected scattered trees are left behind and other, including fruit trees and bamboo are planted. Although the actual stock of trees on such non-forest land is low, because of the short production cycle, the yield is relatively high. These areas may be the best managed areas as farmers have a direct interest in their management. However, there are rules that even privately owned trees cannot be felled without permission of the authorities.

In general, the present management of the tree resources is poor, except where the users of the resource have a direct interest in their preservation. Large areas of land have been set aside for conservation, protection and production, but personnel and funds are lacking to undertake the appropriate actions to ensure that these areas are secured and managed.

III-2.2 Potential and Constraints

1) Resource Base Potential

Several measures can be used to assess the resource base potential. The first measure is the amount and accessibility of wood raw material and other forest products available from the trees in SKR. The second measure is the availability and the skill of the people to manage and use these resources. The third measure is the equipment and capital availability to extract and process these resources. Finally the fourth measure is the actual or potential market for wood and other forest products.

As discussed in Section III-1.2 (see Table III-1.5), there is a surplus of small diameter wood in SKR. Even excluding protection areas, the estimated sustainable supply is nearly 13.8 million m³. This is a low value resource and is scattered throughout the region. Therefore, development has to be at the local level. Many rural industries depend on fuelwood as their energy source. More use could be made of this relatively cheap, available (and greenhouse gas neutral) fuel through expanding small scale local industry such as brick and lime burning, tile and pottery production, agricultural processing where heat is required and charcoal manufacture. Handicraft industries can use waste wood and lesser-known species of small dimensions including bamboo and rattan. Developing or expanding markets for such products is a key to much fuller utilization of this resource.

There should be sufficient large dimensional wood to meet current and expanded demand for sawlogs and veneer logs both for local consumption and for export. However, because of poor logging practices, log removal policy, and relatively inefficient conversion, the actual felling of wood in accessible areas exceeds sustainable supply by two times or more. This can be corrected and in fact the delivery of wood to saw and plymills could be increased if felling and logging waste is reduced, if more species are utilized, and if more of the non-protection area is brought under management. Also the existing production areas must have greatly improved management on them.

Small-scale sawmilling could be introduced based on mobile saws. These could open up areas considered to be un-viable by large-scale loggers. Long concession agreements should be given to logging companies and villagers should be vested considerable areas to manage. Logging practices could be adjusted to the conditions and payment should be geared to the stumpage value rather than the extracted log value.

Through better management, and targeted planting incentives, the sustainable output from the natural forest and plantations could increase over the next 20-years, despite more forest land being converted to arable and pastoral farming.

2) Changes over the last 10 to 18 years

The table below summarizes the changes by the main land-use types for each province for three time periods, namely 1982, 1990 and 2000.

Table III2-1 Summary of Land Use Changes

Khammouan

(Units 000ha.)

| Land use vegetation type | 1982 | 1990 | 2000 | Change | |
|----------------------------------|--------------|--------------|--------------|-------------|-----------|
| | | | | 82-00 | 90-00 |
| High forest | 1,037 | 914 | 817 | -220 | -97 |
| Potential forest | 248 | 315 | 399 | +151 | +84 |
| Other wooded areas | 231 | 83 | 88 | -143 | +5 |
| <i>Subtotal all forest areas</i> | <i>1,516</i> | <i>1,312</i> | <i>1,304</i> | <i>-212</i> | <i>-8</i> |
| Agricultural land | 55 | 125 | 135 | +80 | +10 |
| Other land | 97 | 231 | 229 | +132 | -2 |
| Total all land | 1,668 | 1,668 | 1,668 | +0 | +0 |

Savannakhet

(Units 000ha.)

| Land use vegetation type | 1982 | 1990 | 2000 | Change | |
|----------------------------------|--------------|--------------|--------------|-------------|-----------|
| | | | | 82-00 | 90-00 |
| High forest | 1,214 | 1,203 | 1,076 | -138 | -127 |
| Potential forest | 488 | 630 | 674 | +186 | +44 |
| Other wooded areas | 208 | 32 | 51 | -157 | +19 |
| <i>Subtotal all forest areas</i> | <i>1,910</i> | <i>1,865</i> | <i>1,801</i> | <i>-109</i> | <i>-4</i> |
| Agricultural land | 172 | 232 | 292 | +120 | +60 |
| Other land | 58 | 42 | 47 | -11 | +5 |
| Total all land | 2,140 | 2,140 | 2,140 | +0 | +0 |

Resource Management and Environment

SKR

(Units 000ha.)

| Land use vegetation type | 1982 | 1990 | 2000 | Change | |
|----------------------------------|--------------|--------------|--------------|-------------|-------------|
| | | | | 82-00 | 90-00 |
| High forest | 2,251 | 2,117 | 1,893 | -358 | -224 |
| Potential forest | 736 | 945 | 1,073 | +337 | +128 |
| Other wooded areas | 440 | 115 | 139 | -301 | +24 |
| <i>Subtotal all forest areas</i> | <i>3,427</i> | <i>3,298</i> | <i>3,105</i> | <i>-322</i> | <i>-193</i> |
| Agricultural land | 227 | 357 | 427 | +200 | +70 |
| Other land | 154 | 273 | 276 | +122 | +3 |
| Total all land | 3,808 | 3,808 | 3,808 | +0 | +0 |

Source: GIS Survey 2000.

In all areas, particularly in accessible lowland areas, there has been a considerable decline in the quality and area of high forests. Even in some conservation areas, there have been definite inroads made. This is noticeable when the 1990 maps are compared to the 2000 maps. For example in Nakay Nam Theun NBCA where the proposed Nam Theun II dam is to be built, upper dry evergreen forests and mixed deciduous forests have been converted to shifting cultivation and degraded forests, the latter is probable part of the shifting cultivation cycle. There are 13 villages within this conservation area. These people are dependent on the forest for their livelihood. It may be best to use these villagers as guardians of the forest and capitalize on their skills, while at the same time introducing more sustainable agricultural systems and alternative employment opportunities such as tourist guides, handicraft production and forests guards.

From the analysis of the data, the loss of evergreen and mixed deciduous forest has slowed down in Khammouan, but accelerated in Savannakhet. In this latter province, it has increased from about 5,000 hectares per year in the 1980's to 10,000 hectares per year in the 1990's. In Khammouan, the decrease was from about 17,000 hectares per year in the 1980's to 10,000 hectares per year in the 1990's.

Dry dipterocarps are only prevalent in Savannakhet. They have increased in area, but declined in composition. There are also many scattered paddy fields and grazing areas within this forest type. Over the last 10-years, logging has intensified.

Gallery forests, which are narrow strips along rivers and streams, have almost disappeared: this may have adverse erosion effects and the restoration of a tree belt should be a priority.

As is to be expected with the decline of high forests, the area of degraded forests, including other wooded areas, has increased. In the 1980's, the increase was about 8,000 hectares per year, but this doubled to about 15,000 hectares per year in the 1990's for SKR as a whole.

There has been a slowing down of the rate conversion of forest land to agriculture, especially in Khammouan. This could be because of increased productivity and the declining availability of fertile forest land. Overall, forest conversion to agriculture has dropped by more than half from an average of 16,000 hectares per year in the 1980's to 7,000 hectares per year in the 1990's. Hopefully, this trend will continue, but it must be helped by assisting farmers to improve their productivity.

Overall, the pace of forest degradation has increased over the last ten years, while the rate of conversion of forest land to agriculture has declined. This former trend is worrying, but the latter trend is encouraging. Steps have to be taken to increase both forest and farm productivity in order to reverse the forest degradation trend and to further slow down the rate of forest conversion.

3) Likely Changes without Management Interventions

Judging from the trends over the last 20 years and bearing in mind that the population will increase by another 600,000 from the present 1.1 million in SKR, all types of forest areas will decline considerably without management interventions. Such a decline would reach more than 350,000 hectares.

Survey of Land-use along Route 9. NR9 is a main road between Thailand, Lao PDR and Vietnam. It is being up-graded and the New Mekong Bridge will be built in Savannakhet town, the start of route 9. Because of its pending importance, a survey of existing land use, population and industry was undertaken in April 2000. This survey can act as a baseline to monitor land-use changes along this road over the next 20 years.

The survey recorded land use patterns in a strip 100 meters wide along NR9 from just outside Savannakhet to the Vietnamese border, a distance of 244 km. A sample household population count was made to estimate population changes over the last five years. The results of the survey are as follows.

- *Population:* There are an estimated 28,500 people living along NR9, i.e. 16,500 on the north side and 12,000 on the south side. Since 1995, the net population increase is 2,220. This is a 2.56% increase per year. In the sample

survey, the population increase was 635 people, but 84 people moved away. Thus the net increase was 553.

- *Houses:* The count of houses along the road was 5,193 of which 315 are newly built. 45% of the houses are wood and cement, 37% are constructed with wood and 18% are made with bamboo. In addition, there were two abandoned houses. These houses, other buildings and factories covered about 780 ha.
- *Other buildings and infrastructure:* These are as follows: Shops 314; Markets 4; Schools 20; Temples 7; Sawmills 5; Logyards 31; Industrial buildings 4; Other buildings 122.
- *Villages and location:* The total number of villages recorded along the 244 km of road from Dansavan on the border of Vietnam to Savannakhet was 102.
- *Land Use:* The total length of the road was 244 km. Thus, the area surveyed was 4,880 hectares. The land use along this 200 m wide strip was recorded as follows: forests 42% (2,033 ha.); agricultural areas 40% (1,945 ha.); urban 16% (783 ha.); water etc. 2% (120 ha.). Of the forest area about 1,100 hectares (23%) is classified as unstocked and 1030 hectares of the agricultural land (21%) is classified as paddy fields.

Possible changes brought about by Rural Road Development. Rural road development can have positive and negative effects on natural resources. By opening partially accessible areas there is the danger that forests will be logged to excess and that some pristine upland habitats will be converted to farmland. On the other hand, by opening up the rural areas, villagers have better access to the public services (e.g., schools, health centers, extension services). Rural people will be able to get their products to market and by managing the resources sustainably they will improve their living standard and appreciate the benefits of preserving the natural resources rather than destroying them for short term benefits. Training and advice should be given to rural people in marketing and management in order to augment their innate skills in resource utilization.

III-2.3 Objectives and Strategies for Forest Resource Management

1) Objectives of forest Resource Management

The objectives of forest resource management differ depending on what type of forest area is being managed. However, the overall goal is to increase the resource base while at the same time preserving the habitat.

In conservation areas, the objectives must be to secure the boundaries by mutual agreement with the local people and draw up workable management plans again in cooperation with the villagers. While the principal goal of NBCAs is to conserve

the areas for bio-diversity and in most cases protect the headwaters of rivers, limited production of resources must be allowed. Also, the opening of certain parts of NBCAs for eco-tourism and recreation should be encouraged. This will supply additional benefits to the forest dwellers and open up the beauty of these areas to the world.

In protection areas the main objective is watershed protection or the preservation of 'island forests' in lowland areas or forests. Again the first task must be to delineate the boundaries in agreement with the local people and then draw up management plans including production as well as protection.

Production forests must be clearly defined and mapped. Like the two previous forest uses, the boundaries have to be marked on the ground and agreed to by all interested parties. Management plans should be compiled and where villagers have rights they should be consulted and help draw up the plans. Some forests should be handed over to villages for management and other given out on long term concessions. The forest service could also manage some areas and develop management strategies and maintain sample plots. Such forests could also serve as demonstration sites for villagers and concessionaires.

Plantations serve a number of purposes. They can provide a sustainable resource of uniform quality in a concentrated area: therefore, they can promote industrial development. Plantations can act as markers to natural forest areas and act as a buffer zone between say a NBCA and the outside. They can form a connecting corridor between two areas to allow the passage of animals. They can rehabilitate areas such as watersheds or degraded forests and provide goods and services at the same time. They can be planted in areas that are prone to erosion along rivers and streams or in steep areas. They can be planted in fields as windbreaks or as hedges to contain or keep out farm or wild animals and in agro-forestry formations. Finally trees can be planted along roads and round houses to provide shade and produce and to enhance the amenity of the site. All these objectives will be pursued.

In potential forest areas, a number of differing objects will be followed. Shifting cultivation is one of the land uses in such areas. The objective, where shifting cultivation occurs, is to try to persuade cultivators through demonstration and training alternative and more sustainable forms of farming or commercial crop production such as fruit and nuts, tea and coffee. If successful, then these farmers can managed the remaining area of secondary forest in the shifting cultivation cycle for productive purposes.

Agricultural expansion will occur and from a resource management perspective, it is better to plan for land use changes rather than have them done randomly. Despite promoting increases in agricultural productivity, some unstocked forest land will be converted to arable and pastoral agriculture and maybe to plantation agriculture. Most arable land could come from this category of land use, but land for improved pasture development may, in the main, come from dry dipterocarp forests.

Within the potential forest group, some areas will be converted to plantations and others will be managed and eventually returned back to high forests. Finally in order to promote farm tree planting and trees outside the forest, NGO's and other interested parties will be given training in seedling production and tree management.

All these efforts will be backed up with on-going training initiatives for farmers, foresters, loggers and wood users. In addition efforts will be made to introduce or expand environmental training in schools, technical colleges and other educational establishments including the proposed agricultural college.

2) Strategies for Sustainable Development

(1) Basic Strategies

The over-arching strategy is to try and preserve most of the existing forest resources, plan for land use changes, while at the same time trying to make the remaining forest areas more productive, thus improve their sustainability. This may seem ambitious, but with the help of all involved parties from government ministries, local authorities, resource users, NGO's and most importantly the local people, it can be achieved. The strategy has to be proactive rather than reactive. Many past studies have blamed the logging industry for the demise of the forest resources and to some extent this is correct. But it is the way the logging is undertaken and the lack of correct training and supervision that is the cause of degradation not the logging itself, be it legal, illegal or illicit. Stopping illegal logging will not prevent forest degradation unless the logging practice is improved. In areas where logging does not take place or in countries where logging is banned as in Thailand, deforestation still continues. This is why emphasis is placed on increasing agricultural productivity as one of the main strategies to improve natural resource sustainability.

From inventory information, there appears to be enough large diameter wood in non-conservation/protection forests to support existing log demand if the resource is managed properly and waste is reduced to a minimum in the forest, at the log

landing sites and in the saw and ply mills. There is more than enough small sized wood and dead wood to greatly expand the use of fuelwood, charcoal, poles and small dimensional wood for local industry and use.

For Conservation and Protection forests, the strategy is to secure these areas by mutual agreement with the people living within or near these areas and clearly mark the boundaries. While protection management and enhancement of the biodiversity and/or watersheds are the principal goals, resource extraction should be permitted provided management guidelines are followed. These conservation areas are living entities and should not be off limits to all but a few wildlife experts. They could be opened up so that anyone can enjoy their natural beauty. Such a strategy should bring local benefits and make people want to conserve the areas.

Similarly the strategy for production areas should be to clearly define each area and draw up management plans to improve production, reduce losses and monitor growth. In parallel with this utilization, research should be undertaken to try and find uses for so called non-commercial species and market investigations should be encouraged to find profitable outlets for such species. Long-term concessions should be given to villagers and logging companies so that they have a vested interest in maintaining the areas. These entities should also assist in drawing up management plans for these areas.

The plantation strategy should be to encourage individuals and companies to plant trees where actual and potential opportunities exist for the provision of fiber or other products such as fruit, nuts, latex or plant oil. Plantations should also be used to delineate conservation and protection forests and provide corridors for animal migration. Such plantations may be counted as carbon stores and qualify for carbon credits.

In the goal to improve agricultural productivity and to provide alternatives to shifting cultivation, trees could play a major role. Nitrogen fixing trees judiciously planted in fields on short rotations of one to three years can increase crop yield significantly, while at the same time providing stick wood. Farmers have to be shown that by mulching the tree leaves and twigs into the soil, fertility can be improved and maintained at this enhanced level. Again by planting browse trees in pasture land, trees can improve the diet of animals through protein rich feed while at the same time providing shade for the animals. Therefore, the promotion of tree planting and management should not be confined to the forest, but be advanced on all land formations. And tree planting and environmental protection should be part of the syllabus in schools and colleges.

(2) Strategies for Khammouan

The following proposals are suggested.

NBCA. NBCAs in the province will lose 12,000 hectares when the Nam Theun II dam is flooded. It is proposed to have a corridor of 5,000 hectares of indigenous plantations between Nakay Nam Theun and Hinnamnor NBCAs, a distance of about 5 km. But the proposed corridor between Phouhinpoun and Nakay Nam Theun of 60,000 hectares seems unnecessary as no large animals live in the Phouhinpoun and the Nam Theun II dam will divert such a corridor and make it over 30 km in length.

Watershed Protection. It is proposed to protect the headwaters of major rivers in Khammouan including the Bangfay, Hinboun, Phanang and Xenoy. An estimated 100,000 hectares of natural forest will be protected.

Production Forests. It is proposed to increase production forest areas from the current 199,000 hectares to around 250,000 hectares by 2020.

(3) Strategies for Savannakhet

The following proposals are suggested.

NBCA. It is proposed to reforest the unstocked forest in NBCA. The proposed plantation and the corridor plantations will come from potentially productive forest areas. Management in these zones is mainly geared to bio-diversity conservation.

Watershed Protection. The existing watershed protection areas of 110,000 hectares will come under full management and an additional plantation will be planted in the unstocked forest, along rivers and streams and in areas subject to erosion. Other headwaters of rivers may also be included in this category. The plantations will provide goods and services for the people living in the vicinity of these areas.

Production Forests. It is proposed to increase production forest areas from the current 402,000 hectares to 520,000 hectares by 2020.

3) SKR Overall Development

With improved training, management, plantation expansion and the expansion of more sustainable agro-forestry in place of shifting cultivation, it is assumed that the growing stock on managed areas can increase by 20% over the 20-year time period. This is less than a 1% annual productivity increase; this should be

achievable. Table below gives an estimate of the potential volume production in SRK by 2020, assuming the above indicative plan is fulfilled and the growing stock plus annual yield gradually increases by 20% over the 20-year time period.

Table III2-2 Above-ground Volume and Yield by Land-use Type

(Units: million m³)

| | Area million ha. | Standing stock | | | Estimated yield | | | Total volume All species | |
|---|------------------------|------------------|-------------------|---------------|-----------------|-------------------|--------------|-----------------------------|--------------|
| | | Com.. species | Non-C. species | Total | Com. species | Non-C. species | Total | Stock | Yield |
| Protection areas | 1230 | 154.15 | 110.65 | 264.80 | 3.86 | 2.76 | 6.62 | 478.85 | 14.78 |
| Production areas | 978 | 79.74 | 39.42 | 119.16 | 1.98 | 0.98 | 2.96 | 212.12 | 7.69 |
| Potential forest areas | 727 | 23.24 | 8.24 | 31.48 | 0.57 | 0.20 | 0.77 | 57.68 | 4.08 |
| Sub-total forest areas | 2935 | 257.13 | 158.31 | 415.44 | 6.41 | 3.94 | 10.35 | 748.65 | 26.55 |
| Other land areas | 718 | 1.97 | 1.27 | 3.24 | 0.05 | 0.03 | 0.08 | 9.27 | 1.69 |
| Total all land areas | 3653 | 259.10 | 159.58 | 418.68 | 6.46 | 3.97 | 10.43 | 757.92 | 28.24 |
| Note Rock area 72,000 ha. Swamp and water 83,000 ha. Total area 3,808,000 ha. | | | | | | | | | |
| Comparison of volume and yield with 2000 estimates (Table 1.5 and Annex II 5 m.) | | | | | | | | | |
| Total all land 2000 | 3700 | 218.28 | 138.23 | 356.51 | 5.45 | 3.45 | 8.90 | 719.83 | 27.56 |
| Difference between 2020 and 2000 as a result of management interventions. | | | | | | | | | |
| | - 47 | 40.82 | 21.35 | 62.17 | 1.01 | 0.52 | 1.53 | 38.09 | 0.68 |

Note: Com. = commercial. Non-C. = non-commercial. The yield of small diameter wood was estimated assuming shorter nominal rotations for non-high forest species ranging from 10 to 20 years.

Source: SKR team estimates.

With improved management, the growing stock could be increased by 2020, (on a reduced forest area) and the yield of sawlog sized wood shows an increase of over 1.5 million m³, of which 0.9 million could be commercial wood in production forests. This strategy would not only ensure the protection of conservation and watershed areas, but also increase the output from commercial forests so that the wood using industry would have a secure and increasing supply of fiber.

III-2.4 Resource Management Program

1) On going Programs.

Development initiatives should be to build upon successful programs. Four programs will be summarized, namely the JICA program, The Lao-Swedish Forestry Program, The Forest Management and Conservation Project (FOMACOP), and the Lao-Asian Development Bank Plantation Program.

JICA Initiative. JICA is supporting the Forest Conservation and Afforestation Project (FORCAP) with its training center in Vang Vien. While not having any projects in SKR, there are important lessons that can be learned from this project.

The project is based on people's participation, forest conservation, management technology and capacity building: these are applicable throughout the country.

JICA is also supporting the Forestry Development to collect, codify and help publish all the laws, rules, regulations and decrees concerning forestry management from the ministry level down to the district and village levels. The first part was published in August 2000. One thing that this publication has shown is that at present there are overlapping responsibilities concerning the management of the forests and the responsibility for issuing permits for logs and other forest products. There is an urgent need to clarify the regulatory framework, resolve conflicting rules and regulations, simplify procedure and above all make the process transparent.

The Lao-Swedish Forestry Program. This program has been running for many years and has built up an excellent working relationship with the Forestry Department. The principal goal of the program is to assist in the efforts to encourage a more sustainable use of human and natural resources. To this end it has a three pronged strategy. The first part of the strategy is Method Development. This looks at practical ways to manage natural resources based on field experiences. One of its initiatives under this heading is the Development and Testing of a Provincial Natural Resource Management System (PRONAM). Savannakhet is one of the first provinces to be chosen for this study. Work has just begun to develop and test a replicable provincial system for sustainable natural resource planning and management and to support socio-economic development.

Another initiative under this program is a study of Participatory Management in Nam Phui and Phou Sang Hai NBCAs, the latter being in Savannakhet. This study examined ways to secure the boundaries of the conservation areas with the assistance of the local population and to devise simple management plans for these conservation areas.

The second arm of the program is Competence Development. This is concerned with training of staff both in theory and practice. To this end, on-the-job training is provided as in the above two programs, as well as academic training in universities and training institutes outside the country.

The third arm of the program is concerned with Management and Research. Support for NAFRI (the National Agricultural and Forestry Research Institute) is part of this initiative.

FOMACOP. The Forest Management and Conservation Project was supported by the government of Finland and the World Bank. This project was a pilot study with the objectives of:

- Promoting sustainable forest management by developing forest conservation policies and legislation.
- Promoting village forestry.
- Improving the socio-economic status of the villagers.
- Establishing and efficiently manage four NBCAs.

FOMACOP has two sub-programs, namely forest management and biodiversity conservation. The pilot areas are at Dong Phou Xoi in Khammouan and Dong Sitouane in Savannakhet. In total, an area of 145,000 hectares was covered containing 60 villages and 20,000 villagers. Methods of forest management were developed including resource assessment and low impact logging. The program was considered to be successful, especially by the villagers themselves who not only took an active interest in managing the forest resources, but also were able to finance various development activities through the income generated from the sale of forest products including logs. Unfortunately, the program finished in September 2000. It is an example of a successful village forestry management scheme.

Lao/ADB Plantation Program. The Lao-Asian Development Bank Plantation Program. is an initiative to encourage the planting and management of trees throughout the country. This program is geared to promoting the successful establishment of trees for a number of purposes from timber and pulpwood to poles and fuel. In the past, despite promotion by the government to plant trees with the issue of free seedlings, most planting has not been successful. Less than a third of the trees planted in SKR has survived.

The Lao/ADB initiative is a loan program not a grant and, therefore, the borrowers have a vested interest to ensure the success of their efforts. The BGA/Lao Plantation Forestry project based in Khammouan receives a loan from this plantation program. It intends to plant 50,000 hectares of quick growing species. The yield from this area will be sufficient to feed a pulp mill of 200,000 ton per year. Apart from this project, the Lao/ADB is financing about 2,000 hectares of plantation in 2001 throughout Laos.

2) Resource Management Initiatives

(1) Objectives

One of the government's long term objectives is to ensure that 60% of the land will be covered by forest in 2020. Another objective by that date is to replace shifting cultivation with more sustainable farming practices. Already, 85% of SKR has some form of tree cover, but only 50% of the land is covered by what is termed high or closed forest. This percentage is decreasing due to land use changes and degradation of the existing forest. The proposed Resource Management Initiative (RMI) is geared to increase the areas under management in conservation, protection and production forests and to replace shifting cultivation by more sustainable agro-forestry practices. Also, the planting and management of trees within the arable and pastoral farming systems will be promoted, thereby relieving some of the pressure on forest areas, while at the same time assisting agricultural productivity by reducing erosion, providing an improved micro-climate and supplying mulch and browse.

An indicative plan to secure most of the existing forest estate in SKR by bringing more areas under management, extending agro-forestry and improving productivity has been outlined above in Section III-2.3. Such a plan is meant to be enacted over the 20-year period. If this plan is followed, then by 2020, nearly 60% of the forest area will be managed and have an increased tree cover. Another 6% of the secondary forest area, about 230,000 hectares, will no longer be under shifting cultivation, but will be reverting back to high forest under the management of the former swidden farmers.

(2) Sub-programs (Short-term).

Delineation of Conservation, Production and Protection Areas

Background. Most of the conservation areas, watersheds and production forests are not delineated on the ground nor do they have secure boundaries. They may have been drawn on a map, or proposed by the Forestry Department at the district, provincial or national level as areas in need of protection or areas that can be logged. Alternatively, logging companies may have proposed areas that they want to log and then seek permission to do so. Thus, most of the forest areas under the four categories of conservation, protection, production and potentially productive are not delineated on the ground. In many instances, there are people living within or near these different areas and it will only be through their agreement and cooperation that boundaries will be settled and respected. Recently, the Forestry Department has initiated the study on land-forest allocation, inclusive of the management program for NBCAs. The table below gives a summary of the areas of forests under the four categories mentioned above.

Table III-2-3 SKR National Bio-diversity Conservation Areas, Protection Forests, Provincial Reserves and Protection Forests

(Units: 000 ha.)

| Province | NBCA | Protection forest/watershed | Provincial reserve | Production forest | Un-specified | Forest area | Total area |
|-----------------------|--------|-----------------------------|--------------------|-------------------|--------------|-------------|------------|
| Khammouan | 648.7 | 100.0 | 1.3 | 199.3 | 479.7 | 1429.0 | 1668.0 |
| Savannakhet | 363.6 | 110.5 | 185.2 | 402.2 | 729.5 | 1791.0 | 2140.0 |
| SKR | 1012.3 | 210.5 | 186.5 | 601.5 | 1209.2 | 3220.0 | 3808.0 |
| Percentage of forest | 31.4 | 6.5 | 5.8 | 18.7 | 37.6 | 100 | |
| Percentage total land | 26.6 | 5.5 | 4.9 | 15.8 | 31.8 | 84.6 | 100 |

Note: In Khammouan an additional 65,000 ha. of land have been requested for two corridors connecting three NBCAs. In Savannakhet an additional 7,000 ha. of forest have been requested to add to one NBCA.

Source: JICA/Sida-NAFRI GIS Survey

Program outline. First and foremost, before proposing management initiatives and drawing up management plans, it is necessary to agree on which specific areas should be included immediately under the three headings of conservation, protection and production and which areas could be included in the future. This is relatively straightforward for NBCAs, because they are drawn on a map and sanctioned by the government. But protection and production areas are usually only defined in some forest office and are not detailed on a map or marked on the ground. Therefore, for each province, there must be a series of meetings of interested parties from forestry, agriculture, land-use, environment, provincial government, local authorities and other concerned people to agree on which forests should come under some form of protection and which areas should be designated as production forests. At the same time, plans must be made as to which areas could be converted to arable and pastoral agriculture and which areas must be preserved as forests in one form or another.

These series of meetings should take place quickly, after which fieldwork can start to delineate agreed boundaries. However, fieldwork can begin immediately to determine the boundaries of NBCAs.

Conservation areas. The seven NBCAs in SKR have been drawn on a map and have been sanctioned by the government. In some instances, there are conservation officers in the field trying to mark boundaries and formulate management plans. In a field test that was undertaken through the Lao/Swedish Forestry Program, the people of six villages were contacted and their ideas solicited concerning the Phou Sang Hai NBCA in Savannakhet. These people

lived inside or in close proximity to NBCA. Through their inputs and with their agreement boundaries were marked on the ground and signs erected to indicate the borders of the conservation area. Some villagers suggested that NBCA should be extended by about 7,000 hectares to include a rich upper mixed deciduous forest area. This initiative can be used as a model to delineate the boundaries of all NBCAs within SKR. At the same time where the boundary between an NBCA and the surrounding area is not clear, suggestions can be made to establish a belt of trees, which would clearly define the boundary. Once the boundaries are clearly defined and agreed to, then management plans for NBCAs can be compiled. This should be an immediate follow on to the delineation work. Draft plans were being compiled for some villages during the exercise in the Phou Sang Hai NBCA. These can be used as a model when compiling management plans. Also, the experiences from the JICA plantation initiative and the FOMACOP project should be used.

In several of NBCAs there are farmers practicing shifting cultivation. These should be noted, as there will be another program to persuade farmers to switch to more sustainable forms of agriculture or alternative ways of living.

Three NBCAs in SKR continue into adjoining provinces. Agreement should be reached with the appropriate authorities as to whether this boundary delineating work should cover the whole NBCA or just be confined to two provinces.

Protection Forests/Watersheds & Provincial Reserves. Eighteen (18) rivers need protection of headwaters and banks. In Savannakhet, some of these watersheds have been designated as protection forests, but no official designation exists in Khammouan. In addition, there are isolated forests in both provinces, many rich in flora and fauna, that, if not protected, will be converted to agriculture. Also some of these forests are close to urban centers and should be protected from an amenity viewpoint. The maps indicate that there are many small 'islands' of mixed evergreen forests in lowland areas. These forests if not protected will be converted to agriculture and a potentially productive and bio-diversity rich resource will disappear. These forest areas should be mapped and surveyed. Recommendations can then be made about their present and future status.

In Khammouan, only 1,300 hectares has been designated as provincial reserves, whereas in Savannakhet, 185,200 hectares have been designated. However, in Savannakhet, some of the reserves may also be listed as production forests. Therefore, as stated above, there should be a series of meetings with all interested parties to agree on areas that should be protected, those areas that will be allocated to production forestry and those areas that could be converted to

arable and pastoral agriculture. Included in these deliberations are areas that should be preserved as wetlands.

Once the specific areas have been agreed to and officially sanctioned, then teams should go into the field and mark the boundaries on the ground with the help of and after consultations with the local people. Where boundaries are ill defined, belts of trees can be proposed as for NBCAs. These should be clearly marked on the map. After the boundaries have been agreed, management plans for the specific protection areas can be draw up. The format for management plan compilation could be the same or similar to the one used when drawing up plans for NBCAs.

Production Forests. The area of existing production forests in SKR is given as about 600,000 hectares, less than 20% of the forest area. However, this area and the specific forests are not definite. Without specified forests with defined boundaries, it is impossible to draw up meaningful management plans and to be certain of long-term sustainability. It is imperative that existing production forest boundaries be agreed and that potential forest areas that could be brought under production management should be reserved. This designation of production forest areas is best done at the same time as the protection and provincial reserves are being agreed upon, thus eliminating the possibility of dual designations, unless some areas are intended to serve more than one purpose.

Again, once the boundaries are agreed, then management plans can be draw up. These should be compiled with inputs from interested parties such as villagers, loggers and wood using industries. The FOMACOP model could be used as a guideline for production forests, especially where villagers are to be involved in their management. But the logging industry must also be involved in the management of some of the production forest areas.

Once forests have been allocated to villagers, loggers/industry or the forestry department, then assistance should be given to these entities to manage and monitor their progress. Where successful resource management initiative have been made, funds could be made available to continue and expand these programs. Poverty alleviation and rural development are two goals of the government. Specific villages could be chosen to pursue this initiative. The lessons learnt from the Lao/Swedish and the JICA projects could also be applied to the management of the different forest areas.

As part of the Village Management Association (VMA) contract or the logging quota, enrichment planting and/or under-planting of desirable trees species should

be undertaken if there are insufficient young trees to succeed the felled species. Additional fees are charged to VMA's or logging companies to pay for this work if the entities do not fulfil their obligations or if the trees fail to establish themselves in sufficient quantities. An improved inspectorate should be established to ensure that this under-planting is done and the survival rate is satisfactory. A more realistic set of fines and penalties should also be established, with sufficient enforcement procedures.

Executing Agency. The Forestry Department in the Ministry of Agriculture and Forestry has the overall responsibility to manage the forest areas of the country. Other Ministries such as the Prime Ministers Office and the Ministry of Commerce and Tourism also have some responsibilities in forestry related matters. However, it is the responsibility of the Forestry Department and its agents in the provinces and the districts to manage the forestry estate. Therefore, the teams to determine the boundaries of the different types of forest reserves, including NBCAs should be headed by people from the Forestry Department, preferably from the Provincial Forest Office. However, there should be representation on such a body of all interested parties and hearings should be held at the village level if necessary.

Once the areas have been provisionally drawn on a map and certified by the government, then teams headed by Forestry Department staff can go into the field and delineate the area on the ground. This has to be done with the help of and agreement by the people living in the area. It must be stressed that the traditional rights of the people to use the forest must be respected, unless there is an overriding sustainability or environmental concern. Then alternative practices have to be suggested.

At the same time that boundaries are being fixed, or as soon as they have been fixed, management plans can be drawn up, again with the assistance of the people living in the area. Forestry Department staff should be in charge of the compilation of management plans, but assistance is required from other government agencies such as the Environmental Agency and local government. Research assistance will be required from NAFRI to provide maps and to advise on tree measurements and the establishment of sample plots. Also, if there is insufficient trained personnel within the country, outside assistance may be required.

Providing expert assistance to manage the various reserved forests has to be part of the initiative. This should last for at least five years and take place in all the forest types. While there may be permanent staff in each of the large forest areas,

there should be mobile teams that can travel from forest to forest and assist the resident team and/or the villagers and loggers.

Appraisal of Long-term Concessions

Background. Forest management is a long-term effort and therefore, granting short-term quotas to harvest forest areas is not in the best interests of sustainable management. Generally, this leads to over-cutting of desirable tree species, failure to leave sufficient seed trees to ensure regeneration of desirable species, paying scant attention to the reduction of felling and extraction damage and leaving poorer quality logs behind in the forest. The granting of long-term concessions to logging companies could be one way to improve forest management, because the companies know that they will return to the same area again in the next cycle to fell and extract trees that have graduated into the sizes permitted for cutting. It will be in their interest to reduce felling loss, minimize extraction damage and encourage the survival of commercial species. At one time, long-term concessions were granted, but these were abused. Therefore, a study should be undertaken on the pros and cons of long-term concessions examining experiences in this and other countries, assessing the availability of forest management personnel, and proposing various options if applicable.

Program Outline. This will be a short study to examine and detail long and short term concessions in Lao PDR and other countries in the region such as Malaysia, Indonesia and Burma. Also, information from ITTO (International Tropical Timber Organization) base in Japan will be solicited concerning concessions, concession agreements and their effectiveness.

Executing Agency. An international body would be the preferred agency for such a study. An international consultant would be hired to undertake this assignment, but the consultant would be attached to the Forestry Department in Vientiane for that period of time.

Fuller Utilization of Commercial and Non-commercial Species

Background. Poor and wasteful logging techniques are responsible for the leaving of much commercial log volume in the forest. Up to two-thirds of a felled stem wood and large branches may be left behind, to say nothing of the small branch wood and tops: this latter is potential charcoal wood. The principal reason for this waste is because only logs that are removed are subject to resource payments. Therefore, large diameter logs that have little or no defects are removed from the forest leaving behind much wood that could be sawn. Only selected species are harvested. Several so-called non-commercial trees can be

sold on the local market, but they are usually less profitable to fell, and for others it may be just a question of finding a market for these species. Therefore, much of the potential industrial wood is either left to rot on the forest floor or is not harvested.

If resource payment are based on what is felled and not on what is removed, the logging companies should then increase their utilization efficiency. Also, with good market intelligence it may be able to use small diameter branch wood and tops and some of the non-commercial species. Assessing the volume of standing or felled trees is not difficult, but trained personnel are needed to mark and measure selected trees. If logs are left behind, then the local people should be allowed to utilize them, provided they pay for them. Methods of paying for trees should be proposed to the responsible bodies. In addition, training courses could be given to logging crews on a felling and extraction method that will reduce damage and waste.

Program Outline. A study will be undertaken of current felling techniques and log selection practices by logging companies and village management associations to determine the amount of salvageable waste left behind during logging operations and the amount of damage caused by felling and extraction techniques. The payment system will be examined to see how feasible it is to charge for the standing tree as opposed to the felled logs or the extracted logs. Also, the measurement of logs will be critically examined to check that the correct dimensions are being recorded and that recorded defects are accurate. A note will be made of trees eligible for felling, but not felled to determine if there is an actual or potential market for such wood. Recommendations will be made as to the best ways to reduce felling waste, minimize felling and extraction damage and to improve the utilization of small dimensional wood and 'non-commercial' species.

Executing Agency. The Forestry Department will be the executing agency and the study will take place in recently felled areas and in areas that are currently being felled in SKR. A team of two or three trained foresters with logging and mensuration experience will visit recently felled areas and measure residual logging waste and assess damage to the surrounding trees. The team will study felling operations and report on tree selection, log selection, log measurement, felling methods and extraction techniques. They will follow the logs to the first and second landings and determine the amount of waste at these points as well. NAFRI should cooperate in this program.

Markets for Small-sized Wood and Non-wood Products

Background. While most of the attention has been given to conservation/protection areas and production forests for sawlog output, there is a considerable surplus of small dimensional wood throughout the two provinces. There is need for marketing efforts to develop or expand uses for such wood. This could be for fuel for many small-scale local industries such as brick and tile manufacture, lime burning for mortar and agricultural application and charcoal production. Also, the use of so called non-commercial species has to be pursued. Therefore, studies are required to find markets for this surplus wood and once potential markets are found then promotion efforts are required.

Similarly the expanded use of non-wood products should be investigated and market intelligence provided to rural people. Many locally used products are little known. Thus, a study could be undertaken to codify these products and to list them in terms of potential.

Program Outline. A study of existing wood using industries, including bamboo, rattan and fuelwood/charcoal production, and industries using fuelwood and charcoal as an energy source should be undertaken. This should include an investigation of the use of residues, if any from saw and plymills. Market investigations could also take place for the potential for bricks, pottery, tiles, lime, processed agricultural products that use wood as the energy source, handicraft goods, products made from rattan and bamboo and small dimensional wood products. These studies can then be used as a basis for drawing up a development strategy for small-scale industrial development based on wood either as an energy source or as inputs for handicraft products or small dimensional wood products. This study can be done in collaboration with the “local industries expert.”

A second set of studies should be undertaken on the collection, use and sale of non-wood products. This could be done in parallel with or as part of the management plan formulation for the different forest types –conservation, protection and production. Market investigations could also be undertaken on the potential for each kind or group of products, and where potential exists, plans could be proposed to develop a sustainable supply of the product or products. Where medicinal products are collected, these could be sent to accredited testing centers to determine their usefulness and their curative properties. Such studies can be done in collaboration with the “local industries expert” and “legal expert”.

Executing Agency. As wood energy and the raw material for the various products is derived mainly from forests, the Forestry Department should be the

execution agency. But it should work closely with other departments of the government dealing with small scale industrial development, marketing and energy. Three parallel sets of studies should be undertaken dealing with (i) wood energy; (ii) small dimensional wood/handicraft products including bamboo and rattan; and (iii) non-wood products. Each study should investigate present use and commercial markets and the potential for developing markets both locally and for export.

(3) Sub-programs (Medium and Long-term)

The first proposed initiative, namely Delineation of Conservation Areas has a medium-term component, namely management assistance over 5-years for conservation, protection and production areas, and thus this part should have been included under this sub-program. However, it is a natural progression from delineation through management planning to operating the plan. Therefore, it was kept all together as one package. Within these reserved areas some farmers are practicing shifting cultivation. Part of the task of compiling management plans was to pinpoint areas where shifting cultivation is occurring. This information can then be used to assist farmers in adopting more sustainable farming practices. This is now described.

Agro-forestry Demonstration

Background. It is a government policy to replace shifting cultivation with more sustainable forms of agriculture or alternative livelihood options. In SKR, an estimated 69,000 hectares of land are currently being farmed under shifting cultivation, of which about 47,000 hectares are classified under potentially productive areas and 24,000 hectares are in conservation, protection and production areas. Because of population expansion, new forest areas are being cleared for farming and over the last 18 years an estimated 90,000 hectares of high forests have been cleared by swidden farmers. Over the next 20 years, a similar amount of forest land could be cleared due to this practice unless appropriate measures are taken.

If the fertility of the land being farmed could be maintained or improved, then the farmer could farm the land continuously without abandoning it after two years and clearing a new area of forest. This would mean that the secondary forests could be used for other purposes including reverting back to high forest, and the amount of new forest cleared for agricultural expansion by upland farmers would be reduced. Agro-forestry systems that will stabilize soil fertility are being practiced in other Southeast Asian countries.

Agro-forestry covers several options depending on the type of crops that are being grown, the elevation and the soil type. Usually, nitrogen-fixing trees are planted in rows between the agricultural crops, and grown on a one-to-three year rotation. The leaves from the trees are mulched into the soil. This may be supplemented with farmyard manure and compost. Applying such a system can maintain fertility for a substantial period of time and at the same time provide stick wood. Alternative systems where rice is grown consist of feeding animals with nitrogen fixing plants including tree species and apply the manure to the field either after passing it through a digester to remove the methane or applying it directly to the soil. Agro-forestry can be part of a package farming system. Also, there are systems that can be adapted to pastoral agriculture. In order to convince farmers of the viability of these agro-forestry systems, demonstration plots, together with training should be established in areas where shifting cultivation is common.

Over the next 20 years, it is estimated that a sizable unstocked lowland dipterocarp forest will be converted to pasture land for intensive cattle production. Not all the trees will be cleared from the converted areas as some will be left for shade and browse. In addition, it is planned to plant nitrogen fixing trees in the re-seeded grassland areas to provide nitrogen rich feed for the animals. Hedging plants may also be introduced to contain or exclude animals in certain areas. Therefore, demonstration “pastoral-forestry” plots and farmer training programs should be established in these areas to convince farmers of the benefits of trees within the grazing systems.

In addition, various tree species should be made available to farmers including fruit and nut trees. They should be provided with market intelligence as to the likely market for different crops and produce such as honey. This should be promoted along with nitrogen fixing trees for they are a favorite of bees. Finally, trees within the farming system can help the farmer by improving the microclimate and provide nitrogen rich mulch to the soil. Judiciously, planted trees on farm can help boost agricultural productivity. Thus, agro-forestry demonstration plots should not be confined to the upland areas, but be present in the lowland areas as well.

Program Outline. An inventory of farmers practicing shifting cultivation will be undertaken to pinpoint areas where demonstration plots will be most effective. Similarly, sites will be chosen throughout SKR in pastoral and arable areas to demonstrate agro-forestry methods. It takes about three to five years to build up soil fertility or to obtain browse from trees in pastoral systems. Therefore, the program should have a lifetime of at least 10 years. In addition, a demonstration plot should be established at the proposed agricultural college. To popularize the various agro-forestry initiatives, a course in agro-forestry should be included in the

curriculum at the agricultural college and forestry training centers and an agro-forestry extension manual should be produced for extension workers. This could be done in collaboration with the extension service of the Agricultural Department.

Executing Agency. As this initiative deals both with farming and trees, the execution body should be the Agricultural Department with assistance from the Forestry Department. Assistance should be sought from the International Center for Research in Agro-Forestry (ICRAF), Swiss Aid, who compiled an extension book for agro-forestry specifically for Rwanda, and from a university or college that includes agro-forestry training in their courses.

Rehabilitation of Degraded NBCA Forest Areas

Background. The indicative plan for SKR has proposed considerable tree planting initiatives over the next 20 years. There are an estimated 1.0 million hectares of the NBCA areas in SKR. According to the GIS survey, about 190,000 hectares of forest in NBCAs have been unstocked in the past. This unstocked area in NBCA is a target area for the proposed tree planting initiative. This initiative will be integrated into the government's 20-year target of 500,000 hectares planting for the whole country.

Table III2-4 Unstocked Area in NBCA

| NBCA | NBCA Area | Unstocked Area | |
|------------------------|-----------|----------------|---------|
| | | (Ha) | (%) |
| <Khammouan Province> | | | |
| Nam Khading | 7,400 | 1,300 | (17.6%) |
| Nakai-Nam Theun | 315,900 | 35,600 | (11.3%) |
| Phouhinpoun | 238,100 | 40,500 | (17.0%) |
| Hin Namnor | 87,300 | 5,800 | (6.6%) |
| (Sub-Total) | (638,700) | (83,200) | (12.8%) |
| <Savannakhet Province> | | | |
| Se Bang Nouane | 45,200 | 5,100 | (11.3%) |
| Phon Sang Hai | 114,300 | 12,700 | (11.1%) |
| Dong Phon Vieng | 204,100 | 88,300 | (43.3%) |
| (Sub-Total) | (363,600) | (106,100) | (29.2%) |
| <Total> | 1,012,300 | 189,300 | (18.7%) |

Because these plantations are protecting biodiversity and watershed areas, funding could be obtained from the Global Environmental Facility or AIJ's (Activities Implemented Jointly) and through carbon sequestration trading. Another idea for funding is to set up a trust fund by international donors which would be managed by an international organization (e.g., MRC, ITTO).

At the same time, some enrichment or under-planting of indigenous trees will be required within the conservation forest where there are gaps or where there is insufficient regeneration of under-represented tree species. The purpose of this planting is to enhance the biodiversity. When the management plans are compiled, areas where enrichment/under-planting is required should be noted, together with the scale of planting and the species to be planted.

A preliminary plan of the Rehabilitation of the Degraded Forest Areas in NBCA is formulated as a pilot program, as presented in Part 3, Priority Program Study Report, Chapter V.

Tree Planting Initiatives for Production

Background. While the forest estate has been declining over the last 18 years, - a loss of more than 10,000 hectares per year, the quality of the forest has also been falling. Stocking densities are declining and the amount of degraded forests and other wooded areas have been increasing at more than 8,000 hectares per year. These two trends must be slowed down and eventually reversed, if wood and other forest products are to continue as major (renewable) resources in SKR. Securing the areas of conservation, protection and production forests with improved management is part of the solution, but some of the 1.3 million hectares of forest classified as degraded or other wooded areas could be brought into a more productive state. One such initiative is to eliminate shifting cultivation through the introduction of more sustainable systems such as agro-forestry.

However, this still leaves over 0.9 million hectares of land in a degraded state. And with the gradual decline of accessible commercial species from natural forests, there is need to find alternative supply sources if wood-using industries are not only to survive but also prosper. Plantation programs of quality timber species could augment the supply from natural forests. Also, there is room to grow indigenous softwood (pine) for the construction and joinery industry. But sawlogs are not the only wood fiber in demand. The demand for pulp and paper in Southeast Asia is increasing rapidly and SKR is in a position to take advantage of this demand. Already one joint venture has a lease to grow 50,000 hectares of wood fiber for pulp in Khammouan and further expansion could occur. Planting trees for non-wood products is also feasible. Planting mulberry for sericulture and bamboo for a multitude of uses, are but two options.

As previously stated, not all these will be large-scale efforts and not all will be for wood production. The promotion of sericulture is strongly recommended. For this mulberry trees are required. Similarly, such species as *Jatropha curcas* are ideal

hedging species for containing farm animals or keeping them out of fields. This tree grows in Thailand. The nut from this plant is rich in oil, which can be used for soap making. Also, there are many fruit and nut trees that can be promoted. Market research into opportunities for plantation grown species could be the best way to stimulate interest in growing trees.

Long-term mensuration studies are required to determine the supply and quality of wood from the different production areas in SKR. Included in such a study would be the potential supply of wood from plantations. A separate study could be done on investment costs and returns from investing in plantations.

Program Outline. The plantation program should operate at two levels. Large plantations could be required to ensure a continuous supply of sawlogs and fiber to industry, such as saw and ply mills, board factories and pulp and paper mills. In order to encourage companies to invest in large-scale plantations, there must be sufficient land available on a long lease in concentrated areas. Therefore, as a first step, investigations should be carried out by the appropriate body (the Forestry Department) to pinpoint and list areas of degraded forest land that are available for plantation development. The terms and conditions for leasing this land must be clearly stated.

If trees are to be planted for sawn timber production, this will require long-term investment commitments. Tax incentives and grants to wood industry or investment companies should be considered if such initiatives are to be taken up by private individuals or companies. Otherwise the Forestry Department may have to undertake some of the planting itself. Such incentives and grants, if any, should be published and circulated to potential investors. If there are few or no incentives, a study should be undertaken to look at practices in surrounding countries and then make recommendations to the government.

At present, the Lao/ADB plantation program gives loans to people who want to invest in plantations. This loan initiative should be more widely publicized and if necessary increased and/or modified to accommodate long-term investments in plantations of 20 to 40 years. Alternatively, GEF funds or Clean Development Mechanism Funds (CDM) could be used in part to finance long-term investments. Currently only companies growing wood on short rotations, such as the one growing pulpwood on a 7-year rotation, are applying for ADB loans.

The second level for the plantation program is the small-scale initiatives. These would supply wood and other tree products to local industries. These include sawlogs for mobile or small sawmills, poles for local construction purposes,

fuelwood for cottage industries such as pottery manufacture and lime burning and leaves from the mulberry tree for silk production: the wood from the mulberry could be used for fuel and poles. Therefore, marketing studies could be undertaken to advise village people on the opportunities of investing in plantation development. The government will also have to indicate which areas of land are available for plantations. At present an individual can plant up to 15 hectares of land under trees and it would be possible for villagers to cooperate together to have larger areas. Demonstration plots could be established where necessary to show planting, establishment and tending techniques. Forestry extension workers should be available to advise local people.

Besides block planting, other tree planting initiatives are proposed. Enrichment planting should occur in logged over areas. In the past this has been done in a perfunctory fashion with little attention being paid to digging proper planting pits or planting at the best time to ensure survival and protecting the seedling from browsing animals. This should be part of the training course given to loggers or the people responsible for enrichment planting. The forest service should inspect the planting efforts and if necessary impose fines for failure. Thus if rules do not exist they should be drawn up and if they do they should be enforced.

Executing Agency. The Forestry Department will be the main executing agency. It will undertake mensuration studies and provide information on the supply and demand for different wood and non-wood products, market potential for different products and the opportunities for plantation development. It will investigate areas available for plantation programs and publish the terms and conditions for leasing land for small and large investors. The Forestry Department will publish information about loan programs and grants, tax rebates and other incentives available, if any, for private investors. Regarding this latter point, a study could be undertaken of practices in neighboring countries to promote plantation development.

Environmental Education

Background. Education and training is one way to promote environmental awareness and resource management. As noted previously, it should be part of the syllabus in the proposed agricultural college. However, environmental education should also be taught in schools. Most of the children will live in rural areas and they should be taught appropriate subjects. Therefore, a study should be undertaken to examine ways of introducing environmental education within the school curriculum. UNHCR is promoting environmental education in schools in refugee areas and that syllabus could be obtained to see if it could be adapted to schools in Lao PDR. Investigations could be made as to initiatives in surrounding

countries, if any, and FAO could be approached for assistance with resource management teaching. A school forest is one of the programs to be considered under the Human Resource Development Initiative. Where appropriate, schools should have nurseries to raise various kinds of seedlings, which the children can then plant around the school and take home.

Program Outline. The Ministry of Education (MOE) should be approached to see if it already undertakes environmental education and if so, to what level and if not, whether it is willing to do so. Assuming that MOE already undertakes environmental education or is willing to do so, information will be gathered about the number and kind of schools in SKR, the present syllabus in the different grades of schools regarding environmental and resource management training, if any, and the facilities available for teaching and demonstration. Information will be gathered from various countries and agencies such as FAO and UNHCR about their involvement in environmental education and resource management. From this a program can be devised in cooperation with a panel of teachers and other interested parties to introduce or expand the syllabus in environmental education and a trial introduction can take place in a number of schools throughout the region. As a result of the trial and the feedback, the program can be modified and adapted to local conditions. It then can be introduced in all primary and/or secondary schools throughout SKR. Printed books will have to be provided to schools as well as teaching aids, and experimental equipment.

Executing Agency. The Ministry of Education will be the Executing Agency assisted by the Environmental Department in STEA and the Ministry of Agriculture and Forestry.

Commercial Nurseries

Background. If the plantation program is successful, then commercial nurseries will be required. Training could be provided in seedling production and loans could be made available for people wishing to establish commercial nurseries. To supply nurseries with suitable seeds or clones, seed storage centers should be established in SKR and a cloning facility should be attached to the agricultural college.

Program Outline. If the indicative plan of plantations over twenty years is carried out and if enrichment planting takes place in conservation, protection and production forests, then on average, 21,000 hectares will be planted each year. In addition, seedlings and/or seeds will be required for agro-forestry initiatives and other plantings on farms and along roads. This will require between 40 and 50

million seedlings each year throughout the SKR region. While some of the seedlings will be raised in nurseries owned by plantation companies, there will be opportunities for private individuals communities to grow seedlings for sale. Leaflets could be prepared by Forestry Department staff on the establishment of a nursery, indicating the tools and equipment required to grow tree seedlings. They could also provide training courses. Alternatively, the agricultural college could provide extension courses. Villagers could also earn money from collecting seeds of specific trees in the different forest areas. Equipment and money will be required to prepare, test and store seeds, and funds will be needed to establish a cloning laboratory at the agricultural college and to import certified seeds. This college could be the center for seed testing and storage.

Executing Agency. The Forestry Department jointly with the Agricultural College should be the Execution Agencies.

III-3 ENVIRONMENTAL MANAGEMENT AND REGIONAL DEVELOPMENT

III-3.1 Current Situation

1) Situation in Rural Areas

(1) Agriculture

Agricultural practice is labor intensive with little outside inputs such as pesticides or herbicides. Fertility is maintained through applying manure and mulch, or in the case of shifting cultivation, building up fertility through resting the land and providing minerals through burning wood on the site; wood ash is rich in potassium. Thus, from an environmental viewpoint these practices are benign.

However, some farming practices give cause for concern. These include:

- Farming on steep slopes without taking precautionary measures such as terracing or contour ploughing.
- Farming in close proximity to streams and rivers, thus exposing the river banks to erosion. In this regard, most gallery forests along river have been destroyed.
- Unplanned expansion of farming sometimes in pristine forest areas and with little salvaging of valuable tree species.
- Moving into wetlands for rice production.
- Inappropriate irrigation application, thus making soils saline.
- Clearing old grass in grazing areas by burning which can set off uncontrolled fires, kill young seedling and destroy wildlife habitat.
- Shortening the shifting cultivation cycle.

Farming productivity has been increasing, but not at the same pace as population increase. Therefore there has been an unplanned extension of farming areas, without an assessment of the environmental consequences. This should be examined.

(2) Forestry

Little management is occurring in forestry areas. Pilot schemes such as the various Village Forestry Initiatives have been successful, but not followed up. The national logging companies pay little attention to environmental concerns and therefore environmental damage is caused by:

- Felling all valuable trees within their concession without leaving any seed trees.
- Felling trees without concern to neighboring trees, thus causing some damage.

- Removing only the most valuable portions of the tree. Therefore, to fulfill their quota felling more trees than if they had fully utilized the entire stem and large branches.
- Felling trees in steep areas without regard for the erosion consequences.
- Using the shortest extraction route and heavy equipment, thus destroying young growth and facilitating erosion.
- Paying lip service to their obligations to replant trees in the felled areas, thus upsetting the species mix and decreasing the amount of valuable trees for the next harvesting operation.

There is little incentive to improve these practices, as logging companies have little vested interest in maintaining the resource. Also companies only pay for what is removed and not for what is felled.

As mentioned under the forestry chapter, many conservation areas and watershed are established on paper but are not managed in practice. Thus, there are incursions by logger, poachers, shifting cultivators and plant collectors. Also the local population tends to over-exploit some products such as rattan, bamboo and bush meat as the only means to obtain cash for essential items. Therefore, there is a general long-term decline in their availability.

In addition, shifting cultivation is becoming more unsustainable as the fallow periods are shortening because of the decline in the availability of more suitable and accessible land.

(3) Fishing

Fish are of major importance in the diet of Lao people, but some of the methods used to catch the fish only lead to short-term gains and not long term sustainability. These include poisoning, and using explosives to capture fish. Fish ponds have been established in some important environmental areas, such as wetlands.

Certain infrastructural and industrial development can harm the habitat for fish. Dam construction can prevent migration and heavy metal poisoning can have devastating consequences to the whole habitat in a river system. Also industrial and urban pollution can destroy rivers. This is why such industries such as pulp production must have stringent environmental safeguards concerning their “waste water.”

(4) Infrastructure

Road building, dam construction and transmission line installation while boosting economic development, can have adverse environmental consequences if not

undertaken without doing an impact assessment prior to undertaking the operation. Such damage includes erosion, wetland destruction, and routing power lines through pristine habitats, thus destroying some of them, cutting off migratory routes and increasing the incidence of water-borne diseases.

(5) Local Industrial Development

Local industries are established because of the availability of natural resources such as wood, limestone, gypsum, clay and semi precious or precious mineral resources. Just because these industries are in the rural areas does not excuse them from taking environmental precautions and being aware of waste disposal and noise pollution. Limestone is a potentially valuable asset in Khammouan and gold/copper in Savannakhet. But the extraction and use of such resources must be in compliance with strict environmental rules and regulations. At present, the draft rules governing the mining sector are weak and need strengthening.

(6) UXO

Bomb craters have formed pockets of sterile land in parts of eastern SKR. This is because the habitat was destroyed and the underlying rock exposed. In other areas, there is un-exploded ordnance which can kill or maim large animals including humans. This ordnance has deterred the opening up of some areas for arable and pastoral farming and has forced some farmers to exploit less suitable land, resulting in increased environmental damage. There should be an assessment made of the most suitable areas for agricultural development. This information can then be conveyed to the office concerned with the disposal of UXO so that land use development can occur on the most favorable sites.

On the positive side, the presence of UXO has enabled degraded forest areas to revert back to high forests.

2) Situation in Urban Areas

At present there is little attention paid to environmental matters. The government has issued decrees protecting historic sites, but environmental measures concerning waste disposal, water supply and contamination and the building code are lacking except in large towns such as Thakhet and Savannakhet. Human waste disposal is usually through on-site systems or in the open. Groundwater contamination through on-site sanitation systems such as septic tanks is quoted as becoming a serious problem. Stagnant water can accelerate the spread of water-borne diseases and a lack of storm drains can lead to flooding in the rainy season. Piped water to houses is only available in major centers. Household waste collection is only provided for the regional centers. The disposal of industrial

waste is left to individual industries. Sawmills and rice milling factories dispose of waste by dumping and/or burning the residues in the open. In towns in close proximity to rivers, much waste ultimately finishes up in the water. Similarly garages may dispose of old residual oil directly into the drainage system or burn it in situ.

Thus, in most urban areas, the rules and regulations governing waste disposal and gaseous, liquid, solid and noise pollution are minimal and often ignored.

3) Changes over Last 10 Years

Ten years ago, environmental awareness was in its infancy in Lao PDR. The first National Environmental Action Plan (NEAP) was adopted in 1994. This was followed by the second NEAP published in June 2000. Only now have guidelines for general environment impact assessments (EIA) been approved in July 2000 and the EIA governing sectors are still being formulated. Lao PDR is a late comer to environmental matters, but it is in the position of learning from initiatives in other countries and the drawbacks to certain development options.

One large EIA has been undertaken in the region and that was an impact assessment of the proposed Nam Theun II dam. This will flood an area of about 47,000 hectares 12,000 of which are in the Nakay Nam Theun NBCA. This study was financed by the World Bank and covered all aspects of the proposed dam from the threat to wildlife to the resettling of people. The final report of the environmental assessment and management plan was presented at a public meeting in Vientiane in November 2000. The project is now being appraised and if positive, construction work could start in six months time.

National Biodiversity Conservation Areas (NBCAs) were established in 1994, and there are seven whole or part NBCAs in SKR region covering over 1 million hectares or 27% of the land area. The boundaries of these areas are drawn on maps, but they have not been marked on the ground. This is a priority task. In cooperation with villagers they will agree on the boundaries and mark them. Because most if not all NBCAs have large areas of intact forests which come under the jurisdiction of the Forestry Department. But the Department has limited number of personnel to protect these vast areas. Hence logging, land clearing and wildlife hunting is occurring in these areas.

Besides national protected areas, there are provincial and district protected areas, some concerned with watershed protection and other with protecting small island forests in lowland areas. Most of these have been established within the last 10-years, but most are on paper and not demarcated in the field.

In the past, lack of forest legislation has made forestry exploitation easy. Now, forestry and land laws are readdressing the situation. The Forestry Department has initiated a study for the preparation of legislation for protected area management. But as stated above the Forestry Department is barely capable of protecting these areas. Only with the full cooperation with and active participation of the local people can the boundaries be secured and un-welcomed activities terminated.

Lao PDR is a key country in the Greater Mekong Sub-region and in the Lower Mekong Basin. It is a member of the Mekong River Commission and monitoring of water quality has been executed since 1985 with water monitoring points within SKR. As stated earlier, there are key watershed areas within SKR. These should be protected for the benefit of population in SKR, as well as all the people in the Lower Mekong catchment area. Over the last 10 years, environmental concerns have become important. Within Lao PDR, the SKR is a key area for environmental protection. It still contains large areas of intact forests and is the source of many rivers feeding the Mekong. Therefore, it is imperative that full consideration be given to the environment.

III-3.2 Possible Impacts on Regional Development

The improvement of the road system within SKR and the building of a bridge across the Mekong at Savannakhet by 2004, and perhaps in about 15-years time at Thakhet, will present many opportunities and some environmental challenges. Trade with Thailand and Vietnam will undoubtedly increase, especially as Lao PDR is a fully integrated member of ASEAN. All custom barriers will disappear in 5 to 10 year's time and there will be a free movement of people by then. Therefore, it is vital that SKR's natural resource base be protected and managed sustainably and that the tourist attraction of the area be exploited more fully. Advantage could also be taken of Lao's endowment of degraded land to introduce plantation programs to serve the region and overseas markets.

Several industries have been proposed that can have an impact on the environment and/or the resource base. A 50,000 hectare plantation program to serve a pulp mill is being developed in Khammouan and neighboring Bolikhamxai. If this attracts a pulp mill, then special attention will have to be given to effluent disposal. The opening up of easier access to markets in Thailand, Vietnam and beyond will put pressure on the harvesting of more wood resources. If logging becomes more efficient, whole trees are harvested, not just the most desirable logs, and the utilization of a greater variety of species is undertaken, then the

delivery of more wood to industry could be a reality, while at the same time reducing the amount and impact of felling and logging. This needs improved training and the cooperation of all sectors from the resource owners, the managers including the villagers, the loggers and the millers.

A gold and copper mining operation has been proposed for Savannakhet with operations starting by late 2002 with plans to extract 100 tons of gold and 1,000,000 tons of copper. Two (2) million tons of rock will have to be crushed and treated with heavy metals to extract the gold. This treated rock will then have to be stored in a safe place to prevent spillage into rivers or seepage into the groundwater.

Such a spillage occurred in Romania with devastating environmental effects to Hungary, Romania, the lower Danube River and the Black Sea. Similarly, copper tailings in Papua New Guinea have caused several environmental problems. Therefore, it is vital that before such an activity is approved that an exhaustive environmental impact assessment be undertaken at the proposed site and the dangers to the Bang Hieng river be fully taken into consideration. This catchment, together with its tributaries, covers an area of nearly 1.7 million hectares. Millions of people in the lower Mekong delta could be adversely affected if heavy metals such as arsenic and mercury get into the river system.

SKR has large limestone areas and the use of lime for cement making, mortar manufacture, to add to the soil to increase its alkali content, and to use in several industrial processes such as paper making and sugar refining, opens up considerable possibilities for the quarrying of limestone. As a matter of course, environmental impact assessments should be undertaken before operations are approved.

The population of the region is going to increase by about 600,000 by the year 2020 from 1.1 million today and urban population will double to about 330,000 in the same time period. This increase in urban population may have considerable adverse environmental consequences if little is done to improve disposal of all kinds of wastes.

III-3.3 Environmental Management Policy and Strategy

1) Forest Areas

As has been mentioned on several occasions, SKR contains seven NBCAs and several watersheds, which are summarized in Table III-2.5.

The first priority is to delineate these various land-use types on the ground. This will have to be done in cooperation with local people and the Provincial Forestry staff. A pilot exercise has already been undertaken in Phou Sang Hai NBCA in Savannakhet under the Lao-Swedish Forestry Program (PPAM 1998). Six villages were visited that straggled NBCA or were inside it. At the same time this was being done, work plans were drawn up for the different villages and short training courses were given. Such exercises need to be undertaken in all parts of NBCAs. This has been proposed under the Resource Management Initiatives (RMI) in Chapter III-2.

Similarly, Forest Reserves/Watershed Protection areas and Provincial Reserves need to be delineated in the field and their boundaries agreed with the people living in the areas. Then simple management plans can be drawn up. Again, this has been proposed under the Resource Management Initiatives (RMI) in Chapter III-2.

The present area of production forests is relatively modest ranging from 14% in Khammouan to 22% of the forest area in Savannakhet. This low percentage is a reflection of the degraded state of the un-specified forest areas. As a group these forests represent the largest forest type, although in terms of growing stock, they contain much less than NBCAs and have about the same stem volume as production forests although they contain twice the area.

Production forest areas should be fixed on the ground and by mutual agreement with the government, logging companies, sawmills and villagers, an allocation of these forests can be agreed upon. This has been proposed under the Resource Management Initiatives in Chapter III-2. It may be that joint management is agreed to or a division of duties between forest management including enrichment planting and logging arrived at. It may be agreed that if logging waste is left behind, then villagers or small-scale users have the option of using the 'waste' provided they pay for the resource.

Management plans can then be drawn up for these production areas, with the goal being long term sustainability and much improved use of all the resources. Again, this has been proposed under the Resource Management Initiatives (RMI) in Chapter III-2.

The unspecified forest areas should be surveyed. These contain much of the shifting cultivation and are potential sources of land for plantation initiatives, agricultural development and production/protection management.

The areas of shifting cultivation have been noted on the GIS maps. Follow up survey work is required to pinpoint significant areas where shifting cultivation is occurring and to draw up plans to introduce alternative practices. This was dealt with in detail under the forestry chapter. It should be noted that shifting cultivation also is present in NBCAs and in production forests.

In lowland areas, there are remnants of mixed deciduous forests that could be brought under management for production, bio-diversity preservation and recreation. These island forests if not protected will be converted to agriculture. Of course in the indicative plan, arable and pastoral agricultural expansion has been built into the planning process, but biologically rich forest areas should be worth saving.

The National Environmental Action Plan presents a plan of action, which was agreed upon at a workshop in September 2000⁹. This sets forth three goals:

- To preserve, improve and increase the biological capacity of the present forest, especially by improving the present system of management and protection.
- To rationally use the resources of the forests, especially for economic development.
- To link rehabilitation, preservation and expansion of forests with the needs of the upland population for food and forest products.

Various targets were set including decreasing shifting cultivation to a minimum, allocating land to villagers, bringing production and protection forests under long term management, providing improved training and establishing 0.5 million hectares of plantations by 2020.

Another area stressed in NEAP was identification and protection of critical watersheds. This has already been stressed above and has been proposed under the Resource Management Initiatives (RMI) in Chapter III-2.

2) Agricultural Areas

The overall environmental plan for agriculture should be to decrease poor practices such as farming on steep slopes and near river banks, excessive use of irrigation water, offer alternatives to annual burning of savannah or woodland areas and establish demonstration plots as alternative to shifting cultivation. Also the planned expansion of agriculture should be a priority rather than the piece meal approach used at present. It is encouraging that the proposed agricultural

⁹ NEAP, October 2000. Page 38.

development plan envisages introduction of more organic farming and re-cycled farming.

3) Rivers

Rivers are one of the important assets in the SKR region, hence the importance of watershed and river bank protection. The rivers are a source of irrigation water for rice farming and animal protein for many people in the rural areas. The environmental goal is to manage these rivers sustainably. Thus, practices such as using poison and explosives to capture fish must be eliminated. Again river banks should be stabilized with trees shrubs and grass, and arable farming up to the banks of rivers discouraged.

Pollution of rivers is a concern especially as a result of mining and quarrying activities. Stringent standards must be set to ensure that, if such activities as gold and copper mining is allowed, proper safeguards are in place. These should be inspected at frequent intervals. Also the fines should be realistic if damage occurs. The present NEAP should be strengthened in this topic. The present maximum fine for breaking the mining law is US\$ 637, a very small amount.

4) Wetlands

There are important wetlands in SKR, especially in Champhon district of Savannakhet. These are being reclaimed gradually for agriculture. It is important that they be preserved as wetlands, for they act as a filter and a breeding ground for fish. An inventory of wetlands in SKR should be worked out and a plan drawn up for their future status. This has been proposed under the Resource Management Initiatives (RMI) in Chapter III-2.

5) Local Industry and Infrastructure

It should be a matter of course that all industrial and infrastructural development should undergo Initial Environmental Evaluations (IEE), and where necessary full Environmental Impact Assessments (EIA). A detailed and exhaustive EIA was undertaken for the proposed Nam Theun II dam. Similar EIAs are required for mining development and for the establishment of pulp mills, cement factories and wood using industries.

All these various proposals will cost a considerable amount of money especially drawing up acceptable management plans for conservation and production areas and improving farming practices, including shifting cultivation. However, the preservation of NBCAs is of global importance and the international community

should be more than willing to see these areas brought under protection and management.

6) Rural Dwellers

Rural dwellers should be as entitled to clean water and other essential services as their urban counterparts are. Therefore, part of the rural environmental action plan should be to see that every village has access to clean water.

7) Urban Areas

The environmental policy for the urban areas is to improve key sectors such as water supply, drainage, wastewater management, solid waste management, hazardous waste management, both liquid and solid, and road transport management. All building development should be subject to planning permission and building codes. All industrial and service development should have IEEs and if necessary EIAs. There should be zoning rather than haphazard development of industry, housing and the service sector. The environmental policy must be geared to improving the quality of services for all urban dwellers and to reduce all forms of pollution including noise pollution.

III-3.4 Environmental Management Programs

1) Protected Area Management

NBCAs in SKR contain considerable varieties of flora and fauna and are of regional and global importance as they have multipurpose functions of biodiversity conservation, watershed protection, and a large store of organic carbon. They are also important from a recreational and tourist viewpoint and for preserving a way of life for upland people. It is essential that these areas be protected for posterity. However, Lao PDR has limited personnel or funds to undertake the management and protection of these areas of over 1 million hectares by itself. These areas are of global significance and therefore, there should be a global effort to manage and protect these NBCAs. This has been proposed under the Resource Management Initiatives (RMI) in Chapter III-2.

Boundaries have to be demarcated on the ground with the mutual agreement of the forest service, acting on behalf of the government and the villagers who live in the areas within or in close proximity to these areas. Realistic management plans have to be drawn up with the active cooperation of villagers. These plans must allow for production of forest products as well as protecting the environment, the watershed and the environment. This has been proposed under the Resource Management Initiatives (RMI) in Chapter III-2.

In the proposals for the Phu Sang Hai NBCA, the forest was divided into exclusion zones (totally protected zones) and controlled use zones. This seems to be working well. Also such activities as tourism were promoted with visitors spending the night in villages to the mutual pleasure and satisfaction of both sets of people. The work in this NBCA can be used as a starting point to delineate NBCAs and watershed areas outside NBCAs and draw up management plans for all such areas.

2) Environmental Management through New Village Initiatives.

The above management is one example of environmental management by villagers, with inputs from the forest service. But it should not be confined just to NBCAs. Indeed most villages are outside the reach of NBCAs. Environmental friendly farming activities must be one of the first priorities including alternatives to shifting cultivation. However, the sustainable use of natural resources must be expanded to increase economic opportunities for villagers. As mentioned in the forestry chapter, there is usually a considerable surplus of small dimensional wood, including dead wood. The use of this wood for fuel in various economic activities such as brick and lime burning, charcoal production, pottery and tile manufacture should be investigated.

Similarly, using savaged logging waste for handicraft items and small dimensional wood to make furniture and joinery items could be part of the new village initiative. The local industry development plan has proposed the expansion of the silk industry and growing mulberry trees, as a feed for the silk worms could be another activity. The collection of seeds of indigenous species and the raising of seedlings for enrichment planting in logging and degraded areas could provide cash income for villagers and an alternative to shifting cultivation or environmental damaging pastoral and arable practices. Sustainable use of all the natural resources should be the guiding principal.

3) Other Environmental Management programs

(1) Feeder Road Construction

Feeder roads, if not built properly, can lead to environmental damage through soil and water erosion and the destruction of habitats. Also they could open up areas to commercial logging activities which in turn may lead to environmental degradation. Thus feeder road construction has to be carefully planned to open up economic activities for rural people while at the same time preserving the natural resource base. This is why management planning and management plans in forest areas are so important. Another kind of feeder roads is logging access

routes in forest areas. These should be planned so as to minimize damage to the forest. The FOMACOP Village Forestry Initiative introduced low impact logging that only required small vehicles to enter the forest areas in carefully selected routes.

(2) Rivers and Wetland

The rivers are the lifeblood for many rural people in SKR and beyond its borders. It is important that the headwaters of all the rivers in SKR are protected, gallery forests are restored along the stretches of rivers where they have been destroyed and in other areas river bank protection is promoted. This has been proposed under the Resource Management Initiatives (RMI) in Chapter III-2. Similarly fishing practices must be sustainable and the use of explosives and poison eliminated.

A survey should be undertaken of the wetlands in SKR and a plan drawn up for their protection. This has also been proposed under the Resource Management Initiatives (RMI) in Chapter III-2.

(3) Industries and Urban Area

All proposed industry development should undergo IEEs and when these turn up potential negative environmental impacts then full EIAs must be done. For existing industries an inspection of their facilities should be done and where necessary, steps should be taken to reduce or eliminate negative environmental impacts.

All proposed urban industries should have to undergo IEEs and where necessary EIAs. Existing industries should be inspected for environmental damaging practices and orders issued to rectify the situation.

(4) Environmental Education

Environmental education should not only be part of the school program, but be an on going campaign through the mass media. Improving the environment has benefits, which far outweigh the costs. It will lead to the reduction of pollution, the sustainable use of natural resources and improved health for all citizens. This has been proposed under the Resource Management Initiatives (RMI) in Chapter III-2.

4) Assistance to National Environmental Protection Agency

Background. Many of the Environmental Management Initiatives mentioned in this Chapter have already been covered under the proposed nine (9) Resource Management Initiatives (RMI) in Chapter III-2. However, the National Environmental Protection Agency (NEPA) requires general assistance to undergo Initial Environmental Evaluations (IEE) and Environmental Impact Assessments

(EIA) on all new and proposed projects in SKR. It also needs assistance to inspect existing industry, the service sector, infrastructure and the forestry industries to ensure that these sectors are complying with environmental laws. Assistance is required to strengthen the Mining, Urban, Industry and Infrastructure sections in the National Environmental Action Plan (NEAP) and to assist with the compilation of the Sectorial Environmental Impact Regulations (SEIR).

Program Outline. Support will be provided to NEPA to place a field office both in Khammouan and Savannakhet. These offices will be given logistical support such as vehicles, communication equipment and travel funds so that the officers can go around and inspect existing industries and administer IEE's for proposed new development initiatives in two provinces. Where EIAs are required, the Provincial Office will be an essential team-member and collect information for the assessment. If firms or institutions are breaking the environmental laws, the officers should be empowered to issue warning and ultimately fines, if the infractions are not dealt with.

NEPA should be afforded assistance, if requested, to strengthen the NEAP regarding Mining, Urban Development, Industry and Infrastructure. This may be critical for the mining sector. A large copper and gold mining operation has been proposed for Xepon district of Savannakhet. Spillage of slurry from gold and copper mining activities could have devastating consequences on the Xe Bang Heing and Mekong rivers. The environmental laws governing such mining operations are not strong. An in-depth EIA is required, similar to the one undertaken for the proposed Nam Theun II dam.

Executing Agency. The executing agency will be the National Environmental Protection Agency, based in the Prime Minister's Office.