



Lao People's Democratic Republic

**FOURTH NATIONAL REPORT TO THE CONVENTION
ON BIOLOGICAL DIVERSITY**

DRAFT

September 2010

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PREFACE

The government of Lao PDR acceded the United Nations for Convention o Biological Diversity (UNCBD)-also know as the Rio Convention – in the year 1996 and committed itself as part of its obligations as party (signatory), to develop a series of Biodiversity Country Reports and develop their Action Plans.

The first Biodiversity Country Report and its Action Plan were developed in the year 2004 and since that time, the publication and dissemination of the two documents was conducted by the Science, Technology and Environment Agency (STEA), Prime Minister Office. Biodiversity Action Plans which included 7 main programs then were mainstreamed into relevant sectors.

Lao PDR has found some difficulties in translating CBD into government policies and programs because of the biodiversity issues were not clearly mentioned in relevant national legislations. In the other hand, since 2004, the convention has been transferred from STEA into the Water Resources and Environment Authority in 2007 and finally in 2009, the Convention was transferred again into Ministry of Agriculture and Forestry. Due to these reasons and other factors, the Lao government could not meet its obligation by developing the 2nd and 3rd biodiversity national reports and submitted them to CBD Secretariat due to time.

Since October 2009, the new CBD national focal point was assigned in Department of Forestry, Ministry of Agriculture and Forestry, there were a lots of efforts made e.g conducting the study on “ CBD Institutional Set up and Capacity Assessment in Implementing NBSAP”, and developed the 4th National Report (2nd Report for Lao PDR).

On behalf of Lao Government, we would like to thank all relevant stakeholders, especially IUCN Lao PDR for giving technical assistance and TABI for financial support and for the efforts in developing the 4th National Biodiversity Report.

We also found that, this report is not good enough due to there are some limitations and by this reason it can not avoid the missing valuable data and information. Even that all information in the report will be a good references as based line information for developing the 5th national Report.

Vientiane, September 2010

Ministry of Agriculture and Forestry

Acronyms and Abbreviations

ABS	Access and Benefit Sharing
ACB	ASEAN Center for Biodiversity
ACIAR	Australian Center of International Agricultural Research
ADB	Asian Development Bank
AMS	ASEAN Member States
ASEAN	Association for South-East Asia Nations
ASEAN-WEN	ASEAN Wild Life Enforcement Network
ASOEN	ASEAN Senior Official on the Environment
BCI	Biodiversity Conservation Corridors Initiative
CBD	Convention on Biological Diversity
CFSVA	Comprehensive Food Security and Vulnerability Analysis
CIFOR	Center for International Forestry Research
CITES	Convention on International Trade of Endangered Species of Wild Fauna and Flora
DFRC	Division of Forest Resource Conservation
DOE	Department of Environment
DoF	Department of Forestry
DoFI	Department of Forest Inspection
EU	European Union
EPF	Environment Protection Fund
ESIA	Environmental and Social Impact Assessment
FAO	Food and Agriculture Organization
FLMEC	Forests of the Lower Mekong Ecoregions Complex
FRC	Forest Research Center
FRDF	Forest and Forest Resource Development Fund
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GMS	Greater Mekong Sub-region
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
IBA	Important Bird Area
ICAD	Integrated Conservation and Community Development
IUCN	International Union for Conservation of Nature
IRRI	International Rice Research Institute
JICA	Japan International Cooperation Agency
LDC	Least Developing Country
LNTA	Lao National Tourism Administration
Lao PDR	Lao People Democratic Republic
LLS	Landscape and Livelihood Strategy
MEA	Multilateral Environmental Agreement
MAF	Ministry of Agriculture and Forestry
MEM	Ministry of Energy and Mine
MDG	Millennium Development Goal
MPI	Ministry of Planning and Investment
MRC	Mekong River Commission
NAFIP	National Forest Inventory and Planning
NAFRI	National Agriculture and Forestry Research Institute
NBSAP	National Biodiversity Strategy and Action Plan
NBCA	National Biodiversity Conservation Areas
NEPA	National Environmental Performance Assessment
NGPES	National Growth and Poverty Eradication Strategy
NLMA	National Land Management Authority
NPA	National Protected Area
NSEDP	National Socio-Economic Development Plan
NSDS	National Sustainable Development Strategy

NSC	National Statistic Center
NSTA	National Science and Technology Authority
NTFP	Non-Timber Forest Product
NUoL	National University of Laos
NORAD	Norwegian Agency for Development Cooperation
PM	Prime Minister
PRF	Poverty Reduction Fund
PRSP	Poverty Reduction Strategy Paper
PSR	Pressure-State-Response
SDC	Swiss Development Cooperation Agency
SIDA	Swedish International Development Cooperation Agency
SNV	Netherlands Development Organization
STEA	Science, Technology and Environment Agency
TABI	The Agrobiodiversity Initiative project
TMRC	Traditional Medicine Research Center
UNESCO	United Nations for Education, Science and Culture Organization
UNCBD	United Nation Convention on Biological Diversity
UNCCD	United Nations Convention on Combat Desertification
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
WCMC	World Conservation Monitoring Center
WCS	Wildlife Conservation Society
WREA	Water Resources and Environment Administration
WWF	World Wide Fund for Nature
WFP	World Food Programme



Executive Summary

Introduction

A land-locked country, Lao PDR is an historically, culturally and environmentally rich country with diverse landscapes and ethnic populations. It is located at the heart of the Indo-Chinese Peninsula and is surrounded by China, Vietnam, Cambodia, Thailand and Myanmar, providing a potential for a strategic resource base and land-link in the Greater Mekong Sub-region (GMS).

It has a total land area of 236,800 km², its borders stretching 416 km in the north with the People's Republic of China, 492 km in the south with the Kingdom of Cambodia, 1,957 km in the east with the Socialist Republic of Vietnam, and 1,370 km in the west with the Kingdom of Thailand (WREA, 2009). The country is divided into seventeen provinces, one municipal province of Vientiane Capital with predominant ethnic communities scattered on its 4 major geographical divisions.

Almost 80% of the country is predominantly mountainous with cultivated floodplains only along some reaches of the Mekong River and the larger tributaries. More than one-third of the country's land area has a slope more than 30% while two-thirds of the rest has slopes ranging from more than 20 to 30%.

Lao PDR's Rich Natural and Biological Resources

The country has an abundance of natural resources including the mineral deposits and a wealth of forests, the later covers more than 40% of its total land surface. Its resource endowments vary from the different geographical units and climatic zones. The central and the southern regions of the country, endowed with plains along the Mekong River and other rivers, contain fertile soils and lands that are irrigable. On the other hand, the North is generally mountainous and rugged, with leached and acidic soils and mountain valleys that have limited irrigation capability, and thus are mostly dependent on rainfall as source of water for agricultural production (UNEP, 2001).

With a typical tropical climate, the country has pronounced wet and dry seasons that provide about 1,500 to 2,000 mm of rainfall annually, benefiting the majority of its lowland rice producing areas (MAF & STEA, 2004). The highlands, mostly in the Northern part, receive more than 2,000 to 3,000 mm of rainfall annually, giving significant amount of water for agriculture in these areas during the wet season.

Lao PDR still possesses a rich biological diversity with many species' populations and their habitats probably being less depleted compared to those of several other countries of the Southeast Asian region. However, the fact that Lao PDR's biodiversity remains rich, most notably its wildlife, has less to do with conservation efforts than with the country's low population density and consequently remaining extensive forest cover.

The high international conservation significance of forests and other habitats in Laos has been noted through ecoregional analysis (e.g., MacKinnon, 1986, Berkmüller, et al. 1995b, Duckworth, et al. 1999). Ecoregions are contiguous habitats or ecosystems recognized by WWF as areas of highest significance in the world for biodiversity conservation. There are five larger ecoregions in Indochina, out of which four are located in Laos:

- Annamite Range Moist Forests;
- Indochina Dry Forests;
- Northern Indochina Sub-tropical Moist Forests;
- Mekong River and its catchment.

The country's diverse ecological habitats are populated by various plant communities/species and provided

sanctuaries to numerous significant species of reptiles and amphibians, mammals including bats, birds, insects, and indigenous fish species living in the Mekong River and its tributaries.

Protected Area System: Status and Trends

The system of National Protected Areas in Lao PDR, also known as the National Biodiversity Conservation Areas (NBCAs), was legally established in 1993 through the Prime Minister's (PM) Decree No. 164, under which 18 areas (WREA, 2009) were declared. Later, three more areas and 2 corridors were added, making the total number of NBCAs to 21 and 2 corridors. The total area within the NBCA system now covers more than 3.5 million ha, which is equivalent to almost 15 percent of the country's land area (Fig. 2, 3). In addition to the established NBCAs, there are many provincial and district level conservation and protected areas established countrywide (Fig. 4), which together constitute more than 20% of the total land area (WREA, 2009).

The establishment of the contiguous areas between three NBCAs as corridors (one between Nakai-Nam Theun NBCA and Phou Hinpoun NBCA, and one between Nakai-Nam Theun NPA and Hin Nam Nor NBCA). These corridors, which have the same status as NBCAs, further strengthened the NBCA system thanks to the landscape connectedness beneficial to biodiversity enhancement. In 2008, the extent of the national protected area system further expanded by the establishment of the Nam Kan NBCA through the PM Decree No.163, making the NBCA system one of the most extensive protected area systems in Asia.

Previously in 1999, the Nam Ha NBCA in Luang Namtha province, has been expanded in area to 222,400 ha and is now contiguous with the Shanhyong Nature Reserve, Xishuangbanna Autonomous Prefecture, Yunnan, China. The Nam Ha NBCA was strengthened and received a major boost when it was declared as an ASEAN Natural Heritage Park in 2004.

Likewise, Xe Pian, Dong Hua Sao and Dong Ampham NBCAs in southern Lao PDR are implementing the Biodiversity Conservation Corridor Initiative (BCI) Project supported by ADB under its GMS Programme, and the Nam Et and Phou Loey NBCAs are implementing the Tiger conservation as well as other communities' development activities.

Important bird areas (IBA) were also identified in Lao PDR. To date 44 IBAs have been identified within all the country's protected areas for which ornithological data are available. There are one or two IBAs identified in each NBCA, except for Nakai-Nam Theun NBCA, where three IBAs have been identified.

Major Threats and Risks to the NBCAs

According to the WREA Report (2009), shifting cultivation practiced by the villagers living in or near the protected areas is the major threat to the biodiversity of the NBCAs. An estimated 90% of the shifting cultivation activities in the NBCAs are conducted by people living in or close to them, and the other 10% by people from outside of the immediate vicinity of the protected areas. It is estimated that 70% of the Non Timber Forest Products (NTFPs) are sold by residents inside the NBCA and 30% by people who enter from outside of the NBCAs.

Another major threat is the wildlife harvesting for food which was done by 70% of the local residents living in or near to the protected areas and 30% by outsiders. Both local and provincial residents use lands inside some of the NBCAs for grazing livestock. This practice has resulted to some instances of tiger predation of the livestock, notably the domestic buffaloes.

With the use of a threat assessment methodology, the following direct five top threats to the NBCAs were identified and ranked as presented below (Salafsky and Margolius, 1999):

1. Slash & burn agriculture;
2. Harvesting of NTFPs for sale;
3. Hunting of wildlife for sale;
4. Harvesting of NTFPs for food;
5. Hunting of wildlife for food.

Other related threats to the NBCAs that should not be overlooked include:

- Hydropower development;

- Mining;
- Infrastructure development.
- Land use change

Lao Flora and Fauna

Most of the flora resources are scattered all over the country and are found in different forests, land uses and agricultural ecosystems. There are an estimated 8-11,000 species of flowering plants in the country (MAF & STEA, 2003). However, compared to neighboring countries, there is only very little botanical documentation in Lao PDR due to having very few studies on plant taxonomy in the country since 1975, as a result of which very poor collections of flora species have been made. The situation compounded by inadequate storage facilities for these resources. Further, most of the studies conducted were done by untrained botanists making their works not comprehensive and poorly documented (MAF & STEA, 2003).

On the other hand, Lao fauna is relatively well documented and monitored, making its assessment more accurate as to its richness with many species populations and their habitats identified as less depleted than those in other countries in the region. These resources comprise between at least 150 to more than 200 reported species of reptiles and amphibians, no less than 700 species of birds, over 90 known species of bats and over 100 species of large mammals, about 500 species of fish (WREA, 2008).

A total of 319 species out of the 1,140 species reviewed by Duckworth et al (1999) are of national or global conservation significance, composed of 67% of the large mammals, 53% bats, 6% insectivores, 14% murid rodents, 22% birds, 25% reptiles and 2% amphibians (WREA, 2009). Information on local distribution, habitat uses and population status is most complete for birds and large mammals. Even within these groups, several new species have been discovered within the country in recent years. Bats have also been surveyed extensively since 1995, but coverage remains uneven. Reptiles, insectivores and rodents are still relatively poorly documented on a national scale.

Currently, fish species diversity in the Mekong basin is estimated at 1,200 species (MAF & STEA, 2003). It is believed that the Mekong fish fauna, as in other large river systems, is generally characterized by a high degree of within-species diversity. In Lao PDR portion of the Mekong and its tributaries, there are about 500 indigenous fish species, out of which about 6 to 9 species are believed threatened (MAF & STEA, 2003; ACB, 2009). Fish diversity of the Mekong River basin is estimated to be roughly three times that of the Amazon River.

Other emerging threats include increasing upland cultivation for agriculture, increasing use of exotic species, and climate change. A recent WCS survey in the country identified 56 animals that are expected to fall below the minimum viable population of 500 individuals in the next ten years if no adjustments in the current level of protected area management will be implemented (MAF & STEA, 2004). Virtually all forest resource extraction still primarily relies on natural forests comprised of indigenous species (MAF & STEA, 2004).

Key Actions Taken

Current trends of development in many areas of the country have combined forestation with the development of high commercial value industrial trees, such as teak (*Tectona grandis*) in Luang Prabang, Sayaboury, Vientiane, Bokeo, Champassak, Bolikhamxay and Attapeu Provinces, and rubber in the provinces of Luang Namtha, Khammouane, Champasak, Saravane, Sekong, Attapeu, Bokeo and Oudomxay. Aside from protection and conservation forests, approximately 3.2 million ha are designated as production forest (MAF, 2005).

Wildlife species are normally raised as pets in many of the Lao homes to portray a nature-like look for their homes. These cultural practices further boosted the ecotourism industry as more tourists' interests are generated through Lao cultural tourism with more than 60% of the tourists wanted to enjoy the cultural attributes (MAF & STEA, 2004), which often relate to biodiversity since most Lao people live in close contact with nature.

In line with the different dominant farming systems in the country, 16 predominant rural production

systems were further identified and classified into three main types as practiced by various ethnic communities. These production systems have two common elements in them:

(1) the cultivation of rice (glutinous or non-glutinous) as the staple food, and (2) the diversified livelihood strategy. Regarding the conservation of rice varieties, the National Agricultural and Forestry Research Institute (NAFRI) currently have 13,193 samples of cultivated rice and 237 samples of wild rice genetic materials to beef up the country's rice production resources. Many wild rice species are found in Lao PDR such as those related to *Hygroryza*.

With the government's intent to eliminate slash-and-burn cultivation and implement an integrated rural development as part of its poverty reduction and environmental conservation strategies, major policy shifts have been focused on the 47 poorest districts of the country. One such major policy is the handover of forest lands into major agro-forestry production areas focusing in 8 primary programmes to provide alternative livelihoods to slash-and-burn agriculture (Committee for Planning and Investment, 2007).

Meanwhile, a land management survey was done covering a total area of 99,349 ha (Committee for Planning and Investment, 2007) to determine land allocations for the different land management units devoted for agro-forestry in 3 locations in Vientiane and Saravane provinces.

Successes, Obstacles and Lessons Learned

Foremost among the successes are the implementation of the GMS programmes in partnership with international organizations such as the WWF, IUCN, ADB, among others. In the WWF – Laos Country Programme, various projects were put on the ground such as the Switch project on Sustainable Rattan Harvest and Production that helped Lao farmers in increasing their production and income from their rattan plantations which identified 13 highly marketable species that have the potentials of cornering a significant share of the estimated US\$2.5 billion world rattan industry (WWF, 2008). Other successful programmes implemented in partnership with WWF and the GMS include the Community Fisheries, to augment and increase productivity of the fishery sector in the Mekong River basin, and the Green Club, which deals more on the educational and information campaign for environmental management and other allied activities.

In the BCI programme, which is also partnered with WWF and IUCN, worked in the biodiversity conservation corridor which seeks to ensure that adequate linkages be established and managed to maintain biodiversity resources vital ecosystem services. These in turn will sustain resources productivity and livelihoods of the affected communities and hence, contributing to the sustained growth of the national economy.

Livelihood sources such as the use of the NTFPs and ecotourism activities, are to be enhanced in a more sustainable manner to ensure that productivity of these resources and the community well-being will also be ensured. At the same time, the goals of maintaining the stability of the ecosystems in the NBCAs will be attained through the applications of appropriate management approaches in the corridors on the basis of adequate policies and the enforcement of rules and regulations. Ultimately, the experiences and success stories of these corridors will be replicated nationwide with proper adjustments applied to avoid risks and failures in the sustainable implementation of these activities.

In governance of biodiversity conservation at the national level, successes have been achieved in crafting the many legislations and policies that can be found in the different strategy plans and action programmes of the government, as discussed in Chapter III. One major document is the National Sustainable Development Strategy that was adopted in December 2008. Biodiversity conservation concerns and some indicators have been included in many of the sectors identified in the National Sustainable Development Strategy (NSDS) 2008. Indicators pertaining to biodiversity have been included in the NSDS and are being used in monitoring changes and trends. Monitoring could further be enhanced by training more technical people. At present, the State lacks the technical staff to achieve this.

Lao PDR has formulated and implemented national development plans, strategies and frameworks which integrate environmental considerations, including biodiversity conservation.

Implementation of the National Biodiversity Strategy and Action Plan (NBSAP) is by no means complete and a lot has to be done to improve its implementation. For one thing, human resources development is a

necessary activity which requires financial resources. Addressing the issues on access and benefit sharing and indigenous peoples' knowledge is another challenge and should be one of the priorities of the State. On the other hand, expertise in these issues is lacking and the State is in need of assistance for this in the short and medium terms. As such, reducing or removing the threats to biodiversity remains a challenge.

Other successful programmes implemented in partnership between WWF and the ADB-GMS include the Community Fisheries to augment and increase productivity of the fishery sector in the Mekong River basin, and the Green Club, which deals more on the educational and information campaign for environmental management and other related activities.

However, research by local institutions on biodiversity is waning due to lack of funds and technical capability. Public investment in research and technology development is basically absent from the budget plan 2007-2008 hence, aggravating funding constraints for research & development which is critical in enhancing technical capability development in the country, particularly for biodiversity conservation and management. Only the National University of Lao PDR (NUoL) revealed this research and development deficiency in the country. Furthermore, the education sector got only a little more than 17% budget allocated of the overall budget (Committee for Planning and Investment, 2007).

Conclusions

Since Lao PDR has become a signatory to the Convention on Biological Diversity (CBD), many strides have been made to conserve the country biodiversity. Incorporation of biodiversity conservation in the major programmes of the region such as the GMS Biodiversity Corridor Initiative in general and the implementation of this initiative in Lao PDR in particular has contributed toward fulfilling the programme actions of the NBSAP.

Area covered by high biodiversity biomes such as the forest biome has been steadily increasing. As of late 2008, another national protected area was declared bringing the number of national protected areas to 21, increasing the extent of biodiversity-rich forest cover. At present, the national protected areas cover almost 15% of the total land area of the country and this has contributed to achieving the 2010 target of reducing at least 10% of biodiversity loss in terms of increased land area protected and forest cover. Maintaining and improving this figure would need substantial capacity building and sustainable financing of conservation activities.

One head way is the creation of a graduate/masters degree program in the National University of Lao focusing on biodiversity conservation. At present, there are many graduate students enrolled in the degree course.

Ecotourism in Lao PDR is steadily growing and it has become one of the major areas identified in the National Sustainable Development Strategy.

Fully achieving the 2010 Target remain elusive since there are barriers or obstacles that hinder the implementation of activities. Foremost is the lack of sufficient funds for a sustainable implementation of activities. Second is the availability of qualified personnel which is severely lacking in many of the implementing agencies. This leads to the need for capacitating personnel in managing and conserving biodiversity.

Ethnic communities' hesitancy about change is another obstacle in the implementation of biodiversity conservation; however, this is not an insurmountable obstacle.

Future Priorities

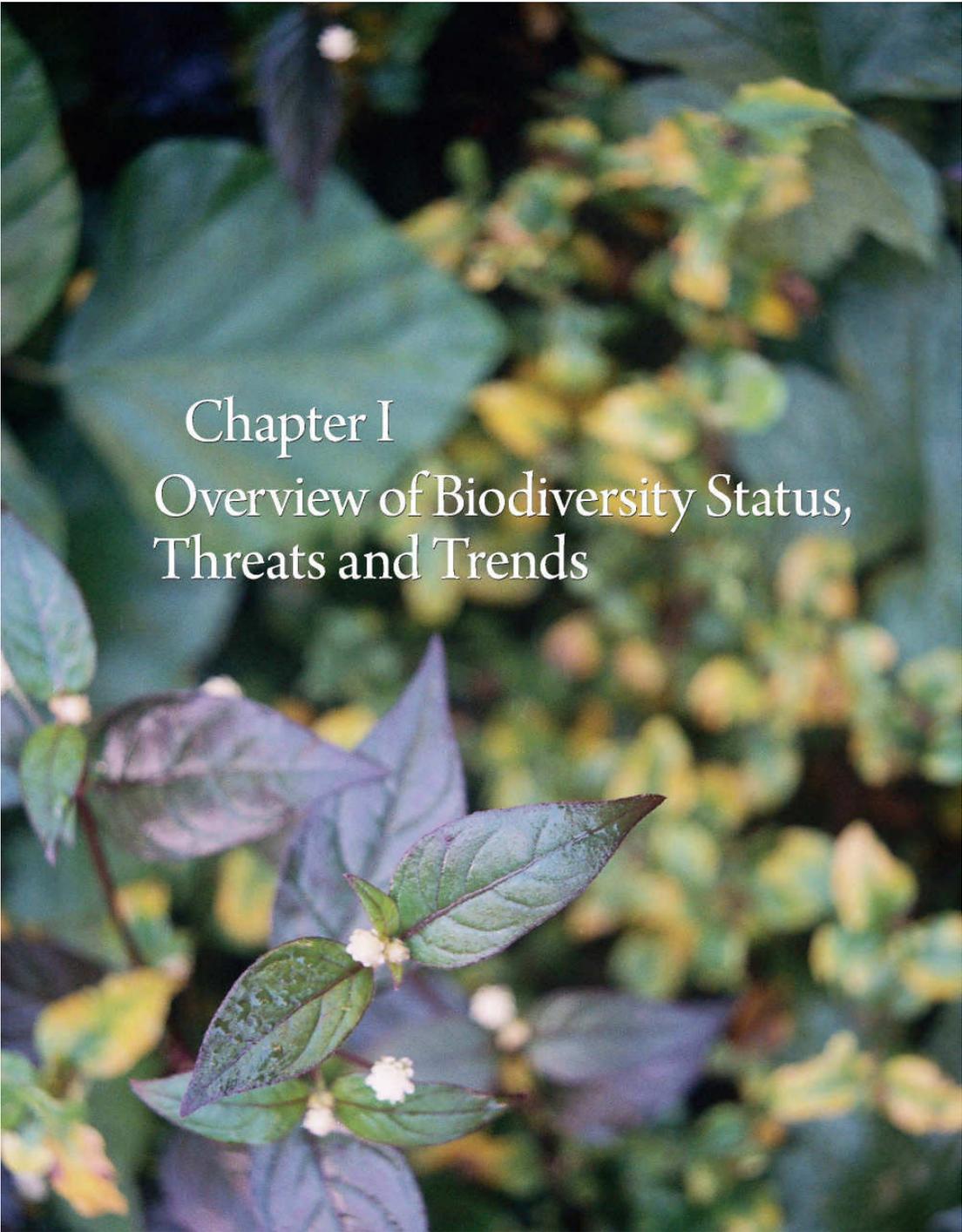
Implementation of the Convention has changed the development landscape of the country. 'Sustainable development' was unknown in the past but now has gained its own place in society. Biodiversity conservation is but one element of the sustainable development picture. Implementing the activities of the Convention has had a profound impact on the sustainable use of biodiversity. An example of this is ecotourism where biodiversity is the main attraction. Hence, conservation of biological resources becomes imperative since it is the main character in the tourism/ecotourism sector.

However, fair and equitable sharing of benefits arising out of the utilization of genetic resources is an issue that has not yet been resolved. The international regime for Access and Benefit Sharing (ABS) was only recently crafted and it will take a long time for the Parties to adopt it.

As stated in the National Sustainable Development Strategy of 2008, the future priorities lie in its Strategic Goals and priority policy areas mentioned in the previous section.

Human resources development is another key priority policy area that has never been so pronounced as in the need for capacity development in the Natural Resources and Agriculture sectors especially in the management of these resources. This includes the other related sectors in biodiversity conservation such as health, ecotourism, education, enforcement, community development, etc.

Lao PDR lies in the heart of the Greater Mekong Sub-region (GMS) where more than half of the population is dependent on the resources that the Mekong River provides. To address their needs, the countries surrounding the Mekong River must coordinate with each other in planning and implementing activities that would improve the lives of their peoples. This is already stipulated in the GMS sustainable development strategy. However, more needs to be done.



Chapter I
Overview of Biodiversity Status,
Threats and Trends

Introduction

A land-locked country, Lao PDR is a historically, culturally and environmentally rich country with diverse landscapes and ethnic populations. It is located at the heart of the Indo-Chinese Peninsula and is surrounded by China, Vietnam, Cambodia, Thailand and Myanmar, providing a potential for a strategic resource base and land-link in the Greater Mekong Sub-region (GMS).

It has a total land area of 236,800 km², its borders stretching 416 km in the north with the People's Republic of China, 492 km in the south with the Kingdom of Cambodia, 1,957 km in the east with the Socialist Republic of Vietnam, and 1,370 km in the west with the Kingdom of Thailand (WREA, 2009). The country is divided into 17 provinces, one municipality containing the capital city of Vientiane. The predominant ethnic groups are scattered in 4 major geographical regions: Upper Mekong, Upper Annamite, Central Plain, Lower Mekong Basin. This reflects the total diversity of the country, not only in terms of bio-physical resources, but also in terms of its socio-cultural, institutional & political assets.

The 2005 census (NSC, 2006) indicates that Lao PDR has a population of 5.8 million people and an average population density of about 24 persons/km², which is the lowest density in Southeast Asia. The population growth rate was about 2.4 percent per annum, crude birth rate 33.7 pr 1,000 people, and total fertility rate between 4.3 per woman in urban areas to 6 per woman in rural areas. Infant mortality rates ranged from 5-12.5 depending on province. Adult life expectancy (male and female) ranged from 50-60 depending on province (Hood et al, 2003). Over 73% of Lao population lives in the rural areas.

The results of official surveys in Lao PDR indicated that in 1992-1993, approximately 38.8 % of poor households were living below the poverty line. In 2002-2003 it was estimated that 28.7 percent of households in the country were poor (NGPES, 2004; Resolution of VIII Party Congress, 2006; and Ministry of Planning and Investment (MPI) (Background Document for the Round Table Implementation Meeting, 2008). Poverty reduction is a key policy directive of the Resolution of the XIII Party Congress. It is also reflected in the National Growth and the Poverty Eradication Strategy (NGPES) where it forms the basis for the formulation and implementation of Government policies that will lift the country from LDC status by 2020. To date, poverty in mountainous and remote areas has been alleviated gradually, in particular in northern provinces and in the provinces along the Lao and Vietnamese borders, in which a large number of ethnic minorities rely mainly on shifting cultivation activities for their livelihoods.

Almost 80% of the country is predominantly mountainous with cultivated floodplains only along some reaches of the Mekong River and the larger tributaries. More than one-third of the country's land area has a slope more than 30% while two-thirds of the rest has slopes ranging from more than 20 to 30%. The country's total area distribution in terms of various land uses, vegetation types, and slope classes as shown in Table 1 suggests that considerable and complex differences exist in resource endowments across the country (UNEP, 2001).

Table 1. Total distribution of various land uses, vegetation types and slope classes ('000 ha), 1992

Land Use Group	Slope Classes (%)					Total Area
	0 – 5	6-19	20-30	31-59	>60	
• Current Forest	2,679	651	3,795	3,072	971	11,168
• Potential Forest	1,137	589	3,969	2,741	512	8,948
• Other wooded areas	516	70	340	323	195	1,444
• Permanent agricultural land	826	20	4	0	0	850
• Other non-forest land	410	51	364	323	122	1,270
Total	5,568	1,381	8,472	6,459	1,800	23,680

Source: UNEP, 2001.

Lao PDR's Rich Natural and Biological Resources

The country has an abundance of natural resources including the mineral deposits and a wealth of forests, which cover more than 40% of its total land surface (Fig. 1). Its resource endowments vary from the different geographical regions and climatic zones.

The Central Region and the South of the country, are endowed with plains along the Mekong and other rivers, which contain fertile soils and lands that are irrigable. On the other hand, the North is generally mountainous and rugged, with leached and acidic soils and mountain valleys that have limited irrigation capability. Therefore, agriculture production in the north is mostly dependent on rainfall as source of water (UNEP, 2001).

Given the typical tropical climate, the country has pronounced wet and dry seasons that deliver about 1,500 to 2,000 mm of rainfall annually, benefiting the majority of its lowland rice producing areas (MAF & STEA, 2004). The highlands, mostly in the Northern part, receive more than 2,000 to 3,000 mm of rainfall yearly giving significant amount of water for agriculture in these areas during the wet season.

With its economic development largely dependent on the country's agriculture and natural resources, it is still classified as a 'Landlocked and Least Developed Country' (LLDC) today, and is among those developing countries with lower human and economic development indices based on a per capita GDP of US\$ 440 (WREA, 2008).

In spite of this, Lao PDR still possesses a rich biodiversity, with many species' populations and their habitats probably being less depleted than those of several other countries of the Southeast Asian region. Currently, the richness of Lao PDR's biodiversity, most notably its wildlife, has less to do with conservation efforts than with the country's low population density and consequently extensive forest cover. This condition enables wildlife to thrive tremendously in the country.

Lao PDR's Ecoregions

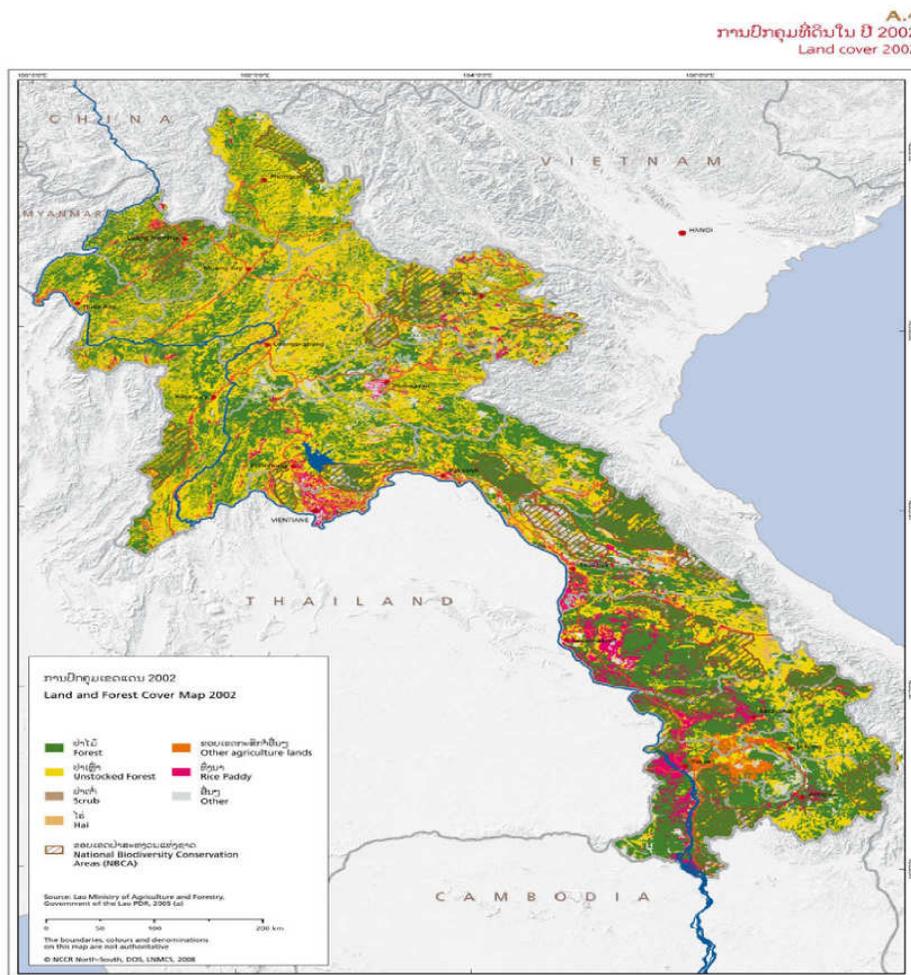
The high international conservation significance of forests and other habitats in Lao PDR has been noted through ecoregional analysis (e.g., MacKinnon, 1986, Berkmüller, *et al.* 1995b, Duckworth, *et al.* 1999). *Ecoregions* are contiguous habitats or ecosystems recognized by WWF as areas of highest significance in the world for biodiversity conservation. There are five larger ecoregions in Indochina, out of which four are located in Laos:

- Annamite Range Moist Forests;
- Indochina Dry Forests;
- Northern Indochina Sub-tropical Moist Forests;
- Mekong River and its catchment .

WWF (2002) recently coordinated the identification and assessment of ecoregions complex covering central and southern Laos, central and southern Vietnam, and Cambodia. Contiguous and biogeographically similar ecoregions can be conceived as one *ecoregions complex*. This has been termed the “Forests of the Lower Mekong Ecoregions Complex” (FLMEC) which covers all non-marine and non-estuarine parts of Cambodia, Lao PDR, and Vietnam (excluding the Northern highlands of Lao PDR and Vietnam).

Under the WWF’s FLMEC, seven terrestrial ecoregions and the Mekong River Basin aquatic region are identified in Lao PDR. The terrestrial ecoregions, which cover large parts of Southern Laos, include: Northern Indochina Subtropical Forest which covers a part of Northeastern Laos, Luang Prabang Montane Rain Forest, Northern Annamite Rain Forest, Northern Korat Plateau Moist Deciduous Forest, Central Indochina Dry Forest, Southeastern Indochina Dry Evergreen Forest, and Southern Annamite Montane Rain Forest (MAF & STEA, 2003).

Figure 1. Land cover of Lao PDR showing various forest, agricultural, and biodiversity conservation areas, 2002



Source:

WREA, 2009

The country’s diverse ecological habitats are populated by various plant communities/species and provided sanctuaries to numerous significant species of reptiles and amphibians, mammals including bats, birds, insects, and indigenous fish species living in the Mekong River and its tributaries. A detailed analysis of ecoregions’ biological significance is still to be published soon (Baltzer et al., in press).

Climate/weather

Lao PDR has a tropical climate, which is influenced by the southeast monsoon that cause significant rainfall and high humidity. The climate is divided into two distinct seasons: rainy season, or monsoon, from May to mid-October, followed by a dry season from mid-October to April. The average annual rainfall is about 1,300-3,000 mm. Average temperatures in the northern and eastern mountainous areas and the plateaus are 20°C, and in the plains 25°-27°C. For the year 2006, the average temperature of the country was 26.5°C (NSC, 2006). Based on elevation, Lao PDR is divided into three different climate zones, as follows:

- (1) The northern mountainous areas above 1,000 m have a montane temperature and hilly sub-tropical climate. This is relatively dry, with an average rainfall between 1,500 to 2,000 mm. Temperature ranges are lower than the rest of the country;
- (2) The central mountainous areas in the Annamite Mountain Range at elevation from 500-1,000m (with some mountain peak over 2,000m). This area has a tropical monsoonal climate with a higher temperature and higher average rainfall than elsewhere. The rainfall ranges from 2,500-3,500 mm;
- (3) The tropical lowland plains and flood plains along the Mekong River and its main tributaries include the plains of Vientiane, Borikhamxay, Khammouane, Savannakhet, Champassak, Saravane and Attapeu provinces. More than 50% of the population of Lao PDR lives in these areas. The average rainfall of these areas is 1,500-2,000 mm.

Protected Area System: Status and Trends

The system of National Protected Areas in Lao PDR was legally established in 1993 and was officially termed the National Biodiversity Conservation Areas (NBCAs) through the Prime Minister's (PM) Decree 164, where 18 areas were declared (WREA, 2009). Later, three more areas plus 2 corridors were added making the total number of NBCAs in the system to 21 and 2 corridors (Table 2). Locations of the NBCAs are shown in Figure 2.

Table 2. List of National Biodiversity Conservation Areas in Lao PDR.

Area Name	Year Declared	Area (ha)	Province Covered
1. Phou Daen Din	1993	222,000	Phongsaly
2. Nam Ha	1993	222,400	Luang Namtha
3. Nam Et	1993	170,000	Houaphanh
4. Phou Loei	1993	150,000	Houaphanh/Luang Prabang
5. Nam Xam	1993	70,000	Houaphanh
6. Nam Phui	1993	191,200	Xayaboury
7. Phou Phanang	1993	70,000	Vientiane Municipality Vientiane Province
8. Phou Khao Khouay	1993	200,000	Borikhamxay/ Xaysomboun
9. Nam Khading	1993	169,000	Borikhamxay
10. Phou Hin Poun	1993	150,000	Khammouane
11. Nakai Nam Theun	1993	353,200	Khammouane/ Borikhamxay
12. Hin Nam Nor	1993	82,000	Khammouane
13. Phou Xang He	1993	109,900	Savannakhet
14. Dong Phouvieng	1996	197,000	Savannakhet
15. Xe Sap	1995	136,897	Saravane/ Xekong
16. Xe Bang Nouan	1993	150,000	Saravane/ Savannakhet
17. Phou Xiangthong	1993	120,000	Champassak/ Saravane
18. Dong Hua Sao	1993	110,000	Champassak
19. Dong Ampham	1993	200,000	Attapeu/ Xekong
20. Xe Pian	1993	240,000	Attapeu/ Champassak
21. Nakai Nam Theun – Phou Hin Poun Corridor	2000	73,860	Borikhamxay/ Khammouane
22. Nakai Nam Theun – Hin Nam Nor Corridor	2000	3,310	Khammouane
23. Nam Kan	2008	136,000	Bokeo
TOTAL		3,526,766	

Source: MAF & STEA, 2003; DFRC/DoF/MAF & WREA, 2009

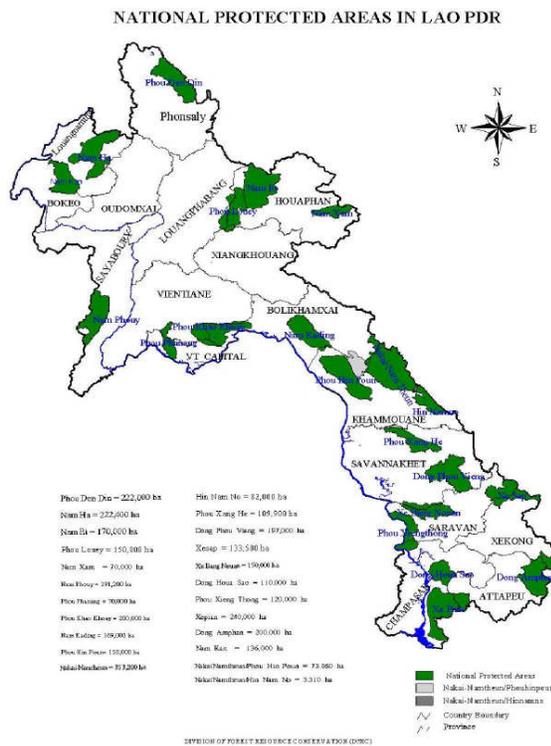
In light of the newly enacted Forestry Law (of December 2007), a Prime Ministerial decree on NBCAs has been currently under an advance stage of development.

Previously in 1999, the Nam Ha NBCA in Luang Namtha province, has been expanded in area to 222,400 ha and is now contiguous with the Shanhyong Nature Reserve of the Xishuangbanna Autonomous Prefecture, Yunnan, China. The Nam Ha NBCA was strengthened and received a major boost when it was declared as an ASEAN Natural Heritage Park in 2004. In 2009, the Hin Nam No NBCA in central Lao PDR was suggested for nomination into the United Nations for Educational, Scientific and Cultural Organization (UNESCO) Natural World Heritage site list as part of the advance toward joining with the transboundary natural world heritage site of the Phong Nha-Ke Bang National Park on the Vietnamese side of the Annamite Mountain Range. Endorsement of the nomination to UNESCO for possible world heritage listing is pending consideration by the Lao PDR government.

Likewise, Xe Pian, Dong Hua Sao and Dong Ampham NBCAs are implementing the Biodiversity Conservation Corridor Initiative (BCI) Project supported by ADB under the GMS Programme, and the Nam Et and Phou Loey NBCAs are implementing the Tiger conservation as well as other communities' development activities. Similarly wildlife conservation and protected area management activities have been also carried out in Nam Ka Ding NBCA in central Lao PDR with important success.

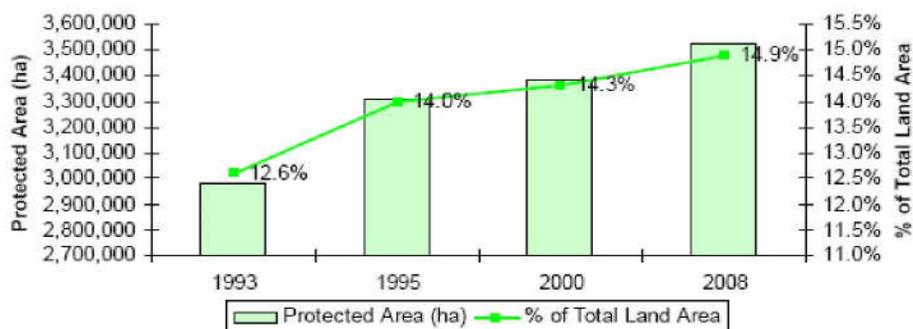
With support from the Forestry Strategy 2020 Implementation Support Programme, work on review of the NBCA system started in 2007 with a view to develop the methodology for applying the International Union for Conservation of Nature (IUCN) protected area management category system in order to enhance the clarity of management in accordance to a primary management objective of an NBCA. Also, further to the study on the valuation of protected area benefits in 2003, in 2008 work on exploring sustainable financing mechanisms for NBCA management in Lao PDR was initiated under the scope of supporting the country action on the CBD Programme of Work on Protected Areas.

Figure 2. The NPA (NBCAs) System in Lao PDR, 2009



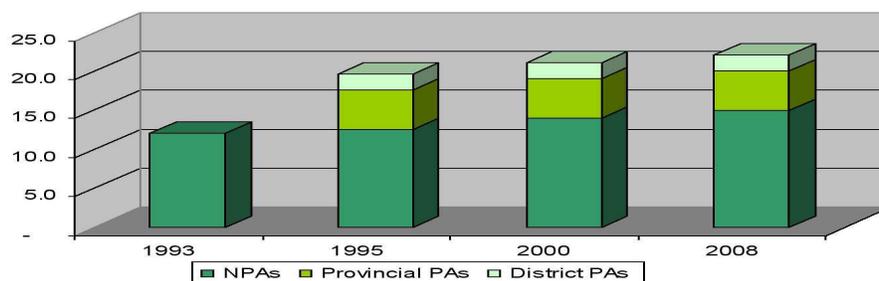
Source: Department of Forestry.

Figure 3. National Protected Area System as Percent of Total Land Area, 1993-2008



Source: Division of Forest Resource Conservation, Department of Forestry, 2009

Figure 4. Trends of the establishment of various protected areas in Lao PDR (WREA, 2009)



Important Bird Areas

Important Bird Areas (IBAs) are sites of international importance for bird conservation, based on internationally recognized standards criteria. IBAs are not only important for birds, but typically support a wide range of other important animal and plant species. Furthermore, many IBAs are also significant for human welfare and economic well-being. Its protective catchments serve as means of flood control, and also as a source of natural resources for use of local communities.

The global IBA programme is coordinated by Bird Life International, and aims to identify and protect a network of critical sites for the world's birds. In Lao PDR, the identification of IBAs is being conducted by the National Forest Inventory and Planning Centre (NAFIP) and the Division of Forest Resource Conservation (DFRC) of the Department of Forestry (DoF), with technical support from Bird Life International and the Wildlife Conservation Society.

To date, 44 IBAs have been identified within all the country's protected areas for which ornithological data are available. There are one or two IBAs identified in each NBCA, except for Nakai-Nam Theun NBCA, where three IBAs have been identified. Because IBAs are spatially- delineated and are important for other taxonomic groups, not only birds, they can be used as basis for protected areas zoning. Consequently, protection of the entire network of IBAs in Lao PDR would go a long way towards ensuring the conservation of the full diversity of bird species in the country.

Ethnic settlements/communities and ecotourism

The area contains a diversity of communities of various ethnic groups who are highly dependent on the forest and its resources, and living comfortably with their traditional lifestyles. These ethnic groups include

the Leu, Thai Dam, Lao Thueng, Ikor, Lao Hoi, Kui, Hmong and Etong.

In Nam Ha East, the Lao Thueng settled along the main road, the Lao Hoi lived along the rivers, and one Hmong village (Ban Nam Vang) settled in the area among them. Some Lao Lum (sub-ethnic Leu) settlements are also found along the Namtha River. In Nam Ha West, these communities are mostly Ikor (ethnic group: Lao Sung) in the highland areas.

In Finho and Nam Bo, there are Lao Hmong, Etong sub-ethnic groups in Etong village, and Lao Lum (Leu) in Tinthat village. The Nam Kong area is dominated by Ikor, except for Lao Lum (Thai dam) in Nam Kong village, Kui in Kui Soung village and Hmong in Suen Ya village. Other class III or IV villages are Lao Lum settlements.

The area has been identified by the National Tourism Authority of Lao as having high potential for both culture and nature tourism. A pilot project for an eco-trekking trail is planned for Nam Ha West, which is also supported by the Luang Namtha Province Ecotourism Project. Boating on the Namtha River and hiking in the hills are activities that are also currently being promoted by the project.

Major Threats and Risks to the NBCAs

According to WREA Report (2009), an estimated 90% of the shifting cultivation activities in the NBCA are conducted by villages living in or near the area, and the other 10% by people from outside of the immediate vicinity of the protected area. Cultivated crops and non-timber forest products (NTFPs), primarily cardamom, rattan, bamboo, jewel orchid, eaglewood, and ginger, are harvested from the NBCA. They are used for food as well as being sold in various markets, locally and internationally. It is estimated that 70% of the sale of NTFPs is conducted by residents inside the NBCAs and 30% by people who enter from outside of the NBCA.

Of the NTFPs harvested for food, it is estimated that 80% of these are used by villages in the NBCA and 20% by people from outside of the area. A wide range of wildlife is harvested for food and for sale. It is estimated that only 40% of the wildlife trading is conducted by the area residents and the remaining 60% by the non-residents. While opportunistic hunting and trapping of wildlife inside NBCAs is not uncommon, efforts have been made to confiscate hunting guns and gears from the owners with a high degree of success, or licensing legal weapon possession in order to control their use.

On the other hand, 70% of the wildlife harvesting for food is done by the local residents and the 30% by outsiders. Both local and provincial residents use lands inside the NBCA for grazing of livestock. This practice resulted in some cases of tiger predation of the livestock, notably the domestic buffaloes.

With the use of a threat assessment methodology, the following direct threats to the NBCA were identified and ranked as presented in Table 4 (Salafsky and Margolius, 1999).

Table 4. Ranking of direct threats to NBCAs with percentage participation of stakeholders

Rank	Threat	Driver/s/Cause/s	Implication/s	% Stakeholders' Participation	
				Locals	Non-locals
1	Slash and burn agriculture	Socio-Economic factors	Habitat & species changes & risks, livelihood effects & economic shifts, upland population increase & risks, uplands/PAs risks	90	10
2	Harvest of NTFPs for sale	Economic factors	Habitat & species risks, livelihood effects & economic shifts, upland population increase & risks, uplands/PAs risks	70	30
3	Hunting of wildlife for sale	Economic factors	Habitat & species changes & risks, livelihood effects & economic risks/illegal trades, upland population increase & risks, PAs risks	40	60
4	Harvest of NTFPs for food	Socio-Economic factors	Habitat & species changes & risks, livelihood effects/risks, upland population increase/risks, uplands & PAs risks	80	20
5	Hunting of wildlife for food	Socio-Economic factors	Habitat & species changes & risks, livelihood & economic risks, upland population increase & risks, PAs risks	70	30
6	Road building	Economic & Socio-Political factors	Habitat & species changes & risks, livelihood & economic risks, upland population increase/risks, PAs risks due to easy access for harvesting & hunting	0	100
7	Harvest of timber resources	Economic factors	Deforestation, habitat & species changes/risks, livelihood effects & economic shifts, upland population increase & risks, PAs risks	50	50
8	Free ranging domestic animals	Socio-Economic factors	Habitat & species changes & risks, wildlife degradation, livelihood & economic shifts/risks, population risks, PAs risks	40	60

Source: MAF & STEA, 2003

Species Diversity

The rich biological species diversity of Lao PDR is less well-known than that of its neighbors: Vietnam, China and Thailand. Nevertheless, it is generally acknowledged that the country has an outstanding biodiversity as it is rich in both flora and fauna (MAF & STEA, 2003).

Lao Flora

Most of the flora resources in the country are scattered all over the land through the different forests, land uses and agricultural ecosystems. There are an estimated 8-11,000 species of flowering plants in the country (MAF & STEA, 2003). However, compared to its neighboring countries, there is only very little botanical documentation in Lao PDR due to very few studies on plant taxonomy in the country since 1975 resulting in very poor collections of flora species coupled with inadequate storage facilities for these resources. Further, most of the studies conducted were done by untrained botanists making their works not comprehensive and poorly documented (MAF & STEA, 2003).

Nonetheless, important documents have been published to account for some of the flora resources, mostly on NTFPs in the country, as well as collection and documentation works done by various researchers and concerned institutions. A 2001 publication, for instance, on orchid resources in Thailand, Laos, Cambodia, and Vietnam mentioned 335 species from the country belonging to 85 genera (MAF & STEA, 2003).

Dominant species other than forest tree species and NTFPs include some species of medicinal/edible shrubs, vines, grasses, and economically-important agricultural crops such as rice, corn, legumes, root-crops, vegetables, fruits and industrial plantation crops (Committee for Planning and Investments, 2007).

Medicinal plant species are plenty and to some extent over-exploited such as False calumba/Ceylon calumba root/ Turmeric tree (*Coscinium usitatum* Pierre), a good source of berberine powder; *Ochna harmandii* H. Lec. var. *annamensis* H. Lec., a treatment for sore throats and weakness; Dita bark (*Alstonia scholaris* R. Br.), used as a vermifuge, anti-malarial and antiseptic to treat dysentery, anemia and other diseases and disorders; and some herbs like Siberian motherwort/ Lion's tail (*Leonurus artemisia*) important documents have been published to account some of the flora resources, mostly on NTFPs in the country, as well as collection and documentation works done by various researchers and concerned institutions. A 2001 publication, for instance, on orchid resources in Thailand, Laos, Cambodia, and Vietnam mentioned 335 species from the country belonging to 85 genera (MAF & STEA, 2003).

Likewise, from 1993 to present, the Department of Biology, Faculty of Fundamental Sciences has collected more than 10,000 samples from 3,200 species. Similar and related works were also done by the Forestry Research Center, NAFRI (FRC) , MAF, IUCN, Care International, National University of Laos, Traditional Medicine Research Institute (TMRC) , among others (MAF & STEA, 2003). Distribution and status of NTFPs in Lao PDR is presented in Table 5.

Table 5. Distribution and Status of NTFPs in Lao PDR

Scientific and Trade Name	Habitat	Status
1. <i>Amomum</i> spp; Cardamom, Chinese cardamom, Medicinal cardamom	Country-wide, mixed/ secondary forests	Natural (open access) and domesticated
2. <i>Styrax tonkinensis</i> ; Siam benzoin or Lao benzoin	Strictly in areas of 4 Northern provinces	Fallow lands, private lands
3. <i>Persea kurzii</i> ; Bong bark (or yang bong), source of Kobuak	Country-wide, mostly in the Central-South, mixed forests	Natural (open access) and domesticated
4. <i>Dipterocarpus alatus</i> and other species; oleo resin (Dammar oil)	Mostly in the Central-South, dense/ mixed forests	Natural and some private lands
5. <i>Dipterocarpus alatus</i> , <i>D. costatus</i> and other species; Dammar resin	Mostly in the Central-South, mixed/ open forests	Natural (open access)
6. <i>Sterculia lychnophora</i> ; Malva nut	Strictly in southern areas, dense/ mixed forests	Natural, village ownership (semi-open access)
7. <i>Strychnos nux-vomica</i> ; Nux-vomica or Vomit nut	4 Southern provinces, mixed/ open forests	Natural (open access)
8. <i>Arenga pinnata</i> ; Sugar palm	Country-wide, dense/ mixed forests (high humidity)	Natural, village ownership (semi-open access)
9. <i>Aquilaria crassna</i> ; Eaglewood, Agarwood	Country-wide, dense/ mixed/ open forests	Natural and domesticated
10. <i>Azadirachta indica</i> ; Neem tree	Prominent in the Central-South, mixed open forests	Natural and domesticated
11. <i>Helminthostachys zeylanica</i> ; Fern roots	Country-wide, mixed/ bamboo forests (close to rivers)	Natural (open access)
12. Orchids (numerous genera)	Country-wide, all forest types	Natural (open access)
13. <i>Coscinium usitatum</i> (syn. <i>C. fenestratum</i> ?); Turmeric tree	Country-wide, mixed/ dense forests	Natural (open access)
14. <i>Thysanolaena maxima</i> ; Tiger grass	Country-wide, mostly in areas of shifting cultivation	Natural (open access)
15. <i>Boehmeria malabarica</i>	Prominent in Northern parts of the country, mixed forests	Natural (open access)
16. <i>Dracaena</i> sp.; Dragon's blood	Country-wide, mostly in limestone mountains	Natural (open access)
17. <i>Calamus</i> spp., <i>Daemonorops</i> spp., <i>Korthalsia</i> spp. and others; Rattans	Country-wide, mixed/ dense forests	Natural (open access), some species domesticated
18. Bamboo (numerous genera)	Country-wide, mixed forests	Natural (open access), many species are domesticated
19. <i>Pinus merkusii</i> , <i>P. kesiya</i> ; Pine resin	High plateau: Phou Kao Khoui, Xieng Khouang, Salavan	Natural
20. <i>Shorea siamensis</i> , <i>S. obtusa</i> ; Dammar resin	Country-wide, mixed/ dense forests	Natural and domesticated (Champassak)
21. <i>Polygonum multiflorum</i>	Northern, mostly in Hua Phan province's mountainous areas	Natural (open access)
22. <i>Smilax glabra</i>	Country-wide, mountainous areas	Natural (open access)
23. Mushrooms (various species)	Country-wide, all forest types	Natural (open access)

Source: MAF & STEA, 2003.

(Lour.) S.Y. Hu), used to treat menses and cardio-vascular related diseases. There are also some wild edible species abundant in various ecosystems as listed in Appendix A with their respective scientific and local names (MAF & STEA, 2004).

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Lao Fauna

In comparison to flora, Lao fauna is relatively well documented and monitored making its assessment more or less accurate as to its richness with many species populations and their habitats found less depleted than those in other countries in the region. These resources comprised between at least 150 to more than 200 reported species of reptiles and amphibians, at least 700 species of birds, over 90 known species of bats and over 100 species of large mammals, about 500 species of fish (WREA, 2008).

A total of 319 species out of the 1,140 species reviewed by Duckworth et al (1999) are of national or global conservation significance, composed of 67% of the large mammals, 53% bats, 6% insectivores, 14% murid rodents, 22% birds, 25% reptiles and 2% amphibians (WREA, 2009). Information on local distribution, habitat uses and population status is most complete for birds and large mammals. Even within these groups, several new species have been discovered within the country in recent years. Bats have also been surveyed extensively since 1995, but coverage remains uneven. Reptiles, insectivores and rodents are still relatively poorly documented on a national scale.

- **Mammals**

There are more than 200 species of mammals present in Lao PDR, of which three large mammals were recently discovered such as the small dark muntjac (*Muntiacus truongsongensis*), the giant muntjac (*Megamuntiacus (Muntiacus) vuquangensis*) and the saola (*Pseudoryx nghetinhensis*). They are endemic to the Annamite range along the border between Lao PDR and Viet Nam. Another 60 or more species of these mammals are threatened/ near threatened based on 1998 WCMC Report, and by Duckworth et al. (1999) identified from 139 key mammal species in the country (MAF & STEA, 2003).

- **Birds**

Approximately 700 species of birds are known or provisionally recorded from Lao PDR and another 100 or so are likely to occur (J.W. Duckworth, R.E. Salter and K. Khounbolin, 1999), of which more than 10% of these species are highly threatened according to the WCMC (MAF & STEA, 2003).

To date, eighty six percent of the globally threatened and near-threatened bird species that have been recorded in Lao PDR are found within at least one IBA. Other bird species have no recent records, such as the Indian Skimmer (*Rynchops albicollis*) among others.

- **Reptiles and amphibians**

Recent surveys in the country have recorded at least 166 to more than 200 species of amphibians and reptiles, out of which 11 species of reptiles and 5 species of amphibians, are being threatened (ACB, 2009). Knowledge on the presence of amphibians and reptiles in Lao PDR has remained unknown for a long time.

Previous reports on the herpetofauna (Gressitt, 1970; Salter, 1993b) are based largely on secondary information, regional accounts, or extrapolations from documented occurrences in adjacent countries (Khounthikoummane & Khounboline, 2009). Observation records of the more easily identified species (*platysternid*, *testudinid* and some *emydid* turtles, Monitors, Pythons and King Cobra), and photographic records of species of unambiguous taxonomy have been included to maintain a conservative list. With the exceptions of two previously identified species of turtles and that of Siamese Crocodile, interview reports of species that were unconfirmed with voucher specimens have not been used to minimize potential taxonomic errors.

- **Invertebrates**

At present, there is not much documentation done on Lao invertebrates, the largest and most varied group of organisms on earth and in the country, except for some accounted species as given in Table 6 (MAF & STEA, 2003, ACB, 2009). Although poorly documented, it is likely that invertebrate diversity is higher in tropical freshwater ecosystems than in marine ecosystems, a typical condition in Lao PDR, at least for crustaceans, mollusks, insects, and especially nematodes.

- **Fish**

Currently, fish species diversity in the Mekong basin is estimated at 1,200 species (MAF & STEA, 2003). It is believed that the Mekong fish fauna, as in other large river systems, is generally characterized by a high degree of within-species diversity. In Lao PDR portion of the Mekong and its tributaries, there are about 500 indigenous fish species, out of which about 6 to 9 species are believed threatened as presented in Table 6 below (MAF & STEA, 2003; ACB, 2009). Fish diversity of the Mekong River basin is estimated to be roughly three times that of the Amazon River.

Table 6. Status inventory of some biological resources in Lao PDR

Species Groups	Estimated number of Species		
	Total	Endemic	Threatened
Plants	412	41	21
Mammals	282	1	46
Reptiles	150	0	11
Amphibians	89	2	5
Insects*	597	7**	0
Birds	700	0	23
Freshwater Fish	468	106	6
Some invertebrates***	3	0	3
TOTAL	2701	157	115

*only butterflies & dragonflies; **only butterflies; ***not specified

Source: ACB, 2009

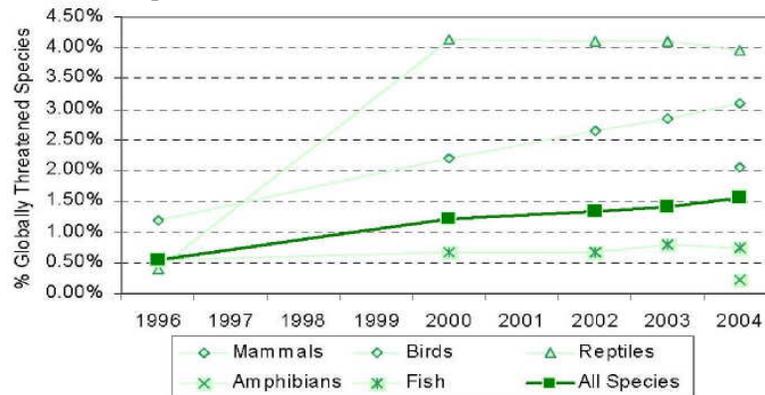
Trends and Threats to Species Diversity

Lao PDR is considered a sanctuary country to an estimated 1.6% of the globally threatened species which consists of the following: 3.1% of globally threatened mammals, 2.1% of globally threatened birds, 4% of globally threatened reptiles, and less than 1% of globally threatened fish or amphibians. However, there is an observed upward trend as to the percentage of these threatened species in Lao PDR with respect to the global situation (Fig. 5).

Based on Fig. 5, the National Environmental Performance Assessment Report (NEPAR) of 2009 emphasized that the rise in the share of globally threatened species from 0.54% in 1996 to 1.56% in 2004 is not indicative of a loss of biodiversity from 1996 to 2004; it reflects more on the progress of the evaluation work done by IUCN biologists. The 0.54% value in 1996 is based on the first version of the IUCN 1994 Red List at which during that time only 60% of the relevant mammals had been evaluated, few reptiles and fish species had been evaluated and at which time amphibians and birds were not part of the equation until 2003. Thus, the indicator value and trend for relevant amphibians and birds before 2003 has very little meaning in the presented analysis.

A summary of the estimated inventory of the different species present in the country is presented in Table 7. None of Lao PDR's share of the globally threatened species is endemic to Lao PDR and therefore Lao PDR alone is not solely responsible for its 1.6% share of globally threatened species. However, for eight out of all the threatened species, Lao PDR and Vietnam mutually share most of the total responsibility.

Figure 5. Trends of threatened species in Lao PDR as percentage to the global threatened species



Source: WREA, 2009.

It was also been observed that 28 of Lao PDR's current 81 threatened species are endemic to GMS. Lao PDR's 1.6% of globally threatened species ranks lowest amongst the six GMS countries. Reptile species are the largest contribution to Lao PDR's share of the threatened species in the GMS. While half of these reptile species are endemic to the GMS and sometimes in one neighboring country, none are endemic to Lao PDR.

The IUCN database has provided some insight as to the major threats relevant to the threatened species in Lao PDR. Loss of habitat is the dominant threat for 35% of the threatened species but overharvesting for food and trade is a close second threat ranging at 24% (MAF & STEA, 2003).

Other emerging threats include the following: increasing upland cultivation for agriculture, increasing use of exotic species, and climate change. A recent WCS survey in the country identified 56 animals that are expected to fall below the minimum viable population of 500 individuals in the next ten years if no improvement in the current level of protected area management will be implemented (MAF & STEA, 2004).

Therefore, mitigation and adaptive measures to respond to these threats and challenges must be done immediately while societal responses which are to deal with the hunting and gathering of these threatened species must be given equal importance in relation to those responses oriented to protect their habitats (WREA, 2009).

Forest and Mountain Ecosystems and Resources

Lao PDR's forest areas contain rich ecosystem diversity and species of great national and international importance as presented earlier. In addition, they provide other environmental services for the well-being of the local people by controlling soil erosion, protecting watersheds and supporting agriculture. The country's rich forest cover is relatively higher compared the levels in many other Asian countries.

It is estimated that the forest cover of Lao PDR in 2002 was 41.5% or 9.7 million ha, which was down from 47% or 11.2 million ha in 1992 (MAF FS2020, 2005). However, conflicting data, alternative definitions and changes in the resource base gave inaccurate picture of the extent and condition of the Lao forest resources. For instance, the World Bank viewed that 80 percent of Lao is forested but more than half of this area is extremely degraded and does not constitute "forest cover" (WREA, 2009).

Forest resources in the country include, in the north, dry evergreen forest, scattered tropical mountain deciduous forest and small areas of sub-tropical mountain forest. The high land areas of the Phouluang Mountain (Annamite Mountains) and Boloven Plateau contain both tropical mountain evergreen forests and small areas of pine forest and limestone forest. While dry dipterocarp forest (7%) and mixed deciduous forest (23%) are found in the southern of the country (UNEP-NORAD, 2001; WREA, 2009). Table 7 shows the area distribution of various classes of forest based on their major flora resources.

Table 7. Forest Classes in Lao PDR generally based on major flora resources (2002 evaluation)

Forest Class	Area ('000 ha)	% Land Area
Dry Dipterocarp	1,317.2	5.6
Lower Dry Evergreen	56.0	0.3
Upper Dry Evergreen	1,387.9	5.9
Lower Mixed Deciduous	881.0	3.7
Upper Mixed Deciduous	5,499.5	23.2
Gallery Forest	28.2	0.2
Coniferous	89.1	0.4
Mixed Coniferous/Broadleaved	525.8	2.2
Sub Total Forest Cover	9,824.7	41.5
Sub Total Non Forest Cover	13,855.3	58.5
Total Land Area	23,680.0	100

Source: WREA, 2009.

The ecosystems of the country are presently classified according to the forest types based on altitude, rainfall, types and dominance of tree species present, and the types of plant communities present (MAFF & STEA, 2004). According to Rundel (1999), forest habitats in Lao PDR can be broadly divided into three groups: Lowland, Montane and Azonal habitats. Communities in Lowland and Montane habitats respond broadly to patterns of climatic regimes, while those in the Azonal habitats respond and develop mainly

under highly specialized conditions of soil characteristics or water regimes. All these classifications are consistent with the identified ecoregions of the WWF's FLMEC system.

- **Lowland Forest Habitats**

Lowland forest habitats are those generally below 800 -1000m elevation where tropical floristic elements predominate in forest structure and diversity. These habitats are primarily distributed in scattered areas of Northern Lao PDR, along the Mekong River valley in the Central Lao PDR, and along the foothills of the Annamite Range in Southern Lao PDR. These habitats can be broadly divided into six groups of forest types: wet evergreen forests, semi-evergreen forests, secondary semi-evergreen forests, mixed deciduous forests, deciduous dipterocarp forests and woodlands, and lowland pine woodlands (MAF & STEA, 2004).

- **Montane Forest Habitats**

These habitats are found above about 800-900m elevation which may generally be called montane evergreen forest, hill evergreen forest or Northern Indochina Montane Forest. These forest habitats typically experience relatively high levels of annual rainfall and cooler temperatures compared with the other forest habitats. In the country, these habitats comprise the transitional montane forests, open montane forests, open montane conifer forests, evergreen forests of *Fagaceae* and *Lauraceae*, mixed hardwood-conifer forests, dense montane conifer forests, *Ericaceous* cloud forest and degraded montane forests (Rundel, 1999 as cited by MAF & STEA, 2004).

- **Azonal Habitats**

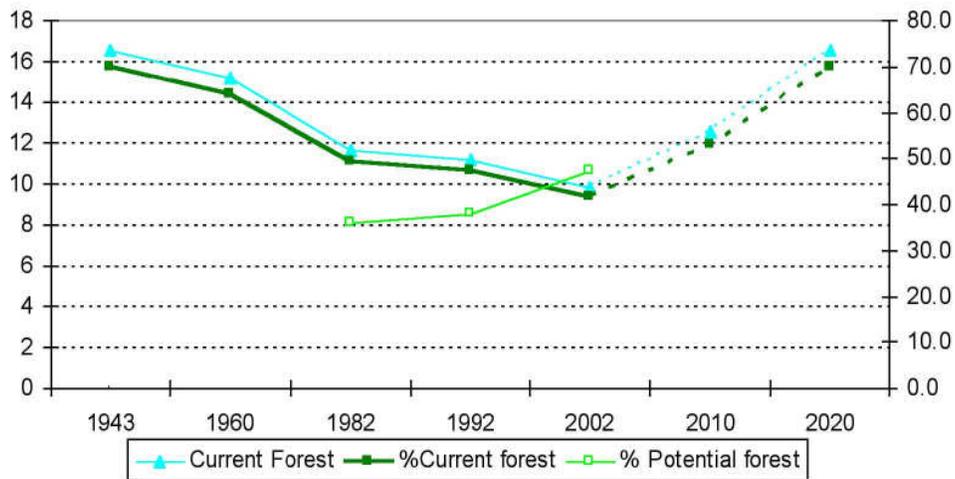
These forest habitats are also known as the zonal communities which are habitats that respond to broad patterns of climatic regimes in their evolution and distribution. However, there are azonal forest communities that grow under highly specialized conditions of soil characteristics and water regimes. These habitats are those where specific local environmental conditions override the broader climatic regimes to produce specific types of communities, most typical of which are the seasonally or perennially flooded.

It was determined that the country has nearly 60,000 ha of seasonally flooded shrub lands, 27,000 ha of permanently flooded swamp forests, and just 120 ha of seasonally flooded forests (MAF & STEA, 2004). Important wetlands in the country are the Mekong River, Xe Champhone, Nong Louang, Bung Nong Ngom, Xe Pian (Xe Khampho), the Khone Falls (Siphandon), the Xe Kong Plains, Soukhouma and the Nam Theun Wetlands (Nakai Plateau).

Forest areas still cover up to 25 percent of land in some Northern provinces and as much as 70 percent in some of the Southern provinces. During the 1940s, the forest cover represented about 70 percent of total area, and declined to about 64 percent at the beginning of the 1960s. By 2002, it was estimated to have further decreased to 42 percent (Fig. 6). This is largely a result of clearing of lowland forest for permanent agriculture and unsustainable logging. Forest clearing continues at an estimated rate of 134,000 ha per annum (Lao PDR MDG Report, 2008).

Forests in Lao PDR were classified into five management types: protection forest, conservation forest, production forest, rehabilitated forest and degraded forest (MAF & STEA, 2004). However, in line with the revised Forestry Law adopted in 2007, the forest types were re-classified into three main types: conservation forest, production forest and protection forest. Protection and conservation forests, which are part of the NBCA system in the country, account for about 22% of the total land area.

Figure 6. Trend in forest cover in relation to the total land area of Lao



At present, forest conservation and development are given increased attention by line ministries and local authorities. The forestation movement by the people has regained momentum, especially in the central provinces, such as Vientiane, Borikhamxay, Khammouane and Savannakhet provinces. During 2001-2005, afforestation covered 91,000 ha, accounting for 91 percent of the target of 100,000 ha, while efforts were made on forest restoration of 481,000 ha (WREA, 2009).

Current trends of development in many areas of these provinces, have combined forestation with the development of high commercial value industrial trees, such as teak (*Tectona grandis*) in Luang Prabang, Sayaboury, Vientiane, Bokeo, Champassak, Bolikhamxay and Attapeu Provinces, and rubber in the provinces of Luang Namtha, Khammouane, Champasak, Saravane, Sekong, Attapeu, Bokeo and Oudomxay.

Table 8. Total protection/conservation forestry areas in the Lao PDR ,2004

Category	No. of areas	Total area (ha)	% Total area
National Protected Areas	20	3,313,596	13.99
Provincial Conservation Forests	57	931,969	3.94
Provincial Protection Forests	23	461,410	1.95
District Conservation Forests	144	503,733	2.12
District Protection Forests	52	55,713	0.23
Corridors	2	77,170	0.33
Total	278	5,343,59	22.56

The Forestry Industry:

Importance to Economy and Biodiversity Conservation

Forest resources have played a central role in the Lao economy. In 1998, forest products accounted for 42 percent of the country's foreign exchange earnings, although their share had declined to about 10 percent by 2006. Forests in Lao PDR make essential contributions to nutrition, income, energy and shelter for four in every five members of the Lao population, who reside in rural areas and rely mostly on non-timber forest products (NTFPs) for subsistence and for offsetting seasonal food shortages.

Aside from protection and conservation forests, approximately 3.2 million ha are designated as production forest (MAF FS2020, 2005), but it is estimated that forest with potential for commercial production may total to more than 5.6 million ha (World Bank, SIDA and Government of Finland, 2001).

Only 57,000 ha of plantations have been established so far, of which less than half are available for production. Hence, virtually all forest resource extraction still primarily relies on natural forests comprising of indigenous species (MAF & STEA, 2004).

Tree plantations establishment and wood production

Wood products account for more than 35 percent of Lao PDR's total export revenues, and forestry contributes more than 15 percent of GDP. In the 1960s, small plantations were established in the Mekong Valley to secure watershed and protect against flooding. Species planted were mainly teak, rosewood and black trees. After it soon, the species of eucalyptus and other fast-growing trees were introduced. About 1,900 ha of plantation were established prior to 1976 growing to as much as around 40,000 ha in 2008 as shown in Figure 7 (WREA & Department of Planning, 2008).

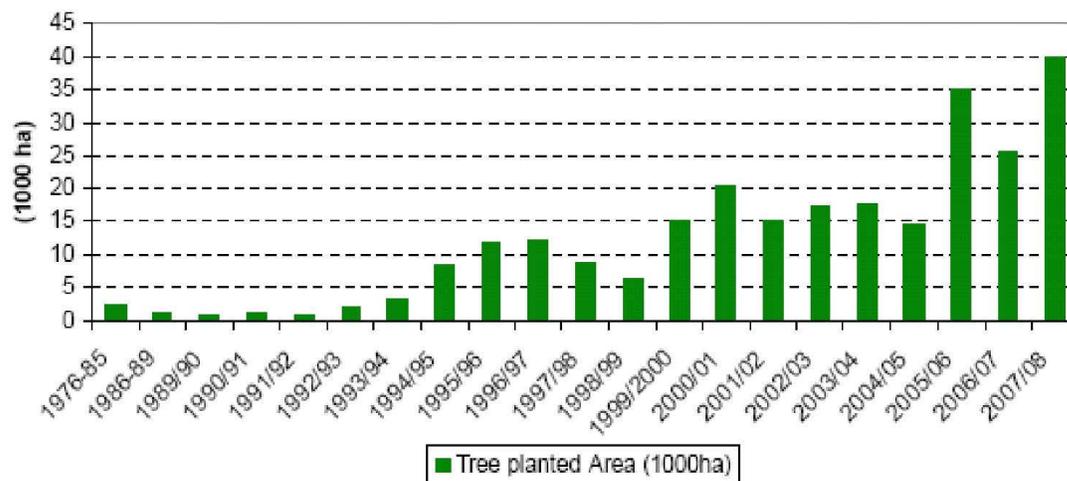
Log production has been increasing steadily over time and was estimated to be around 650,000 m³ per year based on the harvesting statistics for the period 1965–1999. Production forests are projected to produce 100 to 150 m³/ha of commercial timber with a total annual allowable cut of 282,580 m³ per year (MAF & STEA, 2004).

Forest logging during the period 2006-2007, was focused in 3 locations with a target land area of more than 60 ha. However, in actual implementation, it covered only around 44.82 ha, which is only 69% of the planned target (Committee for Planning and Investment, 2007). Some forest products harvested include stumps, some leaves, vines, flowers, fruits, skin and others totaling 2,743 tons.

The Lao PDR forest industry is largely supported in terms of wood production by small capacity sawmills, exploiting keruing (*Dipterocarpus alatus*) and mersawa (*Anisoptera costata*) as the principal commercial species. There are 125-150 sawmills in Lao PDR, with a total capacity of approximately 1.2 million cubic meters. Aside from these mills, there are 2 plywood factories, 28 wood furniture factories, and 3 parquet factories operating in the country.

It was determined that the wood industry operating capacity has been increasing for the last ten years (1988-1999) from just over 300,000 m³ to around 600,000 m³. In 2003-2004, Lao's mills consumed more than 400,000 m³ of timber. It was estimated that the industry had an installed capacity of between 2 to 3 million cubic meters³ (MAF & STEA, 2004).

Figure 7. Growth of tree plantation establishments, 1976 – 2008.



Source: WREA, 2009.

Non-Timber Forest Products (NTFPs)

NTFPs are important to the national and local economy, as they are used as a resource for subsistence as well as for trade. These resources are crucial for meeting subsistence needs and for achieving food security for the majority of rural Lao households. On average a rural family consumes the equivalent of US\$280 per year in NTFPs. This is of particular note since the average per capita income of the Lao population is about US\$402 (MAF & STEA, 2004).

On the other hand, the role of NTFPs in family's security is especially critically important given the occurrences of droughts, pests and rodents in the country which often reduce the available rice yields, the main source of food. The most important NTFPs for food security and local protein consumption are bamboo shoots, fish, wild tubers, and invertebrates (such as snails and insect larvae). Wild vertebrates are used by majority of Lao people, if not all, either for food, medicine or trade. Table 5 above has showed the distribution and status of use of the various important NTFPs in the country.

Various NTFPs have a high commercial value and it is estimated that about half of the cash income of rural households is derived from NTFPs. On the average, collection and sale of NTFPs provide on average 55 percent of family's cash income (MAF & STEA, 2004). The most traded NTFPs in Lao PDR include benzoin, turpentine and resin, damar oil, honey and wax, cardamom, rattan, bamboo and sugar palm. Medicinal plants are also an important portion of this trade and are harvested regularly. Results of a ranking survey of these important NTFPs among the village populations showed bamboo and fish are the top two NTFPs in terms of food security as presented in Table 9.

Table 9. Ten most important NTFPs (out of 50 NTFPs) ranged by villagers in Lao PDR.

RANK	PRODUCT	RANKING (%)		
		Men	Women	Total
1	Bamboo shoots	13	17	13
2	Fish	13	7	10
3	Vegetables	11	11	9
4	Wildlife	11	6	8
5	Cardamom	7	7	7
6	Rattan canes	6	6	6
7	Damar resin	2	4	5
8	Frogs	5	5	5
9	Mushrooms	3	6	4
10	Yang oil	4	4	4
	TOTAL	75*	73	71

Source: MAF & STEA, 2004.

Values of Forestry and Wildlife Resources

- **Food and medicine**

In Lao PDR, the domestic demand for wildlife, which is satisfied through trade, falls in a number of categories. The main ones are: subsistence, food markets, restaurants and food stalls, traditional Lao

medicine, souvenirs, trophies and pets (WREA, 2009; MAF & STEA, 2004). It is believed that values of the resources, mostly NTFPs, consumed for food and medicines may run into millions of dollars, both locally and internationally.

Many rural communities, particularly in the remote areas, are dependent on bartering or selling wildlife to obtain rice to meet food shortfalls during a part of year, as well as trading wildlife for extra income. In markets and restaurants, occasional displays of squirrels, monitor lizards, birds, soft shell turtles, snake and sometimes pangolins, fresh and dried deer meat are widely practiced. On the average, NTFPs are estimated to be worth over US\$300 per household consumption per year including extra incomes from household small-scale selling activities, but excluding firewood, fish & aquatic resources (MAF & STEA, 2004).

For traditional medicines, some of the wildlife products used include: bones of large and small cats, bears, primates, elephants, wild cattle, deer, serow, civets, hog badgers, sambar and muntjac, horns of serow and wild cattle, legs and hooves of deer and serow, oil or fat from serow, bears and cats, skin or fur of elephants, pangolins, civets, cats, teeth of elephants, cats, bears, claws of tigers and bears, carapaces and plastrons of turtles and tortoises, dried birds and the shells of freshwater and marine mollusks (MAF & STEA, 2004).

- **Ecological services**

Forests provide the ecosystem service including the supply of NTFPs and habitats for wildlife. Services provided by the forest have a valuable influence on local climate and weather conditions resulting in the protection and conservation of watersheds and vegetations that support life and ecological balance. It is estimated that forests in the country protect over 4.5 million km² or almost one-third of the country's total watershed area (MAF & STEA, 2004). This has contributed significantly to the country's plentiful renewable freshwater resources estimated at 270,000 million m³ supplied annually. Further, it is estimated that water resources for irrigation produced an average gross return for rice cultivation of approximately US\$317/ha per year (MAF & STEA, 2004).

Some species of animals, insects, worms and other organisms are living in soil and other environments; their functions support the enhancement of resource quality and fertility, efficiency, and perform other related roles. Other wildlife species of mammals, birds, butterflies, and many others including some plant species are also acting as pollinators, seed dispersal agents, pest controllers, and pollution mitigation and regulation services, such as carbon sequestration, toxicity reduction, etc. An estimated valuation of carbon sequestration by maintaining Lao PDR forests as a carbon sink is given in Table 10. Using the estimates given in this Table, these figures can translate into an annual carbon sequestration value of climate change mitigation of US\$29.71 million a year.

Table 10. Estimated value of carbon sequestration by forests

Forest type	Area (ha)	Total carbon sequestered ('000 tonnes)	Value (US\$ million)
• Evergreen/mixed dense	1,589,653	238,448	1,788
• Evergreen/mixed disturbed	4,033,725	302,529	2,269
• Evergreen/mixed mosaic	2,113,086	105,654	792
• Deciduous	733,141	91,643	687
• Deciduous mosaic	600,227	30,011	225
• Regrowth forest	317,999	23,850	179
Total	9,389,828	792,136	5,941

Source: MAF & STEA, 2004

- **Tourism, trade and other productive uses**

During the period 2006-2007, exports of the industry and handicraft goods, mostly from the forestry and

natural resources sector generated US\$143 million in income, while timber and wood products reached US\$72 million (Committee for Planning and Investment, 2007). The export of minerals, which is also part of the natural resources sector, contributed the most for the projected US\$977 million export income for the given period.

However, at current commercial log prices, it is estimated that the commercial timber industry of the country alone has a market value of more than US\$62 million a year with more than a quarter of it generated from the export earnings (MAF & STEA, 2004). Likewise, the domestic noncommercial timber production in the country is estimated to have a market value of around US\$2 million a year. This production is mainly composed of polewood and low-grade timber used for domestic construction and repairs, fencing, poles, household furniture and other domestic uses, except for woodfuel. Woodfuel, both for domestic and commercial purposes, are estimated to have a market value of more than US\$500,000 per year (Table 11).

Table 11. Value of domestic and commercial woodfuel uses

Purpose	Consumption (tonnes/yr)	Value (US\$ '000)
Domestic firewood	5,455,985	4141.2
Commercial firewood	111,188	84.7
Household charcoal	9,489	260.0
Commercial charcoal	32,657	896.5
Total	5,609,319	5382.4

Source: MAF & STEA, 2004.

On the other hand, NTFPs contributed significantly as commercial NTFPs harvested are mainly plant exudates (resins, oleo-resins, Siam benzoin), medicinal plant extracts, spices/condiments, plant barks (paper mulberry or “po sa”/ *Broussonetia papyrifera*, *Persea kurzii*, *Boehmeria malabarica*), fruits (*Malva nuts*/*Sterculia lychnophora*), sugar palm (*Arenga pin-nata*, *Dialium indum*), and bamboo, rattan, broom grass, and other novelty stems & materials for the handicrafts industry (MAF & STEA, 2004).

In the export industry, NTFP estimated value at current commodity prices is between US\$6-7 million per year, which maybe more as these estimates did not include the high-value commodities, such as orchids, berberine vine (*Smilax glabra*), and some other NTFPs. As far as the ecotourism industry is concerned, it is estimated that the industry contributes about US\$53 million to the total Lao PDR’s tourism business (MAF & STEA, 2004).

- **Cultural**

Biodiversity plays an important role in the cultural & religious practices and way of life of the Lao people, especially in the rural areas. For instance, in the past elephants were significant animals to Lao’s religious and cultural affairs and continue to be so. Historically, “Pathetlao Lane Xang” means the land of million elephants, and most Lao people honor the animals as they are used as draught animals for carrying timber, rides for tourism purposes, and for transportation of people and materials.

Other wildlife species are normally raised as pets in many of the Lao homes. It is a common belief for many Lao people to bring life animals and birds for release at the temples, believing that they would bring good luck and good health. This is a typical practice of Lao people, especially as it can be found in practice at Si Muong Temple in the Vientiane Capital.

These cultural practices further boosted the ecotourism industry as more tourists’ interests are generated through Lao cultural tourism with more than 60% of the tourists wanted to enjoy the cultural attributes (MAF & STEA, 2004), which often relate to biodiversity since most Lao people live in close contact with nature. Table 12 below presents the summary of the total benefits derived from the various forest ecosystem resources as previously discussed.

Table 12. Summary of economic benefits to the industry derived from the various forest resources

BENEFITS	ECONOMIC VALUE (US\$ '000)*
• NTFP in household subsistence	186,200
• Commercial timber	62,259
• Cultural & nature-based tourism	61,635.3
• Commercial NTFP exploitation for export	37,035.3
• Carbon sequestration by natural forest	34,600
• NTFP in household cash income	29,870.6
• Household timber consumption	19,859
• Woodfuel	5,388.2
Total	436,847.4

*Estimated at Lao kip 8,500 = US\$1 Source: MAF & STEA, 2004.

Major Threats, Risks and Challenges

• Deforestation

Deforestation and forest degradation remain a significant environmental problem in Lao PDR. Deforestation rates in certain districts have been more than 20 percent over the period 1993-1997. Other blocks of forest are becoming increasingly fragmented and disturbed, resulting in a rapid contraction of mature forest nationally, and decreasing degrees of tree cover and crown density. In a number of upland forest areas, deforestation is mainly a result of logging and unregulated commercial exploitation.

Logging, both legal and illegal, is the main cause of deforestation. In addition to shifting cultivation, unregulated/under regulated logging concessions convert large tracts of healthy forest into more degraded lands. Despite, the government's regulations and policies for projects and companies to follow proper logging practices, these regulations should be strongly enforced by forest authorities. Likewise, these logging activities develop roads deep into the forest interior, creating easier access for wildlife hunting, which is another major threat in the country as far as biodiversity is concerned.

Food insecurity, unsustainable forest exploitation practices, energy needs, and poverty have necessitated local communities to practice shifting cultivation by clearing vast forestlands for agriculture purposes. As for the needs for energy resource, approximately, 80 percent of domestic energy consumption for cooking is based on fuel wood. The estimated amount of annual fuel wood used by local communities is about 4-5 million m³/year (about 1m³/ person/yr). This level of use often leads to excessive fuel wood gathering, tree felling, and further pressures on the remaining forests (MAF & STEA, 2004).

To meet these challenges, the government started the establishment of 400,000 ha of plantations in 1993. Today, however, only 57,281 ha of plantations have been planted, due to lack of appropriate investments, management techniques, regulations and procedures. Many of these plantations were replanted several times because of management failures and fires, and most of them performed poorly in strict economic sense.

• Forest fires

Currently forest fires, usually caused by the clearing of uplands and forests, is a significant threat to biodiversity of Lao PDR. Due attention and action must be taken on forest fire prevention to include information dissemination on proper guidance and methods of forest fire prevention for farmers clearing lands and fields. Strong enforcement of laws and regulations, including close monitoring of these implementations, should be done on areas of high bio-diversity.

Deforestation, shifting cultivation, and forests fire will all lead to the ultimate effect of loss of habitat, which in turn, results in the extinction of some species and the great reduction of biodiversity resources in the country.

- **Over harvesting & trading of wildlife**

Hunting activities in Lao PDR are mostly being done by the local communities in the uplands and remote areas. Wildlife meat is the staple source of protein for them, and the rest of these meats and other wildlife products are sold to the lowland markets and people. They hunt with modern and muzzle-loading guns, hunting dogs, snares and deadfall traps. The two main types of snares used in the country are made from nylon strings meant for small terrestrial mammals and bird, and made from cable, effective for large mammals including bear, tiger, sambar, muntjac and gaur. These activities usually result in over harvesting of these species causing their populations to continue to decline, to the extent that some of these species have become very vulnerable or may have become extinct such as the Chinese Three-striped Box Turtle *Cuora trifasciata*, kouprey *Bos sauveli* and some species of water birds. As the trend continues, more wildlife will risk becoming extinct in the next few years (Table 13).

Table 13. Some recent extinction in Lao PDR

SPECIES	STATUS/OBSERVATIONS
1. Asian two-horned Rhinoceros	Last reported in 1952; no specific location given
2. Kouprey	Last reported in 1980 in Southern Lao
3. Schaumburg's Deer	Last reported in 1990 in Phongsali province
4. Greater Adjutant	Not breeding in Lao PDR
5. Black-necked Stork	Not breeding in Lao PDR
6. Sarus Crane	Not breeding in Lao PDR
7. Chinese three-striped Box Turtle	No field or village records
8. Lesser one-horned (Javan) Rhinoceros	Last reported in the 1940's; no specific location given
9. Asian Tapir	Last reported in 1902 in Champassak province
10. Red Panda	Last reported in 1942 in Northern Lao PDR
11. Hog Deer	Last reported in 1993 in Southern Lao PDR
12. White-eyed Swallow	No report/observation documented
13. Little Tern	One pair known in the far South

Source: MAF & STEA, 2004.

Lao PDR has significant expanses of habitat and internationally important populations of many species, but a strong cultural appetite for hunting and a recent increase in trade are leading to major depletion of wildlife (Nooren and Claridge, 2001). Most of the wildlife trade in Lao is driven by demand outside of the trade, whose consumers include Lao, Chinese, Vietnamese, Thai, and various other ethnic minorities from different affiliations (government, military, large and small businesses).

Increasing domestic demand due to rapidly growing tourism industry makes these trades a growing threat to the wildlife resources in the country. A case in Phin District, for example, reveals that officials confiscated over US\$3,100 worth of wildlife intended for international markets as international demand is on the rise, a big challenge to the Lao authorities at present (Nooren and Claridge, 2001). The level of international trade in live animals and their parts has consistently risen over the last ten years, considered a grave threat and challenge to biodiversity conservation (Duckworth et. al. 1999; Anon., 1999a). It is estimated that 10,000 mammals, 7,000 birds and 4,000 reptiles are sold every year in different markets locally and internationally (WREA, 2009).

Animals of particular significance noted in the various trades included pangolins (mostly *Manis javanica*), freshwater turtles and tortoises, and monitor lizards. Cross-border wildlife trade with China and Thailand as documented by Martin (1992), involved deer antlers, birds' bills, elephant ivory, tiger bones, pangolin scales, and other wildlife products. Also trading were noted for live animals, meat and skins likely originating from Lao PDR that can be bought or ordered from some neighboring countries, such as the sun bear, mouse deer, barking deer, porcupine, civets, leopard cat, wild pig, pangolin, white-cheeked gibbon, pig-tailed macaque, and Douc langur (MAF & STEA, 2004).

Although hunting pressures in the country are increasing threats, the relative abundance of habitats and, in some areas, their relatively far distances from human settlements, have provided to some extent, temporary protection to the country's wildlife. However, the increasing human population and development

pressures will eventually have negative impacts on the wildlife population in the country. Related to this is the clear understanding on the importance of biodiversity and the wildlife resources among most of the Lao people, primarily believing that wildlife species are just wild organisms that have no importance, and most of the time posed dangers to humans and domestic resources.

Other threats to wildlife include loss of habitats, logging activities, conversion of natural forests to commercial plantations, hydropower development, road network development, loss of prey species, invasive alien species, and pollution.

- **Hydropower and road developments**

Hydropower development enables large tracts of land to get flooded and inundate areas during dam construction displacing wildlife from their natural habitats. Nevertheless, if hydropower projects develop funding mechanisms and use power revenues to support conservation and promotion activities related to biodiversity. Some trade offs maybe worth it such as the cases of the Nam Leuk and Nam Thuen II hydropower projects which make contributions to biodiversity conservation. For example, currently 1% of electricity export revenues from the Nam Leuk hydropower project is provided to support the management of the Phou Khao Khouay NBCA (WREA, 2009).

On the other hand, the current road development in the rural areas spur infrastructure development necessary to bring growth and progress in these underdeveloped places in the country. However, as accessibility is enhanced through this road network, access to protected areas also are facilitated which in turn, as mentioned earlier, encourages encroachment, increases over harvesting and trading of wildlife and other forestry resources, and other destructive activities that threaten the biodiversity in the protected areas. Hence, strict regulations and compliance with existing policies on the protection of the protected areas in the country must be strictly enforced and followed.

- **Pollution and poisoning activities**

The use of poisonous substances or materials for some economic activities is practiced widely in Lao PDR. However, the excessive use of poison and other allied substances, have large impacts on wildlife species and other biodiversity resources. Government regulations on the use of poison for fishing and hunting should be enforced by local authorities. Public awareness programs are needed to help local people understand the impacts of excessive poisoning of wildlife and agriculture pests such as insects and rats. Too much accumulation of these toxic elements and other wastes from the industry and the domestic users result in pollution threatening the whole environment and the human population in the country.

- **Alien invasive species**

Loss of biodiversity due to invasive species causes major economic loss as experienced in some advanced countries like the USA and various European countries. Threats to indigenous species notably amphibians and reptiles, from introduction of exotic species is not so prominent in Lao PDR (WREA, 2009). However, two potential sources are worthy of mention.

First, the Red-eared Slider *Trachemys scripta elegans*, a turtle native to southeast U.S.A., has been introduced in many countries around the world, including neighboring Thailand, by the release of animals from the pet trade (Jenkins 1995, Cox et al. 1998). This species was seen for sale in a Vientiane aquarium shop in December 1998 (BLS). Escaped individuals of this successful colonist could pose a threat to native populations of turtles by competitive exclusion or spread of disease, were the species to become popular for food, as pets or as release animals in Buddhist tradition. Whether the threat of colonisation by this exotic species outweighs the possible benefits from relieving pressure on native species as food and trade commodities, is still unknown.

Secondly, at least two commercial frog farms, one in Vientiane (J. Foppes verbally 1999) and one near

the Lao border in Ubon-Ratchatani, Thailand (T. Hansel verbally 1998) reported rare native ranid frogs that have been hybridised with a large African ranid (of a yet undetermined species) for domestic sale in markets. Native populations of frogs could be displaced or genetically altered by escaped individuals of these larger artificially-selected modified species (WREA, 2009).

- **Wildlife threats to human and domestic animals and crops**

In another point of view, threats from the wildlife resources to humans and domesticated crops and animals, are widespread in Lao PDR, although a number of them are declining compared to the previous years. On several situations, wild animals mostly tigers, attacked people, crops, and domesticated animals. However, these situations are mainly due to pressures from increasing human activities that cleared wildlife habitats for the cultivation, hunting, trade, and occurrences of forest fires (WREA, 2009).

In Nam Et NPA, one or two tigers were killed by farmer, while there were two or three domesticated animal attacks by tigers that happened in the area. In Nakai NamTheun, three villagers were killed by elephants and have caused several crop field losses. In 2000, a farmer shot two elephants when the animals raided a banana field in Ban Na located in Phou Khao Kouay NPA. Since 1998, elephants are raiding some planted crops, and it is increasing every year including attacks on humans

Agricultural Ecosystems and Resources

Agricultural development is the main sector of the entire Lao PDR economy, contributing more than half of the country's GDP. In tandem with its development is the general consideration on its agricultural ecosystems and resources. The country's strategic vision of the agricultural development has comprehensively analyzed the agro-economy of the Lao PDR in two areas namely the flatland areas along the Mekong and its tributaries and the upland areas (WREA, 2009).

The Agricultural Habitats & Classifications: Status and Trends

There are three main agricultural climatic zones that divide the overall agro-ecological landscape of the country (UNEP, 2001):

- **Moist to dry sub-tropical climate**

These areas received an annual rainfall between 1,500 to 2,000 mm with relatively cooler dry season, and hence, higher intra-annual temperature variation than the rest of the country. This climatic zone characterizes the mountainous north with steeper slopes and elevations over 1,000 m. Soils in these areas tend to be heavily leached and acidic with low water retention capacity and generally low fertility. Thus, the combination of rugged terrains and relatively poor soils leave little room for intensive agricultural production.

- **Tropical monsoon climate**

Annual rainfall in these areas ranged from 2,500 to 3,500 mm apart from some localized rain shadow zones on the Bolaven Plateau. This climate is dominant in the mountainous part of the Central and South of the country that has elevations between 500 to 1,000 m (and some peaks over 2,000 m) but with generally moderate slopes. Soils in these areas resemble those in the North except for the Boloven Plateau which has deep, well-structured, less acidic soils with relatively good water retention and drainage capacity.

- **Moist tropical climate**

It has rainfall amounts varying from 1,400 to 2,000 mm that dominates the areas of the river plains along the Mekong and its tributaries that include the Vientiane plain, the narrow plain in Borikhamxay and Northern Khammouane, and Savannakhet and a series of smaller plains in the southern provinces of

Champasak, Saravane and Attapeu.

These production areas support more than 50% of the country's population. The floodplains and adjacent levies are generally characterized by recent alluvial deposits which are acidic and shallow, with low organic matter and low fertility.

Farming and Production Systems

As agriculture dominates the economy of the country, it is estimated that more than 80% of the population relied heavily on agriculture and fisheries for their livelihood (MAF & STEA, 2004). The sector is dominated by subsistence production, mainly rice cultivation, with some growing trends on market potential cash crops like coffee at present. There is a relative stability on the sharing of different crops in agricultural production for the past ten years.

Based on agroecological system zones in the country, three main farming systems classified into five types are commonly practiced as presented in Table 14. These farming systems are basically rice-based as Lao PDR lies within the center of the domestication of Asian rice, particularly the glutinous types, which are also popular in the neighboring Northern Thailand (MAF & STEA, 2004).

At present, in line with the different dominant farming systems in the country, 16 predominant rural production systems were further identified and classified into three main types as practiced by various ethnic communities (Table 14). These production systems have two common elements in them: (1) the cultivation of rice (glutinous or non-glutinous) as the staple food, and (2) the diversified livelihood strategy.

Table 14. Main farming systems in the Lao PDR

AGROECOLOGICAL ZONE	FARMING SYSTEM	CHARACTERISTICS
Lowland	Lowland Rainfed	Single cropping of traditional glutinous rice varieties (80%), 2-4 varieties of different maturation; Yields 1.1-3 tons/ha (estimates); Buffalo & cattle for draft, cash income & occasional meat, free ranging during the dry season, confined when in rainy season; Pigs, poultry, fish & NTFPs used for food & cash income
	Lowland Irrigated	Double cropping of traditional photoperiod-sensitive rice varieties, with higher use of improved varieties, and fertilizers, etc. for the 2 nd crop, mainly for cash income; Wet season yields 1-3 tons/ha, dry season 2-4 tons/ha; Dry season vegetables grown in areas near urban centers; Relatively few livestock due to shortage of grazing land, buffaloes are used for ploughing, smallstock for meat & cash income
Upland	Upland Rainfed	Shifting cultivation for rice, yields 1.4-1.5 tons/ha intercropped with cucumber, chillies, taro, sesame, etc. on sloping land with fallow periods of 8-10 years; Maize for livestock is 2 nd most important crop; Other crops: sweet potato, ginger, cassava, groundnuts, soybean, cotton & sugarcane, papaya, coconuts, mango, tamarind, banana, and citrus (more fruits at lower altitudes); Melons & watermelons are dry season crops in some areas; Pigs, cattle & poultry are main livestock; High dependence on NTFPs for income to buy rice, etc.; Adoption of paddy cultivation is becoming rapidly possible
	Highland	Similar to the upland rainfed farming system, but with high altitude crops such as opium, sometimes intercropped with lettuce & mustard, and temperate fruit trees like plum, peach & local apple
Plateau	Plateau	Coffe, tea, and cardamom, have largely replaced shifting cultivation; Supplemented by fruit trees & vegetables in home gardens; Poor cash crop quality & yields due to poor management, use of poor varieties, lack of fertilizers & shades, weeds, poor harvesting & drying techniques; Cattle are important as a savings enterprise; Pigs & poultry are also raised

Source: MAF & STEA, 2004 Source: MAF & STEA, 2004.

Rice varieties and other crops diversity

In addition to the traditional rice varieties grown in the country, hybrids from cultivated and wild rice types are also commonly used by farmers. The richness and diversity of rice varieties in Lao PDR can be seen from the 3,169 distinct names given to the different traditional varieties (MAF & STEA, 2004). In the traditional lowland rainfed ecosystem, farmers grew 3-5 different varieties on the average in the same field and sometimes up to 18 varieties in a single village.

Diversity is even higher in the upland ecosystem as up to 13 different phenotypes of rice, all with distinct names, can be found in one single field. Farmers growing various rice varieties use them as their main strategy of reducing risks due to climatic variations, pests and diseases, etc., as well as the even distribution of labor demand, and to meet the desired grain quality and specific consumption demands. On the varietal conservation efforts, the National Agricultural and Forestry Research Institute (NAFRI) currently have 13,193 samples of cultivated rice and 237 samples of wild rice genetic materials to beef up the country's rice production resources. Many wild rice species are abundant in Lao PDR such as those related to *Hygroryza* as described in Table 16.

Table 15. Types of agricultural production systems in Lao PDR

Table 16. Types of agricultural production systems in Lao PDR

TYPE	SYSTEM CLASSIFICATION	PRODUCTION SYSTEM PRACTICES
1	Main Upland Rice-based Production System	<ul style="list-style-type: none"> a. Glutinous rice, vegetable, small livestock, hunting, gathering NTFPs, handicraft, woodcraft, basketry (everywhere in remote mountain areas, especially in Mon-Khmer communities) b. Glutinous rice, vegetables, cash crops (cotton, sesame, groundnut, soybean, sugarcane, castor beans), small livestock, hunting, gathering NTFPs (everywhere in accessible valleys where produce can be transported, especially in Mon Khmer communities and the Tai-Kadai group) c. Non-glutinous rice, vegetables, maize, opium-poppy, small livestock (sometimes large animals), hunting, gathering NTFPs (in the Northern Region in Hmong-Yao and Tibeto-Burman communities) d. Glutinous rice, benzoin trees, vegetables, small livestock, hunting, gathering NTFPs (Mon-Khmer language speaking groups of some districts in Houaphan, Xieng Khouang, Oudomxai, and Phongsaly) e. Glutinous or non-glutinous rice, seasonal work, small handicraft, small livestock, vegetables, gathering NTFPs, selling products in markets (in areas of reduced forest cover, near communication networks and where employment is possible, mainly in Mon-Khmer & Tibeto-Burman communities)
2	Main Wetland Rice-based Production Systems	<ul style="list-style-type: none"> a. Glutinous rainfed lowland rice (South, Central, North) or wet-season irrigated rice (with supplementary irrigation), buffaloes, cattle, small livestock, fish culture, vegetables, fruit, weaving, with hunting & NTFP collection near mountains (Tai-Kadai & groups of other ethno-linguistic families) b. Glutinous rainfed lowland rice (South, Central, North) or wet-season irrigated rice (with supplementary irrigation), buffaloes, cattle, small livestock, fish culture, vegetables, weaving, handicraft, services (rice milling, ploughing, etc.) temporary labor, processing of products for marketing (Tai-Kadai, some Mon-Khmer communities, Hmong-Mien around Vientiane; people living around main cities and close to Thailand borders) c. Intensive irrigated rice (glutinous & non-glutinous, double cropping), mechanization, processing & marketing of rice, other service activities & trade (Tai-Kadai communities in irrigated plains along the Mekong & some areas such as Phien district of Sayaboury, Vang Vieng district of Vientiane, the irrigated plains of Oudomxai & Luang Namtha) d. Glutinous rice, buffaloes, small livestock, riverbank vegetables, fishing, small trade (Tai-Kadai along the Mekong)
3	Other Main Production Systems	<ul style="list-style-type: none"> a. Large animals, small livestock, secondary crops, hunting, NTFP collection, opium-poppy (Hmong of Nonghet district in Xieng Khuang, some Tibeto-Burman groups in Phongsaly and some Hmong in Samneua district of Houaphanh) b. Buffaloes or cattle raising, glutinous rice, small livestock, vegetables, small trade (Tai-Kadai in Pek and Khoun districts of Xien Khouang, some Mon-Khmer villagers on the pastoral lands of Oudomxai, Luang Namtha & Phongsaly) c. Buffaloes, cattle, coffee, tea, cardamon, castor beans, fruit, small livestock (Mon-Khmer & Tai-Kadai on Boloven Plateau) d. Fishing, hunting monitor lizards & tortoises, riverbank vegetables, small livestock, small trade (Kai-Kadai along middle & lower Mekong) e. Various village activities linked to markets, intensive vegetable production, weaving, mushroom cultivation, marketing, small trade, handicraft, seasonal labor (areas around urban centers & near Thai borders, (located between Vientiane & Champasak; Tai-Kadai & some Khmer)) f. Systems based on local opportunities such as charcoal production, contracted handicraft, seasonal labor in Thailand, urban labor opportunities, community projects (peri-urban areas & along the Thai border) g. Contract-based cash crop production such as cotton, groundnuts, sesame, beans, maize, mulberry, Job's tears, etc., also for tree-seed production (Tai-Kadai & Mon-Khmer along borders to Thailand & China (Vientiane, Sayaboury, Bolikhamsay, Kammouane, Savannakhet, Champasak, Luang Namtha, Bokeo, Luang Prabang))

Source: MAF & STEA, 2004

Aside from rice and corn, other major important crops grown in the country include root crops such as cassava, sweet potato, taro and *manh phao*, soybeans, groundnuts, bushy peas, sugarcane, cotton, coffee, tea, cardamom, tobacco, sesame, Job’s tears, and rubber (MAF & STEA, 2004; Committee on Planning & Investments, 2009). Generally, the biodiversity of other crops than rice is not well known due to limited if not absence of detailed systematic study or research on these resources.

On the other hand, the dominant highland agriculture systems use mainly the shifting cultivation strategy among farmers to distribute the cultivation of their main staple crop(s) over many sections of the land for some period of time to restore and regenerate land resources fertility. This is also the natural way of the ethnic farming communities in the country to keep the ecological balance and preserve the environment. Nevertheless, regardless of whatever production systems, farming systems or livelihood strategies Lao people are employing, their heavy dependency on natural resource-based agriculture made them highly vulnerable to natural disasters and climate change, as well as to unstable or changing economic conditions like most countries worldwide.

With the government’s intent to eliminate slash-and-burn cultivation and implement an integrated rural development as part of its poverty reduction and environmental conservation strategies, major policy shifts have been focused on the 47 poorest districts of the country. One such major policy is the handover of forest lands into major agro-forestry production areas focusing in 8 primary concerns to provide alternative livelihoods to slash-and-burn agriculture (Committee for Planning and Investment, 2007).

Table 16. Major species of wild rice in Lao PDR

Specie	Characteristics
<i>O. rufipogon</i>	A perennial plant found near ponds, along roads and paddy fields' partition dikes; Reproduces vegetatively and by seeds, with a height of 3-5 meters and carries long panicles with red tips
<i>O. nivara</i>	An annual plant that occurs in shallow water ponds and reproduces by seeds, grows up to 2 meters high and carries prolific panicles with long red-tipped grains
<i>O. granulate</i>	Occurring in dry environments, and in bamboo shade, is commonly found in the North of the country
<i>O. officinalis</i>	Usually found in water canals in the province of Khammouane
<i>O. ridleyi</i>	Commonly found in bamboo shade near stagnant water in Champasak province

Source: MAF&STEA, 2004.

These concerns cover the following: (1) persuade people to practice wet rice cultivation, (2) industrial crop production, (3) fruit plantations, (4) livestock and fisheries, (5) integrated agriculture, (6) industrial tree plantations, (7) forest products, and (8) microfinance. The implementation of these priority concerns resulted in 25,000 families planting maize for livestock production, 2,000 families involved in grass production for cows, 1,00 families engaged in eco-friendly agriculture, 1,000 families planting rubber trees, plantations of forest products and cardamom, 1,100 families involved in integrated agriculture (plantation crops plus livestock), and 65,000 families engaged in commercial plantations.

The Agricultural Resources Management Systems: Importance to Economy and Biodiversity Conservation

Agriculture has a significant contribution to the Gross Domestic Product (GDP) of the country. Its GDP growth rate is generally increasing (Table 17). In the past years, the growth of agricultural production in lowland shifted from the self-subsistence economy to the market-oriented production as farm households can produce for their own consumption with a surplus for reserve and for sale.

The Agriculture Industry

In 2006-2007, irrigated rice area reached 72,800 ha which is 91% of the yearly target. Production was 329,000 tons or roughly 13% of the total production of 2.59 million tons for the same period. However, the total production is 11,000 lower than the expected target according to the National Socio-Economic Development Plan 2007-2008 (Committee for Planning and Investment, 2007).

For wet season rice production, a total of 631,463 ha were cultivated, which is 1% above the target for the period 2006-2007. However, an area of 35,433 ha was destroyed by natural disasters (flood, drought and soil erosion) giving only an estimated production of 2.09 million tons for the given period. Upland rice production contributed 175,000 tons out of the total cultivated area of 104,585 ha for the same period.

Table 17. GDP growth rates and trend of Agriculture relative to the other sectors and the population

Description	Unit	2004 – 2005	2005-2006	2006-2007
Total population	'000	5,610	5,722	5,831
GDP at current prices	US\$M	2,840	3,248	3,448
GDP at constant prices	US\$M			
GDP growth rate	%	7.2	8.1	8.0
- Agriculture	%	2.7	2.8	2.8
- Industry	%	15.1	16.8	15.7
- Service	%	6.9	7.2	7.4
Share of GDP				
- Agriculture	%	45	42.9	40.9
- Industry	%	28.8	31.1	33.1
- Service	%	26.2	26	26
GDP per capita	US\$/head	506	568	678

Source: National Socio-Economic Development Plan 2007-2008

Meanwhile, a land management survey was done covering a total area of 99,349 ha (Committee for Planning and Investment, 2007) to determine land allocations for the different land management units devoted for agro-forestry in 3 locations in Vientiane and Saravane provinces. The survey yields that rubber tree plantations cover 24,520 ha, cassava production has 10,000 ha, 7,500 ha for sugarcane production, jatropha production has 1,000 ha, stake acquisition is 15,000 ha, and flood stake acquisitions is 25,300 ha. Forest allocation for production and rural development projects in 63 locations of the provinces of Khammuane, Savannakhet, Saravane and Champasak covered an area of 577,403 ha.

Other food production sources contributed a total of 700,966 tons from a total area of 130,959 ha during the dry season (Table 18). Total meat production was 90,700 tons for the same period, mostly from livestock and poultry.

Commercial production of major plantation products and exports for the same period include 501,907 tons of maize, 20,907 tons of coffee, 2,992 tons of tobacco, 379 tons of cardamon, 339,059 tons of sugarcane, 28,447 tons of peanut, 11,858 tons of soybean, 2,595 tons of mung-bean, 1,683 tons of tea, 22,034 tons of sesame seeds, 17,417 tons of Job's tears, and 400 tons of rubber.

The animal industry (only for livestock and fishery) growth rate was 3% per year on the average with animal registration records reaching a total of 117,964 for the period 2006-2007 (Committee for Planning and Investment, 2007). For the period, there are 117 cattle farms with 11,636 cows, 285 pig farms with 54,252 heads, 30 sheep farms with 2,056 sheep, and 185 poultry farms with 488,000 birds.

Table 18. Other Food Production Sources and their Production Outputs.

Commodities	Production area (ha)	Production output (tons)
Seed plantation, (starchy rootcrops)	74, 971 (18, 983)	426, 415 (151,664)
Other vegetables	27, 967	139, 835
Fruit plantations	15, 418	92, 508
Sweet corn	12, 603	42, 208

Source: National Socio-Economic Development Plan 2007-2008.

Value of Agricultural Production & Resources

For the animal industry including fishery, there is a continuous exportation of cattle, buffaloes, free range pigs, fish and some animal products such as horn, skin and bones with estimated total value of US\$25 million. The country's agriculture-based food processing reached US\$15.14 million.

Overall, exports of agriculture-based products and animals amounted to US\$70 million during the period 2006-2007 (Committee for Planning and Investment, 2007).

Major Threats and Risks – Implications to Food Security & Biodiversity Conservation

Rising food prices contributed to an acceleration of inflation across the Asia and Pacific region during 2007, and in 2008 the further rise in food prices reached alarming proportions. There is a clear and present danger that rising food prices will have significantly adverse impacts on the ongoing poverty reduction efforts in developing countries in Asia.

Key contributing factors to the recent food price increases are both on demand-side and supply side. Demand for meat, dairy and high value food has experienced rapid growth. Causes on the supply-side include declining productivity, population growth outstripping productivity growth, underinvestment in agricultural R&D, land degradation, water scarcity, increasing land conversion to non-agricultural uses, rising energy prices and growing demand for bio-fuels driven by oil prices and climate change concerns. In ensuring sustainable food security, it is critical to address the ecological foundations of agriculture, namely, land, water, biodiversity and the atmosphere.

In contrast, the farmers in the upland mainly live on subsistence production and have no market connection, primitive production techniques and lack of capital for development. Moreover, the growth of population in that area increases the pressure in the use of natural resources and environmental degradation. The Comprehensive Food Security and Vulnerability Analysis (CFSVA), the first nation-wide food security study undertaken in rural Lao PDR by the World Food Programme(WFP), found out that two thirds of the rural population are food insecure (13%) or live on the edge of food security boundary and could become food insecure should a shock occur during the year. The study findings indicate that chronic malnutrition is as high today as it was ten years ago and the poor are very vulnerable to natural hazards (floods and droughts) and current climatic variables and future projected climate change.

In 1999, about 600,000 ha were identified as shifting cultivation land. The ongoing *Land Use Planning and Land Allocation* aims to provide farmers with permanent land titles, with the purpose of improving agricultural production through improved investment when farmers get security of tenure. However, farmers often lack knowledge, skills and resources in the transition phase, and therefore continue to practice shifting cultivation. At least, half of the country's population practices swidden agriculture on forest lands to grow upland rice and other crops.

The total production of various agricultural commodities from 2005-2008 is summarized in Table 19 comparing the implemented production against the planned production targets.

Table 19. Total production of various agriculture commodities for the period, 2005-2008

Commodity	Implemented (2005-2006)		Planned (2006-2007)		*Implemented (2006-2007)		Planned (2007-2008)	
	Area (ha)	Volume (tons)	Area (ha)	Volume (tons)	Area (ha)	Volume (tons)	Area (ha)	Volume (tons)
• CROPS								
Wet-season rice	618,820	2,161,400	625,000	2,210,000	631,463	2,084,764	635,000	2,286,000
Irrigated rice	68,500	310,000	80,000	345,000	72,800	329,126	90,000	414,000
Upland rice	109,255	192,300	85,000	170,000	104,585	174,526	100,000	170,000
Sweet maize	113,815	449,945	68,383	22,195	68,383	22,195	12,603	42,208
Vegetable	83,835	669,200	19,300	810,000	68,157	286,047	89,700	830,500
Fruit	-	-	34,000	357,000	15,418	92,508	41,830	449,600
Tobacco	5,660	2,428	5,500	25,000	4,630	21,045	5,700	26,200
Cotton	2,560	2,370	2,500	2,100	2,318	2,253	2,750	2,450
Sesame seeds	15,420	14,840	7,000	7,000	16,112	22,034	13,000	9,700
Sugarcane	6,070	218,430	138,000	420,000	6,648	339,059	13,800	941,000
Coffee	43,140	25,250	42,750	27,550	0	20,927	54,750	28,250
Job's tear	-	-	12,500	18,500	14,253	17,417	13,700	9,700
Maize	71,910	314	77,000	355,000	114,430	501,907	87,500	388,000
Soybean	10,000	12,900	11,500	14,500	9,632	11,858	14,000	20,000
Peanut	-	22,730	17,500	26,500	15,787	28,447	22,000	36,300
Black bean + mung bean	3,220	3,610	6,000	8,000	3,731	3,630	6,300	7,100
• ANIMALS		('000 heads)		('000 heads)		('000 heads)		('000 heads)
Buffalo	-	1,108	-	1,116.8	-	1,116.8	-	1,146
Cow	-	1,320.6	-	1,320.3	-	1,320.3	-	1,350
Pigs	-	2,032.5	-	1,987.4	-	1,987.4	-	1,987
Sheep, goat	-	210	-	172.9	-	172.9	-	267.8
Poultry	-	20,802.5	-	20,192.2	-	20,192.2	-	20,192

*Estimated

Source: National Socio-Economic Development Plan 2007-2008.

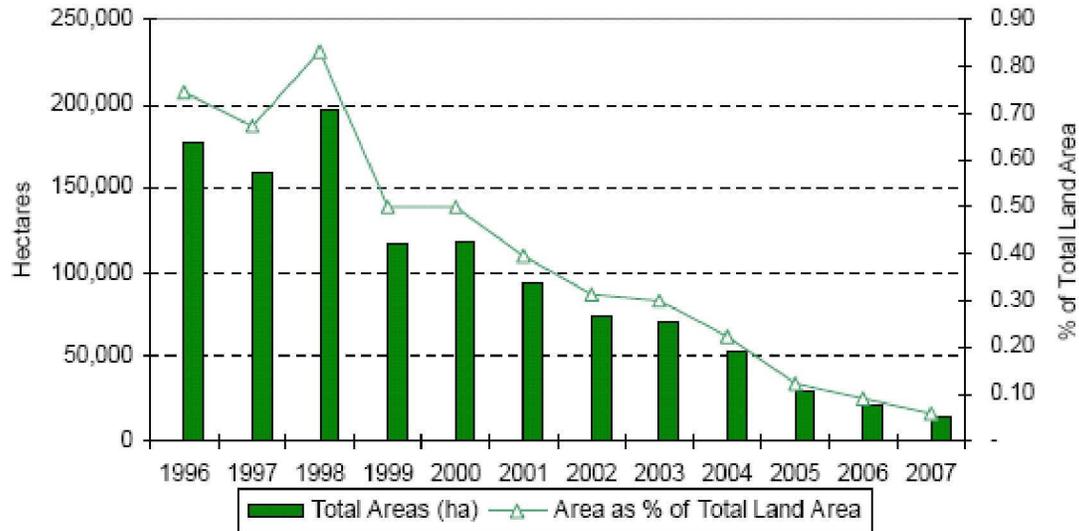
Since 2006, an estimated 146,000 hectares of planted forests have been established, particularly in a recent planting boom, primarily by large foreign companies according to the Lao PDR MDG Report (2008). This limits the area available for farming of food crops. Farmers themselves are also beginning to use agricultural land for plantations instead of agricultural production. In some instances, natural forests have been cleared to establish planted forests. A multi-stakeholder process to prepare the national guidelines for responsible management of planted forests is under way to enhance the social, cultural, environmental and economic benefits of planted forests.

In addition to farming, rural families also collect edible forest foods and medicines, hunt, and raise livestock on common land. In fact, many communities depend on the forest for more than half of their food supply throughout the year. Thus, the sharp decline in forest cover poses grave consequences for livelihoods as well as for wildlife and plant diversity.

It is however, significantly noted that the percentages of villagers involved in shifting cultivation in two Lao Biodiversity Conservation Initiative (BCI) sites is declining since 1990 up to the present (Figure 8), and is projected to be on a downward trend onwards to 2012 (ADB, 2008). Hence, as other villages remain

under pressure to abandon upland rice production, it is necessary to find a balance between effective forest management and conservation practices vis-à-vis alternative sources of food security for the upland population.

Figure 8. Trends and projections in shifting cultivation in 2 representative villages in Lao BCI site.



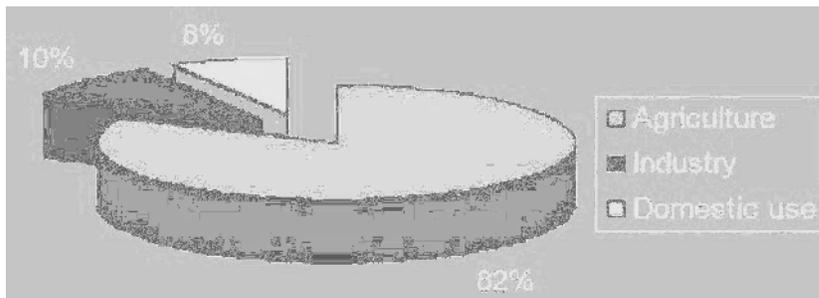
Source: WREA, 2009

Aquatic Ecosystems and Resources

The country receives annual rainfall between 1,300 mm in the North and 3,000-3,700 mm in the South. An estimated 35 percent of all water in the Mekong River originates from watersheds within Lao PDR; these watersheds form 26 percent of the Mekong Basin. About 80 percent of the water flows in streams during the rainy season, and the rest in the dry season.

Water resources are used for agriculture, fisheries, hydropower, navigation, tourism and municipal supply. Total water withdrawal was estimated at 1,000 million m³ in 1987, of which 82 percent went for agriculture, 10 percent for industry and 8 percent for domestic use (Fig. 9). The relative proportions have changed little since then.

Figure 9. Total water uses in the different economic sectors in Lao PDR.



Source: Lao PDR MDG Report 2008

Water resources are one of Lao PDR's principal assets, with total surface water standing at more than 55,000 m³ per capita annually. Indeed, Lao PDR has the highest per-capita water supply among all Asian countries. However, little of the national available water supply is developed: Total storage capacity of large reservoirs is only 7,000 million m³, or 2.8 percent of annual surface water supply.

Total water availability (assuming no obligation to downstream countries) is 270 billion m³ per year. Yet in 1999, total water developed was 5.7 billion m³ per year -- or about 2 percent of the existing capacity; the current estimate is between 2 and 5 percent. Efficient use of water resources remains a critical factor in realizing the Government's dual strategic objectives of poverty reduction and sustainable economic growth.

The Inland Waters and Aquatic Habitats: Status and Trends

The Nam Tha watershed is the first major tributary of the Mekong River after it enters Lao PDR. It is an important watershed, being used to support agricultural production and electricity generation along the Luang Namtha plain. Three large river watersheds drain southward to the Mekong: the Nam Tha, Nam Fa, and Nam Long.

The Mekong is one of the most species-rich river systems in the world with 1,300 species of fish, including the largest freshwater fish in the world – the Mekong giant catfish (WWF, 2009). The native fish fauna in Lao PDR is known to include 47 out of a total of 91 families recorded in the Mekong Basin.

In the Indochinese Peninsula, despite limited surveys, 87 families of fish have been identified in comparison to 74 families in the whole of Africa and only 60 in South America. About 500 indigenous fish species are reported to live in the Mekong River and its tributaries within the borders of the Lao PDR. Of the total number of indigenous fish species, about 25 species are used in aquaculture. There are 30 commonly occurring fish species within the Lao section of the Mekong which migrate between at least two different countries.

Fisheries in Lao PDR play an important economic role. Hundreds of wild fish species are caught as well as a wide range of other aquatic animals, including shrimp, crab, mollusks, insects, snakes and turtles. Most rural people rely on aquatic biodiversity resources as their main source of protein, fat, vitamins, iron and calcium.

Inland fish make up 43 percent and other aquatic animals 5 percent of animal protein consumed. Fishing takes place in the Mekong River and its 14 tributaries, as well as in large reservoirs, floodplains, swamps and rice fields. Assessing the size and value of the capture fisheries is difficult and complex because of the diversity of habitats and species, the seasonal variability of the yield, and the dispersed geographical spread of different fishing techniques.

Livelihood analysis by Shoemaker et al. (2007) in the Xe Bang Fai river basin revealed that "from place to place and from season to season, different ethnic groups take advantage of the natural wealth of the basin in different ways." Livelihoods of rural communities living in seasonally flooded habitats in southern Lao PDR are closely linked to the preservation of biodiversity in these ecosystems. No definite way exists of discriminating between the relative proportions of the two sources of production, capture fisheries and aquaculture production.

FAO estimates suggest that aquaculture accounts for about 60-70 percent of annual fish production in Lao PDR and conversely, capture fisheries account for some 30-40 percent. It is estimated that aquaculture production is increasing. While it is still a relatively limited contributor to fish supply in rural areas, its share in supplying fish for urban and peri-urban areas is growing. Yet rivers, streams, wetlands and rice fields still provide a vastly more diverse and significant source of fish and other aquatic biodiversity. Increasingly, wetlands are being converted into rice fields, even as the connectivity between rice fields and natural waterways must be maintained to ensure recruitment of fish to paddy fields.

Healthy aquatic life in inland water resources of the country, especially the Mekong River Basin, depends on water of good quality, with acceptable concentrations of dissolved oxygen and low concentrations of toxic ammonia. Likewise, pH values of these waters are not too low, and concentrations of nutrients are balanced necessary to support aquatic resource primary production.

Assessment by the Mekong River Commission (MRC) of some mainstream stations of the Mekong Basin located in Lao PDR from 2000 to 2006 rated excellent as far as the protection of the aquatic life is concerned (Table 20). This situation is generally true also to other ASEAN countries in the Mekong Basin except for Vietnam where some portions of the river deteriorated from its excellent rating to just “good” rating as shown in Fig. 10. This situation is primarily attributed to salinity intrusion and increasing nutrient concentrations (MRC, 2008).

Table 20. Lao PDR’s MRC stations along the Mekong River Basin, 2000-2006

Station Name	Class						
	2000	2001	2002	2003	2004	2005	2006
- Houa Khong	A	A	A	A	A	A	A
- Luang Prabang	A	A	A	A	A	A	A
- Vientiane	A	A	A	A	A	A	A
- Savannakhet	A	A	A	A	A	A	A
- Pakse	A	A	A	A	A	A	A

Note: Rating of “A” means excellent thus, all aquatic life is protected with a virtual absence of threat or impairment.

Source: Mekong River Commission (MRC), 2008.

Due to this alarming situation, routine water quality monitoring is being done on four (4) main parameters: Total Suspended Solids (TSS), Total nutrients (phosphorous, nitrite-nitrate), and Organic matter expressed as chemical oxygen demand (COD). Results of the monitoring efforts of MRC showed very positive picture of the water quality for Lao PDR’s part of the Mekong River System.

The Aquatic Resources Management Systems: Importance to Economy and Biodiversity Conservation

In Lao PDR, 71 percent of all farming households fish part-time on a seasonal basis. Besides fish, small aquatic species including snails, frogs, clams, crustaceans, etc, are an important source of nutrition for rural poor households, providing animal protein, vitamins, and minerals.

Given the importance of aquatic resources to food security and as a supplement to household income, there is an urgent need for baseline and monitoring studies of fish, fisheries and aquaculture to reliably predict the impacts of water resource development, pollution, and use of aquatic resources. Awareness of the value of fisheries and aquatic resources to the subsistence economy of Lao PDR also needs to be raised.

The Aquaculture and Fishery Industry

In Lao PDR, maintaining biodiversity concerns the livelihood of the majority of the population, the basis for sustained economic development and therefore the sustainable use of the nation's biological resources. It is part of the 70 million people dependent on the Mekong River's fishery and aquatic resources for their livelihood (WWF, 2009).

The sustainable management of the country's terrestrial and aquatic environments is essential to ensure the sustainable use and conservation of biodiversity. Therefore, the Lao PDR needs to bridge the gap between current efforts and the effective identification, conservation and sustainable management of the country's rich biodiversity by cooperation and coordination from all levels of government and within the entire Lao society.

Value of Production and Resources

Currently, the inland fishery of the lower basin of the Mekong River is the largest in the world with a value of US\$2 billion per year (WWF, 2009). Per capita, Lao PDR consume approximately 40 kg of fish each year and accounts for a significant portion of the household's income (WWF, 2009). For instance, in Southern Laos, over 80% of households participate in fisheries, accounting for around 20% of the income of households.

Major Threats & Risks – Implications to Economy and Biodiversity

Man-made alterations to water flow and discharge, resulting from water resource developments, modifies aquatic habitats and consequently affects fish and other aquatic organisms' migratory behavior and spawning, water quality, and the availability of food resources for fish. Other major threats to aquatic ecosystems include water pollution (domestic, industrial, aquacultural and agricultural sectors), over harvesting, and introduction of exotic species for aquaculture.

- **Sedimentation loads on rivers**

The overall state of land resources degradation, especially on the increasing state of soil erosion, generally affected the state of sedimentation loads recorded in the rivers of major watersheds in the country. Leaving out the Mekong itself, the conditions of which are also affected by factors beyond Lao PDR, the sedimentation load situation is reflected in the water quality status as shown in Fig. 10.

Figure 10. Water quality status of the Mekong Basin among the GMS-AMS



Source: MRC, 2009.

Major Implications and Challenges to Biodiversity Conservation

Unsustainable commercial logging, accelerated by the need for Lao PDR to raise capital from exports combined with neighboring countries' increasing demand for wood, since many countries in region have enacted logging and timber export bans, remained a major challenge and resilient factor to consider in the attainment of the MDGs and sustainable biodiversity management in the country. The increasing shift to plantation forests for commercial logging provides some temporary relief to this challenge but not in the long-term. Agro-forestry and diversified forest systems coupled with innovative high-value product development offer a more sustainable strategy in facing this major concern in the future as emphasized in the country's 2015 targets contained in the MDG Report of 2008 (Table 21).

Table 21. Sustainable Environment and Natural Resources Management 2015 Targets

	1991	1995	2002	2005	2006	2015 Target
Proportion of land area covered by forests (%)*	47 (1992)		42			Under consideration
Consumption of Ozone Depleting Substances (metric tonnes)**		50 (1999)	42	19	18	0
Proportion of total water resources used (%)**		2 (1999)			2-5	

Sources: * Department of Forestry, MAF. **STEA

Wildlife hunting for consumption and trade is another major challenge to sustainable biodiversity management. Wildlife comprises up to 80 percent of protein of rural households and major portion of income from local and international trades. Each year an estimated 10,000 mammals, 7,000 birds and 4,000 reptiles are sold in various markets. As conservation of biodiversity resources is taking a center stage in many of the country's sectors, challenges and threats to this effort will be more enormous. Nevertheless, employment of sustainable strategies to overcome these concerns will have to be done as immediately as possible.

Further, wildlife and non-timber forest resources produce provide vital sources of subsistence and cash income for an impoverished, marginalized and widely dispersed rural population. Inherent vulnerability of national biodiversity conservation areas management system created by this financial dependency remains a biggest threat to conservation efforts.

Promotion of ecotourism and related activities in the country, reinforced with sustainable natural resource management measures such as the use of NTFPs or lesser-used timber species, conservation farming, buffer zone management, etc., and coupled with effective formulation and enforcement of conservation-related policies and regulations could provide some ways of addressing these concerns.

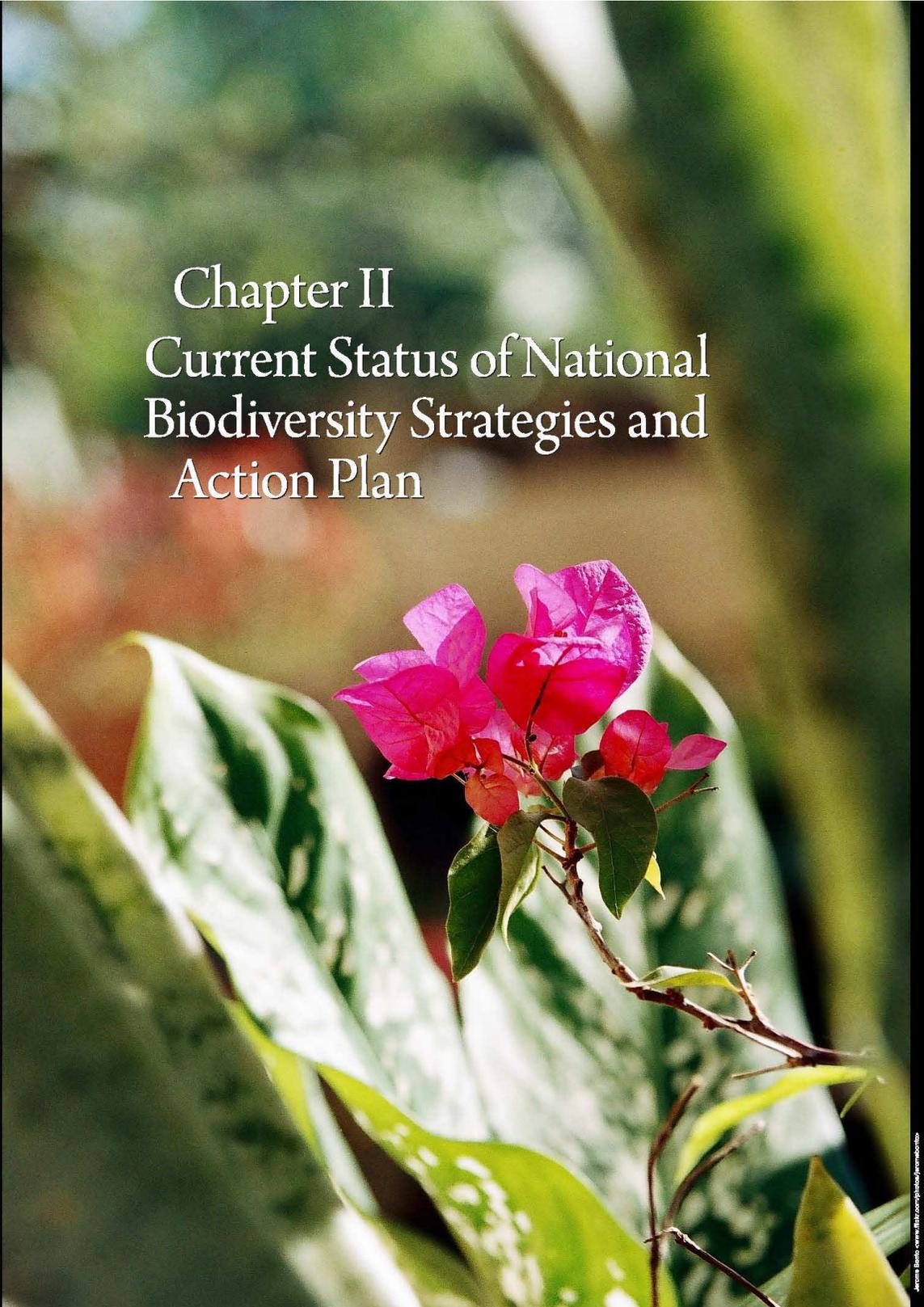
Hydropower development is a potential concern despite its importance as source of national export income. The development of this resource may be detrimental to forest, wildlife and cultural values despite mitigation by portion of revenues for national biodiversity conservation area management.

Other development priorities and activities including road construction, logging, peat, commercialization of agriculture and large scale farming with pesticides, which require increased availability of suitable land, may lead to direct and indirect negative impacts on forest and forest resources within the NBCAs. These infrastructure developments, especially road construction, are accelerating the exploitation of natural resources, exacerbated mainly by uncoordinated planning and implementation.

Gaps in technical capacity at policy and management levels and instability at the political and administrative system enhanced by unsustainable practices such as shifting cultivation and shrinking fallow periods due to expanding population and cultural preference, thereby stunting forest regeneration, decreasing soil fertility, altering cropping patterns, and changing NTFPs collection practices provide major

challenge to these developments.

Nevertheless, the government provides various national programs, in particular the National Biodiversity Strategy and Action Plan (NBSAP), and other related programs, and support activities such as research and technology development, capacity development and extension, policy development and implementation, and other potential measures in overcoming them.



Chapter II
Current Status of National
Biodiversity Strategies and
Action Plan

In order to support the long-term development objectives set by the Socio-economic Development Vision, especially the National Environment Strategy and National Poverty Eradication Programme as well as to ensure the environmental protection, conservation and sustainable use of biodiversity, the National Biodiversity Strategy and Action Plan (NBSAP) of Lao PDR addresses the following issues in its strategy to 2020:

- The sustainable utilization of natural resource as well as the protection and conservation of the environment to ensure the sustainable development of the country, the reduction of poverty and the enhancement of the quality of life and health of all the people in Lao PDR.
- Cultivated areas should remain diverse and productivity should be increased through protection, conservation and the sustainable use of land resources.
- The forests of Lao PDR should remain rich and productive, through sustainable and productive management, and where necessary through conservation and protection.
- The rich biodiversity of Lao PDR should be maintained, through the protection, conservation and the sustainable utilization of biodiversity resources, including wild, semi-domesticated and domesticated biodiversity.
- Water resources such as ground water, lakes, rivers, streams and wetlands should remain clean and abundant, and where necessary, be improved, through their protection, conservation and sustainable use.
- Human settlements, including urban areas as well as cultural and historical heritage sites should be protected and improved.
- The air should remain clean and Lao PDR should contribute towards the protection of the earth's atmosphere by limiting air pollution, ensuring that no contributions are made towards climatic change and by assisting in the maintenance of the protective ozone layer.
- User rights should be safeguarded to ensure the equitable sharing of benefits amongst Lao people of the utilization of national biodiversity resources.
- The improvement and development of laws and regulations; and securing their effective enforcement.

Objectives and Programmes of the NBSAP

The primary objective of the NBSAP is to maintain the country's biodiversity since it provides the key to poverty alleviation, and protect the current asset base of the poor as support to the implementation of the government's priority programmes. Its main objectives are to:

1. Improve biodiversity data and fill data gaps through basic and applied research.
2. Improve biodiversity management and monitoring.
3. Plan and implement a biodiversity specific human resource development programme.
4. Increase public awareness of and encourage participation in the sustainable management of biodiversity.
5. Adjust national legislation and regulations related to biodiversity and harmonise them with Multilateral Environmental Agreements (MEAs).
6. Secure the NBSAP's implementation.
7. Promote country needs driven international cooperation.

Implementation of the NBSAP

Indicators have been used in monitoring the progress of implementation of the NBSAP. Although the NBSAP have specific indicators, these are also related to the indicators of CBD and those set by the ASEAN Member States and the other indicators identified in the different Lao PDR National Strategies and Action Plans. These are thoroughly discussed in Chapter IV and identified in Appendix IV.

These indicators have been used in the National Environmental Performance Assessment Report 2007 and used again in the National Sustainable Development Strategy of 2008. Although there are some differences, the indicators are similar to one another in the documents especially on biodiversity conservation and sustainable forest management. However, in the NSDS 2008, indicators have been identified to cover other sectors in tourism, sustainable forest management, watershed development and management, and sustainable land use management. All have relation to biodiversity conservation.

The indicators in the NSDS 2008 document are considered to be “progress indicators” wherein its strategy is to monitor progress of sustainable development in general and biodiversity conservation and other related sectors in particular. The NBSAP, as implemented, uses the indicators to monitor changes. These changes can further be examined through the different programmes of the NBSAP. Accordingly, the NBSAP has been implemented through the following programmes:

1. Scientific Data and Biodiversity Knowledge Development
2. Biodiversity Management
3. Human Resource Development
4. Public Awareness and Involvement
5. Institutional and Legal Frameworks
6. NBSAP Implementation
7. International Cooperation

Progress in the Implementation of the NBSAP

This section discusses the progress made in the implementation of the NBSAP through its programmes identified above and based on the goals and objectives of each programme:

Programme 1. Scientific data and biodiversity knowledge development

The primary organizations in generating knowledge in biodiversity are the National Agriculture and Forestry Research Institute (NAFRI) and the academia (universities and colleges). However, much of the information generated comes from the big projects funded by donor agencies. Such projects include the GMS and the BCI, which are coordinated by the WREA and the different sectoral ministries, the Mekong Regional Wetland Biodiversity Conservation and Sustainable Programme, and activities undertaken under the Forestry Strategy 2020, and others. Overall, however, there were relatively limited research on biodiversity conducted due to the insufficient technical capability and lack of funds. For example, public investments in research and technology development was absent in the budget plan 2007-2008, hence aggravating funding constraints for research & development which is critical in enhancing technical capability development in the country.

Some progress was made in terms of generating scientific information to improve taxonomic knowledge of biodiversity, particularly for plants. Major information generated includes the research Checklist of the Lao Vascular Plants (2007) produced by the NUoL Faculty of Science and the publication of a Manual on 100 Commercial and Traditional NTFP Products (2007) led by NUoL, NAFRI and SNV. Under the Darwin

Initiative Project cooperation with NUoL and NAFRI conducted plant taxonomy work on orchids. In addition, in 2006, with support from the Darwin Initiative Project field guides, “Selected Resources for Plant Identification in Lao PDR” as produced and widely distributed and many others.

International cooperation in respect of biodiversity research was forged with the Australian Center for International Agricultural Research (ACIAR); Ullswater Race Development Program (URDP); Center for International Forestry Research (CIFOR); Large Animal Research Facility (LARF); Center for International Research and Development (CIRAD), International Rice Research Institute (IRRI); Swedish Agency for Research Cooperation with Developing Countries, and others.

Although direct indigenous communities involvement in the research programme was relatively limited, community participation has been the main strategic approach to biodiversity resource management, including in protected area management. In addition, there were success stories about support provided by the Poverty Reduction Fund Project to indigenous people in the management of fish conservation areas through applying the indigenous knowledge and practice.

Information on the NBCAs has been available widely through various websites or linked to the MAF website. Nationally, exchange of NBCA information was enabled through various projects undertaken with donor funding such as the projects in Nam Et and Phou Loey, Nam Kading, Xe Pian NBCAs and others. Likewise NBCA management experience in Lao PDR was also shared at international meetings, workshops and forums. The integrated conservation and development (ICAD) concept was widely accepted amongst donors and the government as the appropriate approach to natural resource management and conservation.

Programme 2. Biodiversity management

Among the 12 objectives of this program, about 75% have been or being addressed by the government. Among them is the promotion of ecologically sustainable practices for ecotourism wherein indigenous communities are being encouraged to showcase their indigenous knowledge in conserving biodiversity. Protecting native biodiversity from the uncontrolled introduction and spread of alien species and genetically modified organisms is integrated into the GMS and BCI project.

As a legal basis for improving biodiversity conservation in the country, the revised Forestry Law and Wildlife Law were adopted in 2007. Furthermore, the Lao Wild Animal Red List was revised and approved by government in 2009, in which the aquatic and wild animals are classified into 3 main categories: Protected Species List (category I and II) and common or Managed Species (category III). Wildlife resource conservation efforts have been enhanced through the establishment of a new Department of Forestry Inspection under the Ministry of Agriculture and Forestry. Finally, conservation efforts were also promoted through flagship species conservation such as of the Saola (*Pseudoryx nghetinhensis*), gibbon spp., Asian elephant, Tiger, Siamese crocodile, Eld's deer, which were initiated by different organizations in partnership with relevant government agencies.

One objective of the programme is to establish and manage a comprehensive and representative system of protected areas (PA). In this respect, Lao PDR has had a highly representative and extensive NBCA system covering almost 15% of the country land area as well as the provincial PA and district system that are found across the country. These are discussed at length in Chapter I.

Under the Forestry Strategy Implement Support programme, work on review of the national protected area system was undertaken by the Department of Forestry with the aim to develop the methodology for NBCA review toward applying the IUCN protected area management category system. Improvement to the management of biodiversity was also made through assigning the management responsibilities to different levels such as national (macro), provincial (meso) and district/village (micro) level. Thus, in each province a provincial NBCA division/unit was set up and works vertically (with DoF and DFRC) and horizontally with their local authorities and concerned sectors.

Despite the lack of systematic and long term support from donors, the Lao government has used its limited national resources, particularly budget from the Forestry and Forest Resource Development Fund to

fund each NBCA management. In addition, the Environment Protection Fund has been providing a degree of funding support to protected area management. Incentives for NBCA management have been made by allowing local people to enter certain parts (such as controlled use zones and buffer zones) of NBCAs, for example, for collecting NTFPs, firewood and medicinal plants as to gain their cooperation in NBCA management including being involved in patrolling. The other tangible incentive is ecotourism undertaking into NBCAs which can contribute funding for the management of the NBCAs. For example, the ADB-LNTA Ecotourism project in 4 NBCAs (Nam Ha, Phou Khao Khouay, Phou Hin Poun and Xe Pian) was fairly successful, which also generated some revenues for the NBCA management. In this case, entry fee of US\$2/tourist/entry was made to support a NBCA conservation fund. Other funding mechanism that has been in use is the contribution from hydropower projects having reservoirs inside an NBCA, such as the case of Nam Leuk and Nam Theun hydropower projects to fund the management of the area or watershed concerned.

Another objective is to improve the standards of management and protection of the nation's biodiversity. By involving technical staff from the ministries, especially in nature conservation and the WREA, in training programs and meetings especially in the ASEAN Wildlife Enforcement Network, management and protection of the nation's biodiversity is continuously being improved. This is similarly being done in another objective of this programme in which threatened and endangered species should be conserved by enabling the species to survive in their natural habitats.

Being a signatory to the CITES, the MAF and the Wildlife Conservation Society embarked on vigorous efforts to regulate threatening activities through the implementation of a national gun collection, and strict enforcement of existing relevant laws and regulations to curb and minimize the widespread practice of these activities. These efforts resulted in the modest decline and less visibility of the wildlife trading in the country and more or less regulated the harvesting of wildlife and wild products that are traded locally and internationally (WREA, 2008).

Another success was the development of guides for ecotourism management to build tourist awareness about cultural practices in Lao PDR regarding the dos and don'ts when traveling around the country. In addition, there was promotion about respect for local culture and taboos. Biodiversity related ecotourism involved also the promotion of conservation attitude toward key biodiversity species, for example, the wild elephant observation tower experience in central Lao PDR, the sighting of the Irrawady dolphin in the Siphandon wetlands in the south and the ecotourism venture "The Gibbon Experience" in the north of the country. Ecotourism also benefited local communities through the created employment opportunities such as tour guides, local accommodation including home-stay, services to tourists, sale of local souvenirs and others.

On the other hand, the remaining 25% of the objectives (i.e. 3 objectives) are not being addressed yet. The concerns of the remaining three objectives are in access and benefit sharing, establishment & maintenance of *ex-situ* research and conservation facilities, and the conservation of biodiversity in urban areas. This is due in part to lack of qualified personnel to handle these concerns.

The implementation of the different programmes addressing biodiversity conservation and management such as the BCI and other related programmes reinforced the implementation of NBSAP in the country. However, the activities therein in addressing the objectives of these programmes are implemented in varying degrees depending on the prevailing situations and conditions in the target areas in the country.

Programme 3. Human resources development

The National University of Lao PDR has established a biodiversity conservation related course in the Forestry Faculty's curriculum of its graduate programme within a general natural resources management discipline. Until recently, several graduate students were taking up the master degree program for biodiversity conservation. Broadly, biodiversity aspect has been covered in a number of higher education disciplines across the NUoL including in the Faculty of Science, Faculty of Environment Studies and Faculty of Agriculture.

The National Capacity Needs Self-Assessment for Global Environment Management under Rio Convention (UNCBD, UNFCCC, UNCCD) was finalized in 2009. On the other hand, the capability of relevant organizations of Lao PDR has been enhanced by the expatriate support provided through donor funded projects. In addition, technical people of the Lao PDR government also participated in international workshops and training courses that have enabled them to enhance their capacity and skills. However, the relevant Lao PDR government institutions still lack necessary technical expertise and capability to effectively cope with the commitments of the NBSAP.

Programme 4. Public awareness and involvement

The Poverty Reduction Fund (PRF) has included the action on public awareness of the importance of biodiversity in relation to poverty reduction in its plan. Accordingly many fish conservation zones, forest protection areas were established that linked with food security. In addition, other conservation and livelihood support projects, such as the Landscape and Livelihood Strategy project (LLS) of IUCN, The Agrobiodiversity Initiative Project (TABI) implemented by MAF with support from the Swiss Development Cooperation Agency (SDC). Likewise, WWF has implemented a project on Sustainable Rattan Management and Harvesting as a means for improving people livelihood that enhanced the involvement of the later.

General public awareness of the importance of biodiversity has been consistently pursued, especially through the National Wildlife Day celebration which is carried out annually. Awareness raising included wildlife conservation campaign in schools, media release, radio and TV broadcast. As part of the effort various posters, leaflets, booklets, and documentary films on biodiversity were released to the public through government organizations, international organizations and projects.

Public participation in project planning and design processes is clearly mandated in the Environmental and Social Impact Assessment (ESIA) regulations. More specific community involvement in biodiversity management planning is reflected through the collaborative management arrangement that was strongly promoted in the country in the context of protected area management.

The tourism sector has also incorporated biodiversity consideration in its promotion programme. Specific to the tourism sector is the promotion of ecotourism which depends largely on natural attractions and attributes that often involve national protected areas. This programme has been included in the National Sustainable Development Strategy.

Programme 5. Institutional and legal frameworks

In terms of institutional arrangements, the Water Resources and Environment Administration (WREA) and the Ministry of Agriculture and Forestry are two directly responsible agencies for biodiversity conservation. Other agencies include the National Land Management Authority (NLMA), National Science and Technology Authority (NSTA), Ministry of Defense, Ministry of Industry and Commerce, Ministry of Energy and Mines and others (MEM).

Progress made in reviewing existing laws and regulations related to biodiversity includes the revision and adoption of the Forestry Law and developed Aquatic and Wildlife Law in 2007. The Environmental Protection Law is also undergoing revision and improvement. Establishment of the new Department of Forestry Inspection (DoFI) in 2008 was considered a major step forward in an effort to control the use and reduce the loss of forest and biodiversity resources. In 2004, Lao PDR acceded to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), signifying another move toward consistent effort to conservation of biodiversity. Within this context, the CITES Management Authority and Scientific Authority were established to support the implementation of the Convention. Recently Lao PDR has acceded to the Ramsar Convention on Wetlands.

In 2009, the CBD National Focal Point was transferred from the WREA to MAF. Currently ongoing consideration is being made on setting up a CBD National Steering Committee to coordinate and supervise the implementation of the Convention as well as the National Committee for NBSAP will also be institutionalized within MAF. These efforts will enhance institutional coordination and participation of various sectors toward biodiversity conservation.

Programme 6. NBSAP implementation

The implementation of the NBSAP has been supported by the different policies and legislations formulated by the government of Lao PDR. Many of these are already discussed in the above programme actions. However, limited progress has been made on the NBSAP implementation due mainly to the ability to disseminate and translate the programme actions into concrete activities of concerned stakeholders. In addition, lack of funding and capacity hampered the effective implementation of these actions.

Despite the significant reduction of external funding for biodiversity conservation, the government has been able to allocate limited resources from the central budget amounted 3,000 billion Kip for the NBCAs. This financial resource has been made available mainly from the Forestry and Forest Resource Development Fund. Funding for biodiversity conservation related activities has also been obtained from the Environment Protection Fund and donor funded projects.

Programme 7. International cooperation

Collaborative projects with international funding organizations have been established that contribute to biodiversity protection in Lao PDR, as well as with neighboring countries such as Cambodia and Viet Nam. These collaborative projects are funded by international donor agencies and international non-government organizations such as the Asian Development Bank, World Bank, UNPD, the EU, GTZ, SDC, JICA, Sida, MRC, the Conservation International, GEF, WWF, WCS, Bird Life International, and others. Projects supported ranged from natural resource management and biodiversity to agricultural biodiversity conservation.

The ratification of the ASEAN Centre for Biodiversity as a legal body within the ASEAN framework has also increased the participation of Lao PDR in the collaboration and sharing of knowledge and experiences among the other ASEAN Member States. Many of the technical people have attended workshops and training courses conducted by the ACB on biodiversity related conservation and management.

Successes, obstacles and lessons learned

Foremost among the successes are the implementation of the GMS programmes in partnerships with international organizations such as the WWF, IUCN, ADB, among others. For example, the BCI programme, which was partnered by WWF and IUCN, identified biodiversity conservation corridors to ensure that adequate linkages in the landscapes will be properly and adequately protected and managed to maintain biodiversity resources and vital ecosystem services to sustain resources productivity and livelihoods of the affected communities and hence, contribute to the sustained growth of the national economy. In the WWF Laos Country Programme, various projects were put in operation such as the Switch Project on Sustainable Rattan Harvest and Production that helped Lao farmers to increase their production and income from their rattan plantations. The project identified 13 highly marketable species of rattan that have the potential of cornering a significant share of the estimated US\$2.5 billion world rattan industry (WWF, 2008). Other successful programmes implemented in partnership with WWF and the GMS include the Community Fisheries, to augment and increase productivity of the fishery sector in the Mekong River

basin, and the Green Club, which deals more on the educational and information campaign for environmental management and other related activities. In partnership with the Champasak Provincial Agriculture and Forestry Office and district authorities, IUCN has implemented a project 'Landscape and Livelihood Strategy' aiming to conserve the biodiversity of the area concerned while at the same time enhance the effective use of forest resources, especially NTFPs to meet the local need. The project has achieved significant success in promoting the sustainable management and harvest of the Malva nut, a commercially valuable species of NTFP.

The other successes can be found in Chapter IV-Progress towards 2010 targets.

Livelihood benefit such as from the use of the NTFPs and ecotourism activities can be enhanced in a more sustainable manner to ensure the productivity for the long term benefit of local as well as national economic development. At the same time, maintaining the stability of ecosystem services in the NBCAs will be attained through applying appropriate management approaches on the basis of adequate policies and enforcement. Given the extensive NBCA system, good potential exists for ecotourism which was incorporated in the national development activities and has gained recognition in the tourism sector as a major area in Lao PDR.

In terms of governance of biodiversity conservation at the national level, successes have been made in the enactment of many legislations and policies reflected in the different sector strategies, plans and action programmes of the government, as discussed in Chapter III. One major document is the National Sustainable Development Strategy that was adopted in December 2008. Biodiversity conservation concerns and some indicators are included in many sectors identified in the NSDS.

Major obstacles include the limited government human capacity and financial resources to put the various programmes into effective action across concerned sectors. One of the most important obstacles is the unclear division of roles and responsibilities among different concerned agencies who would put relevant action programmes into the practice. There has been sufficient attention paid to status update and monitoring of the implementation to inform stakeholders about progress towards achieving the objectives so that actions can be taken to address deficiencies.

The most important lessons learned of the implementation are cross-sectoral coordination which has not been adequately overcome, lack of prioritization of the actions with proper implementation guidelines, and the role of the leading agency in making sure that other concerned line agencies are dealing with the implementation in a effective manner. Furthermore, given the limited human and financial resources of the Lao PDR Government, international cooperation remains highly critical in providing funding support towards fulfilling the range of important actions.

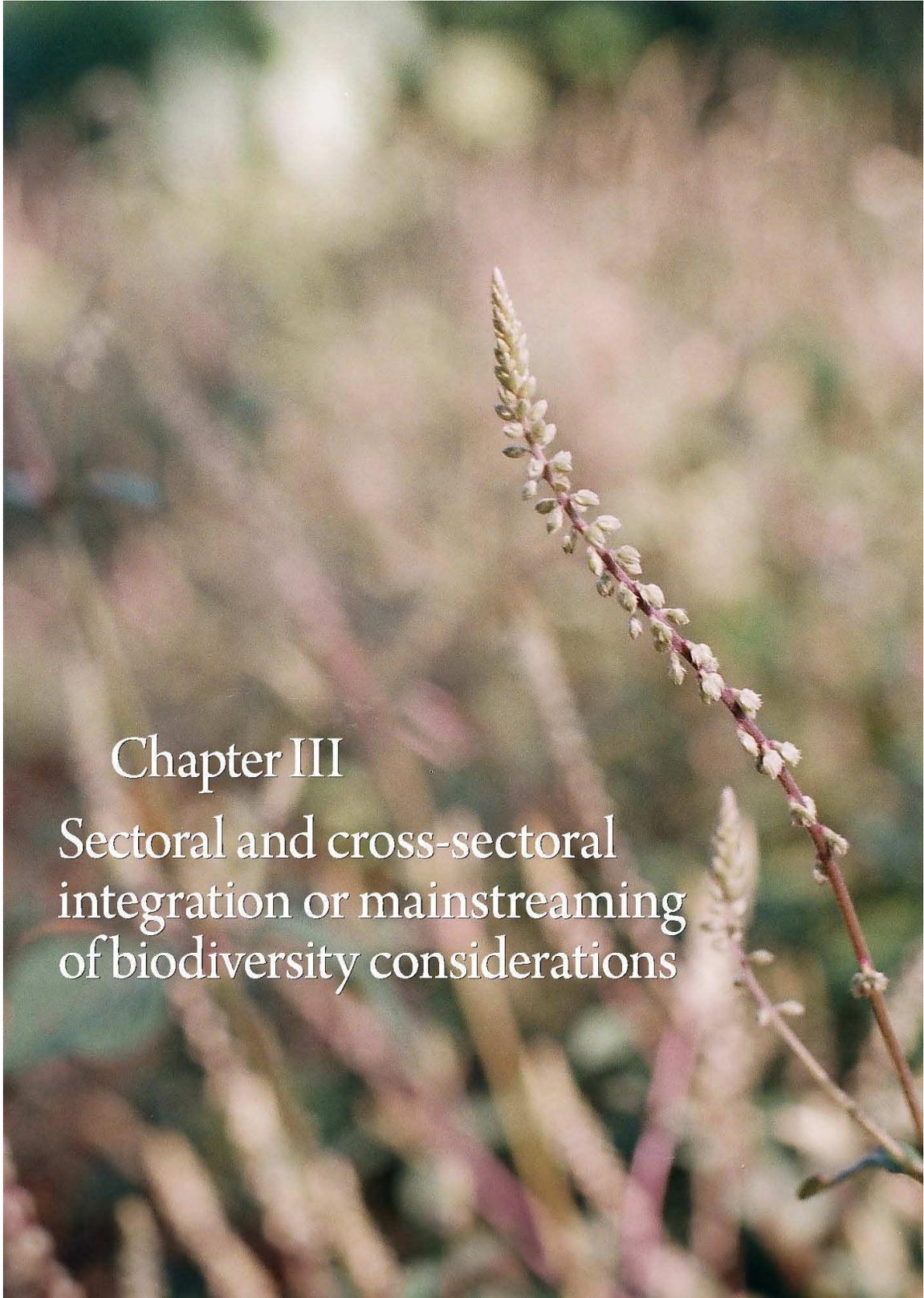
Effectiveness of the implementation of the NBSAP

From the discussions in Chapters I & III, the goals and objectives of the NBSAP have been and are being addressed, but success has been made to varying degrees. Many actions identified require further attention, however, the government has faced with insufficient human and financial resources to address them. Overall, the effectiveness of the implementation has been positive, however, there is a need for the government to take efforts in mobilizing more internal as well as external resources in order to enhance the effectiveness of the implementation.

Indicators pertaining to biodiversity were included in the NSDS and are being used in monitoring changes and trends. Monitoring could further be enhanced by training more technical personnel to strengthen their monitoring capacity.

Implementation of the NBSAP is by no means complete and a lot has to be done to improve its implementation. For one thing, human resources development is a necessary activity which requires financial resources. Addressing the issues on access and benefit sharing and indigenous peoples'

knowledge should be one of the government priorities. On the other hand, expertise in dealing with issues is limited and assistance is needed for addressing this issue in the short and medium terms. As such, reducing or removing the threats to biodiversity remains a challenge.



Chapter III

Sectoral and cross-sectoral
integration or mainstreaming
of biodiversity considerations

T

o strengthen the implementation of the NBSAP and attain sustainable development goals by 2010 and onwards, Lao PDR has formulated and implemented national development plans, strategies and frameworks which integrate environmental considerations, including biodiversity conservation.

Biodiversity Considerations in National Development Plans and Strategies

The **Poverty Reduction Strategy Paper (PRSP) of Lao Government or the National Growth and Poverty Eradication Strategy (NGPES)** prepared in October 2006 serves as the country's poverty reduction strategy. The NGPES recognizes the vital role which Lao PDR's rich natural resources play in the country's socio-economic development. Lao Government plans to prepare and implement the national strategic plan on the environment. This would entail improving environmental management, plans, policies and laws; increasing environmental education and awareness; establishing mechanisms and promoting investment; and improving international coordination and cooperation. Environmental conservation is among the cross-sector issues included in the strategy, along with gender mainstreaming, population strategy, social security system, information and culture, and capacity building.

The Government of Lao PDR has integrated the NGPES and the MDGs in the **Sixth five-year National Socio-Economic Development Plan—NSEDP (2006-2010)**. The Plan draws together the various strands of poverty reduction in the NGPES into a coherent strategy, and integrates as appropriate the various poverty reduction interventions including the targeted ones and the MDGs into the respective sector development and regional development chapters of the Plan. It focuses on the eradication of poverty and promotion of equity among different groups of the Lao multi-ethnic population within a rapid and sustainable economic growth framework.

The Lao Government's overarching development goal is to lift the country from the ranks of LDC's by 2020. The MDGs form an integral part of the Plan in the overall poverty reduction and in sectoral strategies, especially in the four key sectors, agriculture, infrastructure, education and health. Environmental considerations are recognized in these plans and strategies. The NSEDP has specifically included the following targets related to biodiversity, which were also included as priorities of the Forestry Strategy and the NBSAP:

- Put an end to slash-and-burn cultivation by 2010;
- Reduce the proportion of the population using solid fuels;
- Biodiversity Conservation by improving NBCA management ;
- Conserve threatened and endangered species in their habitat (NBSAP);
- Controlling Wildlife Trade; and
- Biodiversity management and ecologically sustain-able agriculture and forestry.

The **National Biodiversity Strategy and Action Plan (NBSAP)** aims to maintain the country's biodiversity as one key to poverty alleviation and protect the current asset base of the poor as support to the implementation of the government's priority programmes.

The Lao Government is committed to protecting National Biodiversity Conservation Areas (NBCAs) and bio-diversity as seen in recent Orders of the Prime Minister and the preparation of the Wildlife Law. With international support for NBCA management declining over the years, Lao Government established two important funds to continue NBCA management: (1) The Forestry and Forest Resource Development Fund (FRDF), the main source of which is logging related fees; and (2) The Environmental Protection Fund (EPF) with ADB and World Bank financing. FRDF has started to distribute funds to selected Provinces for management of NBCAs. EPF focuses on the NBCAs surrounding Nakay Nam Theun area.

Hin Nam Nor NBCA has been proposed as a Transboundary World Heritage Park together with Phonya-Kebang National Park of Vietnam and a dialogue for cross-border cooperation in the management of the two areas has been initiated.

Lao PDR shares 4 of the 9 high-priority GMS Biodiversity Conservation Landscapes: (1) Northern Plains Dry Forests (Cambodia and Lao PDR); (2) Tri-border Forests (Cambodia, Lao PDR, and Viet Nam); (3) Central Anna-mites (Viet Nam and Lao PDR) and (4) Northern Anna-mites (Viet Nam and Lao PDR).

Lao PDR's **Strategic Framework for National Sustainable Development Strategy** (NSDS, December 2008) embodies the country's strategic planning process to address the full integration of economic, social and environmental objectives across sectors, territories and generations and sector-wide mainstreaming of sustainable development principles and poverty-environment linkages. It will also address other key elements not considered in other existing plans and strategies, such as: sustainable development policy instruments; indicators to evaluate the overall status of national sustainable development; institutionalized mechanism for public participation; linking the short-term plans to medium and long-term addressing inter-generational equity; and coordinating different sectors and territories.

Fulfilling Lao PDR's commitments to Multilateral Environmental Agreements (MEAs)

Lao PDR is party to ten global multilateral environmental agreements, providing a framework for the country to cooperate with the international community in the protection of the global environment. This global participation is an opportunity for the nation to seek financial and technical assistance to support the environmental protection activities required to ensure sustainable development. These global environmental issues cover climate change, biological diversity, world cultural and natural heritage, the Kyoto Protocol and the international trade in endangered species. These MEAs include the: Convention on Biological Diversity (ratified in September 1996); World Heritage Convention; Convention on International Trade in Endangered Species (CITES, ratified in May 2004); Convention on the Conservation of Wetlands of International Importance (Ramsar Convention); Convention on Climate Change (ratified in April 1995); UNFCCC, among others.

Lao PDR recently completed a UNDP-supported project on "Coordinating the Implementation of Multilateral Environmental Agreements" which has contributed significantly to improving national capacity to negotiate and implement global environment commitments and enabled improved efficiency and efficacy of implementation of those ten multilateral environment agreements. This has been achieved mainly through strengthened institutional and individual capacities, increased national awareness of related issues, and the participation of Lao PDR in international meetings. Major outcomes of the project include improved awareness of global environmental issues and a comparative analysis between multilateral environmental agreements and relevant national legislation (UNDP and WREA, 2009).

Poverty and Environment Initiative (PEI) in Lao PDR

Poverty reduction in Lao PDR depends on sustainable natural resource management and a healthy environment, and yet many of the key decisions that impact the environment are outside the direct control of environmental institutions. It is critical to include the environment in economic and social decision-making. Improved natural resource management was highlighted as a priority. More than 50% of the nation's GDP is derived from agriculture, forestry, livestock and fisheries. Sound environmental management is critical not only at the national level, but also at the local level where it is closely linked to household income, health, nutrition and clean water. The direct use of natural resources and biodiversity by poor households and enterprises is estimated to be worth some US\$650 million a year. Food security and household nutrition are dependent on the availability of and access to wild foods, which currently provide more than half of non rice food consumption.

In March 2009, the Ministry of Planning and Investment, the Ministry of Agriculture and Forestry, the Ministry of Energy and Mines, the Water Resources and Environment Administration, the National Committee for Rural Development and Poverty Eradication and Provincial authorities, along with key donors and representatives from international non-governmental organizations and the private sector, met to identify and discuss key poverty-environment linkages that are central to the achievement of poverty reduction in Lao PDR. The workshop, organized by MPI with support from United Nations Development Programme (UNDP) and United Nations Environment Programme (UNEP) marks the end of PEI's preparatory phase.

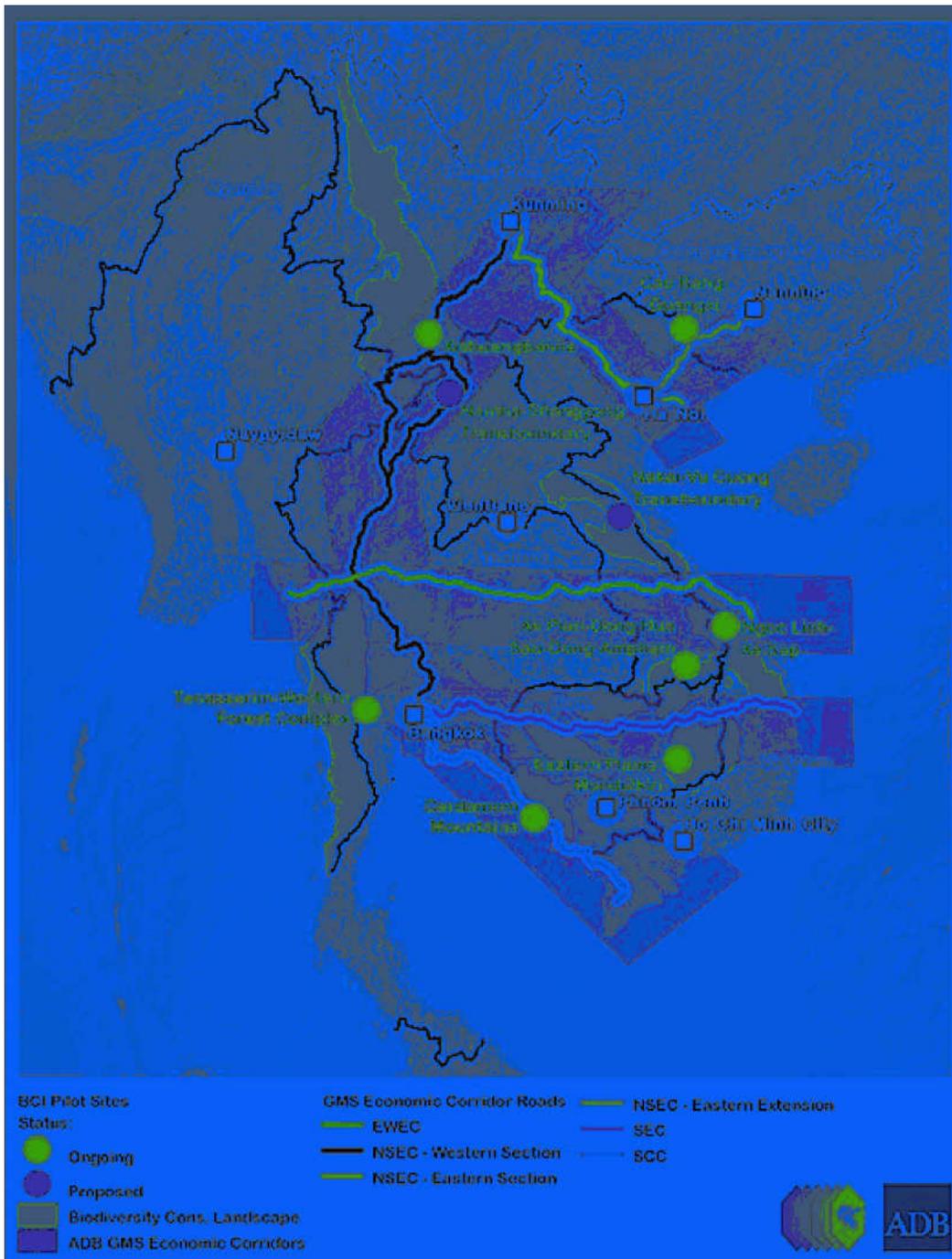
Lao PDR now embarks on activities to be rolled out in Vientiane and in selected provinces from now until 2011 on PEI. PEI activities will focus on integrating poverty and environmental concerns and opportunities within the 7th National Socio-Economic Development Plan (NSED), raising the awareness of poverty-environment linkages amongst decision makers, and building national and provincial capacity to consider environment in investment, land use and development planning. The programme's design has been driven by national and provincial authorities from Oudomxay, Phongsaly, Saravane and Savannakhet through extensive consultations and two sub-national workshops.

The Biodiversity Corridors Initiative

Lao PDR is part of the Greater Mekong Sub-region (GMS), one of the fastest growing regions in the world with increasing economic, social and environmental transformation. Recognizing that such transformation will inevitably affect the environment, in 2004, the Asian Development Bank (ADB) initiated review of GMS economic program from an environment and sustainable development perspective. Endorsed by the GMS Environment Ministers and Heads of States, the Core Environment Programme and the Biodiversity Corridors Initiative (BCI) geared up implementation in 2005.

Lao PDR is one of the GMS participating countries of the BCI. The BCI is part of the Economic Cooperation Program of the GMS Sub-region (an association of six countries: Cambodia, Lao PDR, Myanmar, Thailand, Viet Nam and People's Republic of China – Yunnan Province and Guangxi Zhuang Autonomous Region) which includes a program of economic corridors based on highways linking the countries in north-south, southern coastal, and east-west direction (Fig. 11). The BCI addresses the concern that possible fragmentation and damage to critical ecosystems and biodiversity could undermine the long-term gains of the economic program for GMS.

Figure 11. The GMS coverage of the BCI Pilot Project.



Source: ADB, 2008

Specifically, the BCI will involve the following components: (1) Poverty alleviation through sustainable use of natural resources and development of livelihoods; (2) Clear definition of optimal land uses and harmonized land management regimes; (3) Restoration and maintenance of ecosystem connectivity; (4) Capacity building in local communities and government staff; and (5) Sustainable financing mechanisms and structures integrated with government planning and budgeting procedures. The programme exemplifies

- Increase technical the capacity of forest volunteers in community forest management;
- Conduct public awareness raising campaign in management of water and water resources.

Complementary to these proposals, the Lao National Assembly has already approved relevant laws to support national socio-economic development and existing laws related to biodiversity conservation. These are the following (STEA,2004)

- Constitution Lao PDR (6/5/2003)
- Environmental Protection Law (3/4/1999)
- Water and Water Resources Law (11/10/1996)
- Land Law (21/10/2003)
- Agriculture Law (10/10/1998)
- Forestry Law (24/12/2007)
- Aquatic Animals and Wildlife Law (24/12/2007)
- Processing Industry Law (3/4/1999)
- Road Transport Law (12/4/1997)

Progress on various activities done to mainstream biodiversity conservation and management among the different sectors/component resources are cited herein to be able to see how these activities contribute to the integration of biodiversity concerns into the national policies affecting these sectors/resources, and how these policies were able to support the country's commitments to the MEAs.

Forestry

The **Forestry Strategy to 2020** of Lao PDR keeps the development of the forestry sector in line with the national development plans and strategies. Protected Areas are an integral component of the forestry sector and until the forests are managed on a sustainable basis, PAs will come under constant pressure from unsustainable NTFP management.

A large proportion of Lao PDR's rural poor derives some part of their livelihood from NTFPs. For many the dependence on NTFPs is a function of their poverty - they lack better alternatives. Helping poor communities meet their subsistence and food security needs through sustainable NTFP management needs to be a high priority for the forestry sector and protected area managers. NTFPs are uniquely essential for the Lao national economy, both for subsistence and trade. NTFPs are key elements in poverty alleviation, forest and biodiversity conservation, land use planning and allocation, substitution of shifting cultivation and industrial development. Every project or program aimed at rural development or biodiversity conservation in Lao PDR should have an NTFP strategy, similar to the way each project should have a gender/equity strategy.

Water Resources

Water supplies from protected areas are treated as a free resource, with no revenues channeled back to protected areas management and watershed protection. *Valuing watershed protection* is one of the key ways that Lao PDR can integrate ecosystems-based management approach into development activities. Water tariffs are introduced to recover costs of supply and to improve efficiency in use. Tariff levels also need to be set to include protected area and watershed management costs.

Energy

Institutionalizing hydropower water catchment levies as a standard policy tool in all hydropower schemes is being considered to benefit protected areas with revenues going directly to conservation management.

Such levies should be enacted in legislation to ensure transparency and a consistent policy so that every hydropower producer is treated similarly and according to the same conditions and standards.

Fisheries

The fisheries sector would benefit from a re-orientation resulting in:

- official status for wetland protected areas;
- increased assistance for community co-management and conservation;
- a more balanced approach to aquaculture development and conservation of natural fish habitat; and,
- a specific program for capture fisheries and frogs in upland areas.

Road/Infrastructure development

Integrated development planning: Roads to remote areas and especially to or near protected areas should be built as a component of integrated development plans by provincial and district authorities.

Appropriate specifications: Not all roads in remote areas need to be built for heavy transport or indeed cars. Road infrastructure should be developed at a scale and form appropriate to local needs.

Improved environmental assessment and mitigating action: A component of a good integrated development plan will be an EIA of a high standard which has a regional perspective and which assesses carefully the direct and indirect impacts of proposed new roads.

Trade and industry

Key issue: Wildlife trade in the lower Mekong region is a regional issue, not solely a bilateral issue and addressing it deserves greater regional recognition and attention. While domestic trade and use of wildlife in Lao PDR is probably significant, the cross-border wildlife trade is far more serious in its impact on natural systems and their long term development potential. Lao PDR should actively build the capacity needed to become a signatory to and implement CITES – the Convention providing the international umbrella for management and control of wildlife trade.

Agriculture

Sustainable Agriculture Strategy

Key issues on Agriculture and biodiversity related to protected areas management include: (1) *Sustainable upland agriculture:* Unsustainable upland agriculture continues to be the subject of critical importance to the conservation of protected areas; (2) *Cash crop encroachment and land allocation:* For NPA management, the two issues of cash crop encroachment and land allocation are strongly intertwined, the latter specifically in the form of zonation which is a legal requirement within NPAs; and (3) *Land zoning based on land capability:* If land allocation is to result in a successful move from swidden to sedentary farming, a critical requirement is zoning based on land capability assessment.

Conserving agricultural biodiversity

Owing to the limited storage facilities in the country, conservation of genetic materials is minimal with only a few institutions doing it like NAFRI and NUoL. As already discussed in Chapter 1, samples of plant materials especially rice cultivars were collected and stored for medium-term in these institutions' facilities. For long-term storage and conservation purposes, in the case of rice, the International Rice Research Institute (IRRI), based in the Philippines, is collaborating with Lao PDR on this matter (MAF & STEA,2004).

Tourism

The implementation of the National Ecotourism Strategy and Action Plan (2005-2010) is being spearheaded by the Lao National Tourism Administration. It aims to: (1) raise the profile of Lao ecotourism; (2) communicate the vision, goals and objectives of the strategy to a wide audience; (3) encourage dialogue and cooperation among the public and private sector; (4) facilitate the involvement of donor and development agencies; and (5) promote business confidence and investment in Lao ecotourism and the wider tourism sector.

In 1999 the National Tourism Administration, with assistance from UNESCO and the New Zealand government, launched a tourism project in the Nam Ha NPA in Luang Namtha Province. This highly successful initiative introduced the concept of ecotourism to Lao PDR – and in so doing received significant international acclaim and a UNDP award in recognition of its contribution towards poverty alleviation. Building on the success of the Nam Ha initiative, and the wider foundations of an expanding tourism industry, the Lao National Tourism Administration has produced the Ecotourism Strategy and Action Plan to further develop and promote this important sector – a sector which tour operators believe will become the mainstay of the Lao tourism economy.

Actions on Integrating Biodiversity Conservation into Development Activities

Ecotourism development is a government priority and there are several initiatives underway, including the well-known ecotourism of Nam Ha project. Integrated Conservation and Development has been promoted and eco-tourism development plans are formulated for 5 NBCAs, namely: (1) Nam Ha; (2) Phou Khao Khouay; (3) Phou Hin Poun; (4) Nam Kading; and (5) Xe Pian. A review of the lessons learned was undertaken to provide practical guidance to provincial governments in promoting protected areas as a development strategy.

As part of WREA's function to integrate various environmental concerns, it has spearheaded pilot projects on Integrated Spatial Planning at the provincial level in Oudomxay and Champasak provinces.

Environment and Biodiversity Conservation Governance in Lao PDR

A long-term development vision of the Lao PDR was developed in the late 1990s within the ASEAN framework, defining the goals for the government's national development objectives. The government's overarching national goal is to lift the country from the rank of LDCs by 2020 through a strategy of growth with equity and the eradication of basic poverty by 2010.

The strategy states that “socio-economic development should progress continuously and be stable; there should be balance between social, economic and cultural development and the protection of the environment, so ensuring sustainability”. Based on this existing national vision to 2020, the national sustainable development vision was proposed as a result of consultation processes as follows:

“Achieving the sustainable well-being of all people of the Lao PDR through the simultaneous and integrated pursuit of prosperous economy, equitable society and healthy environment”.

Clear goals were formulated and defined to guide the government's overall development objectives towards realizing the long-term vision. Stakeholders' consultations held in particular, through a Workshop in 2008 identified the following key strategic goals:

1. Sustainable Economic Development

2. Sustainable Social Well-being and Development
3. Sustainable Environment and Natural Resource Management
4. Good Governance

Each of these strategic goals is addressed by proposed sectoral action programs that clearly present situational analysis, responsible institutions, existing strategies and policies, objectives and targets, and proposed strategic actions and progress indicators (WREA, 2008). This framework is presented in Fig. 13.

The Water Resources Environment Administration (WREA) of Lao PDR was created in 2007 as the main environment authority in Lao PDR. The creation of WREA brings together the environment functions of the former Science Technology and Environment Agency, the Water Resources Coordination Committee and the Lao National Mekong Committee Secretariat. The WREA's Water and Environment Research Institute provides support to fulfilling various commitments of Lao PDR related to the UN Convention on Biological Diversity .

The Director-General of WREA Cabinet also serves as the Chair of the Lao-ASOEN and Member of the Governing Board of the ASEAN Centre for Biodiversity. As such, Lao PDR participates in a number of ASEAN-wide initiatives on biodiversity conservation, including policy development and capacity building activities.

WREA and MAF are directly responsible for cooperation and coordination with concerned agencies including both central and local administration authorities and international agencies, and also for identifying sources of funding in order to support the implementation of the NBSAP.

Other concerned agencies

All sectors, both at the central and local level have the responsibility to translate the NBSAP into their action plans, which are to be implemented effectively.

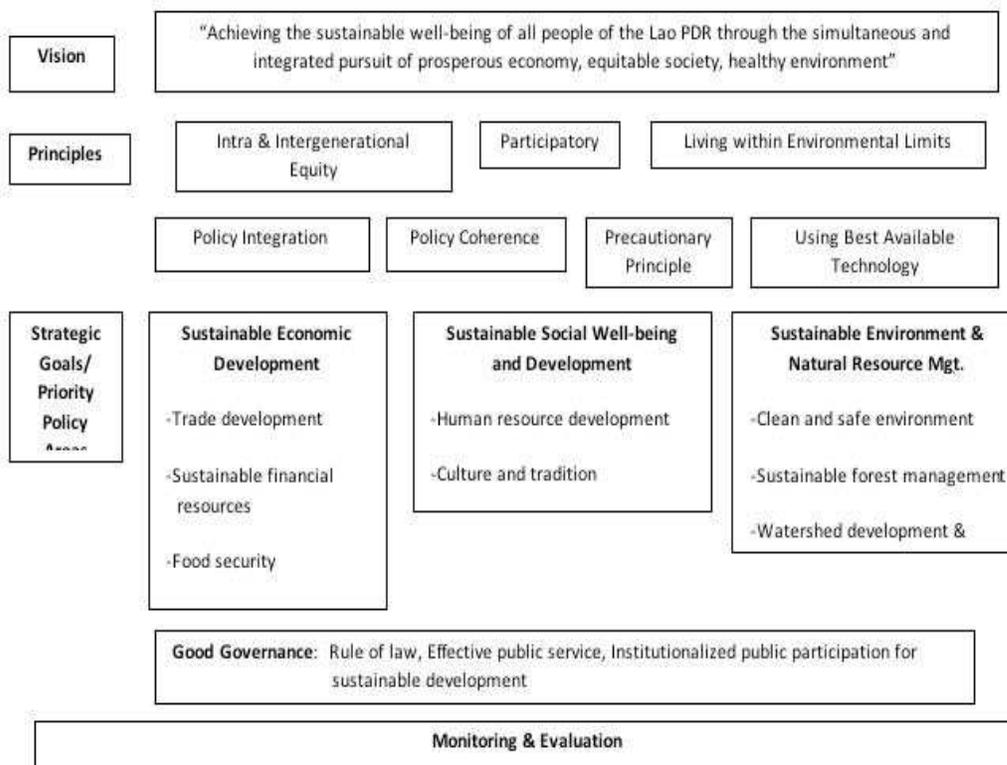
Public organizations in collaboration with other agencies are responsible for encouraging people to actively participate in the protection, conservation and sustainable use of biodiversity. Internal and external private sectors running business in the Lao PDR must strongly support government sectors in the management, conservation and sustainable use of biodiversity.

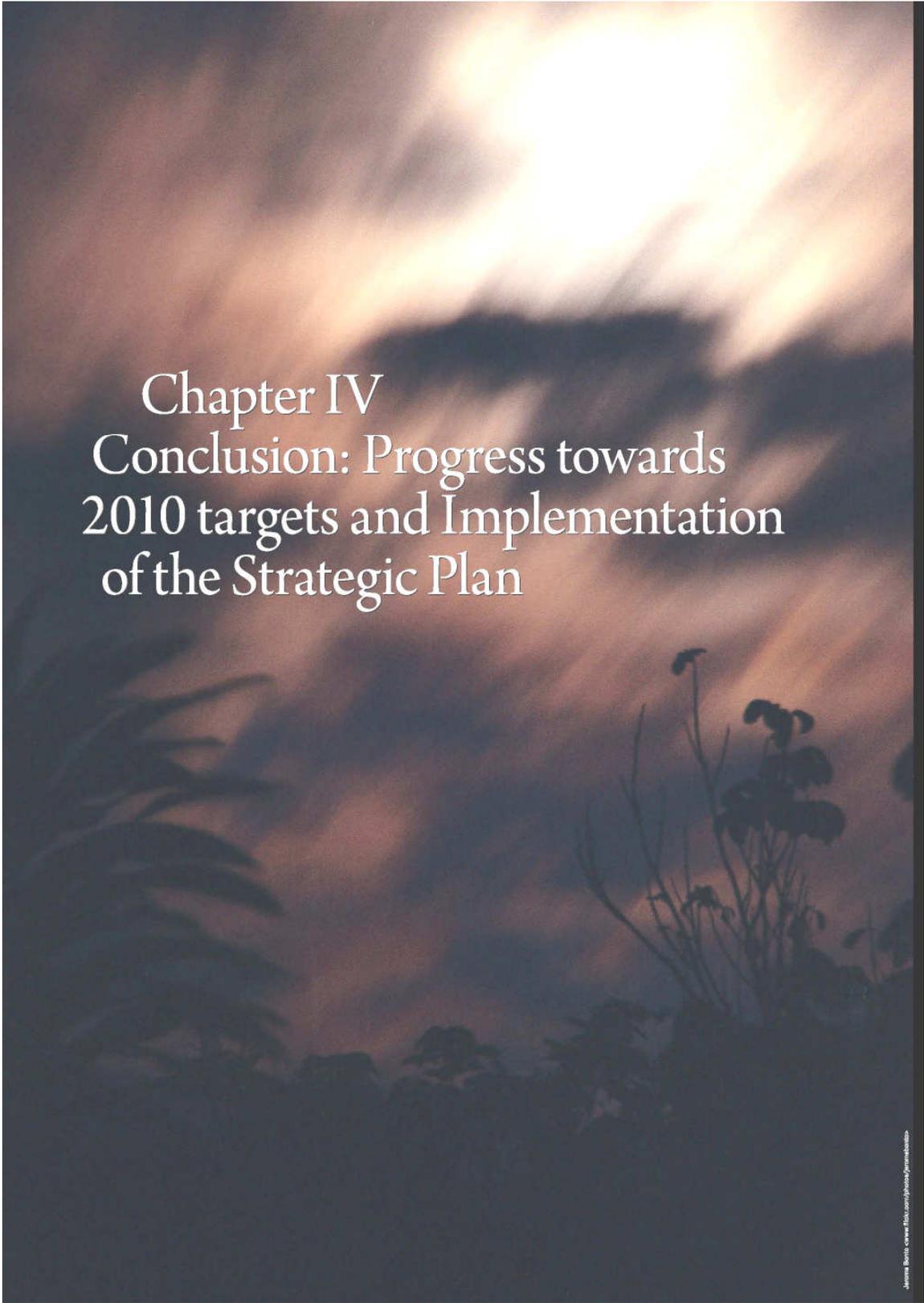
Mobilizing Resources for Biodiversity Conservation

Lao PDR's regulations on the Management of NBCAs, Living Aquatic Resources and Wildlife provided the mechanisms in sourcing the financial requirements of the NBCA Development Fund aimed at boosting the conservation and effective management of biodiversity resources in the country. This fund will be specifically used for the management and administration of NBCAs only covering the following concerns: the preservation of water resources, aquatic and wildlife resources and the environments within the areas; and the dissemination of legislations/policies, related capacity development trainings, and the supporting promotional activities (MAF & STEA, 2004).

Funding mechanisms strategy of the Lao National Government include the use of the National Tourism Fund which is supported by a 5% tax on national operators, income from the so-called "Biodiversity Maintenance Fee" generated from the costs of obtaining tourist visas in the country, and the hydropower concessions in major power generating projects like the Nam Leuk and Nam Theun II projects (MAF & STEA, 2004). Other sources of funding will come from the potential bilateral and multilateral, the private sector and external donors.

Figure 13. Strategic Framework for Sustainable Development Action Plan in Lao PDR (WREA, 2008)





Chapter IV
Conclusion: Progress towards
2010 targets and Implementation
of the Strategic Plan

Alena Borisova www.flickr.com/photos/arenaborisova

Biodiversity conservation in Lao PDR has been a priority ever since the country became a signatory to the Convention. This concern has been incorporated in the activities of the Greater Mekong Sub Region (GMS) program which is funded by different donor agencies such as the Asian Development Bank (ADB). The global targets, as set by the CBD, are also considered among others in coming up with the national targets set by Lao PDR with respect to the implementation of the GMS and formulating the National Sustainable Development Strategy. Likewise the indicators of the CBD were also integrated in the GMS and the NSDS.

The difference is that the approach made by the GMS is the PSR model (Pressure, State, Response) in which indicators were identified and adopted and used in the National Environmental Performance Assessment Report 2007 (NEPAR). The National Sustainable Development Strategy (NSDS 2008), on the other hand, makes use of “progress indicators” in monitoring sustainable development that includes biodiversity conservation and related concerns.

The table 22 shows the progress towards 2010 targets and table 23 shows the implementation of the strategic plan.

Progress towards the 2010 Targets

Table: 22 progress towards the 2010 targets.

PROTECT THE COMPONENTS OF BIODIVERSITY	
GOAL 1: Promote the conservation of the biological diversity of ecosystems, habitats and biomes.	
Target	Prospects for progress by 2010
1.1 Effectively conserve at least 10% of each of the world’s ecological regions	<ul style="list-style-type: none"> - There 21 National Biodiversity Conservation Areas (NBCAs) include one that was added in 2008 and 2 biodiversity corridors which cover about 3.5 million ha. There are also other conservation areas that belong to Provinces (0.93 million ha) and districts (0.5 million ha). According to Forest Law, there are 106 production forest sites that cover around 3.2 million ha and protection forests that cover about 0.5 million ha. The protection forests are under the responsibility of provincial and district authorities; - Even though a high percentage of Lao PDR is composed of forest, forest law policy should expand to protect up to 65% of forests by 2015 and 70% by 2020; - Laos has a high density of river networks and wetland sites. According to first wetland inventory in 1996, there are more than 30 important sites of which some are significant at regional and global level such e.g Siphanhdone wetland, Xe Pian wetland, Xe Cham phone wetland.
1.2 Areas of particular importance to biodiversity protected	<ul style="list-style-type: none"> - Generally, NBCA management system in Lao PDR defines areas into 3 management zones such as: buffer zones, common management zones and strict management zones. Lao PDR has not yet designed specific areas for conserving of particular species. Of the 21 NBCAs, there are only 6 that have management plans. However, these management plans cannot lead to proper management due to lack of sufficient financial support. IUCN and DoF are now conducting the review of its management. This will result in more guidance and a manual that will be developed and tested; - Laos acceded to Ramsar Convention in mid-2010 and proposed 2 important sites under this convention namely: Xe Champhone wetlands in Champhone district

	Savannakhet province (24,000 ha) and Kiet Ngong wetlands(a part of Xe Pian wetland) in Outhoumphone district, Champasack provice (3,000 ha)
GOAL 2: Promote the conservation of species diversity.	
2.1 Restore, maintain, or reduce the decline of the populations of species belonging to selected taxonomic groups.	<ul style="list-style-type: none"> - This issue has progressed at certain level. The revised Forestry Law which focus and a new Wildlife Law was adopted in 2007. The Lao Wild Animal Red List was revised and approved by government in 2009. In it, the aquatic and wild animals are classified into 3 main categories: Protected Species List categories I, II and III. Wildlife resource conservation efforts have been enhanced through the establishment of a new Department of Forestry Inspection under the Ministry of Agriculture and Forestry. These steps provide tools in controlling and managing biodiversity in Laos in general; - Laos is a ASEA-WEN.
2.2 Status of threatened species improved.	<ul style="list-style-type: none"> - As a legal basis for improving biodiversity conservation in the country, the revised Forestry Law and Wildlife Law were adopted in 2007. Furthermore, the Lao Wild Animal Red List was revised and approved by government in 2009, in which all aquatic and wild animals are classified into 3 main categories: Strict Protected Species List (category I) and Less Strict Protected Species List (category II). The two categories were approved by the Prime Minister. The Common Management Species Lists was approved by Agriculture and Forestry Minister; - Conservation efforts were also promoted through flagship species conservation of species such as of the Saola (<i>Pseudoryx nghetinhensis</i>), gibbon spp., Asian elephant, Tiger, Siamese crocodile, and Eld's deer, efforts were initiated by different organizations in partnership with relevant government agencies; - Laos acceded to CITES 2004; - Laos is a member of ASEAN-WEN; - Even though, there were many Laws (Environmental Law, Land Law, Agriculture Law, Plant Quarantine Law,...) and instruments developed, there was not a focus on their enforcement so the management status was not evidently improved within last 10 years. The main threats are: illegal harvesting/hunting and trading, forest fire, illegal logging.
GOAL 3: Promote the conservation of genetic diversity.	
3.1 Genetic diversity of crops, livestock and harvested species of trees, fish, wildlife and other valuable species conserved, and associated indigenous and local knowledge maintained.	<ul style="list-style-type: none"> - The NAFRI is responsible for the genetic diversity of crops and aquatics e.g the rice research center conducted a rice variety survey and found that there are more than 3,169 distinct names given to the traditional varieties. The aquatic animals are under responsibility of the aquatic research center. In the Mekong River alone, more than 500 indigenous fish species reported. Harvested species of trees including NTFPs/medicine plants and wild life conserved through different means developed by government; - Parallell with in – situ conservation, ex-situ conservation efforts were also made on a small scale. The Faculty of Forestry developed botanic garden for study purposes in its campus. The Forest Research Center has developed plots for planting 34 rattan and 54 bamboo species. Some orchid species are now kept in the Faculty of Forestry and Forest Research botanical garden. A newly established botanical garden also found in Pha Tat Kair of Luang Prabang province. The Traditional Medicine Research Institute has established a medicinal plant garden in Borikhamxay province. The medicine garden is around 200 ha and was created through cooperation with JICA recently established in Saravane province; - Lao Government has a clear policy on protecting local knowledge as well as its proper use developed in the Intellectual Protection Law. Traditional technology was widely used in conservation of biodiversity and production such as utilization of medicine plants, fish conservation areas.

PROMOTE SUSTAINABLE USE	
GOAL 4: Promote sustainable use and consumption.	
<p>4.1 Biodiversity based-products derived from sources that are sustainably managed, and production areas management consistent with the conservation of biodiversity.</p>	<ul style="list-style-type: none"> - Sustainable Forest Management and Rural Development Project under DoF/MAF supported by WB defined 51 forest lands as production forest which followed by well management plans; - Product certification project on rattan is under the way to develop. The WWF and DoF by cooperation with local authority in Borikhamxay province is running one NTFP project called “Sustainable Rattan Management and Plantation” in Khamkeut district of Borikhamxay province. Beside managing rattan canes, the project also supports villages to plant rattan and collect them as shoots – as food for local consumption and income generation. The SNV by cooperation with Santhong district authority in Vientiane Capital, supports local people to define bamboo forests and develop a management plan. The bamboo derived from forest then was added value as semi-products or finished products as various goods for domestic use and export to Thailand. Similar work was also introduced in Houaphanh province by the same organization.; - The establishment of fish conservation areas were widely scaled up throughout the country. The poverty reduction fund under Ministry of Planning and Investment is a good example in supporting local people to establish fish conservation areas and production forests for foods and environmental protection. - The cooperation among ASEAN named ASOP is continuing to implement a wood/timber certification program.
<p>4.2 Unsustainable consumption of biological resources, or consumption that has an impact on biodiversity, reduced.</p>	<ul style="list-style-type: none"> - Consumption behavior that relies up on natural products has changed to domestication. One good example is rattan shoot production in some districts of Savannakhet province and some central provinces. People are aware that the NTFP items were easy to found in forests in the past, but now due to forest loss or long distances from their villages; some NTFPs have to be cultivated. The plantation of rattan provide growers not only its canes but shoots as well. Growers who planted one ha of rattan or about 1.600 seedlings , can harvest shoots to sell in local markets and make at least 1,500 US\$ per year after 4-5 years; - Forest products including woods, NTFPs, have to be processed, semi-processed and finished products to add more value before exporting to international markets; - Strict control over massive destruction equipments/tools for collecting or harvesting biodiversity resources, is clearly addressed in national related law and regulations such as Aquatic and Wild life Law, Environmental Law , Forest Law,...
<p>4.3 No species of wild flora or fauna endangered by international trade.</p>	<ul style="list-style-type: none"> - Wildlife is hunted mostly by rural people for home-consumption, although meat and wildlife products are also sold at local markets. Commercial hunting and fishing, in contrast, can be much more damaging and as a result, some species such as rhino and some turtles have almost disappeared from Lao PDR; - Harvesting of some NTFPs on a commercial scale, often in unsustainable manners and quantities is still found Throughout the country. Eagle woods, berberines, and orchids are often improperly collected and traded; - Being a signatory to the CITES, the MAF and the WCS made efforts to regulate threatening activities through the implementation of a national gun collection, and strict enforcement of existing relevant laws and regulations to curb and minimize the widespread practice of these activities. These efforts resulted in a modest decline and less visibility of the wildlife trade in the country and more or less regulated the harvesting of wildlife and wild products that are traded locally and internationally; - In some cases, village regulations also developed for specific species conservation.;

	<ul style="list-style-type: none"> - It was observed that at present, there are a lots of laws and regulations to prevent unauthorized use of wildlife, although in reality, they are not strongly enforced. In addition, the knowledge and skill of staff, as well as the resources and facilities at their disposal, are limited, so there are still illegal hunting and trading along borders with neighboring countries.
ADDRESS THREATS TO BIODIVERSITY	
GOAL 5: Pressure from habitat loss, land use change and degradation, and unsustainable water use reduced.	
5.1 Rate of loss and degradation of national habitats decreased.	<ul style="list-style-type: none"> - During 2004, forest destruction was about 53,000 ha/year, now the situation is improving through government initiatives such as Land and Forest Allocation Program, community forest projects, tree plantation, shifting cultivation reduction program and other; - Habitat degradation comes from 2 main causes namely: agricultural practices such as people settling within and around some NBCAs encroaching upon the protected areas by expanded paddy fields, gardens or commercial cropping areas. Some other NBCAs are relatively well preserved but are also under pressure from unauthorized and development activities; livestock grazing is another cause that led habitat loss. In some cases, to improve grazing, villagers may burn the forest under storey to promote grass growth and to drive away large predators, such as tigers, to avoid cattle loss; - It was observed that agriculture lands/paddy fields and wetland areas in and surrounding towns are being converted into urban areas; it seems that this trend will increase in the future.
GOAL 6: Control threats from invasive alien species.	
6.1 Pathways for major potential alien invasive species controlled.	<ul style="list-style-type: none"> - The trans-boundary movement of genetic resources is following international regulations/procedures on “advance informed agreement procedure”; - The regulation on biosafety management of Lao PDR is now being prepared which was already mentioned in National Biodiversity Framework project supported by UNEP/GEF; - The Plant and Wildlife Quarantine Law contains specific regulations that prevent importing or introducing invasive alien species; - In the past, it was observed that, there were some newly introduced species found in different places such as snails, giant crabs, memosa, ...but these issues were less considered and need to study in depth.
6.2 Management plans in place for major alien species that threaten ecosystems, habitats, or species.	<ul style="list-style-type: none"> - Due to lacking information on impacts arising from the alien species and less cooperation with international agencies, Lao PDR has no management in place.
GOAL 7: Address challenges to biodiversity from climate change and pollution	
7.1 Maintain and enhance resilience of the components of biodiversity to adapt to climate change.	<ul style="list-style-type: none"> - This is mentioned clearly in the National Program of Action to Climate Change. Priority projects under the Agriculture Sector are: strengthen the capacity of the National Disaster Management Committees, promote secondary professions in order to improve the livelihoods of farmers affected by natural disasters affected by climate change,... Priority projects under Forestry Sector are: Continue the slash and burn eradication program and permanent job creation program, strengthen capacity of village forestry volunteers in forest planning, caring and management techniques as well as the use of village forests,... - Maintain and increase forest cover in accordance with Forest Strategy and other relevant strategies in which the main focus is on relevant responsible sectors.
7.2 Reduce pollution and its impacts on biodiversity.	<ul style="list-style-type: none"> - The prevention measures were developed by Department of Environment such as SEA, EIA, IEE, ECA. - The promotion measures are strongly applied to organizations or individuals who contribute to protect environment. Beer Lao Factory is one of the good contributors in term of reducing its CO₂ emissions ; - To celebrate Vientiane 450th anniversary, the propagation on topic “Clean” is widely promoted. In Lao PDR, there were a lot of cultural villages established.

	<p>One of many categories used to select is also “Clean Village”;</p> <ul style="list-style-type: none"> - To reduce fuel wood consumption, reduce CO₂ release to the atmosphere and for hygiene purposes, the bio-gas, Solar Energy, small – household scale hydro power schemes are being actively promoted in rural remote areas.
MAINTAIN GOODS AND SERVICES FROM BIODIVERSITY TO SUPPORT HUMAN WELL – BEING.	
GOAL 8: Maintain capacity of ecosystems to deliver goods and services and support livelihoods.	
8.1 Capacity of ecosystems to deliver goods and services maintained.	<ul style="list-style-type: none"> - According to the adjusted Forest Law (2007), all forests were re-classified into 3 types namely: conservation forests, protection forests and production forest. Main purposes of these are: conservation areas for conservation of biodiversity and environmental services; protection forests for watershed protection, natural disaster prevention and environmental services; production forests for wood and food supplying, environmental services,....The total forest area is more than half of the country area; - The Agro-Biodiversity Initiative (TABI) supported by SDC, under Department of Planning, MAF is implementing project activities in Luangprabang and Xiengkhouang provinces. Not only Agro-Biodiversity, but Forest and Mountain Biodiversity are being managed; - The sustainable tourism program, especially ecotourism projects supported by ADB, rely heavily on Biodiversity. Tourists, who visit NBCAs, beside seeing the beautiful landscape, have a chance to see various trees, NTFPs and wildlife; - The RIGHTS-LINK Lao Project supported by SDC, is one project that focuses on public awareness- raising on Lands and Natural Resources issues. The project aims to improve stakeholder capacity, knowledge and participation in policy dialog on land – related issues. Posters, and other promotion materials were developed and distributed to target people.
8.2 Biological resources that support sustainable livelihoods, local food security, and health care, especially of poor people, maintained.	<ul style="list-style-type: none"> - The national land and forest allocation program, the shifting cultivation program and other government projects are ongoing and aim to reduce slash and burn cultivation and at the same time provide alternatives to local people to deal with permanent/sedentary cultivation. Through these methods, the forest cover in Laos is maintained and is predicted to expand in area in the future; - The BCI programme, which was partnered with WWF and IUCN, identified biodiversity conservation corridors to ensure that adequate linkages in the landscapes will be properly and adequately protected and managed to maintain biodiversity resources and vital ecosystem services to sustain resource productivity and livelihoods of the communities. As a result, the programme should contribute to the sustained growth of the national economy; - Various Projects of the WWF Laos Country Programme were put in operation such as the Switch Project on Sustainable Rattan Harvest and Production that helped Lao farmers to increase their production and income from their rattan plantations; - The Netherlands Development Organization (SNV) by collaboration with some provincial authorities and other sectors provided support on bamboo value chain development and rattan shoot value chain development. These programs have very clear objectives to conserve and manage NTFPs in proper manner for improving local livelihoods and contribution to poverty reduction of government program; - In partnership with the Champasak Provincial Agriculture and Forestry Office and district authorities, IUCN has implemented a project ‘Landscape and Livelihood Strategy’ aiming to conserve the biodiversity of the area concerned while at the same time enhance the effective use of forest resources, especially NTFPs to meet the local need.
PROTECT TRADITIONAL KNOWLEDGE, INNOVATIONS AND PRACTICES.	
GOAL 9: Maintain socio-cultural diversity of indigenous and local communities.	
9.1 Protect traditional knowledge,	- Traditional knowledge, innovations and practices on biodiversity are well

<p>innovations, and practices.</p>	<p>protected through various means e.g conservation sacrifices for water areas, sacrifices for forest areas, bans on hunting specific animal species during Buddhist lent or Kao Phan Sa, ban on eating some animal meats, releasing animals. Dok Champa (<i>Plumeria</i>), May Chanh, (?) May Pho (<i>Ficus religiosa</i>) are plants that Lao people believe are good wills;</p> <ul style="list-style-type: none"> - The Environmental Awareness Raising project under WWF Lao program capitalized all traditional knowledge on biodiversity conservation and its utilization in their project areas to teach or transfer to the new generation.
<p>9.2 Protect the rights of ethnic groups and local communities over their traditional knowledge, innovations, and practices, including their rights to benefit sharing.</p>	<ul style="list-style-type: none"> - There are many places, especially in remote areas that keep traditional ways of conserving biodiversity by developed their own taboos. For instance : do not make noise when enter into forests (which would disturb wild animals) and do not kill animals in full month days,... - The Intellectual protection Law developed a legal frame work that ensures that all local and ethnic group knowledge will be protected and utilized through equitable sharing of benefits.
<p>ENSURE THE FAIR AND EQUITABLE SHARING OF BENEFITS ARISING OUT OF THE USE OF GENETIC RESOURCES.</p>	
<p>GOAL 10: Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources.</p>	
<p>10.1 All access to genetic resources are in line with the Convention on Biological Diversity and its relevant provisions.</p>	<ul style="list-style-type: none"> - Lacking scientific records and having only physical characteristics made it difficult to deal with this issue. So far only a few products are registered as national property. Lack of genetic bank is another issue that makes progress on this issue difficult; - The Intellectual protection Law mentioned all relevant issues, but the law not widely disseminated and enforced.
<p>10.2 Benefits arising from the commercial and other utilization of genetic resources shared in a fair and equitable way with countries. Resources should be provided in such a way that they are in line with the Convention on Biological Diversity and its relevant provisions.</p>	<ul style="list-style-type: none"> - Benefits arising from the commercial and other utilization of genetic resources are protected by some legal frameworks such as: Domestic Investment Law, Law on Promotion of Foreigner Investment, Intellectual Protection Law,...
<p>ENSURE PROVISION OF ADEQUATE RESOURCES</p>	
<p>GOAL 11: Parties have improved financial, human, scientific, technical and technological capacity to implement the Convention.</p>	
<p>11.1 New and additional financial resources are transferred to developing-country Parties to allow for the effective implementation of their commitments under the Convention, in accordance with Article 20.</p>	<ul style="list-style-type: none"> - During 2000-2005, the external assistance was reduced in terms of numbers and since that time, financial support to implement biodiversity conservation has started to increased again. Some of the main donors are: GEF, ADB, WB, SDC, Sida, MRC, GTZ, FAO, UNDP, UNEP, JICA,... - There is some financial support from foundations that deal directly with INGOs, institutions. The Environmental Protection Fund which is under WREA and supported by WB and ADB also released a certain amount to local authorities/ communities to implement conservation work.
<p>11.2 Technology is transferred to developing-country parties to allow for the effective implementation of their commitments under the Convention, in accordance with Article 20.</p>	<ul style="list-style-type: none"> - Under ASEAN framework, Clearing House Mechanism was set up for each country member by ACB experts. At the same time, Lao counterparts have got benefit through short term training, practicing, experiences sharing,... - The technology transfer normally conducted in various stakeholder organizations in the forms of job training, training courses, and study tours at education institutions.

PROGRESS TOWARDS THE GOALS AND OBJECTIVES OF THE STRATEGIC PLAN OF THE CONVENTION.

Table 23 : progress of the implementation of the strategic plan.

Goal 1: The Convention is fulfilling its leadership role in international biodiversity issues.	
1.1 The Convention is setting the global biodiversity agenda	- Yes, the CBD was well developed and used as the fundamental document for parties to translate in their own country. In Lao PDR, the government tried implement the Convention through the formulating of the 1 st Biodiversity National Report by involving of relevant stakeholders, later the National Biodiversity to 2020 and Action Plan to 2010 was developed and these two documents were submitted to CBD's Secretariat in 2004. Unfortunately, due to limited financial support, only some action plans made progress and major activities were not implemented.
1.2 The Convention is promoting cooperation between all relevant international instruments and processes to enhance policy coherence.	- Yes, there are a number of international processes that considered biodiversity including e.g the World Food Security Program, MDG, Climate Change Program,...
1.3 Other international processes are actively supporting implementation of the Convention, in a manner consistent with their respective frameworks.	- The ACB, MRC, GMS,... are also support the convention implementation at regional level.
1.4 The Cartagena Protocol on Biosafety is widely implemented.	- Lao PDR acceded to the Cartagena Protocol on Biosafety on 3 rd August 2004 and since that time the National Science and Technology Authority(STEA) as a coordinating agency together with relevant stakeholders completed the National Biosafety Framework (NBF) in December, 2004; - Since 2010 to 2013, the NBF is implementing by the supporting of GEF 4. IT can say that the Cartagena Protocol on Biosafety just started to implement or in the initial stage.
1.5 Biodiversity concerns are being integrated into relevant sectoral or cross-sectoral plans, programs and policies at the regional and global levels.	- GMS, ACB and MRC are international organizations that support biodiversity work in Great Mekong Sub-region.
1.6 Parties are collaborating at the regional and sub-regional levels to implement the Convention.	- Director general of WREA cabinet office is a Chair of Lao-ASOEN and a member of the Governing Boards of the ASEA Center for Biodiversity; - The GMS Secretariat under WREA is a member in the ASEAN Working Group on MEAs and also works as national focal point for ACB.
Goal 2: Parties have improved financial human, scientific, technical, and technological capacity to implement the Convention.	
2.1 All parties have adequate capacity for implementation of priority actions in national biodiversity strategy and action plans.	- Yes, Lao PDR has capacity to a certain extent in implementing NBSAP. Even so, it still needs collaboration with international institutions and experts to get new updated technology.

<p>2.2 Developing country parties, in particular least developed countries(LDCs) and small island developing States(SIDS) among them, and other parties with economies in transition, have sufficient resources available for implement the three objectives of the Convention.</p>	<ul style="list-style-type: none"> - There are 3 main financial sources for biodiversity works in Lao PDR : Government, private investors and interested donors. From government is derived from the Forest Development Fund, from private investors is e.g hydropower developments, mining inside or around NBCAs contribute a certain amount of budget to restore environment and community development, from interested donors mainly in form of grant for specific projects. Even so, the funds available are not sufficient because Laos has a high number of NBCAs that cover almost 15 % of national land.
<p>2.3 Developing country parties, in particular LDCs and SIDS among them, and other parties with economies in transition, have increased resources and technology transfer available to implement the Cartagena Protocol.</p>	<ul style="list-style-type: none"> - Yes, in term of financial resource, GEF4 allocated 995,000 US\$ to implement one project called “ Support the Implementation of National Biosafety Framework for Lao PDR”; - In term of technology transfer, the capacity building on Biosafety Clearing mechanism was defined under the project. The public service and monitoring project component also specified priority topics for staff to train such as the inspection of GMO products, increase knowledge and skill for LAB staff ,...
<p>2.4 All parties have adequate capacity to implement the Cartagena protocol on Biosafety.</p>	<ul style="list-style-type: none"> - Yes, Lao PDR has certain qualified staff to conduct some activities, but some could not be conducted so this requires external experts to assist or transfer new technology; - The Cartagena Protocol on Biosafety deals mainly with scientific works and biosafety management in Lao PDR is in its initial stage, so they do not yet have sufficient qualified staff to implement activities.
<p>2.5 Technical and scientific cooperation is making a significant contribution to building capacity.</p>	<ul style="list-style-type: none"> - The ratification of the ASEAN Centre for Biodiversity as a legal body within the ASEAN framework has also increased the participation of Lao PDR in the collaboration and sharing of knowledge and experiences among the other ASEAN Member States. Many of the technical people have attended workshops and training courses conducted by the ACB on biodiversity related conservation and management; - Bilateral or multilateral cooperation with various institutions and donors through on job training, workshops, site visits and study tours; have all increased the knowledge and capacity of Lao counterparts in implementing biodiversity relevant works e.g wild life survey with IUCN, WCS or Plant Taxonomy work with DARWIN project.
<p>Goal 3: NBSAPs and the integration of biodiversity concerns into relevant sectors serve as an effective framework for the implementation of objectives of the Convention.</p>	
<p>3.1 Every party has effective NBSAPs in place to provide a national framework for implementing the three objectives of the Convention and to set clear national priorities.</p>	<ul style="list-style-type: none"> - NBSAP was well developed in 2004 and widely participated in by the majority of stakeholders. The Strategy identified 7 major program and a lots of actions; - The institution arrangement mentioned in the strategy was the Science Technology and Environment Agency (STE) and Ministry of Agriculture and Forestry (MAF) as leading agencies. During 2007-08, STEA was re-organized and one new government line agency was set up called: Water Resources and Environment Authority which the Environment Department (DoE) is underneath. The NBSAP which under responsibility of DoE also moved to newly set up agency. WREA which is limited in terms of human resources as well as financial support

	<p>together with weak collaboration with other key institutions could not lead implementing the said strategy. From these reasons, the national priority of actions and national report 2 and 3 were not made. These issues will be improved for the 2nd 5 year action plan of the strategy.</p>
<p>3.2 Every party to the Cartagena Protocol on Biosafety has a regulatory framework in place and it is functioning to implement the Protocol.</p>	<p>- There is a component of NBF Lao concerned with a regulation regime on biosafety. Currently, the National Biosafety Strategy and Action Plan is drafting and Law on Biosafety will be followed and completed by 2013.</p>
<p>3.3 Biodiversity concerns are being integrated into relevant national sectoral and cross-sectoral plans, programmes and policies.</p>	<ul style="list-style-type: none"> - Biodiversity is mainstreaming into rural development and poverty eradication; - Biodiversity guideline for environmental assessment; - Importance of biodiversity for climate change; - Biodiversity in land zoning & land use planning; - Nutrition and biodiversity; - National Environmental Strategy; - 6th National Socio-economic Development Plan; - National Food Security Strategy; - Forest Strategy till 2020; - National Sustainable Development Strategy - Vientiane Declaration set up biodiversity sub-working group under Rural Development and Natural Resources working group; - At the provincial level, short and long term management plan of each NBCA developed by provincial NBCA management unit and then submitted to incorporate in provincial development plan.
<p>3.4 The priorities in NBSAPs are being actively implemented as a means to achieve national implementation of the Convention, and as a significant contribution towards the global biodiversity agenda.</p>	<p>- The NBSAP did not identify national priority actions, but NSEDP has specifically included the following targets related to biodiversity, which were also included as priorities of the Forestry Strategy and the NBSAP:</p> <ul style="list-style-type: none"> • Put an end to slash-and-burn cultivation by 2010; • Reduce the proportion of the population using solid fuels; • Biodiversity Conservation by improving NBCA management ; • Conserve threatened and endangered species in their habitat (NBSAP); • Controlling Wildlife Trade; • Biodiversity management and ecologically sustain-able agriculture and forestry.
<p>Goal 4: There is a better understanding of the importance of biodiversity and of the Convention, and this has led to broader engagement across society in implementation.</p>	
<p>4.1 All parties are implementing a communication, education, and public awareness strategy and promoting public participation in support of the Convention.</p>	<ul style="list-style-type: none"> - The Poverty Reduction Fund has included the action on public awareness of the importance of biodiversity in relation to poverty reduction in its plan. Posters depicting a comparison of right and wrong land use were issued and distributed to target groups. Many fish conservation zones, forest protection areas were established that linked with food security; - The conservation and livelihood support projects, such as the Landscape and Livelihood Strategy project (LLS) of IUCN, The Agrobiodiversity Initiative Project (TABI) implemented by MAF with support from the Swiss Development Cooperation Agency (SDC); - WWF has implemented a project on Sustainable Rattan Management and Harvesting as a means for improving people's

	<p>livelihoods;</p> <ul style="list-style-type: none"> - General public awareness of the importance of biodiversity has been consistently pursued, especially through the National Wildlife Day celebration, Biodiversity Day celebration which is carried out annually; - Awareness raising included a wildlife conservation campaign in schools, media release, radio and TV broadcast. As part of the effort various posters, leaflets, booklets, and documentary films on biodiversity were released to the public through government organizations, international organizations and projects; - The SEM II project under DoE has focused in education awareness for young generation in schools, the TV program on environment is broadcast once a week.
<p>4.2 Every party to the Cartagena Protocol on Biosafety is promoting and facilitating public awareness, education and participation in support of the Protocol.</p>	<ul style="list-style-type: none"> - The 6th component of NBF mentioned public awareness, education and participation. Some activities have been done to promote and create public awareness and participation such as developed dissemination material in local language and organized several dissemination workshops and exhibitions at several events.
<p>4.3 Indigenous and local communities are effectively involved in implementing and in the processes of the Convention, at national, regional and international levels.</p>	<ul style="list-style-type: none"> - The integrated conservation and development or ICAD concept was applied in NBCA management. From early stages, there was a series of meetings organized to work with relevant stakeholders in communities. In some cases, various agreements between NBCA authority and communities were developed; - The Poverty Reduction Fund is supporting the creation of fish conservation areas and \managing themt, while TBI is supporting local people in dealing with sub-project proposals to implement agrobiodiversity works in project areas.
<p>4.4 Key actors and stakeholders, including the private sector, are engaged in partnerships to implement the Convention and are integrating biodiversity concerns into relevant sectoral and cross-sectoral plans, programmes and policies.</p>	<ul style="list-style-type: none"> - The tourism sector has also incorporated biodiversity consideration in its promotion programme. Specific to the tourism sector is the promotion of ecotourism which depends largely on natural attractions and attributes that often involve national protected areas. This programme has been included in the National Sustainable Development Strategy; - The Lao non-profit associations namely : CSO, LBA, PADETC, NORMAL,...are also actively involved in implementing the NBSAP; - Some mining companies e.g Oxiana MMG, Phou Bia Mining have clear policy in term of supporting biodiversity conservation and village development; - There are many INGOs who have relevant mandate to conservation works such as: IUCN, WWF, WCS, VFI, SNV,... - Nam Leuk and Nam Theun II hydropower projects fund the management of the area or watershed concerned.

Many of the indicators from both official documents are similar especially those used in forest management and biodiversity conservation. Also many of the indicators address the CBD global goals and targets, but unfortunately, not all.

The progress indicators have been developed and adopted in the NSDS only in 2008 as part of its strategy to monitor progress of sustainable development in general and biodiversity conservation and other related sectors in particular. Despite its late development, the indicators can be used retroactively to track changes in biodiversity conservation activities in meeting the 2010 target. These are evident in the information generated and being used in the GMS and other sectors involved in biodiversity conservation

as mentioned in the previous chapters.

Since the time that Lao PDR has become a signatory to the Convention, many things have happened in relation to biodiversity conservation. Incorporation of biodiversity conservation in the major programs of the region such as the GMS and the Biodiversity Corridor Initiative in general and Lao PDR in particular was an outcome of the implementation of the Convention worldwide. The Environment Protection Fund was also created.

Area covered by high biodiversity biomes such as the forest biome has been steadily increasing. Another national protected area was declared around the time this report was written bringing the total number of protected areas up to 21. At the same time, forest cover is generally decreasing throughout the country and hence, biodiversity that is found in the forest.

At present, there is almost 15% of the total land area protected under the national protected area system, which addresses the 2010 target of at least a 10% reduction of biodiversity loss in terms of land area and forest cover. Maintaining and improving this figure would need substantial capacity building and sustainable financing of conservation activities. One example of progress is the creation of a graduate/masters degree program in the National University of Lao focusing on biodiversity conservation. At present, there are 6 graduate students enrolled in the program.

Ecotourism in Lao PDR is steadily growing and has become one of the major areas identified in the National Sustainable Development Strategy.

It will be challenging to fully achieve the 2010 Target because there are barriers and obstacles that hinder the implementation of activities. Foremost is the lack of sufficient funds for a sustainable implementation of activities. Second is the fact that qualified personnel in many of the implementing agencies is severely lacking. We need more personnel who can manage and conserve biodiversity.

Ethnic communities' hesitations about change are another obstacle in the implementation of biodiversity conservation concerns; however, this is not an insurmountable obstacle.

Conclusions

Implementation of the Convention has changed the development landscape of the country. 'Sustainable development' was unknown in the past but has now gained a place in society. Biodiversity conservation is but one element of the sustainable development picture. Implementing the activities of the Convention has had a profound impact on the sustainable use of biodiversity. An example of this is ecotourism where biodiversity is the main attraction. Hence, conservation of biological resources becomes imperative since it is the main character in the tourism / ecotourism sector.

However, the issue of fair and equitable sharing of benefits arising out of the utilization of genetic resources is not yet a resolved issue. For one thing, the international regime for Access and Benefit Sharing (ABS) was only recently crafted but it will take a long time for the Parties to adopt it.

As stated in the National Sustainable Development Strategy of 2008, the future lies in its Strategic Goals and priority policy areas mentioned in the previous section.

Human resource development is another key priority policy area and it has never been so pronounced as in the need for capacity development in the Natural Resources and Agriculture sectors, especially in the management of these resources. This includes other sectors related to biodiversity conservation such as health, ecotourism, education, enforcement, community development, etc.

Lao PDR lies in the heart of the Greater Mekong Sub-region where more than half of the population is dependent on the resources that the Mekong River provides. To address their needs, the countries surrounding the Mekong River must coordinate with each other in planning and implementing activities that can improve the lives of their peoples. This is already stipulated in the GMS sustainable development

strategy. However, more needs to be done.

Lessons Learned from Less Successful Implementation

International Agreements are not self-executing and so must be implemented in national law. An overarching recommendation in Section 5.4 of the report on MEAs (Dec. 2007), is *to develop a national biodiversity law that would provide the framework for implementing the biodiversity – related MEAs* in the same way that the Environmental Protection Law provides a framework for implementing the MEAs that deal with climate change

- The national strategies and plans have recognized the critical link between ecosystems management and conservation with species conservation and management because habitat destruction is the primary cause of species loss
- No government – initiated projects are being carried out that specifically addresses the primary issues reported in the main report, according to the WREA and MEA Focal Points (2007)
- Program development and implementation, monitoring & evaluation, need to be strengthened
- Under-reporting of successful cases in biodiversity-related activities should be addressed so that we can learn from them and apply that knowledge in other cases
- Only the Environment Protection Law(EPL) and the Law on National Heritage contain obligations concerning public awareness and education. The the other sectoral laws and policies do not. Current principal issues related to environmental education and public awareness are the following:
 - Limited knowledge and understanding among the general public about environmental protection and natural resources conservation
 - Very limited public access to environmental data and information

However, the DOE/WREA has collaborated with the Ministry of Education to work on incorporating environmental studies into formal and non-formal education. Other agencies have worked to raise public awareness but these have been ad hoc programmes. Therefore, CEPA activities need to be strengthened.

- Presently there are no opportunities for the private sector to be an active participant in environmental protection and natural resources management. The private sector is more interested in forming partnerships to achieve specific results and does not see itself as a primary resource provider.

Suggested Actions to be taken at the international level (Regional/Global) in order to enhance national implementation of the CBD.

- The lack of expertise and capacity to monitor and evaluate/analyze data hamper efforts to achieve the 2010 global targets. This could be addressed by capacity development programs conducted by international agencies, especially in the Greater Mekong Sub Region where the Lao PDR is just one of the players in conserving the resources of the Mekong River.
- Agricultural biodiversity is one ecosystem that is not fully addressed and this shows in the data reported in chapter one. The bulk of the information on this ecosystem is on production data. Agricultural biodiversity in terms of its genetic resources and species richness are not addressed. Again, the lack of qualified personnel to look into plant genetic resources makes it difficult to make an acceptable assessment of trends in genetic resources (which is one of the global targets).
- Enhance technical assistance and support from the ASEAN Member States in complying with CBD commitments.
- Establishing/strengthening linkage, partnerships with academe, private sector and governments in the ASEAN Region and beyond in implementing biodiversity conservation and development projects

APPENDIX I

A. Reporting Party

Contracting Party: Lao People's Democratic Republic

NATIONAL FOCAL POINT

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Full name of the institution: Same as the above

Name and title of contact officer:

Mailing address:

Telephone:

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SUBMISSION

Signature of officer responsible for submitting national report: Same as the above

Date of submission:

B. Process of preparation of national report

(Please provide information on the process used to prepare this report, including information from the different stakeholders involved and material used as a basis for the report).

As the start of the process, a key personalities' meeting or a small group discussion was called and organized by DoF and DoE (WREA) to discuss the developments of biodiversity conservation activities implemented in line with the country's NBSAP and other related programs, and the availability of data/information critical in the preparation

of the 4NR, in particular to update the 4th National Report prepared for the ASEAN Centre for Biodiversity (ACB).

Those who attended the said meeting included the following: Mr. Khamphanh Nanthavong, DoF Deputy Director, Mr. Bouaphanh Phanthavong, DFRC Head, Mr. Sangvane Bouavong, Mr. Khampadith Khammounheuang, DoE, Deputy Director, Mr. Khonesavanh Louangrath DoE, Mr. Lee Meng Bouapao, DoE, and key officials of the Department of Forestry.

The remaining paragraph will be based on the coming outcomes of our consultation workshop before finalising this national report.

The stakeholders' workshop-meeting was held on 19 August 2010 at Lane Xang Hotel, Vientiane, Lao PDR and co-led by the WREA (the Department of Environment) and MAF (the Department of Forestry). Other personalities that attended the stakeholders' meetings came from the Ministry of Agriculture, Fishery and Forestry (National Agriculture and Forestry Research Institute; Department of Forestry, Department of Agriculture, and others); the Water Resources and Environment Administration (Department of Environment, Climate Change Office, GMS), Science Technology Administration, the Leading Committee for Rural Development and Poverty Reduction, the National University of Lao PDR; the World Wildlife Fund; Conservation International; IUCN-Lao PDR; and others.

The stakeholder meeting shared the draft national report (already submitted to the CBD secretariat) with the focus in more discussions on the gaps of reference materials and information in certain areas that can be used in coming up with the report and the activities done by the different stakeholders related to biodiversity conservation and management. A draft report together with the presentation summary of the CBD report was also presented and distributed to the different stakeholders for them to provide the necessary information before finalising to the final national report to be submitted to the Secretariat of CBD by WREA (DoE) as part of the agreement during the handover responsibilities to the Ministry of Agriculture and Forestry. The revised version of the national report was incorporated comments and suggestions from the stakeholder meeting and from the advisory team (DoE, DoF and NUoL) organised in a separate meeting to focus on updating all annexes.

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Appendix III A

Progress Towards Targets of the Global Strategy for Plant Conservation and the Programme of Work for Protected Areas

Targets of the Global Strategy for Plant Conservation

Targets	Progress
1. A widely accessible working list of known plant species, as a step towards a complete world flora.	- Working list of Lao flora was completed in principle, especially for orchids. Other lists of known plants are still being updated, including the work of Vidal, J. (1972), the Kethphanh, S. (2004) ' <i>Sustainable use of NTFPs</i> ' which includes flora, by Lao institutions like the National University of Lao and the National Agriculture and Forestry Research Institute, the Traditional Medicine Research Center among others.
2. A preliminary assessment of the convention status of all known plant species at the national level.	- There have been efforts made in this field, however there has been inconsistency in consolidating a comprehensive national level assessment. Agrobiodiversity species have been better compiled and assessed such as rice varieties, including the native rice species <i>Oryza Sativa L.</i> , corn, beans and others. Herbaria have been set up in the National University of Laos and at the Traditional Medicine Research Center; others are being considered to be established. Past work was carried out in an uncoordinated fashion. In the future, it is suggested that the CBD Focal Point office takes the lead in the coordination of the efforts.
3. Development of models with protocols for plant conservation and sustainable use, based on research and practical experience.	- Large number of management models have been developed, including for key plant species conservation such as NTFPs including orchids although software models have not been specifically developed. For example, the designation of three forest categories: conservation forest, protection forest and production forest aim to develop models for biodiversity management, including the plant species. Sustainable Forest Management and Rural Development Project (SUFORD), The Biodiversity Initiative Project (TABI), Integrated Conservation and Development (ICAD) are some of the examples of the management models.
4. At least 10% of each of the world's ecological regions effectively conserved.	- The fact that the national protected area system of Lao PDR accounts for 15% the total land area, apart from the protection forests, provincial and district protected areas. These effectively contribute to the conservation of the important ecological regions encompassing the country, specifically the dry forests Ecoregion, the Greater Annamites and the Mekong River Basin.
5. Protection of 50% of the most important areas for plant diversity assured.	- The established 21 national conservation forest system (protected areas also known as NBCAs) and 2 corridors and Ramsar sites. There are national protection forest system, provincial & district conservation forests can contribute to the achievement of the protection. Together these areas will protect more than 50% of important areas for plants.
6. At least 30% of production land	- Efforts are being made to manage and conserve

managed consistent with the conservation of plant diversity.	Agrobiodiversity in agriculture land use. Major initiatives include TABI project, Mainstreaming Agrobiodiversity in Lao PDR's Agriculture Policies, Plans and Programmes supported by GEF. Also other ecological agriculture production and organic farming system. - National Biosafety Framework to control the GMO's plants and others. Implementation of these initiatives will contribute to achieving the target set.
7. 60% of the world's threatened species conserved in-situ.	- The conservation of the Lao PDR threatened plant species (121 species) at the present will contribute to conserving the world's threatened species in-situ.
8. 60% of threatened plant species in accessible ex-situ collections, preferably in the country of origin, and 10% of them included in recovery and restoration program.	- A number of 3,169 rice varieties, 13, 193 samples have been stored at the IRRI Rice Gene Bank in the Philippines. Many plant species are conserved in the botanic gardens such as in the herbarium of the National University of Laos, Phou Phanang botanic garden, Pha Tad Ke botanic garden. A large species of medicinal plants are grown in the garden in Bolikhamxay province and others.
9. 70% of genetic diversity of crops and other socio-economical valuable plant species conserved, and associated indigenous and local knowledge maintained.	- About 80% of the Lao population of 49 ethnic groups still practice traditional agricultural system for family subsistence by using local crop varieties. Thanks to this practice, Lao PDR can maintain the genetic diversity of crops to reach this high degree, including maintaining the indigenous knowledge system. There is a need for strong technical and financial support for the continuous conservation of the genetic diversity in the future.
10. Management plans in place for at least 100 major alien species that threaten plants, plant communities and associated habitats and ecosystems.	- There is recognition in the country about the impact of alien invasive species such as <i>Mimosa grandis</i> , water hyacinth, and some others. However, there is no specific action to deal with these invasive species at the national scale. There is a need for further research into these species toward developing appropriate measures for the control.
11. No. species of wild flora endangered by international trade.	- Wild plants being threatened by trade such include 6 medicinal plants , 4 orchid species, 5 wild edible plants, 7 NTFPs plant species have potentials to be endangered due to their multiple uses and high demands by trade consumers.
12. 30% of plant based-products derived from sources that are sustainably managed.	- Establishment of the forest categories is a step to achieving sustainable management and use of forest resources. In this forest classification, more than 3 million hectares of production forest resource aims to establish plant- based products which are harvested sustainably, including ecologically harmonized plantation investments. For the realization of this initiative, SUFORD project, which is the main actor for this establishment, has so far established more than 50 sites of production forests.

<p>13. The decline of plant resources and associated indigenous and local knowledge innovations and practices, that support sustainable livelihoods, local food security and health care halted.</p>	<p>- To address the loss of forest cover with its consequent degradation of forest resources, efforts have been made to increase the forest cover from the current 41.5% to 65% in 2015 and 70% in 2020. This strategic direction supports indigenous and local knowledge innovations and practices, that support sustainable livelihoods, local food security toward poverty eradication.</p>
<p>14. The importance of plant diversity and the need for its consumption incorporated into communication, education and public awareness programs.</p>	<p>- The national education strategy has integrated biodiversity aspect into the formal and non-formal education since the primary school to university level, including public and private education. The National University of Laos has developed concerned curricula into the Faculty of Environmental Science, Faculty of Forestry, Faculty of Natural Sciences and Faculty of Agriculture. For the public awareness system has been established through developing mass media such as national TV and radio programs that have broadcast numerous awareness messages.</p>
<p>15. The number of trained people working with appropriate facilities in plant conservation increased, according to national needs, to achieve the targets of this strategy.</p>	<p>- Annually there are more than 300 graduates in Bachelor degree; 20 Master degree graduates, but there are few Doctoral degree completed from abroad. In addition, a number of staff get trained in related field annually through project support or international training courses. For example, the WCS supported training in protected area management for national and provincial forestry staff in cooperation with the National University of Laos, and other organizations that support similar training.</p>
<p>16. Networks for plant conservation activities established or strengthened at the national, regional and international levels.</p>	<p>- The network is classified at two levels: at the international conventions level, Department of Forestry is maintaining the linkage with CBD. At the ASEAN and GMS level, it is the National Secretariat of GMS, at the Mekong River Commission has the network with the Water Resources Department of WREA. Research and academic institutes have the network with relevant international institutions and work closely with IUCN, WWF, WCS, and other INGOs and international organizations.</p>

Appendix III B

Goals and Targets of the Programme of Work on Protected Areas (Tailored to Lao PDR requirements)

Goals	Targets	Progresses
<p>1.1 To establish and strengthen national and regional systems of PAs integrated into a global network as a contribution globally agreed goals.</p>	<p>- By 2010, terrestrial (includes inland aquatic ecosystems) global network of comprehensive, representative and effectively managed national and regional PA system is established as a contribution to (i) the goal of the Strategic Plan of the Convention and the World Summit on Sustainable Development of achieving a significant reduction in the rate of biodiversity loss by 2010; (ii) the Millennium Development Goals- particularly goal 7 on ensuring environmental sustainability; and (iii) the Global Strategy for Plant Conservation.</p>	<p>- NBCA was expanded to 21 PAs plus 2 corridors (as of 2008);</p> <p>- Established 1 ASEAN Heritage Park (Nam Ha PA). Hin Nam No NBCA was considered for nomination into a natural world heritage site;</p> <p>- Hosted and actively coordinated the GMS (includes Secretariat).</p>
<p>1.2 To integrate PAs into broader land and seascapes and sectors so as to maintain ecological structure and function.</p>	<p>- By 2015, all PAs and PA systems are integrated into the wider landscape, and relevant sectors, by applying the ecosystem approach and taking into account ecological connectivity.</p>	<p>- Established the Biodiversity Conservation Corridor Initiative;</p> <p>- Hosted and actively coordinated the GMS (Includes Secretariat).</p>
<p>1.3 To establish and strengthen regional networks, transboundary PAs (TBPAs) and collaboration between neighbouring PAs across national boundary.</p>	<p>- Establish and strengthen by 2010/2012 6/ transboundary PAs, other forms of collaboration between neighbouring PAs across national boundaries and regional networks, to enhance the conservation and sustainable use of biological diversity, implementing the ecosystem approach, and improving international cooperation.</p>	<p>- Held workshop on transboundary PAs with Vietnam and Cambodia in 2008. Cooperation MoU signed in 2009 between Lao PDR and Southern China on transboundary PA management;</p> <p>- Established the Biodiversity Conservation Corridor Initiative</p> <p>- Joined ASEAN-Wildlife Enforcement Network (ASEAN -WEN).</p>
<p>1.4 To substantially improve site-based planning and management.</p>	<p>- All PAs to have effective management in existence by 2012, using participatory and science-based site planning processes that incorporate clear biodiversity objectives, targets, management strategies and monitoring programs, drawing up on existing methodologies and a long- tem management plan with active stakeholder involvement.</p>	<p>- Established network of NBCAs;</p> <p>- Developed site-based ecotourism strategy and action plan in 4 target NBCAs;</p> <p>- Developed co-management plans for 2 NBCAs</p>

		<ul style="list-style-type: none"> - Established the Biodiversity Conservation Corridor Initiative.
1.5 To prevent and mitigate the negative impacts of key threats to PAs.	<ul style="list-style-type: none"> - By 2008, effective mechanisms for identifying and preventing, and/or mitigating the negative impacts of key threats to PAs are in place. 	<ul style="list-style-type: none"> - Implemented the NBSAP; - Implemented legislations; - Applied the Monitoring Information System (MIST) in selected NBCAs
2.1 To promote equity and benefit sharing.	<ul style="list-style-type: none"> - Established by 2008 mechanisms for the equitable sharing of both costs and benefits arising from the establishment and management of PAs. 	<ul style="list-style-type: none"> - Established & Implemented the Environment Fund and established Forest Resource Development Fund; - Co-Implemented and partnered with WWF in the Switch to Sustainable Rattan Harvest & Production in Lao PDR project; - Benefit sharing arrangements with local people established under SUFORD project as well as in ecotourism projects inside NBCAs.
2.2 To enhance and secure involvement of indigenous and local communities and relevant stakeholders.	<ul style="list-style-type: none"> - Full and effective participation by 2008, of indigenous and local communities, in full respect of their right and recognition of their responsibilities, consistent with national law and applicable international obligations, and the participation of relevant stakeholders, in the management of existing, and the establishment and management of new PAs. 	<ul style="list-style-type: none"> - Co-management plans developed for 2 NBCAs which outline roles, responsibilities and benefits to all stakeholders involved; - Implemented the National Ecotourism Strategy in NSDS; - Co-Implemented and partnered with WWF in the Switch to Sustainable Rattan Harvest & Production in Lao PDR project.
3.1 To provide an enabling policy, institutional and socio-economic environment for PAs.	<ul style="list-style-type: none"> - By 2008 review and revise policies as appropriate, including use of social and economic valuation and incentives, to provide a supportive enabling environment for more effective establishment and 	<ul style="list-style-type: none"> - Forestry Law and Aquatic and Wildlife Law were adopted in 2007; - Implemented relevant legislations.

	management of PAs and PA systems.	
3.2 To build capacity for the planning, establishment and management of PAs.	- By 2010, comprehensive capacity-building programs and initiatives are implemented to develop knowledge and skills at individuals, community and institutional levels, and raise professional standards.	- Capacity-building programmes included in the GMS & BCI programmes; - Attended various ASEAN Regional workshops; - Established graduate programmes in National University of Laos; - Training modules on NBCA management developed and tested.
3.3 To develop, apply and transfer appropriate technologies for PAs.	- By 2010 the development, validation, and transfer of appropriate technologies and innovative approaches for the effective management of PAs is substantially improved, taking into account decisions of the Conference of the Parties on technology transfer and cooperation.	- Incorporated in the BCI, GMS, and international organizations programmes such as IUCN, WWF, FFI, Birdlife, etc. - Implemented various strategies in Ecotourism programmes; - Applied the monitoring and evaluation system such as MIST, and satellite-based habitat monitoring.
3.4 To ensure financial sustainability of PAs and national and regional systems of PAs.	- By 2008, sufficient financial, technical and other resources to meet to costs to effectively implement and manage national and regional systems of PAs are secured, including both from national and international sources, particularly to support the needs of developing countries with economies in transition and small island developing states.	- Established & Implemented the Environment Fund and Forest Resource Development Fund (a government source); - Contributions made by hydropower projects to NBCA management; - Ecotourism revenue partially made available for NBCA management; - Co-Implemented and partnered with WWF in the Switch to Sustainable Rattan Harvest & production in Lao PDR project.
3.5 To strengthen communication, education and public	- By 2008 public awareness, understanding and appreciation of the importance and benefits of PAs is	- The national education strategy has integrated biodiversity aspect into the

awareness.	significantly increased.	<p>formal and non-formal education since the primary school to university level, including public and private education. The National University of Laos has developed concerned curricula into the Faculty of Environmental Science, Faculty of Forestry, Faculty of Natural Sciences and Faculty of Agriculture;</p> <p>- For the public awareness system has been established through developing mass media such as national TV and radio programs that have broadcast numerous awareness messages.</p>
4.1 To develop and adopt minimum standards and best practices for national and regional PA systems.	- By 2008, standards, criteria, and best practices for planning, selecting, establishing, managing and governance of national and regional systems of PAs are developed and adopted.	<p>- Established network of NBCAs;</p> <p>- Adopted the ASEAN PA competent standards;</p> <p>- Discussed the international PA category system;</p>
4.2 To evaluate and improve the effectiveness of PA management.	- By 2010, framework for monitoring evaluating and reporting PAs management effectiveness at sites, national and regional systems, and transboundary protected areas levels adopted and implemented by parties.	- Assessed the application of Management Effectiveness Tracking Tools (METT).
4.3 To assess and monitor protected area status and trends.	- By 2010, national and regional systems are established to enable effective monitoring of protected-area coverage, status and trends at national, regional and global scales, and to assist in evaluating progress in meeting global biodiversity targets.	- Second round of national forest cover assessment has been on-going since 2009, aiming to be completed by end of 2010.
4.4 To ensure that scientific knowledge contributes to the establishment and effectiveness of PAs and PA systems.	- Scientific knowledge relevant to PAs is further developed as a contribution to their establishment, effectiveness, and management.	<p>- Number of Master and Bachelor graduates increased including those who are specialized in PA management;</p> <p>- PA management training and course curricula developed for the National</p>

		<p>University of Laos. Teaching and learning experience contributed to the PA management;</p> <ul style="list-style-type: none">- Research programmes & information established under the NBCAs;- Research programmes incorporated in the GMS operation;- Research programmes implemented in the Biodiversity Conservation Corridor initiative.
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Appendix IV

Lao PDR Indicator Matrix

Goals and targets	Related national targets	Relevant national indicators	Threats	Status	Trend	Impact
Protect the components of biodiversity						
Goal 1. Promote the conservation of biodiversity.						
Target 1.1 Effectively conserve at least 10% of each of the world's ecological regions	- More than 10% of the total land area allocated to biodiversity conservation & protection	- NBCAs/ Forest area as % of total land area; - Area under shifting cultivation; - Ratio of Natural Forest to Plantation Forest.	- Unsustainable shifting cultivation - Unfamiliar/ untested ordinance implementation - Deforestation due to population growth - Encroachment of plantation forest into natural forest (Land use conversion) - Infrastructure development (hydropower, roads, mining).	- There 21 National Biodiversity Conservation Areas (NBCAs) include one that was added in 2008 and 2 biodiversity corridors which cover about 3.5 million ha. There are also other conservation areas that belong to Provinces (0.93 million ha) and districts (0.5 million ha). According to Forest Law, there are 106 production forest sites that cover around 3.2 million ha and protection forests that cover about 0.5 million ha. The protection forests are under the responsibility of provincial and district authorities; Even though a high percentage of Lao PDR is composed of forest, forest law policy should expand to protect up to 65% of forests by 2015 and 70% by 2020; - Laos has a high density of river networks and wetland sites. According to first wetland inventory in 1996, there are more than 30 important sites of which some are significant at regional and global level such e.g Siphanhdone wetland, Xe Pian wetland, Xe Cham phone wetland,...	- National PAs covers 15% of total land area; - Forest cover is over 40% of total land area; - Area of shifting cultivation is about 79,995 ha - Total plantation forest area is 177,710 ha	No assessment carried out
Target 1.2 Areas of particular importance to biodiversity protected	- Expansion of the total land area allocated to biodiversity conservation & protection	- Number of Habitats/area of particular importance protected; - NBCAs/Forest areas as % of total	- Shifting cultivation - Unfamiliar/ untested ordinance implementation - Deforestation due to	- Generally, NBCA management system in Lao PDR defines areas into 3 management zones such as: buffer zones, common management zones and strict management zones. Lao PDR has not yet designed specific areas for conserving of particular species. Of the 21 NBCAs, there are only 6 that have management plans. However, these management plans cannot	- All NBCAs are well maintained; management is a big issue due to lack of human and financial resources; - National PAs covers 15% of total land area; - Forest cover is over 40%	No assessment carried out

		land area.	population growth - Encroachment of plantation forest into natural forest(Land use conversion) - Infrastructure development (hydropower, roads, mining).	lead to proper management due to lack of sufficient financial support. IUCN and DoF are now conducting the review of its management. This will result in more guidance and a manual that will be developed and tested; - Laos acceded to Ramsar Convention in mid 2010 and proposed 2 important sites under this convention namely: Xe Champhone wetlands in Champhone district Savannakhet province (24,000 ha) and Kiet Ngong wetlands(a part of Xe Pian wetland) in Outhoumphone district, Champasack province (3,000 ha).	of total land area;	
Goals and targets	Related national targets	Relevant national indicators	Threats	Status	Trend	Impact
Goal 2 Promote the conservation of species diversity.						
Target 2.1 Restore, maintain, or reduce the decline of the populations of species belonging to selected taxonomic groups	- Restore 900 ha of NPAs between Xe Pian and Dong Hua Sao to support livelihoods, and harbour endangered species like the Asian elephant and Indochina tiger(WWF-GMP target)	- Improve population of threatened species as per cent of globally threatened species change in species abundance and distribution of selected taxonomic groups.	- Lack of experienced deal with these issues; - Low awareness of local people; - Lack of budget; - Weak of law enforcement.	- This issue has progressed at certain level. The revised Forestry Law and a new Wildlife Law was adopted in 2007. The Lao Wild Animal Red List was revised and approved by government in 2009. In it, the aquatic and wild animals are classified into 3 main categories: Protected Species List categories I, II and III. Wildlife resource conservation efforts have been enhanced through the establishment of a new Department of Forestry Inspection under the Ministry of Agriculture and Forestry. These steps provide tools in controlling and managing biodiversity in Laos in general; - Laos is a ASEA WEN.	- Lao PDR's threatened species will remain constant in the very near future;	No assessment carried out
Target 2.2 Status of threatened species improved	- Restore habitats in the 900 ha of NPAs between Xe Pian and Dong Hua Sao to support local people livelihoods and harbour endangered species like the	- Decline number of threatened species as per cent of globally threatened species change in Status of threatened species; - Change in species	- Transboundary and local trading activities; - Weak of law enforcement; - Loss of habitat; - Over harvesting ; - Local preferences.	- As a legal basis for improving biodiversity conservation in the country, the revised Forestry Law and Wildlife Law were adopted in 2007. Furthermore, the Lao Wild Animal Red List was revised and approved by government in 2009, in which all aquatic and wild animals are classified into 3 main categories: Strict Protected Species List(category I) and Less Strict Protected Species List (category II). The two categories were approved by the Prime Minister. The Common Management Species Lists was approved by	- Government declared 2 corridors 77,000 ha in central part and other potential corridor in southern part of Laos 900 ha; - Afforestation and reforestation is under government program in which till 2015 forest cover target 60% and in 2020 70% of total land.	No assessment carried out

	Asian elephant and Indochina tiger (WWF-GMP target); - Improve species diversity through afforestation of 100,000 ha and forest restoration covering 481,000 ha nationwide (WREA 2009)	abundance and distribution of threatened species; - Extent of afforested and restored forests.		Agriculture and Forestry Minister; - Conservation efforts were also promoted through flagship species conservation of species such as of the Saola (<i>Pseudoryx nghetinhensis</i>), gibbon spp., Asian elephant, Tiger, Siamese crocodile, and Eld's deer, efforts were initiated by different organizations in partnership with relevant government agencies; - Laos acceded to CITES 2004; - Laos is a member of AEAN-WEN; - Even though, there were many Laws (Environmental Law, Land Law, Agriculture Law, Plant Quarantine Law,...) and instruments developed, there was not a focus on their enforcement so the management status was not evidently improved within last 10 years. The main threats are: illegal harvesting/hunting and trading, forest fire, illegal logging,...		
Goals and targets	Related national targets	Relevant national indicators	Threats	Status	Trend	Impact
GOAL 3: Promote the conservation of genetic diversity.						
Target 3.1 Genetic diversity of crops, livestock and harvested species of trees, fish, wildlife and other valuable species conserved, and associated indigenous and local knowledge	- Development of community river management plans that conserve aquatic health and biodiversity and help integrate the knowledge and experiences of rural communities in to national fishery policies and management meet market	-Trends in genetic diversity of domesticated plants & animals; - Number of sustainable development management plans related to biodiversity conservation integrated into national policies and strategies; - Number species of biodiversity resources conserved/ maintained; - Number of	- New hybrids introduced; - Intensive production for market oriented; - Invasive alien species; - Loss of habitats; - Over harvesting; - Modern technologies and equipments.	- The NAFRI is responsible for the genetic diversity of crops and aquatics e.g the rice research center conducted a rice variety survey and found that there are more than 3,169 distinct names given to the traditional varieties. The aquatic animals are under responsibility of the aquatic research center. In the Mekong River alone, more than 500 indigenous fish species reported. Harvested species of trees including NTFPs/medicine plants and wild life conserved through different means developed by government; - Parrallell with in – situ conservation, ex-situ conservation efforts were also made on a small scale. The Faculty of Forestry developed botanic garden for study purposes in its campus. The Forest Research Center has developed plots for planting 34 rattan and 54 bamboo species. Some orchid species are now kept in the Faculty of Forestry and Forest Research botanical garden. A	- National Water Resources Strategy drafted and on the way to consult with relevant stakeholders; - The Watershed Steering Committee, in some cases, established, - Water dialog within GMS members; - Theses are positive actions in aquatic resources management.	No assessment carried out

maintained.	demands (WWF-GMLCP target)	indigenous / local knowledge / practices culturally preserved / maintained.		newly established botanical garden also found in Pha Tat Kair of Luang Prabang province. The Traditional Medicine Research Institute has established a medicinal plant garden in Borikhamxay province. The medicine garden is around 200 ha and was created through cooperation with JICA recently established in Saravane province; - Lao Government has a clear policy on protecting local knowledge as well as its proper use developed in the Intellectual Protection Law. Traditional technology was widely used in conservation of biodiversity and production such as utilization of medicine plants, fish conservation areas,...		
Goals and targets	Related national targets	Relevant national indicators	Threats	Status	Trend	Impact
Promote sustainable use						
Goal 4: Promote sustainable use and consumption.						
Target 4.1 Biodiversity – ty based-products derived from sources that are sustainably managed, and production areas management consistent with the conservation of biodiversity.	- Improve biodiversity management & monitoring increase public stakeholders awareness and encourage participation in the sustainable management of biodiversity; - Ensure & secure the NBSAP's implementation.	- Volume of biodiversity sustainably produced; - Size and extent of production area producing the said products.	- Improper cultivation and over harvesting practices; - Destruction of habitats / biological resources; - Illegal trading; - Weak enforcements of existing laws and regulations.	- Sustainable Forest Management and Rural Development Project under DoF/MAF supported by WB defined 51 forest lands as production forest which followed by well management plans; - Product certification project on rattan is under the way to develop. The WWF and DoF by cooperation with local authority in Borikhamxay province is running one NTFP project called "Sustainable Rattan Management and Plantation" in Khamkeut district of Borikhamxay province. Beside managing rattan canes, the project also supports villages to plant rattan and collect them as shoots – as food for local consumption and income generation. The SNV by cooperation with Santhong district authority in Vientiane Capital, supports local people to define bamboo forests and develop a management plan. The bamboo derived from forest then was added value as semi-products or finished products as various goods for domestic	- Even Lao government has difficulty in terms of human and financial resources, but the effort to biodiversity management is in place; - Provincial government take a lead in managing NBCAs under their administrative territory and villages invited to involve planning and implementing activities; - To met ASEAN standards, the provincial PA management units established; - Prime Minister decree on PA is on the way to public consultation; - These initiatives can help	No assessment carried out

				<p>use and export to Thailand. Similar work was also introduced in Houaphanh province by the same organization.;</p> <ul style="list-style-type: none"> - The establishment of fish conservation areas were widely scaled up throughout the country. The poverty reduction fund under Ministry of Planning and Investment is a good example in supporting local people to establish fish conservation areas and production forests for foods and environmental protection. - The cooperation among ASEAN named ASOP is continuing to implement a wood/timber certification program. 	<p>to improve biodiversity management and monitoring.</p>	
<p>Target 4.2 Unsustainable consumption of biological resources, or consumption that has an impact on biodiversity, reduced.</p>		<ul style="list-style-type: none"> - Change in status of threatened species change in abundance and distribution % of local & private sectors participation; - Ratio of area protected to maintain biodiversity to total surface area(% national , provincial , district); - Health & well being of people in biodiversity-dependent communities - No. of staff at implementing sector agencies for biodiversity production of an 	<ul style="list-style-type: none"> - Illegal harvesting/ extraction & trading of resources; - Destruction of habitats; - Weak enforcements of existing laws and regulations. 	<ul style="list-style-type: none"> - Consumption behavior that relies up on natural products has changed to domestication. One good example is rattan shoot production in some districts of Savannakhet province and some central provinces. People are aware that the NTFP items were easy to found in forests in the past, but now due to forest loss or long distances from their villages; some NTFPs have to be cultivated. The plantation of rattan provide growers not only its canes but shoots as well. Growers who planted one ha of rattan or about 1.600 seedlings, can harvest shoots to sell in local markets and make at least 1,500 US\$ per year after 4-5 years; - Forest products including woods, NTFPs, have to be processed, semi-processed and finished products to add more value before exporting to international markets; - Strict control over massive destruction equipments/tools for collecting or harvesting biodiversity resources, is clearly addressed in national related law and regulations such as Aquatic and Wild life Law, Environmental Law , Forest Law,... 	<ul style="list-style-type: none"> - No specific figures has been identified on this target, but implementation of the regulations in line with CITES agreements & other relevant policies is intensified to arrest the rapid increase in illegal trading & over harvesting; - Some NTFP items are domesticated and some forest area assigned to be sustainable production forests; - Some villages has developed their own regulations aim to sustainable use of natural resources. 	<p>No assessment carried out</p>

		annual report on policies ,activities and plans for the implementers				
Target 4.3 No. species of wild flora or fauna endangered by international trade.	<ul style="list-style-type: none"> - Improve biodiversity management & monitoring increase public /stakeholders 'awareness and encourage participation in the sustainable management of biodiversity; - Ensure & secure the NBSAP's implementation promote country needs-driven international cooperation 	<ul style="list-style-type: none"> - Change in status of threatened species abundance and distribution % of local & private sectors - participation; - Ratio of area protected to maintain biodiversity to total surface area (% national, provincial, district); - Health & well-being of people on biodiversity-dependent communities; - No. of staff at implementing sector agencies for biodiversity production of annual report on policies, activities and plans for the implementers. 	<ul style="list-style-type: none"> - High demand from international markets; - Illegal harvesting/ extraction & trading of resources; -Destruction of habitats; -Weak enforcements of existing laws and regulations. 	<ul style="list-style-type: none"> - Wildlife is hunted mostly by rural people for home-consumption, although meat and wildlife products are also sold at local markets. Commercial hunting and fishing, in contrast, can be much more damaging and as a result, some species such as rhino and some turtles have almost disappeared from Lao PDR; - Harvesting of some NTFPs on a commercial scale, often in unsustainable manners and quantities is still found Throughout the country. Eagle woods, berberines, and orchids are often improperly collected and traded; - Being a signatory to the CITES, the MAF and the WCS made efforts to regulate threatening activities through the implementation of a national gun collection, and strict enforcement of existing relevant laws and regulations to curb and minimize the widespread practice of these activities.These efforts resulted in a modest decline and less visibility of the wildlife trade in the country and more or less regulated the harvesting of wildlife and wild products that are traded locally and internationally; - In some cases, village regulations also developed for specific species conservation.; - It was observed that at present, there are a lots of laws and regulations to prevent unauthorized use of wildlife, although in reality, they are not strongly enforced. In addition, the knowledge and skill of staff, as well as the resources and facilities at their disposal, are limited, so there are still illegal hunting and trading along borders with neighboring countries. 	<ul style="list-style-type: none"> - All trading activities deal with flora and fauna strict follow by international agreement e.g SITES; - The Lao Red List of Flora and Fauna approved by government; - Transboundary collaboration initiatives were promoted. 	No assessment carried out

Goals and targets	Related national targets	Relevant national indicators	Threats	Status	Trend	Impact
Address threats to biodiversity						
Goal 5: Pressure from habitat loss, land use change and degradation, and unsustainable water use reduced.						
Target 5.1 Rate of loss and degradation of national habitats decreased.	<ul style="list-style-type: none"> - Improving biodiversity management & monitoring; - Increase public/stakeholder's awareness and encourage participation in the sustainable management of biodiversity; - Ensure & secure the NBSAP's implementation improve biodiversity data & fill data gaps through basic & applied research plan & implementation a biodiversity specific human resources development programme. 	<ul style="list-style-type: none"> - Ratio of area protected to maintain biological diversity to total surface area (% including national, provincial and district); - Change in status of threaded species; - Change in species abundance and distribute connectivity and fragmentation of ecosystems; - Health and well-being of people biodiversity – dependent communities; - Production of an annual report of policies, activities and plans for the implementer; - Local and private sector's participation (%); - Number of staff working at national and 	<ul style="list-style-type: none"> - Shifting cultivation practices are ongoing in some parts of country; - Land use changing; - Land concession; - Weak enforcements of existing laws and regulations; - Forest fires. 	<ul style="list-style-type: none"> - During 2004, forest destruction was about 53,000 ha/year, now the situation is improving through implementing of government programmes; - Habitat degradation comes from 2 main causes namely: agricultural practices such as people settling within and around some NBCAs encroaching upon the protected areas by expanded paddy fields, gardens or commercial cropping areas. Some other NBCAs are relatively well preserved but are also under pressure from unauthorized and development activities; livestock grazing is another cause that led habitat loss. In some cases, to improve grazing, villagers may burn the forest under storey to promote grass growth and to drive away large predators, such as tigers, to avoid cattle loss; - It was observed that agriculture lands/paddy fields and wetland areas in and surrounding towns are being converted into urban areas; it seems that this trend will increase in the future. 	<ul style="list-style-type: none"> - More industrial tree plantations are established to address the demand for the wood product including fuel needs, to save regenerate the remaining natural forests; - Rate loss and degradation of national habitats were addressed through different means such as: land and forest allocation program, shifting cultivation reduction program, tree plantation program,.. 	No assessment carried out

		provincial level for biodiversity; - Number of staff at implementing sector agencies for biodiversity; - Number of student studying biodiversity at university.				
Goals and targets	Related national targets	Relevant national indicators	Threats	Status	Trend	Impact
Goal 6: Control threats from invasive alien species.						
Target 6.1 Pathways for major potential alien invasive species Controlled.	- Improve biodiversity management & monitoring; - Increase public/stakeholders' awareness and encourage participation in the sustainable management of biodiversity data & fill data gaps through basic & applied research plan & implement a biodiversity specific human resource development programme	-Ratio of area protected to maintain biological diversity to the surface area (% including national, provincial and district); - Change in status of threatened species; - Change in species abundance and distribution; - Connectivity and fragmentation of ecosystems; - Production of an annual report on policies, activities and plans for the implementers; - Local and private sector's participation (%);	- Lack of sufficient staff; - Share large boundary with neighboring countries; - Low awareness on this issue among public; - Weak enforcement of existing laws and regulations; - Initiatives are not in place to deal with this issue.	- The trans-boundary movement of genetic resources is following international regulations/procedures on "advance informed agreement procedure"; - The regulation on biosafety management of Lao PDR is now being prepared which was already mentioned in National Biodiversity Framework project supported by UNEP/GEF; - The Plant and Wildlife Quarantine Law contains specific regulations that prevent importing or introducing invasive alien species; - In the past, it was observed that, there were some newly introduced species found in different places such as snails, giant crabs, memosa, ... but these issues were less considered and need to study in depth.	- No specific figures has been identified on this target; - There are some alien invasive species found in the country, but concerned organizations have less actions on them; - Beside this, the GMOs are also make Laos face difficulties to control due to lack of knowledge and resources to address the issue.	No assessment carried out

		<ul style="list-style-type: none"> - Number of staff working at national and provincial level for biodiversity; - Number of staff at implementing at sector agencies for biodiversity; - Number if biodiversity at university 				
Target 6.2 Management plans in place for major alien species that threaten ecosystems, habitats, or species.	<ul style="list-style-type: none"> - Improve biodiversity management and monitoring; - Increase public, stake holders awareness and encourage participation in the sustainable management of biodiversity Ensure & secure the NBSAP's implementation . 	<ul style="list-style-type: none"> - Change in status of threatened species; - Change in species abundance and distribution; - Connectivity and fragmentation of ecosystems; - Production of annual reports on policies, activities and plans for the implementers; - Local and private sector's participation (%); - Numbers of staffs working at national and provincial level for biodiversity; - Number of staffs at implementing sector agencies for biodiversity. 	<ul style="list-style-type: none"> - Lack of understanding in deep this issue; - Lack of scientific knowledge on the issue; - Lack of international coordination. 	<ul style="list-style-type: none"> - Due to lacking information on impacts arising from the alien species and less cooperation with international agencies, Lao PDR has no management in place. 	<ul style="list-style-type: none"> - The invasive alien species issue is quite new terminology for Laos, so there is a lack of data and information about their threats to ecosystems, environment or even human, so this should be carefully paid attention in the future. 	No assessment carried out
Goals and targets	Related national targets	Relevant national indicators	Threats	Status	Trend	Impact
GOAL 7: Address challenges to biodiversity from climate change and pollution						

<p>Target 7.1 Maintain and enhance resilience of the components of biodiversity to adapt to climate change.</p>	<ul style="list-style-type: none"> - Improve biodiversity management and monitoring; - Increase public, stockholders awareness and encourage participation in the sustainable management if biodiversity; - Ensure and secure the NBSAP's implementation Achieve a low carbon society and build resilience of ecosystems, communities and vulnerable sectors. - Implement a GHG Mitigation Plan Increase public awareness activities in climate change. 	<ul style="list-style-type: none"> - Change in status of threatened species; - Change in Species abundance and distribution; - Connectivity and fragmentation of ecosystems; - Production of an annual report policies, activities and plans for the implementers; - Number of staffs working in national and provincial level for biodiversity; - Number of staff at implementing sectors agencies for biodiversity; - National climate change strategy formulated and implemented; - Data collection mechanism GHG Inventory improved and updated; - Negotiation vulnerability and impact assessment. 	<ul style="list-style-type: none"> - Forest fires; - Deforestation -Lack of budget for preventing unpredicted natural disasters. 	<ul style="list-style-type: none"> - This is mentioned clearly in the National Program of Action to Climate Change. Priority projects under the Agriculture Sector are: strengthen the capacity of the National Disaster Management Committees, promote secondary professions in order to improve the livelihoods of farmers effected by natural disasters affected by climate change,... Priority projects under Forestry Sector are: Continue the slash and burn eradication program and permanent job creation program, strengthen capacity of village forestry volunteers in forest planning, caring and management techniques as well as the use of village forests,... - Maintain and increase forest cover in accordance with Forest Strategy and other relevant strategies in which the main focus is on relevant responsible sectors. 	<ul style="list-style-type: none"> - GHG Survey and Monitoring revealed that Lao PDR is net CO2 sequester and overall, No trend in GHG emission can be establish at the moment. - The Country is currently strengthening its monitoring capability by installing a national warning systems, in dept study on the impact of climate change and formulate appropriate strategies and mitigation plans. 	<p>No assessment carried out</p>
<p>Target 7.2 Reduce pollution and its</p>	<ul style="list-style-type: none"> - Consistently promote waste reduction policies, 	<ul style="list-style-type: none"> - Waste generation rate (%); - Recycling rate of municipal waste 	<ul style="list-style-type: none"> - Land Degradation; - Deforestation; - Soil erosion; 	<ul style="list-style-type: none"> - The prevention measures were developed by Department of Environment such as SEA, EIA, IEE, ECA,... - The promotion measures are strongly applied to 	<ul style="list-style-type: none"> - Pollution survey & monitoring is being conducted & implemented, especially in 	<p>No assessment carried out</p>

impacts on biodiversity.	greater utilization of waste and safe treatment & strong waste management strategies. - Reduce municipal waste generation by 50% Increase waste recycling by 50 %. In 2015 through expansion of recycling facilities/ industries improve biodiversity management & monitoring; - Increase public/ stakeholders' awareness and encourage participation in the sustainable management of biodiversity; - Ensure & secure the NBSAP's implementation	(%); - Waste collection efficiency (%); - Scientific waste management system; - Change in species abundance and distribution - Production of an annual report on policies, activities and plans for the implementers; - Number of staff working at national and provincial level for biodiversity; - Number of staff at implementing sector agencies for biodiversity; - Local and private sector's participation (%).	- intensive inorganic farming; - Weak enforcements of existing laws and regulations. - Unregulated urbanization & industrialization; - Increased number of vehicles.	organizations or individuals who contribute to protect environment. Beer Lao Factory is one of the good contributors in term of reducing its CO ₂ emissions ; - To celebrate Vientiane 450th anniversary, the propagation on topic "Clean" is widely promoted. In Lao PDR, there were a lot of cultural villages established. One of many categories used to select is also "Clean Village"; - To reduce fuel wood consumption, reduce CO ₂ release to the atmosphere and for hygiene purposes, the bio-gas, Solar Energy, small – household scale hydro power schemes are being actively promoted in rural remote areas.	the Mekong river basin, where rich fishery resources are found, as threatening trend of increasing Industrialization is now occurring in the GMS. - The Country is currently strengthening its monitoring capability by formulating appropriate strategies & mitigation plans through the NBSAP & other allied programs	
Goals and targets	Related national targets	Relevant national indicators	Threats	Status	Trend	Impact
Maintain goods and services from biodiversity to support human well-being.						
Goal 8: Maintain capacity of ecosystems to deliver goods and services and support livelihoods.						

<p>Target 8.1 Capacity of ecosystems to deliver goods and services maintained.</p>	<ul style="list-style-type: none"> - Maintain the country's diverse biodiversity as one key to poverty alleviation & protect the current asset base of the poor in support of the National Biodiversity Strategy 2020; - Ensure valuable land use in support of a sustainable socio – economic development by establishing a sustainable land management system develop & promote environment in agriculture, industrial, mining, infrastructure, tourism & urban development projects. 	<ul style="list-style-type: none"> - Ratio of areas protected to maintain biological diversity to total surface area (%including national, provincial and district); - Change in species abundance and distribution; - Connectivity and fragmentation of ecosystems; - Production of an annual report on policies, activities and plans for the implementers; - Local and private sector's participation (%); - Number of staff working at national and provincial level for biodiversity. - Number of staff at implementing sector agencies for biodiversity; - Cultivated land area (percent of total land use); - Land under protection (% of total land); - Crop yields 	<ul style="list-style-type: none"> - Land degradation; - Deforestation; - Infrastructure development; -- Weak enforcements of existing laws and regulations; - Improper land uses; - Land concession. 	<ul style="list-style-type: none"> - According to the adjusted Forest Law (2007), all forests were re-classified into 3 types namely: conservation forests, protection forests and production forest. Main purposes of these are: conservation areas for conservation of biodiversity and environmental services; protection forests for watershed protection, natural disaster prevention and environmental services; production forests for wood and food supplying, environmental services,....The total forest area is more than half of the country area; - The Agro-Biodiversity Initiative (TABI) supported by SDC, under Department of Planning, MAF is implementing project activities in Luangprabang and Xiengkhouang provinces. Not only Agro-Biodiversity, but Forest and Mountain Biodiversity are being managed; - The sustainable tourism program, especially ecotourism projects supported by ADB, rely heavily on Biodiversity. Tourists, who visit NBCAs, beside seeing the beautiful landscape, have a chance to see various trees, NTFPs and wildlife; - The RIGHTS-LINK Lao Project supported by SDC, is one project that focuses on public awareness- raising on Lands and Natural Resources issues. The project aims to improve stakeholder capacity, knowledge and participation in policy dialog on land – related issues. Posters, and other promotion materials were developed and distributed to target people. 	<ul style="list-style-type: none"> - Defined 3 main forest types: conservation forest, protection forest and production forest which total areas more than 40% of country area; - The forest ration is going to increase 70% in 2020. 	<p>No assessment carried out</p>
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		<ul style="list-style-type: none"> (trends); - Net farm income; - Soil loss reduction; - Change in Biodiversity; - Number of households participating in sustainable land management (SLM) activities; - Number of functional institutions on sustainable land management; - Number of policies on SLM enacted and regulations formulated; - Dissemination of available SLM technologies/ Databases. 				
<p>Target 8.2 Biological resources that support sustainable livelihoods, local food security, and health care, especially of poor people, maintained.</p>	<ul style="list-style-type: none"> - By 2020, a total area of 500,000 ha for industrial tree plantations will be established for pulpwood and agriculture products like rubber and sugarcane (WWF-GMLCP target); - Maintain the 	<ul style="list-style-type: none"> - Health and well-being of people and biodiversity – development communities; - Land area size (total) devoted and conserved for the production of biodiversity resources for livelihoods, food and health-related commodities, especially for the 	<ul style="list-style-type: none"> - Loss of habitat - Land degradation due to improper land uses & farming practices; - Illegal/improper harvesting practices/extraction of resources; - Weak enforcements 	<ul style="list-style-type: none"> - The national land and forest allocation program, the shifting cultivation program and other government projects are ongoing and aim to reduce slash and burn cultivation and at the same time provide alternatives to local people to deal with permanent/sedentary cultivation. Through these methods, the forest cover in Laos is maintained and is predicted to expand in the future; - The BCI programme, which was partnered with WWF and IUCN, identified biodiversity conservation corridors to ensure that adequate linkages in the landscapes will be properly and adequately protected and managed to maintain biodiversity resources and vital ecosystem 	<ul style="list-style-type: none"> - A lot of legislations developed and enforced; - Some good practices developed such as fish pond conservation areas, village production forests; bamboo and rattan production areas;... 	No assessment carried out

	<p>country diverse biodiversity & natural resources base as one key to poverty alleviation & protect the current asset base of the poor in support of the National Biodiversity strategy 2020;</p> <ul style="list-style-type: none"> - Ensure valuable land use in support of a sustainable socio-economic development by establishing a sustainable land management system develop & promote environmental & social assessment in agricultural, industrial, mining, infrastructure, tourism & urban development projects; - Promote sustainable forest 	<p>poor communities;</p> <ul style="list-style-type: none"> - Cultivate land area (percent of total land area); - Land under protection (%of total land area); - Crop yield (trends); - Net farm income; - Soil loss reduction; - Change in biodiversity; - Ratio of area protected to maintain biological diversity to total surface area (%including national, provincial, and district); - Change in species abundance and - Connectivity and fragmentation of ecosystems; -Production of an annual report on policies, activities and plans for the implementers; - Proportion of land area covered by forest (percent); - Rate of 	<p>of existing laws and regulations;</p> <ul style="list-style-type: none"> - Local and international trading. 	<p>services to sustain resource productivity and livelihoods of the communities. As a result, the programme should contribute to the sustained growth of the national economy;</p> <ul style="list-style-type: none"> - Various Projects of the WWF Laos Country Programme were put in operation such as the Switch Project on Sustainable Rattan Harvest and Production that helped Lao farmers to increase their production and income from their rattan plantations; - The Netherlands Development Organization (SNV) by collaboration with some provincial authorities and other sectors provided support on bamboo value chain development and rattan shoot value chain development. These programs have very clear objectives to conserve and manage NTFPs in proper manner for improving local livelihoods and contribution to poverty reduction of government program; - In partnership with the Champasak Provincial Agriculture and Forestry Office and district authorities, IUCN has implemented a project ‘Landscape and Livelihood Strategy’ aiming to conserve the biodiversity of the area concerned while at the same time enhance the effective use of forest resources, especially NTFPs to meet the local need. 		
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	management to ensure sustainability of agriculture & forestry development vital to national economic development & progress; - Secure a reserve of 60,000 tons & sufficient food stuffs production an increase of 5%/year; - Maintain a 4-5% growth rate of agricultural output annually; - Stop slash-burn cultivation by 2015; - Maintain a healthy & productive forest cover as an integral part of the rural livelihood system with a sustained increase forest cover up to 70% by 2020	deforestation (hectares per year); - Level of agriculture land degradation; - Incidence of slash and burn cultivation; - Rice output (ton per year); - Agriculture growth rate; - Food price index.				
Goals and targets	Related national targets	Relevant national indicators	Threats	Status	Trend	Impact
Protect traditional knowledge, innovation and practices.						
Goal 9: Maintain socio-cultural diversity of indigenous and local communities.						
Target 9.1 Protect traditional knowledge, innovations, and practices.	- Promote the awareness to preserve and protect Lao PDR's culture heritage & properties;	- Number of tourism of and conservation projects; - Number of workshops and events on culture	- Influx of foreign culture due to tourism & culture corruption sources; - Weak	- Traditional knowledge, innovations and practices on biodiversity are well protected through various means e.g conservation sacrifices for water areas, sacrifices for forest areas, bans on hunting specific animal species during Buddhist lent or Kao Phan Sa, ban on eating some animal meats, releasing	- Intellectual Property Law and other government regulations developed and enforced; - By working with INGOs, local knowledge was capitalized, well	No assessment carried o

	<ul style="list-style-type: none"> - Increase the participation & capacitate ethnic communities in national & local governance, and in local development planning 	<ul style="list-style-type: none"> and tradition undertaken; - Review of the school curriculum on culture and tradition; - Number of offences to the law on the national heritage; - Number of national historical and ancient sites renovated; - Number of site designated at world Heritage site; - Mechanisms for dispute resolution strengthened to address the needs of multiethnic population. 	<ul style="list-style-type: none"> educational system; - Weak enforcements of existing laws and regulations; - Low awareness both to officials and public on value of traditional knowledge, innovations and practices; - New technologies introduced. 	<ul style="list-style-type: none"> animals...Dock Champa, May Chanh, May Pho,... are plants that Lao people believe are good will; - The Environmental Awareness Raising project under WWF Lao program capitalized all traditional knowledge on biodiversity conservation and its utilization in their project areas to teach or transfer to the new generation. 	<ul style="list-style-type: none"> documented and transferred to new generation. 	
<p>Target 9.2 Protect the rights of ethnic groups and local communities over their traditional knowledge, innovations, and practices, including their rights to benefit sharing.</p>	<ul style="list-style-type: none"> - Increase the participation capacitate ethnic communities in national & local governance, and in local development planning; - Promote the awareness to preserve and protect Lao PDR's cultural heritage & 	<ul style="list-style-type: none"> - Level involvement of local people in decision- making of local tourism policies; - Revenue from ecotourism; - Number of households participating in sustainable land management activities; - Local & private sectors participation. 	<ul style="list-style-type: none"> - Weak enforcements of existing laws and regulations; - Absences of proper & effective policies; - Increasing foreign influences; - Weak & deficient educational system; - Property Law 	<ul style="list-style-type: none"> - There are many places, especially in remote areas that keep traditional ways of conserving biodiversity by developed their own taboos. For instance : do not make noise when enter into forests (which would disturb wild animals) and do not kill animals in full month days,... - The Intellectual protection Law developed a legal frame work that ensures that all local and ethnic group knowledge will be protected and utilized through equitable sharing of benefits. 	<ul style="list-style-type: none"> - Intellectual Property Law and other government regulations developed and enforced; - Recently, there were a lots of cases that local knowledge and innovations were illegally copied to use in other countries. Due to Lao is rich of culture, so these issues have to be paid attention in the future. 	<ul style="list-style-type: none"> No assessment carried out

	properties		is not widely disseminated.			
Goals and targets	Related national targets	Relevant national indicators	Threats	Status	Trend	Impact
Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources.						
Goal 10: Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources.						
Target 10.1 All access to genetic resources are in line with the Convention on Biological Diversity and its relevant provisions.	- Secure sufficient food & access to food nationwide; - Maintain the country's diverse biodiversity & nature resource base as one key to poverty alleviation & protect the current asset base of the poor in support of the national Biodiversity Strategy 2020; - Increase the Participation & Capacities ethnic communities in national & local governance, and in local development planning; - Establish an institutionalized mechanism	- Health and well-being of people in biodiversity – dependent communities; - Land area size (total) devoted and conserved for the production of biodiversity resource for livelihood, food and health – related communities, especially for the poor communities; – Number of households participating in sustainable development activities; - Local & private sectors participation; - Number of sustainable development management plan related to biodiversity conservations	- CBD was not well disseminated into government and public; - Weak enforcements of existing laws and regulation; - Lack of scientific knowledge and clear actions to control on this issue.	- Lacking scientific records and having only physical characteristics made it difficult to deal with this issue. So far only a few products are registered as national property. Lack of genetic bank is another issue that makes progress on this issue difficult; - The Intellectual protection Law mentioned all relevant issues, but the law not widely disseminated and enforced.	- Due to the lack of law and regulation enforcement, it was observed that a lot so of lora and fauna were taken to other countries; - This issue is need to address by awareness raising to our people and work closely with neighboring countries.	No assessment carried out

	<p>for public participation in comprehensive sustainable development issues & programs</p>	<p>integrated into national policies and strategies; – Number of population of various species of biodiversity resources conserved / maintained - Legal and institutional framework developed for public participation in the country's priority sustainable development issues; - Number of sustainable development policy debates and follow- up actions undertaken at the National Assembly increased for a for participation by women, youth and ethnic group to discuss economic, social and cultural development; - Number of public communication strategies</p>				
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		undertaken using mass media by the government agencies; - Number of communities with adequate access to quality information on community sustainable development activities.				
Target 10.2 Benefits arising from the commercial and other utilization of genetic resources shared in a fair and equitable way with countries. Resources should be provided in such a way that they are in line with the Convention on Biological Diversity and its relevant provisions.	- Promote bilateral & multilateral cooperation in terms of scientific research, projects, technology transfer; - Adjust national legislation & regulations related to biodiversity & harmonize them with MEAs; - Promote country needs-driven, international cooperation, and strengthen cooperation especially with the ASEAN & concerned	- Number of sustainable development management plans related to biodiversity conservation integrated into national policies and strategies.	- Weak enforcement of existing laws and regulation; - Lack of public awareness & information; sharing; - Weak education system - Lack of qualified officials to deal with the issue.	- Benefits arising from the commercial and other utilization of genetic resources are protected by some legal frameworks such as: Domestic Investment Law, Law on Promotion of Foreigner Investment, Intellectual Protection Law,...	- This target was not well controlled. This issue perhaps happened, but due to lack of scientific information, so there was less paid attention on it .	No assessment carried out

	international organizations					
Goals and targets	Related national targets	Relevant national indicators	Threats	Status	Trend	Impact
Ensure provision of adequate resources.						
Goal 11: Parties have improved financial, human, scientific, technical and technological capacity to implement the Convention.						
Target 11.1 New and additional financial resources are transferred to developing-country Parties to allow for the effective implementation of their commitments under the Convention, in accordance with Article 20.	- Establish and provide sustainable financing mechanisms through the Environment Protection Fund (targeted approximately US\$ 2 million annual budget) for various environment protection strategies and sustainable livelihood schemes for socio-economic development / and poverty reduction (EPF 2007 target).	- Biodiversity in investment programs (in Million US\$); - Dissemination of Forestry Technology and policy Amount of domestic & international funding generated for ecotourism; - Amount, percentages and trends of the new and additional financial resources to the total resource available for the implementation of the CBD commitments.	- Less competence to access to donor support; - Global economic crisis; - Competition from other countries for donor's financial support; - Weak of international collaboration.	- During 2000-2005, the external assistance was reduced in terms of numbers and since that time, financial support to implement biodiversity conservation has started to increased again. Some of the main donors are: GEF,ADB, WB, SDC, Sida, MRC, GTZ, FAO, UNDP,UNEP, JICA,... - There is some financial support from foundations that deal directly with INGOs, institutions. The Environmental Protection Fund which is under WREA and supported by WB and ADB also released a certain amount to local authorities/communities to implement conservation work.	- Progress made on this target e.g from GEF, SDC, DIDA,WB, ADB,...but in small amounts; - Additional financial resources also came from development projects that have impact to certain areas; - REDD should be other contributor to support on this issue.	No assessment carried out
Target 11.2 Technology is transferred to developing-country parties to allow for the effective implementation-	- Improve access to information, including the dissemination of research, results , development of demand – driven, household-base	Dissemination of forestry technology and policies number & extent of technology promotion / transferred	- New or modern technologies sometimes were not match with country condition; - High cost for transferring is big barrier for	- Under ASEAN framework, Clearing House Mechanism was set up for each country member by ACB experts. At the same time, Lao counterparts have got benefit through short term training, practicing, experiences sharing,... - The technology transfer normally conducted in various stakeholder organizations in the forms of job training, training courses, and study tours at education institutions.	- Technology transfer conducted in various sectors in forms of formal education and training; - Various projects supported from international organizations also created opportunity to counterparts working with experts/scientists and	No assessment carried out

<p>tation of their commitments under the Convention, in accordance with Article 20.</p>	<p>system for exchanging information, and publication , information & resource results(WREA target)</p>		<p>developing countries; - Lack of institution & infrastructural capacities to absorb available technologies.</p>		<p>researchers; - Technology transfer carried out and focused on certain fields ,in future there is a need to other priority fields as well.</p>	
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