

**Kingdom of Cambodia**  
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**National Biodiversity Strategy  
and Action Plan**

**"To Use, Protect And Manage Biodiversity  
For Sustainable Development In Cambodia"**

**Royal Government of Cambodia**  
Ministry of Environment

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**FAO/UNDP/GEF  
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## Acronyms

- 1.CARDI : Cambodian Agricultural Research and Development Institute
- 2.CBD : Convention on Biological Diversity
- 3.CBEA : Cambodia Biodiversity Enabling Activity
- 4.CITES : Convention on International Trade in Endangered Species of Wild Fauna and Flora
- 5.CSD : Council Social Development
- 6.IUCN : The World Conservation Union
- 7.EEZ : Exclusive Economic Zone
- 8.EIA : Environmental Impact Assessment
- 9.EMS : Environmental Management System
- 10.FCMU : Forest Crime Monitoring Unit
- 11.GIS : Geographic Information System
- 12.GPS : Global Positioning System
- 13.IMSCEE : Inter-Ministry Steering Committee on Environment Education
- 14.IRRI : International Rice Research Institute
- 15.MAFF : Ministry of Agriculture Forestry and Fisheries
- 16.MARPOL : International Convention for the Prevention of Pollution from Ships
- 17.MCFA : Ministry of Culture and Fine Arts
- 18.MCRA : Ministry of Cults and Religious Affairs
- 19.MEF : Ministry of Economy and Finance
- 20.MIME : Ministry of Industry Mine and Energy
- 21.MLMUPC : Ministry of Land Management Urban Planning and Construction
- 22.MOC : Ministry of Commerce
- 23.MOE : Ministry of Environment
- 24.MOEYS : Ministry of Education Youth and Sports
- 25.MOH : Ministry of Health
- 26.MOI : Ministry of Interior
- 27.MOP : Ministry of Planning
- 28.MOT : Ministry of Tourism
- 29.MOWRM : Ministry of Water Resource and Metrology
- 30.MPWT : Ministry of Public Works and Transport
- 31.MRD : Ministry of Rural Development
- 32.MWAV : Ministry of Women Affairs and Veteran
- 33.NBSAP : National Biodiversity Strategy and Action Plan
- 34.NCDM : National Committee Disaster Management
- 35.PA : Protected Area
- 36.RUPP : Royal University of Phnom Penh
- 37.UNCED : United Nations Conference on Environment and Development



**KINGDOM OF CAMBODIA**  
**National Biodiversity Strategy and Action Plan**

**A National Endeavor for the Conservation and Sustainable Use of Biological Resources**

Nature protection in Cambodia has been a constant concern of both the King and Government always realizing the fragile nature of ecosystems owing to the socio-economic, physiogeographic and climatic conditions of the country. In modern times, the Kingdom's commitment to environmental protection has been demonstrated by a number of significant legal measures to prevent pollution, habitat damage and to protect wildlife, including the creation of an Environmental Secretariat in 1993, the enactment, in 1996, of the "Law on Environmental Protection and Natural Resource Management" creating a full fledged Ministry of Environment and the adoption of a National Environmental Action Plan in 1998. The National Assembly of the Government of Cambodia has also ratified several international conventions related to the environment including: the Convention on Biological Diversity, the Convention on Climate Change, the Convention on Wetlands of International Importance (Ramsar Convention), the Convention on International Trade in Endangered Species (CITES), the World Heritage Convention, the United Nations Convention on the Law of the Seas, International Convention for the Prevention of Pollution from Ships (MARPOL), the Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin, etc.

In view of its commitment to the Convention on Biological Diversity (CBD), the Government of Cambodia is taking serious steps for implementing conservation programs and for applying concepts of awareness raising for the sound use and conservation of biodiversity resources. Soon after the CBD was ratified, the Ministry of Environment was designated as the key agency responsible for the development of a National Biodiversity Strategy and Action Plan to determine the measures required to meet the obligations of the Convention, and to enhance co-ordination of national efforts aimed at the conservation of biodiversity and the sustainable use of biological resources.

The full extent of Cambodia's biodiversity is not known yet, but Cambodia is expected to have a rich biodiversity of species and may be considered a biodiversity '*hotspot*' (an area very rich in biodiversity) due to its location. Compared with neighboring countries Cambodia has a low population density and relatively large natural areas that are still intact. Natural resources are the mainstay of Cambodia's economy; therefore it is vital that their sustainable management is given a high priority.

The primary responsibility for conserving biodiversity and ensuring the sustainable use of biological resources is shared among the Ministry of Environment and other sectoral departments such as the Ministry of Agriculture, Forestry and Fisheries, Ministry of Land Management, Urban Planning and Construction, Ministry of Rural Development and Ministry of Water Resources and Meteorology. As these and most other ministries have an integral role to play in the processes needed to implement the articles of the CBD, an intergovernmental National Biodiversity Steering Committee with representation from each of these and other relevant departments was therefore established to develop the Cambodian National Biodiversity Strategy and Action Plan. Experts from relevant projects, the NGO sector and universities also participated to the preparatory workshops and helped to ensure that technical data was up to date.

Provincial and urban government, private property owners, businesses, local and indigenous communities, international conservation organizations, university and research institutions and other groups also play an essential role in conserving biodiversity and sustainably using biological resources. Several of these stakeholders were consulted in the course of the preparation of the National Biodiversity Strategy and Action Plan.

The Strategy clearly recognizes that governments cannot act alone to ensure the conservation of biodiversity and the sustainable use of biological resources. It invites and encourages all Cambodians to take action in its support and recognizes that Cambodia has an important role to play in cooperating with other countries, especially neighbor countries, to implement the Convention.

Conserving biodiversity and sustainably using biological resources are fundamental to reduce poverty and improve the quality of life of all Cambodians. These goals are an echo to the teachings and beliefs of Buddhism on the obligation for man to maintain balanced relations with the other elements of creation.

The National Biodiversity Strategy and Action Plan recognizes existing constitutional and legislative responsibilities for biodiversity in Cambodia. It also emphasizes the importance of intergovernmental cooperation to create the policy, management and research conditions necessary to advance ecological management. National and provincial governments and sectoral agencies, in cooperation with stakeholders and members of the public, will pursue the implementation of the strategic directions contained in the Strategy in accordance with their policies, plans, priorities, and fiscal capabilities.

## ***Executive Summary***

### ***Implementing the Convention on Biological Diversity***

Biodiversity supports human societies ecologically, economically, culturally and spiritually. Despite its importance, however, ecosystems are being degraded and species and genetic diversity reduced at an alarming rate due to the impact of our growing human population and increasing resource consumption rates. The global decline of biodiversity is now recognized as one of the most serious environmental issues facing humanity.

Recognition of the worldwide impact of the decline of biodiversity inspired the global community to negotiate the United Nations Convention on Biological Diversity. The Cambodian delegation participated actively in these negotiations. The Kingdom of Cambodia ratified the Convention in 1995.

The three objectives of the Biodiversity Convention are:

- *the conservation of biodiversity;*
- *the sustainable use of biological resources; and*
- *the fair and equitable sharing of benefits resulting from the use of genetic resources.*

These objectives echo the three poles of sustainable development (ecological integrity, economic sustainability and social equity) and illustrate the nature and breadth of the Convention. As a global instrument, it sets the stage for each nation to assess the adequacy of current efforts to conserve biodiversity and sustainably use biological resources and to determine how gaps will be filled and opportunities realized.

One of the key obligations for parties that have ratified the Convention is to prepare a national strategy. The National Biodiversity Strategy and Action Plan is a response to this obligation and has been developed as a guide to the implementation of the Biodiversity Convention in Cambodia. All of the strategic directions contained in the Strategy are relevant from a national perspective, but some elements of the Strategy may not be relevant in some areas of the country or for some sectoral agencies.

The National Biodiversity Strategy and Action Plan recognizes existing constitutional and legislative responsibilities for biodiversity in Cambodia. It also emphasizes the importance of intergovernmental co-operation to create the policy, management and research conditions necessary to advance sustainable management of natural resources. National and regional governments and sectoral ministries and departments, in cooperation with stakeholders and members of community, will pursue implementation of the directions contained in the Strategy according to their policies, plans, priorities and fiscal capabilities.

### ***Elements of the National Strategy and Action Plan***

The National Strategy and Action Plan presents a **vision** for Cambodia of:

***"EQUITABLE ECONOMIC PROSPERITY AND IMPROVED QUALITY OF LIFE THROUGH SUSTAINABLE USE, PROTECTION AND MANAGEMENT OF BIOLOGICAL RESOURCES".***

The Strategy provides a framework for action at all levels that will enhance our ability to ensure the productivity, diversity and integrity of our natural systems and, as a result, our ability as a nation to reduce poverty and improve the quality of life of all Cambodians. It promotes the conservation of biodiversity and the sustainable use of our biological resources, and describes how we will contribute to international efforts to implement the Convention.

#### **Mission statement:**

***TO USE, PROTECT AND MANAGE BIODIVERSITY FOR SUSTAINABLE DEVELOPMENT IN CAMBODIA.***

#### **Main strategic goals:**

- Maintaining biological diversity and productivity of ecological systems by protecting the various species of living organisms in their natural and manmade environments, especially forests, aquatic ecosystems, wetlands and agricultural land.
- Managing human activities and utilizing biological resources in a way that preserves for the long term the basic natural resources, which are necessary for human livelihood and development.
- Ensuring that the benefits coming from the sustainable use of biological resources contribute to poverty reduction and improve quality of life for all Cambodians.

#### **Strategic Objectives:**

The strategic objectives listed in each section constitute a reflection of the intentions of the government regarding each sector of activity. They are specific and measurable objectives that will guide the relevant ministries during the implementation phase of the strategy and action plan. Ministries will regularly document and report on the identified indicators attached to each objective.

#### **Priority Actions:**

Priority actions adopted by the government can be grouped in three broad categories: actions promoting awareness and capacity building of government staff and local communities for biodiversity conservation and sustainable use of biological resources; actions promoting the implementation of community-based natural resource management; and actions aimed at clarifying ministerial jurisdictions, reducing responsibility overlap and promoting interministerial coordination and collaboration in a sustainable development perspective.

**Proposed mechanisms for implementing the National Biodiversity Strategy and Action Plan include:**

- the production of an annual national report on policies, activities and plans aimed at implementing the Strategy;
- co-ordinating the implementation of national and international elements of the Strategy through a permanent Interdepartmental Biodiversity Steering Committee and National Secretariat for Biodiversity;
- measures to allow and encourage non-government participation in the implementation of the Strategy;
- regular reporting on the indicators identified for each strategic objective
- reporting on the status of biodiversity at the country level; and,
- revision of the Strategy after an initial implementation phase of two years.

Successful implementation of the Strategy will be determined, in large measure, by the degree to which all parts of society adopt its vision and principles and contribute to achieving its goals. Ultimately, the conservation of biodiversity and the sustainable use of biological resources will require the support and participation of individual citizens, local communities, urban and local authorities, conservation groups, business and industry, educational and research institutions. The implementation of the actions listed in the Action Plan will be decentralized, de-concentrated and under the responsibility of each participating ministry, agency or non-governmental organization.

To monitor and evaluate the progress through the report, it is necessary to fix target of some available indicators in the plan. The BSAP Actions and indicators matrix (appendix 1) can be used to effectively monitor and evaluate the effectiveness of the BSAP through the measurable indicators for the themed actions.

### **Developing the National Biodiversity Strategy and Action Plan**

The National Biodiversity Strategy and Action Plan is the culmination of, sectoral meetings with relevant government departments, combined with two national and three provincial workshops on biodiversity. The workshops highlighted the key issues for biodiversity in Cambodia, which are highlighted in each theme. The sectors have given background information and commented on the relevant themes and specifically given the governments focus in Priority Actions for these themes.

### **Linkages between National Biodiversity Strategy and Action Plan Themes**

The themes presented in the Strategy and Action Plan seeks to highlight a sectoral approach to biodiversity management. As Biodiversity is a cross-sectoral issue there are many areas of overlap throughout the themes, and these should compliment each other rather than lead to duplication. This is the first plan, but it is expected that future revisions will better recognise the crosscutting linkages between all themes.

The National Strategy and Action Plan proposes a series of strategic objectives and priority actions that are presented according to the following themes involving most sectors of society:

**Protection of Natural Resources (Protected areas, Endangered species, *Ex situ* conservation)**

**Animal Wildlife Resources**

**Freshwater Fisheries and Aquaculture**

**Coastal and Marine Resources**

**Forest and Wild Plant Resources**

**Agriculture and Animal Production**

**Energy Resources**

**Mineral Resources**

**Industry, Technology and Services (Manufacturing, Biotechnology and Biosafety, Tourism)**

**Environmental Security**

**Land Use Planning**

**Water Resources**

**Climate Change and Biodiversity**

**Community Participation**

**Awareness, Education, Research Coordination and Development**

**Legislation and Institutional Structure**

**Quality of Life and Poverty Reduction**



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## **PREAMBLE**

### **The Convention on Biological Diversity**

Biological diversity refers to the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems. As a result of human activities, biological diversity is being eroded at a rate that far exceeds natural processes. This accelerating decline in diversity threatens the ecological, economic, spiritual, recreational and cultural benefits that we currently derive from the Earth's living resources.

Acknowledging these threats, the world community successfully negotiated the United Nations Convention on Biological Diversity that was opened for signature by world leaders at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil, in June 1992. The Kingdom of Cambodia actively participated to the negotiations leading to the Convention, and ratified it in 1995 by National Assembly.

The Convention builds on and echoes the philosophy of such predecessors as *Caring for the Earth, A Strategy for Sustainable Living*, published in 1991, *Our Common Future* (the Brundtland Report), published in 1987, and the *World Conservation Strategy*, published in 1980. All are based on the principle that development must be ecologically, economically and socially sustainable. That is, our efforts to meet human needs must be carried out within the finite resources of the planet.

#### **The objectives of the Convention are:**

- the conservation of biodiversity;
- the sustainable use of biological resources; and
- the fair and equitable sharing of benefits arising from the use of genetic resources.

These objectives echo the three dimensions of sustainable development (ecological integrity, economic sustainability and social equity). The Biodiversity Convention is thus about global sustainable development, which requires the conservation of biodiversity and the sustainable use of biological resources. It conveys an understanding of the relationship between human activity and the natural world and the need to sustain living organisms, genetic diversity and the integrity of ecosystems. It will influence, perhaps profoundly, the future of life on Earth. Implementation of the Convention will require a significant shift in the way we use and manage living things. A cooperative, cross-sectoral approach, based on partnerships, must be adopted within and among the nations of the world.

### **On-going Efforts for Biodiversity in Cambodia**

The Kingdom's commitment to environmental protection has been demonstrated by a number of significant legal measures to prevent pollution, habitat damage and to protect wildlife, including the creation of an Environmental Secretariat in 1993, the enactment, in 1996, of the "Law on Environmental Protection and Natural Resource Management" creating a full fledged Ministry of Environment and the adoption of a National Environmental Action Plan in 1998. The National Assembly has also ratified several international conventions related to the environment including: the Convention on Biological Diversity, the Climate

Change Convention, the Ramsar Convention, CITES, the World Heritage Convention and the Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin.

This National Biodiversity Strategy and Action Plan reflects the national goals of poverty reduction through accelerated economic growth, environmental sustainability and social equity. It constitutes as such a major contribution to the country's development plan. Land, water, pasture, terrestrial and marine ecosystems as well as wildlife and aquatic resources in particular are central to agriculture, fisheries and tourism development. Habitat protection, natural resource conservation and sustainable use options offer significant opportunities for demonstrating that conservation of biodiversity represents a vital investment in future sustainability of Cambodia's economic and social development.

### **Role and Importance of Biodiversity**

Every ecosystem provides habitat for plants, animals and microorganisms which we can use or which perform useful functions. The World Resources Institute call ecosystems "the productive engines of the planet", providing us with everything from the water we drink to the food we eat and the fiber we use for clothing, paper, or wood for construction (WRI 2000). **Table 1** gives examples of the many goods and services provided by four broad ecosystem categories found in Cambodia.



**Table 1. Examples of services & goods provided by ecosystems**

Ecosystem	Goods provided	Services provided
<b>Agroecosystems</b>	<ul style="list-style-type: none"> <li>■ Food crops</li> <li>■ Additional food items (e.g. rice field fisheries)</li> <li>■ Fiber crops</li> <li>■ Crop genetic resources</li> </ul>	<ul style="list-style-type: none"> <li>■ Maintain limited watershed functions (infiltration, flow control, partial soil protection)</li> <li>■ Provide habitat for birds, pollinators, soil organisms important to agriculture</li> <li>■ Build soil organic matter</li> <li>■ Bind atmospheric carbon</li> <li>■ Provide employment</li> </ul>
<b>Forest Ecosystems</b>	<ul style="list-style-type: none"> <li>■ Timber</li> <li>■ Fuelwood</li> <li>■ Drinking and irrigation water</li> <li>■ Fodder</li> <li>■ Non-timber products (vines, bamboo, leaves, etc.)</li> <li>■ Food (honey, mushrooms, fruit, and other edible plants; game)</li> <li>■ Genetic resources</li> </ul>	<ul style="list-style-type: none"> <li>■ Remove air pollutants, emit oxygen</li> <li>■ Cycle nutrients</li> <li>■ Protect water resources (infiltration, purification, flow control, soil stabilization)</li> <li>■ Maintain biodiversity</li> <li>■ Bind atmospheric carbon</li> <li>■ Moderate weather extremes and impacts</li> <li>■ Generate soil</li> <li>■ Provide employment</li> <li>■ Contribute aesthetic beauty and provide recreation</li> </ul>
<b>Freshwater Ecosystems</b>	<ul style="list-style-type: none"> <li>■ Drinking and irrigation water</li> <li>■ Fish and other aquatic organisms</li> <li>■ Hydroelectricity</li> <li>■ Housing materials</li> <li>■ Medicines</li> <li>■ Genetic resources</li> </ul>	<ul style="list-style-type: none"> <li>■ Lessen or prevent the impact of flooding</li> <li>■ Dilute and carry away wastes</li> <li>■ Cycle nutrients</li> <li>■ Maintain biodiversity</li> <li>■ Provide transportation corridor</li> <li>■ Provide employment</li> <li>■ Contribute aesthetic beauty and provide recreation</li> </ul>
<b>Coastal Ecosystems</b>	<ul style="list-style-type: none"> <li>■ Fish and shellfish</li> <li>■ Sea weeds (for food and industrial use)</li> <li>■ Salt</li> <li>■ Genetic resources</li> </ul>	<ul style="list-style-type: none"> <li>■ Moderate storm impacts (mangroves; barrier islands)</li> <li>■ Provide wildlife (marine and terrestrial) habitat</li> <li>■ Maintain biodiversity</li> <li>■ Dilute and treat wastes</li> <li>■ Provide harbors and transportation routes</li> <li>■ Provide employment</li> <li>■ Contribute aesthetic beauty and provide recreation</li> </ul>

Source: adapted from WRI 2000. Global Ecosystem Assessment

There are numerous ways to value biological diversity. While it is not difficult to assign a value to biological resources that are available on markets, such as rice, wood, medicines, etc., there are many functions that cannot be so easily measured in monetary terms. For example, ecosystem services or social benefits. For many people who rely on the products of ecosystems for their daily subsistence, it would be difficult to put a monetary value on all the products they use or benefits they enjoy.

Natural areas provide support systems for commercially valuable natural resources. For example fish spawning areas in flooded forests, mangroves and wetlands. Other habitats act as genetic reservoirs for commercial crops. As many of the species in Cambodia and elsewhere are not even known yet, we can assume that with an increase in knowledge new biological resources to increase human welfare will be discovered. There is a clear relationship between the conservation of biological diversity and the discovery of new biological resources.

## **A Biodiversity Portrait for Cambodia**

### **Background**

Cambodia, a tropical country found on the peninsula of mainland Southeast Asia adjacent to the gulf of Thailand with a land area of 181,035 km<sup>2</sup>. Cambodia has a coastline of 435 km, and its land border of 2,438 km runs along Thailand to the west, Vietnam to the east and Laos PDR to the north. Biogeographically, Cambodia is dominated by the lowlands along the Mekong River and Tonle Sap (Great Lake), which are the sites of most of the population and agriculture and three mountainous regions in the Southwest, North and Northeast, which are less populated and rich in forest resources.

This geography helps to form an unusual phenomenon whereby in the Rainy season the Mekong River backs up and actually flows into the Tonle Sap causing the lake to swell up to 4 times its size. The Tonle Sap Lake provided a wealth of biological resources. Specifically the seasonal flooding of the Tonle Sap, supplies suitable conditions for rice and fish, which were and still are the staples of diet in Cambodia. This is probably why the ancient Khmer empire of Angkor was located near its shores. Depictions of plants and animals, throughout Angkor Wat, give an indication of the biodiversity of the area and its cultural importance through utilization. The Tonle Sap ecosystem was, and is still considered by many to be the heart of the country.

The full extent of Cambodia's biodiversity is not yet known; however Cambodia is thought to have a rich diversity of species and is considered a biodiversity 'hot spot' (an area very rich in biodiversity) given its tropical location. Compared with neighbouring countries, Cambodia has a low population density and relatively large intact natural areas that are still intact.

### **BIODIVERSITY USE**

Biodiversity supports human societies ecologically, economically, culturally and spiritually. Cambodia is host to a great diversity of life, which can be seen most directly in the use of biological resources such as agriculture, forestry and fisheries.

In agriculture the importance of ecosystems is combined with the species preferred for food and the genetic diversity of these species allows for increased capacity to deal with diseases or pests. Others are of considerable importance for the control of natural depredators of agriculture productions (e.g. carnivores control rodent populations, insect eating birds protect crops), the control of pest animals (e.g. bats prey on biting insects, fish prey on mosquito larvae) or pollination (e.g. bees). Wildfowl are currently being domesticated for egg and meat production, cormorants are used as fishing aides. Some species are notable tourist attractions (e.g. elephant, birds) or constitute on the other hand important parasites and vectors of disease affecting domestic animals and people (e.g. mosquito). In Cambodia biodiversity

## **BIODIVERSITY STATUS**

Definitions for biodiversity often include three components; genetic diversity, species diversity and ecosystem diversity. In Cambodia and indeed around the world and there tends to be varying levels of information on these components. Species diversity is commonly the best-known and most thoroughly investigated component, while genetic diversity has been focused on a few species that are of commercial interest, and the true ecological functions of ecosystems are only slowly coming to light. The following seeks to summarize current knowledge on the status of these three components of biodiversity in Cambodia.

### **Genetic Diversity**

Very little is known about the genetic diversity within species in Cambodia, as little research has been done in this area. Genetic diversity can be divided into plant and animal genetic resources and most often refers to those plants and animals, which have human uses.

### **Plant Genetic Resources**

In regards to plant genetic resources, crop cultivation in Cambodia is largely dependant on traditional cultivars, old primitive varieties and land races. Almost 80% of the area is cultivated with local, unimproved varieties of rice, maize, sesame, vegetables and sweet potato. Traditionally farmers have been using their own produce as seeds for the next crop without any changes. New pests and pathogens have contributed significantly in the loss of landrace diversity. Rich diversity has been built up in crops like rice, maize, soybean, sesame, sweet potato, peanut and vegetables. Home gardens and backyards possess many different species. There are serious information gaps pertaining to the distribution and occurrence of wild species and wild relatives of crops in Cambodia. This is primarily due to a lack of systematic scientific studies or their taxonomical description and delineation. Rice is the dominant crop for Cambodia, and some research has been undertaken by IRRI, finding over 2,000 varieties of rice and several wild rice species, samples from which have been taken to the IRRI gene bank.

### **Animal Genetic Resources**

Cambodia has important wild and domesticated animal genetic resources; even less is known about animal genetic resources than the plant genetic resources. Species and breeds of domestic and wild cattle, found within Cambodia, include domestic, feral and wild species. Domestic Swamp Water Buffalo are used and wild Swamp Water Buffalo are also believed to still exist. There are also several breeds of domestic pig, including an indigenous variety, a Chinese variety and several European varieties. Cambodia has a distinctive strain of the South-East Asia pony, and domestic elephants are still worked in more remote parts of the country. Furthermore most of the world's poultry is believed to have come from wild species in South-East Asia, with Cambodia now having both locally domesticated and introduced varieties of chicken, goose, duck, and even an endangered breed of domestic Turkey.

### **Species Diversity**

Better information exists on species diversity than either genetic or ecosystems diversity for Cambodia, although this is still limited. The following estimates for species found in Cambodia, have been taken from a variety of authors that have submitted papers for the Cambodia's Biodiversity Status Report.

## **Mammal species**

Approximately 100 species of Terrestrial Mammal are recorded for Cambodia. A total of 49 mammal taxa are currently listed by IUCN (2000) as being Globally Threatened, Near-threatened or Data Deficient and present in Cambodia. However, 17 have not been recorded from the country, with some unlikely to occur, while a further 3 species of bat have recently been added. Thus, to date, 35 IUCN-listed terrestrial species of mammal are known from Cambodia. Of these, Kouprey and Javan Rhinoceros are potentially extinct (globally and nationally respectively).

## **Bird Species**

Over 500 species of Birds have been recorded from Cambodia, but based on data from neighbouring countries (Thailand, Laos and Vietnam) more than 600 species are likely to occur. BirdLife International designates thirty-nine species of birds confirmed in Cambodia as being globally threatened or globally near threatened. Of these 25 are species that are primarily reliant on wetlands, the majority being large waterbirds. The two most important areas for conservation of globally threatened bird species in Cambodia are the Boeung Tonle Sap and its inundation zone and the northern deciduous dipterocarp forest plains.

## **Fish Species**

Estimates for freshwater fish in Cambodia range from 850–1,200, however an understated but highly cross referenced estimate of overall Cambodian fish species is made by the Fishbase, showing a fish species list for freshwater (486) and marine/brackish (357), totalling 843 fish species for Cambodia. Freshwater fish species in Cambodia are very diverse because the variety of ecosystems and historical geological changes. While the Gulf of Thailand and the South China Sea coastal waters in general and specifically those off Cambodia are highlighted as being zones of high biological productivity and important nurseries for fish breeding. There is anticipated to be a much higher number of fish species found in Cambodia as further scientific research is conducted.

## **Reptile and Amphibian Species**

Surveys on Reptiles and Amphibians are either historical or relatively recent and have not been rigorously taxonomically studied or effectively peer reviewed. As such an estimate of overall species numbers has not been made. There are however 28 species of reptile listed on the CITES list for Cambodia, highlighting the regional and international significance of these species found in Cambodia. The results from recent studies should soon make more accurate information available for the estimation of reptile and amphibian species in Cambodia.

## **Flora Species**

No accurate assessment of the size of the Cambodian Flora is available. Dy Phon (1982) suggested a known flora of 2308 species of seed plants, but this total seems far too small given more reasonable estimates of about 12,000-15,000 species for Laos, Cambodia and Vietnam combined. Cambodia is not expected to have a high level of endemic plants, however the wet forests of the Cardamom and Elephant Mountains and swamp forests of the Tonle Sap floodplain might be expected to harbour locally distributed species.

## **Ecosystem Diversity**

Cambodia has an interesting diversity of ecosystems including; coastal, wetlands, forests and agriculture. The coastal zone contains; corals, sea grasses, islands and mangroves found along Cambodia's 435 km of the coast. Extensive wetlands occupy up to 30% of the country and are linked to geography, the Mekong River and a monsoon climate. Forests, which once covered most of the country in a blanket of green, include lowland, montane and azonal forest types. Finally and perhaps most significantly for the people of Cambodia are the agricultural ecosystems, which are dominated by rice based agriculture and shifting cultivation. Combined these ecosystems form the mosaic of the country and land uses patterns follow these natural systems.

## **BIODIVERSITY THREATS**

Biodiversity loss is the greatest threat to biodiversity; extinction or deaths of an entire species, loss of unique habitats and ecosystems or reduction of genetic variations within a species are all losses of biodiversity. As we still know so little about biodiversity, we don't know how much biodiversity we are losing, and it is often difficult to now the threats to biodiversity.

The main threats to biodiversity stem from an increased population pressure, a lack of planning and law enforcement in natural resource management, and uncertainties in land tenure. Having only recently emerged from three decades of war and civil unrest Cambodia has to rebuild much of its institutional framework and has many urgent development needs. Many people in Cambodia rely directly on biological resources for their livelihoods, however biological resources have been privatised and in many cases overexploited. The Government has taken important steps in mitigating threats to biodiversity, through increased community management and good governance, however the greatest concern is the time and resources it is taking to implement these measures.

Some areas remained largely undisturbed because they were considered unsafe. In recent years, increased security throughout the country has brought with it, increased migration of people into areas that were formerly considered unsafe, and as such similar unsustainable natural resource exploitation activities are occurring around the country. If this trend continues there is a danger that areas that are important for the conservation of biodiversity could be rapidly degraded or lost with serious ecological and economic consequences for Cambodia.

We now know that there are many different threats directly causing biodiversity loss. Among these threats increasing population can be considered a root cause, as it is the basis of many of the other threats. Other threats include; ignorance, policies, global trading, inequity, lack of participation, natural disasters, man-made disasters, climate change, loss of habitat & overexploitation of biological resources, wildlife trade, pollution, modern agriculture, invasive alien species, and biotechnology. It is becoming more and more important to implement management for these threats now, as with an increasing population these threats will become more of a problem for Cambodia in the future.

## **CONCLUSION**

This summary of the biodiversity found in Cambodia, shows some of the issues related to biodiversity. From the limited information that is currently known we can see that Cambodia is rich in genetic, species and ecosystem diversity, but that there are a range of threats to all components of biodiversity. There is still much more to learn about the rich biodiversity of Cambodia, but the first steps to greater knowledge, awareness and appreciation of Cambodia's biodiversity have been taken. The more we learn about biodiversity, the more we realize its importance for Cambodia's prosperity and overall quality of life. This will only



be possible if people are willing to use protect and manage Cambodia's biodiversity sustainably.

The biodiversity information available in Cambodia is limited and typically what is considered grey literature, as it comes from sources that are not scientifically peer reviewed. This lack of strong scientific information should not be seen as an excuse for inaction, indeed it should be seen as a reason to be more cautious in ensuring a sound approach to biodiversity issues. The information base of Cambodia's biodiversity is currently expanding, and this increased knowledge and awareness can help in the use, protection and management of biodiversity for sustainable development in Cambodia.

There are many threats to biodiversity in Cambodia, and combined with increasing population these threats are creating the potential for the increasing loss of biodiversity. As more biodiversity is lost it becomes more difficult to maintain a path towards sustainable development, future prosperity and most importantly it is more difficult to maintain food security and ecosystem functions that are the basis of real quality of life.

The Royal Cambodian Government and many international organizations have recognized the significance of Cambodia's biodiversity, and are showing increased interest in conducting activities that reduce biodiversity threats. Many activities currently being undertaken are concentrating on the important links between biodiversity and sustainable development, while at the same time encouraging the protection of representative components of Cambodia's biodiversity. Such approaches will help to ensure Cambodia's ability to use, protect and manage biodiversity for sustainable development, and prosperity into the future.



## THE STRATEGY

### A Vision of Biodiversity

The development of Cambodia is oriented towards poverty reduction through accelerated economic growth, environmental sustainability and social equity. In this perspective, the people of Cambodia share this vision of biological diversity:

*"Equitable economic prosperity and improved quality of life through sustainable use, protection and management of biological resources".*

### Mission Statement

*To use, protect and manage biodiversity for sustainable development in Cambodia*

### General Goals

- Maintaining biological diversity and productivity of ecological systems by protecting the various species of living organisms in their natural and manmade environments, especially forests, freshwater and marine ecosystems, wetlands and agricultural land.
- Managing human activities and utilizing biological resources in a way that preserves for the long term of the basic natural resources, which are necessary for human livelihood and development.
- Ensuring that the benefits coming from the sustainable use of biological resources contribute to poverty reduction and improve quality of life for all Cambodians.

### Guiding Principles

- Biodiversity has ecological, economic, social, cultural and intrinsic values.
- The people of Cambodia depend on biodiversity and have a responsibility to contribute to biodiversity conservation and to use biological resources in a sustainable manner.
- All Cambodians will be encouraged to understand and appreciate the value of the biodiversity and to participate in decisions involving the use of air, water, land, plants, animals and other resources.
- An ecological approach to resource management is central to conserving biodiversity and to using biological resources in a sustainable manner.
- Development decisions must reflect ecological, economic, social, cultural and spiritual values of local populations.
- Healthy, evolving ecosystems and the maintenance of natural processes are prerequisites for the *in situ* conservation of biodiversity and the sustainable use of biological resources.

- *Ex situ* measures may be required to support the conservation of some species and populations and are essential to ensuring the sustainable use of many agricultural, forest and aquatic resources.
- The knowledge, innovations and practices of local communities should be respected, and their use and maintenance carried out with the support and involvement of these communities.
- The conservation of biodiversity and the sustainable use of biological resources will be carried out using the best knowledge available and approaches refined as new knowledge is gained.
- The conservation of biodiversity and the sustainable use of biological resources require local, national and global co-operation and a sharing of knowledge, costs and benefits.

### **Monitoring and Evaluation for Implementation of the National Biodiversity Strategy and Action Plan**

The Biodiversity Strategy and Action Plan is viewed to be an ongoing, continuous and cyclical process, and the actions outlined in the strategy get implemented along the line of national development and in light of the regional and international context. In this way, the national planners will become the national implementers so that biodiversity conservation becomes sustainable and its management can thus positively affect the national economy and the livelihood of the people of Cambodia. **Proposed mechanisms for implementing the National Biodiversity Strategy and Action Plan include:**

- coordinating the implementation of national and international elements of the Strategy through a permanent **Interministerial Biodiversity Steering Committee** and **National Secretariat for Biodiversity**;
- the preparation of an annual national report on policies, activities and plans aimed at implementing the Strategy;
- measures to allow and encourage non-government participation in the implementation of the Strategy;
- regular reporting on the indicators identified for each strategic objective;
- reporting on the status of biodiversity at the country level; and,
- revision of the strategy after an initial implementation phase of two years.

Successful implementation of the Strategy will be determined, in large measure, by the degree to which all parts of society adopt its vision and principles and contribute to achieving its goals. Ultimately, the conservation of biodiversity and the sustainable use of biological resources will require the support and participation of individual citizens, local communities, urban and regional governments, conservation groups, business and industry, and educational and research institutions.

To monitor and evaluate the progress through the report, it is necessary to fix target of some available indicators in the plan. The BSAP Actions and indicators matrix (appendix 1) can be used to effectively monitor and evaluate the effectiveness of the BSAP through the measurable indicators for the themed actions.

The **Strategy** provides a framework for action at all levels that will enhance our ability to ensure the productivity, diversity and integrity of our natural systems and, as a result, our ability as a nation to develop sustainably. It promotes the conservation of biodiversity and the sustainable use of our biological resources, and describes how we will contribute to international efforts to implement the Convention.

The **Action Plan** list priority actions that will be undertaken by the different ministries, departments and agencies during the implementation phase. Priority actions adopted by the government can be grouped in three broad categories:

- actions promoting awareness and capacity building of government staff and local communities for biodiversity conservation and sustainable use of biological resources;
- actions promoting the implementation of community-based natural resource management;
- actions aimed at clarifying ministerial jurisdictions, reducing responsibility overlap and promoting interministerial coordination and collaboration in a sustainable development perspective.

Projects and activities implemented in regard to this Action Plan will be developed on the basis of the guiding principles of the Strategy with an emphasis on capacity building, community involvement and intersectional cooperation.

### **Developing the National Biodiversity Strategy and Action Plan**

The National Biodiversity Strategy and Action Plan is the culmination of, sectoral meetings with relevant government departments, combined with two national and three provincial workshops on biodiversity. The workshops highlighted the key issues for biodiversity in Cambodia, which are highlighted in each theme. The sectors have given background information and commented on the relevant themes and specifically given the governments focus in Priority Actions for these themes.

### **Linkages between National Biodiversity Strategy and Action Plan Themes**

The themes presented in the Strategy and Action Plan seeks to highlight a sectoral approach to biodiversity management. As Biodiversity is a cross-sectoral issue there are many areas of overlap throughout the themes, and these should compliment each other rather than lead to duplication. This is the first plan, but it is expected that future revisions will better recognize the crosscutting linkages between all themes.



## **Theme 1. Protection of Natural Resources**

### **1.1 Protected areas**

#### **Context**

Cambodia was the first country in Southeast Asia to establish a national park in 1925, when the 10,800 ha forest around the Angkor Temple complex was declared a protected area. By 1969, the country had established six national parks and wildlife sanctuaries covering nearly 2.2 million ha, about 12% of the country's total land area. The civil war disrupted management activities in these parks, but the country renewed conservation efforts by establishing protected areas after the war ended.

In November 1993, His Majesty King Norodom Sihanouk issued a Royal Decree (or Kret) designating 23 protected areas, covering about 3.3 million ha (18.23% of total land area), and including seven national parks, ten wildlife sanctuaries, three protected landscapes, and three multiple use areas. The four categories reflect the different characteristics and management objectives for these areas and correspond to international classifications such as those of IUCN (The World Conservation Union).

The boundaries of Kirirom and Ream National Parks have almost fully defined with the participation from relevant stakeholders and recognised by relevant stakeholders including the Ministry of Land Management, Urbanization and Construction, Provincial Authorities and local communities. A part from this, boundary markers have been placed in special boundary points within a number of protected areas. Headquarters, rangers stations, sign posts; boundary markers; and education signs have been developed at basic level in 12 protected areas to provide basic protection and public understanding about their administration. Field wildlife surveys such as bird; mammals have been carried out in some protected areas. Specific species survey such as Tiger and Elephant survey begin to be initially conducted in Bokor; Virachey; Kirirom national parks; Phnom Prich; Kulen Prom Tep; Luphat; Phnom Oral and Phnom Somkos WSs.. Field information and documentation have been shared among stakeholders through a number of workshops. Preliminary assessment and priority setting for conservation areas have been conducted. By early 2001, 525 rangers have been totally recruited and deployed in 59 stations within the national protected areas; plans are made to reach 600 rangers in 2003. They are doing basic patrolling activities. About 15% of existing rangers have received basic training. Close cooperation between the Department with a number of conservation organizations have been developed to promote the capacity development, environmental education, community livelihood development; and on-site protection. Threats analysis has not been systematically conducted. Defining zoning system to meet multiple objectives of protected areas management begun with two protected areas included Ream National Park and the Tonle Sap Biosphere Reserve. Steering Committees on Consultation and Conflict Resolutions have been created at national and provincial level but have only meet very occasionally to solve any conflicts. Local participation in sustainable natural resource management is being promoted in a number of protected areas. National policy document such as the National Environmental Action Plan for 1998-2002 have been developed and other policies document such as protected areas law, community sub-decree, community fishery sub-decree and community forest sub-decree are drafted.

Even if a high percentage of Cambodia's land area already falls under designated protected areas, there is some need to complete the network. Recently, the Tonle Sap Lake was formally listed as a Biosphere reserve. There are also three Wetlands of International Importance, Ramsar sites, designated in Cambodia (Boeung Chhma, Kaoh Kapik, and a

northern section of the Mekong river in Stung Treng Province), and potential new world heritage sites also planned to become protected areas in the near future. The designation of the Sarus Crane Reserve, in February 2000, at Ang Tropeang Thmor highlights the need and possibility for species-specific reserves and sanctuaries to be added into the protected areas system.

Within existing system there are 7 transboundary protected areas. The location of one of Cambodia's protected areas, Virachey National Park (332,500 ha) in northeastern Cambodia, provides an opportunity for creating a trans-frontier reserve with the proposed Dong Amphan National Park (122,100 ha) in Lao P.D.R. and the Mom Ray National Park (101,400 ha) in Vietnam. However, tiger and elephant survey begin to extensively carried out by using camera traps and signs identification techniques, these have not yet been fully surveyed, their boundaries have not been demarcated, and there has been no conservation and management within the parks.

Protected areas play a significant role in the development of tourism, and the provision of ecological services (watershed protection, sanctuaries for wild plants and animals). However, several protected areas are subjected to unrestricted grazing by livestock, unmanaged fishing, illegal logging, collection of fuelwood, non-timber forest product collections, and habitat degradation and disturbance resulting from human activities. These issues can be best addressed through the development and implementation of management underpinned by the participation of local communities.

**Key Issues:**

- ⇒ Weak legal, institutional framework and law enforcement
- ⇒ Lack of close cooperation and coordination with relevant stakeholders and local communities
- ⇒ Information base to support decision making is limited
- ⇒ Promoting public awareness is limited and not properly managed
- ⇒ Social and political constraints
- ⇒ Field management problems and patrolling
- ⇒ Lack of financial and human resources
- ⇒ Lack of technical expertise and human resources
- ⇒ Boundary demarcation and zoning not clearly defined in the field
- ⇒ Increasing pressures on nature conservation areas and ecosystems as a result of expansion in forestry, agriculture, fisheries, road building, tourism and urbanization.
- ⇒ Illegal activities and conflicts with local populations
- ⇒ Lack of or incomplete implementation of management plans for existing protected areas.
- ⇒ Incomplete network of protected areas.

**Goals**

- Maintain and develop an integrated, representative and sustainable network of protected areas that will ensure the preservation of representative components of biodiversity and cultural resources as well as the sustainable development of selected recreation and tourism activities.
- Conserve plant and animal diversity in existing and proposed protected areas.
- Promote the active involvement of local communities in the management of protected areas.

### **Strategic Objectives (indicators)**

- 1.1.1 Develop management plans for all protected areas and buffer zones in collaboration with local communities and relevant ministries (number of management plans developed)
- 1.1.2 Provide basic infrastructure, supplies, staff and equipment for the management of all protected areas (increase in protected areas budget)
- 1.1.3 Appropriately demarcate protected areas boundaries (number of signs posted, number of protected areas demarcated)
- 1.1.4 Include in the existing protected areas network new sites of biological importance (number of new protected areas established)
- 1.1.5 Improve public awareness on the importance of protected areas (number of people reached by awareness programs)
- 1.1.6 Facilitate capacity-building, technology and information exchange between protected areas (number of reports, meetings, workshops)
- 1.1.7 Prevent illegal resource extraction from protected areas (number of illegal events recorded, number of fines issued).
- 1.1.8 Promote and strengthen the cross-sectoral communication and coordination based on the existing mechanisms to solve any conflicts of interest (number of meetings; number of conflicts solved, number of joined resolutions).
- 1.1.9 Develop capacity and institutional management system of the Department of Nature Conservation and Protection, which lead to provide effective services at national and protected areas level. (a number of management guidelines developed; a protected areas legislation developed; organizational reviewed; policy reviewed; monitoring and evaluation guidelines).
- 1.1.10 Develop a system which leads to the development of National Financial Mechanism (Trust fund development; national sustainable financing mechanism assessment)
- 1.1.11 Develop national protected areas monitoring system (GIS system and database developed and shared, information sharing mechanism developed).

### **Options**

- Select priority areas for conservation (formulate criteria governing establishment of protected areas with reference to fragile, rare or endangered ecosystems).
- Identify the status of the habitats and species of the proposed protected area.
  
- Study/research protected areas geography through either mapping or fieldwork.
- Collect and review existing documents and information on protected areas.
- Develop inventory on biological resources in protected areas.
- Produce management, zoning, tourism and other sustainable use plan for the protected areas including recreation
- Overview road system within protected areas.
- Overview sanitary water & electrical power system within protected areas.
- Develop human resources, recruit and hire sufficient staff.

- Ranger training program related to field patrolling techniques; basic law enforcement; field wildlife identification, PRA; field equipment use etc.
- Develop leadership and professional training programs related to monitoring, research, management and interpretation of cultural and natural resources in protected areas.
- Provide appropriate salary and allowances.
- Provide health care services for protected areas staff.
- Supply sufficient equipment to manage the protected areas.
- Develop target species conservation action plan such as Tiger; Gibbon; Elephant; Bear and bird etc. Ensure participation of the local population in the design, demarcation and management of natural conservation areas.
- Educate the public on the role of protected areas and communicate laws and regulations from national level to local level.
- Increase and strengthen surveillance activities.
- Take action against illegal activities through fines penalties and public profiling.
- Supply equipment and funds to communities.
- Give priority to local communities in employment opportunities and to utilize natural resources in protected areas.
- Give priority to local community members participating in protected areas management for development programs.
- Enhance the ecological, economical and social value of PA's by increasing the benefits to people in and around them.
- Gather existing and collect more socio-economic and ecological data on PA's.
- Clearly demarcate PA boundaries with poles/marks and labels with signs /logos.
- Identify and prevent the introduction of plant and animal species into protected areas.
- Create a monitoring group on illegal activities and illegally exploiting in PA's.
- Study and increase understanding about biological features of PA's.
- Utilize electronic information networks and organize meetings between PA's.
- Set up study tour programs.
- Disseminate policies on PA management to private sector investors.
- Create favorable conditions for investors.
- Organize discussion about the roles and responsibilities of relevant institutions.
- Create an interministerial board to facilitate the relevant works / activities in PA's.
- Increase the annual financial contribution of government.
- Pursue support funds from international and national agencies.
- Generate income from services offered to visitors and fines from protected areas.
- Develop budgetary income and expenditure plans for protected areas.
- Set up a monitoring group on expenditure and income for protected areas.
- Improve management of protected areas based on international experiences.
- Monitor biodiversity including natural and human impact assessments in PA's.
- Conduct study tours for exchanging relevant experiences in the country and abroad.
- Demarcate a natural boundary, such as strip planting local tree species.

#### Priority Actions (coordinating and participating agencies)

- 1.1.1 Strengthening the on-going management of designated protected areas by development and enforcing management policies, guidelines and plans (MOE, MAFF, MRD, MLMUPC & MOI) (incl. Protected areas law, boundary identification, biological surveys, awareness program, institutional review; legal and policy assessment; community participation, equipment, funding, impacts of human activities, staff and infrastructure assessment, ranger and leadership training program development; management plan development, guideline; monitoring and information management, surveillance activities, zoning system; national and provincial steering committee coordination etc.)



- 1.1.2 Integration of the Management of the Tonle Sap Biosphere Core Zones into the management of the whole Tonle Sap Ecosystem Approach for sustainable use of biological diversity (MOE, MAFF & CNMC) (management of biosphere reserves; community fishery management; boundary demarcation, commercial fishery management; wildlife and fishery monitoring; land security; cross-institutional communication and coordination; field staff and community training program; environmental education and awareness and outreach, local governance)
- 1.1.3 Identification and designation of new protected areas within wetland; marine and coastal habitats (MOE & MAFF)
- 1.1.4 Identification and designation of new fish reserves and sanctuaries (MAFF & MOE)
- 1.1.5 Economical evaluation and assessment of resources for potential development of revenue-based activities within protected areas (MOE). Ecotourism development in Protected Areas, and Buffer zone management with community benefit.
- 1.1.6 Training programs targeted for park rangers, technical staff and protected areas directors; and local community (MOE) (incl. PA system and categories, participatory management, concept of boundary demarcation and zoning, roles and responsibilities of MOE/DNCP/Rangers, using map, compass and GPS, policy and legal framework of PA management, conflict resolution in PAs, field observation techniques and reporting, patrolling techniques and workplan, wildlife identification, resource mapping, etc.).
- 1.1.7 Integrated conservation and development of Cardamom's protected areas (management plans; patrolling; training, boundary demarcation; ecological and social assessment, security of community land use; sustainable financing; critical habitat protection; world heritage nomination, law enforcement poverty alleviation; multi-stakeholder participation and coordination; local governance; watershed protection etc.) (MOE, MAFF & MLMUPC).
- 1.1.8 Integration of the management of Kulen Prom Tep Wildlife Sanctuary into the Northern Plain Landscape Conservation. (MOE, MAFF, MLMUPC & MRD) (management plans; patrolling; training, boundary demarcation; ecological and social assessment and research, security of community land use; critical habitat protection; poverty alleviation of local community; multi-stakeholder participation; local governance; corridor development)
- 1.1.9 Integration of the management of protected areas in the northeastern dry forest plain conservation landscape (MOE, MAFF, MLMUPC & MRD) (management plans; patrolling; training, protected areas infrastructure development, boundary demarcation; ecological and social assessment, security of community land use; critical habitat protection; poverty alleviation of local community; multi-stakeholder participation; local government; corridor development).
- 1.1.10 Sustainable integration of the Management of Biodiversity and Virachey National Park with the development of local indigenous community to provide a model for integrated conservation and development. (Park management plan; ecological and socio-economic survey; boundary demarcation; land use change monitoring, trans-boundary coordination mechanism, community livelihood development; community based natural resource management; ranger training; park infrastructure development; community outreach and education; local governance; rural credit development, and stakeholder coordination) (MOE, MLMUPC & MRD).

1.1.11 Development of an approach to build a linkage between conservation and local society by enhancing conservation and sustainable use of biological resources associated with Preah Soramrith Kohsomak (Kirirom), Preah Mony Vong (Bokor) and Preah Sihanouk (Ream) National Parks. (MOE)

## 1.2. Endangered species

Species of animals, which were present in Cambodia in the past but are now believed to be extinct, include the Kouprey and the Javan rhinoceros. Endangered species include for example Asian elephant, tiger, banteng, freshwater Irrawaddy dolphin, greater adjutant stork, sarus crane, white-shouldered ibis, white-winged duck, Siamese crocodile and marine turtles. The giant catfish, known to reach up to 5 m in length, is also threatened as well as at least 14 other fish species. Among other animals, which are now considered rare or vulnerable, are the brow-antlered deer, the gaur, the pygmy loris, the pileated gibbon, the sun bear, several species of terrestrial turtles, the spot-billed pelican, and several other bird species. Threats to these animals include poaching, egg collecting, predation (by feral animals etc) pollution, accidental fisheries by-catch and habitat destruction.

Several plant species or varieties occurring in Cambodia are currently at risk. These include valuable tree species such as Chankreussna (*Aquilaria crassna*), Cheuteal (*Dipterocarpus* sp.) and Koki (*Hopea* sp.), rare endemics that are not found anywhere else such as *Fokeinia hodgsonii*, a highly valued coniferous tree, and several species of orchids. Major threats to the terrestrial flora are encroachment caused by human settlements, deforestation, cultivation, landscape gardening and livestock grazing, as well as illegal collecting for local or international markets.

Recent efforts to assess the status of Cambodia's species diversity are limited and the national distribution of these and other significant animal species is not well known. Illegal trade is common for several species due to the lack of enforcement capacity within the relevant agencies.

### **Key Issues:**

- ⇒ Lack of enforcement of protection measures.
- ⇒ Little systematic population monitoring of most species.
- ⇒ Lack of detailed information on the occurrence, status and habitat requirements of species at risk
- ⇒ Habitat destruction caused by activities associated with development.
- ⇒ Illegal trade.

### **Goals**

- Ensure the protection, conservation and recovery of known endangered plant and animal species in their native habitats.

### **Strategic Objectives (indicators)**

- 1.2.1 Develop and implement recovery programs for all endangered vertebrate and vascular plant species (number of recovery programs in place)
- 1.2.2 Improve the implementation of the Convention on the International Trade of Endangered Species (CITES) and minimize impacts of illegal trade on wildlife (number of fines)
- 1.2.3 Develop a national database on species at risk (quantity of data collected)

## **Options**

- Manage and conserve endangered species and their habitats.
- Enhance hunting control and monitor illegal trade, especially for those species listed in the CITES.
- Establish the status of species at risk according to international standards and criteria.
- Rehabilitate endangered and endemic species.
- Promote the participation of local communities to reintroduction programs.
- Establish a CITES unit.
- Build up capacity of related organizations to CITES and its regulations and implementation, identification of species, rehabilitation of species and their introduction procedures.
- Improve awareness within the country towards the importance of CITES and its implementation and its role in conservation of global and local biodiversity.
- Undertake systematic monitoring activities for species at risk.
- Implement protection measures for rare and vulnerable plant and animal species threatened with disappearance or extinction.
- Prohibit development and activities that threaten a critical habitat.
- Establish a national database on species at risk.

## **Priority Actions (coordinating and participating agencies)**

- 1.2.1 National assessment and recovery program for species, populations and ecosystems at risk (MAFF & MOE) incl.:
- evaluation of the status of species likely to be at risk (red list)
  - systematic monitoring of critically endangered species
  - development and implementation of recovery programs
  - measures ensuring the protection of critical habitats
- 1.2.2 Application of IUCN Red List criteria for all groups and production of national red lists (MAFF & MOE).
- 1.2.3 CITES implementation, capacity building and awareness program (MAFF & MOE).
- 1.2.4 Improve the critically endangered species program provided to conservation and development (MAFF& MOE).

### 1.3 *Ex situ* conservation

*Ex situ* conservation should never be considered as a solution for the long-term preservation of biological diversity. Zoos, botanical gardens, herbariums, tree nurseries, seed banks or gene banks can only play a significant role in conservation when coupled to *in situ* conservation efforts and sustainable agriculture, forestry and animal husbandry practices.

Cambodia does not have proper *ex situ* conservation facilities such as national gene bank for long-term conservation of germplasm. It also does not have an *in vitro* repository or a cryobank. Most of its germplasm collections are maintained under field conditions and are subjected to field rejuvenation too frequently. For example, all rice germplasm holdings are presently maintained at Cambodia-IRRI-Australia Project (CIAP) in Phnom Penh and duplicate samples are maintained at the International Rice Research Institute (IRRI), Los Banos, the Philippines. Cambodia in collaboration with IRRI has done extensive survey for the collection of landrace diversity of rice and assembled 2209 accessions (1989-1994), which is perhaps the only documented study of genetic resources in the country. Evaluation programs are very poor and data documentation facilities inappropriate.

The government is managing the Phnom Tamao Wildlife Rescue Centre, created in 1994, which acts largely as a refuge for confiscated animals. If properly developed, this Centre could play an important role in public awareness. In recent years however, at least nine private menageries have opened in diverse locations, the most important collections being kept in Kampot, Siem Reap and Prey Veng. Unfortunately these facilities suffer from deficient infrastructures, their staffs are not properly trained and they are not involved in the breeding of any animals. In fact the death rate of their animal occupants is very high. As these private menageries get their animals from illegal capture and trade, their very existence might be an incentive for poachers to look for rare animals and an indirect contribution to the decline of Cambodian threatened wildlife.

There is no botanical garden as such in the country except for a small collection of native trees in the Phnom Tamao Centre. The Hun Sen Kraing Yov nursery and the Kop Svau Center support a small seed collection and produce crop plants for farmers. There is limited production of native trees for reforestation purposes. Proper development of existing and new facilities should be oriented towards native tree production for reforestation.

#### **Key Issues:**

- ⇒ Deficient infrastructures for *ex situ* conservation.
- ⇒ Growing demand of live animals for private zoos
- ⇒ Absence of integrated *ex situ* conservation strategy and management plans.
- ⇒ Incomplete representation of cultivars in existing seed banks.
- ⇒ Insufficient capacity-building efforts in this field.

#### **Goals**

- Conserve *ex situ* vulnerable, threatened or exceptional elements of natural or agricultural components of biological diversity.

#### **Strategic Objectives (indicators)**

- 1.3.1 Develop national expertise in *ex situ* conservation (number of people reached by workshops or training programs).

1.3.2 Develop *ex situ* conservation capacity for endangered wild plants and cultivars (number of plants and cultivars represented in seed banks or other *ex situ* collections)

1.3.3 Increase use of native trees used for reforestation projects (number of native plants used in reforestation activities)

### **Options**

- Practice *in vitro* conservation and cryopreservation protocols of endangered plant genetic resources.
- National botanical garden(s) should be created to act as *in-situ* and *ex-situ* conservation site.
- Training Wildlife Rescue Centre staff in modern husbandry techniques.
- Prevent the development of private zoos.
- Establish a center for the conservation and enhancement of genetic resources of domestic animals and plants gene pools.
- Strengthening crop plants gene banks.
- Local community involvement in *ex situ* conservation practices.
- Expansion of existing parks to include a botanical garden that could support nurseries growing native plants including medicinal plants.
- Incentives for local participation in *ex situ* conservation practices.

### **Priority Actions (coordinating and participating agencies)**

1.3.1 Establishment of a National Botanical Garden (MAFF, MOE, & CARDI).

1.3.2 Establishment of general herbarium (MAFF, MOE, & CARDI).

1.3.3 Identification and collection of plant species and cultivars in need of protection for propagation (MAFF, CARDI).

1.3.4 Training program in wildlife husbandry techniques for the Phnom Tamao Wildlife Rescue Centre staff and private zoo (MAFF).

## **Theme 2. Animal Wildlife Resources**

### **Context**

Cambodia is host to a great diversity of animal life. Some of these animals are of considerable importance for the control of natural predators of agriculture productions (e.g. carnivores control rodent populations, insect eating birds protect crops), the control of pest animals (e.g. bats prey on biting insects, fish prey on mosquito larvae) or pollination (e.g. bees). Wildfowl are currently being domesticated for egg and meat production, cormorants are used as fishing aides. Some species are notable tourist attractions (e.g. elephant, birds) or constitute on the other hand important parasites and vectors of disease affecting domestic animals and people (e.g. mosquito).

Despite its illegality, hunting is widely spread and is particularly detrimental to several species of birds and mammals especially among the most vulnerable and rare species. Harvesting of water snake, frogs and toads, spiders, snails, water bugs and locusts for local markets is common though not posing a real threat to these species for the moment. Turtles, birds and monkeys are captured and sold as foodstuff or pet animals; butterflies, green peafowl feathers and hornbill's bill casques are sold as ornaments or souvenirs. Illegal trade and commerce of live animals and their products are very important and have definitely contributed to the decline of several species especially reptiles, birds and mammals.

Habitat alteration and encroachment caused by inappropriate land use, pollution and biological invasions constitutes a major threat for most wildlife species (see section 1.2). Many recent activities associated with urbanization and development alter habitats. Construction of recharge dams and roads for example, have severe impacts on habitats. Similarly, activities associated with mining, logging, and agriculture also physically impair habitats. Alteration of waterways and changes in the drainage characteristics of catchments impact both aquatic and terrestrial biodiversity. The improper application and handling of pesticide has a negative impact on aquatic biodiversity as well as deleterious effects on non-target species of arthropods, reptile, amphibian and bird all the while posing a threat to human health. The introduction of exotic fish species for aquaculture purposes is also a problem of special concern for local fish species.

Information on the status and trends of most animal species being scarce, it is urgent that the country starts developing its capacity to properly monitor and manage its wildlife to allow for a sustainable use of this vital resource and prevent the extinction of irreplaceable species.

### **Key Issues:**

- ⇒ Lack of information on the status of wildlife.
- ⇒ Habitat destruction, degradation and pollution
- ⇒ Illegal hunting, overexploitation and trade
- ⇒ Invasions of exotic species

### **Goals**

- Ensure the conservation and sustainable use of wild fauna.

### **Strategic Objectives (indicators)**

2.1 Reduce illegal hunting and trade of wild animals (number of fines issued).

2.2 Reduce the impact of alien invasive species on indigenous animal species (measures taken to prevent dissemination of alien invasive species).

2.3 Monitor the status and exploitation levels of wildlife (monitoring programs in place)

**Options**

- Improve law enforcement against illegal hunting activities
- Establish a working group to examine threats from animal species invasion and draw up action plans to tackle those currently causing concern
- Develop community-based controlled hunting activities
- Community awareness activities highlighting importance of wildlife species for human activities (i.e. bird eat insects & bats are important pollinators)
- Strengthening the Protected Areas cluster so wider habitats are protected.

**Priority Actions (coordinating and participating agencies)**

2.1 National campaign against illegal hunting (MAFF& MOE).

2.2 National monitoring program and database on alien invasive species and exploited wild animal species (MAFF& MOE).

2.3 Management plans for commercially valued species (MAFF& MOE).



## Theme 3. Freshwater Fisheries and Aquaculture

### Context

Cambodia is fortunate to have one of the most productive freshwater fisheries in the world. An estimated number of 486 freshwater fish species occupy various ecological niches, including plankton feeders, detritus feeders, predators and opportunists. At least 45 fish species are already known as commercially important. The freshwater floodplains of Cambodia can be categorized into varieties of habitat types ranging from marshes/ swamps, shrublands, grasslands, flooded forest, to rice fields. The Mekong River and Tonle Sap Lake are the main freshwater. The reversal of flow between the Mekong River and the Tonle Sap Lake in different seasons is a unique characteristic of the Cambodian floodplains contributing to the high productivity. When the waters rise in monsoon most fishes migrate from the Mekong mainstream to the floodplains.

Fish serve as the main source of protein for Cambodians with an estimated average per capita consumption of 75 kg in central Cambodia and an estimated average consumption of 30 to 40 Kg/person/year in Cambodia. Most fresh fish or fish products (prahoc) are still very cheap and affordable to the rural poor. Fish together with rice serve as the foundation of food security in Cambodia. The estimated annual production was in the range from 300,000 to 450,000 tons giving the value at the landing sites of US\$ 200 -250 millions. The estimated retail value was US\$ 250-500 millions which is Cambodia about 8 to 10% of the country's annual GDP.

The present estimated catches may be higher than in the past as a result of the application of systematic estimation than so far it was never been done. It was also observed that the catch rates of large and medium-sized fish have declined but the small are still relatively abundant. There are some reports saying that some fish species have become endangered. The floodplain habitats, such as flooded forests, have contributed to the high productivity and rich in species diversity. The practices such as forest destruction or the conversion of flooded forest to agriculture lands have deteriorated the quality and the quality of these fish habitats. Fish productivity is linked to the extent of land, which was inundated. In dry years fish productivity is lower than in wet years. The construction of water related work such as dams and, water irrigation, system has caused a negative impact on fishery.

The fisheries in Cambodia can be categorized into industrial (large-scale), artisanal (medium-scale) and family fisheries. Industrial fisheries are "fishing lots" or fishing concessions. The fisheries are allocated through an auction system for exclusive exploitation over a two-year period. The large lots are typically 15-20 km long and 5-10 km wide and can be auctioned for as much as US\$ 200,000 a year while smaller lots are valued at \$2,000-5,000.

Fishing gears and methods can be divided in two broad categories: **limited access fisheries** and **open access fisheries**. The fishing lot system, or **limited access fisheries**, has been used in Cambodia for over a century. The government through an auction-like process, which by many has been accused of being rigged, usually limits access. The large-scale fishing lot concessions located around the Tonle Sap Lake control approximately 80% of the lakeshore, including important inundated forest area. The value of the fishing lot depends on their perceived fish production, making unbiased data collection very difficult.

Fishing lot operators harvest the fish by building bamboo fences to retain the fish and at the end of the season, the lake drains to capture the fish at the lowest point, allowing for a near

total harvest. The success of the harvest varies according to the water level of the lake and the extent to which it drains. The operators often sub-lease the original fishing lots, as the area is usually too big to harvest for one operator. As the lots are sub-leased and become smaller concessions, the pressure to harvest 100% fish stock increases.

Each lot has a burden book that stipulates the boundaries, the times for fishing and the times and areas set-aside for public access. The fishing lots are typically guarded to stop poaching and protect the natural habitat. Many conflicts occur between lot operators and local villagers, because of boundary disputes, conversion of land and illegal fishing operations.

**Open access fisheries** are considered to have increased dramatically in recent times, and can be divided into small-scale or family fisheries, licensed fisheries and illegal fisheries. Small scale or family fisheries are able to use many fishing gears; however the size of gears is limited. Small scale or family fishing does not have a set season but are allowed to operate all year round. If they use a larger size they to licensed and can fish only on the open fishing season from October 1 to May 31 for fishery domain located in the northern of the parallel Quatre Bras (Chaktomok) and from November 01 to June 30 for the fishery domain located in the southern of the parallel Quatre Bras (Chaktomok). There are a number of fishing gears specified by the fishery law by size or type requiring a license such as gillnets, seines, arrow shaped traps, etc. Illegal fisheries are those fishing practices, which are determined as illegal by the fishery law such as brush parks and explosives.

The Department of Fisheries have been implementing a fishery reform initiated by the prime minister .As a reform of the fisheries, some 500,000 ha of fishing lots was cut and handed over to small scale fishers and will be managed by a community.

### **Freshwater Aquaculture**

Many families living in floating fishing villages around the Tonle Sap Lake use floating fish cages. The fish cages are used to farm local varieties of fish that are kept and fattened before being sold at a higher price. The Fisheries Department with the assistance of a variety of development agencies has actively promoted aquaculture in the uplands for food security. Most of this form of aquaculture is based on small dams, some of which are linked to rice paddies. This aquaculture is predominantly based on introduced species of fish and as such may be a serious threat to local species biodiversity.

Aquaculture production, especially inland pond culture, has increased from 1,600 metric tons in 1984 to 15,000 metric tons in 1999; with such capacity for progress, there are obviously good chances of rapid expansion in the industry. Yet there are no guidelines regulating the importation of exotic species for culture, the scope for environmental impact studies and environmental standards required for fish-farms. Under these conditions, the development of freshwater aquaculture raises the question of potential negative impacts of introduced alien species on native fish-stocks.

### **Key issues**

- ⇒ Destructive fishing practices
- ⇒ Habitat destruction (deforestation of flooded habitats, increased sediment load)
- ⇒ Legislation and law enforcement
- ⇒ Overexploitation of fisheries (illegal fishing and over-fishing)
- ⇒ Knowledge about the fisheries resource
- ⇒ Demarcation of the flooded forest
- ⇒ Allocation of fishing lots

- ⇒ Responsibility of the fishing authority
- ⇒ Corrupt practices by authorities within the fishery domain
- ⇒ Insufficiently trained fishery staff for development of community fisheries
- ⇒ Improper management skills and training by communities
- ⇒ Shortage of suitable indigenous fish species for aquaculture production
- ⇒ Development of dams, irrigation and flood control programs
- ⇒ Expansion of fishing lots by powerful operators
- ⇒ Lack of protection of critical aquatic habitat (fish sanctuaries)

### **Goals**

- Improve food security, increase income generated in the fishery industry, preserve fisheries environment and ensure expansion of fish production is not at the expense of sustainability.

### **Strategic Objectives (indicators)**

- 3.1 Support and organize community fisheries (number of community fisheries established)
- 3.2 Promote the use of environmentally sound fishing techniques (number of fishermen reached by awareness or training programs) and reduce illegal fisheries activities (number of illegal events recorded)
- 3.3 Require transparency and accountability from the commercial fishery sector and ensure responsible protection and management of natural resources by commercial fisheries operators (number of illegal events recorded)
- 3.4 Promote and sustain aquaculture development (number of fish ponds established)
- 3.5 Preserve fisheries environment (percentage of flood forest and wetland ecosystem protected)
- 3.6 Increase knowledge of fisheries ecosystems and their diversity (quantity of data collected)

### **Options**

- Clearly demarcate and manage all different fisheries areas such as fishing lots, public fisheries areas and fish sanctuaries
- Promote the use of native fish in aquaculture activities
- Promote and modify fisheries regulations to support community fisheries
- Organize community fisheries
- Promote cooperation and skill transfer between communities and institutions
- Ensure the protection of peripheral forest and similar flooded areas
- Undertake biodiversity inventory of freshwater ecosystems
- Include fisheries ecosystem information into education programs for all stakeholders
- Increase knowledge on important fisheries areas, and highlight their values
- Assess the threat to native fish-stocks from the introduction of alien species for aquaculture.
- Promote the development of community fish sanctuaries to ensure that there are fish stocks to replenish the landscape in the wet season.
- Develop a Community Fisheries Management Manual.

- Define appropriate, economically viable sustainable family fishing gears
- Highlight appropriate fishing sanctuaries to maintain fish stocks.

**Priority Actions (coordinating and participating agencies)**

- 3.1 Demarcation and management of fisheries areas (MAFF)  
(incl. review of the fishing lot system, establishment of boundaries, local community participation, revision of burden books, objective supervision of fishing lot operators)
- 3.2 Community-based fisheries management program (MAFF) (incl. staff training, manual development and budgetary support)
- 3.3 Tonle Sap Great Lake Floodplain integrated management program (MAFF & MOE) (incl. landuse planning, resource zonation, community development, small scale industrial development, fish and agriculture products processing, involvement of local authorities)
- 3.4 Fisheries environment protection program (MAFF, MOE & MOEYS)  
(incl. comprehensive commune-by-commune environmental education program, emphasis on protecting and managing natural vegetation as fish habitat, establishment of fish sanctuaries.
- 3.5 Indigenous fish Aquaculture development project (MAFF)  
(incl. promotion of native fish production)
- 3.6 Critical fisheries ecosystem monitoring and protection program (MAFF & MOE)(incl. identification and monitoring of priority areas and establishment of fish sanctuaries)
- 3.7 Revision of Department of Fisheries organizational structure (MAFF)  
(incl. clarification of job descriptions, staff promotion based on merit, salary increase, measures to improve staff efficiency and accountability)

## **Theme 4. Coastal and Marine Resources**

### **Context**

Cambodia's 435 km coastline is strewn with beaches, mangroves forests, coral reefs and seagrass beds that play a major role in ecosystem productivity. The country has an Exclusive Economic Zone (EEZ) - the area from the shore to 200 nautical miles offshore - covering 500,000 km<sup>2</sup> (SEAPOL, 1991).

Fauna significant to biodiversity conservation reportedly found in the coastal and marine area include marine mammals such as the dugong and marine dolphins, whales marine turtles and fisher and crustacean and molluscs. Information on the status of fish stocks, which is needed to develop a management program for the fisheries are very limited. Fisheries statistic from Department of Fisheries that shows 30,000 tons of fish are harvested annually though the actual catch may be higher because this figure does not include the harvest of foreign fleets that land their catch outside Cambodia, illegal commercial boats, and subsistence fishers. The fishing zones that are closest to the shore are over harvested by artisan fishermen lacking the capacity to sail in higher seas.

The effectiveness of the Department of Fisheries in preventing illegal fishing, and monitoring the resource has been limited by lack of technical capacity, inadequate equipment and budget constraints despite the fact that it generates important revenues namely through the sale of fishing permits, fines and other fees from the four coastal municipalities and provinces (\$4 millions in 1995).

The coastal area is essential habitat to numerous species and must be protected accordingly. Mangrove forest play an essential role in the survival of some fish species and other marine organisms; they serve as spawning ground or nursery grounds for several commercially important fish species. Thus overexploitation of mangrove can adversely impact the fisheries.

Mangroves have been severely affected by wood harvesting for charcoal production and other uses, urbanization, coastal development, pollution, and intensive shrimp aquaculture, which converts these highly productive areas into agricultural land. Coral reefs and seagrass beds that are highly critical to marine productivity are also threatened by human activities namely offshore oil and gas development and the pollution associated with it. As human activities are expected to increase in the future, land use planning of the coastal areas involving local communities will be essential to protect these areas of utmost importance for the future of the fisheries.

### **Key Issues:**

- ⇒ Watershed degradation.
- ⇒ Pollution caused by oil spills and other human activities.
- ⇒ Over-fishing of high value coastal resource.
- ⇒ Coastal erosion and depletion of mangroves.
- ⇒ Inadequate information on fish stocks.
- ⇒ By-catch of non-target or protected species.
- ⇒ Use of illegal fishing gears and fishing out of season.
- ⇒ Weak management/surveillance/enforcement capacity from Department of Fisheries
- ⇒ Non-sustainable coastal aquaculture

### **Goals**

- Ensure the conservation of marine and coastal life and the sustainable harvesting of commercial fish.

### **Strategic Objectives (indicators)**

- 4.1 Promote the use of environmentally sound fishing techniques (number of fishermen reached by awareness or training programs).
- 4.2 Manage related watersheds.
- 4.3 Ensure the protection of mangrove forests and coastal zones in general (percentage of coastal areas included in protected areas; number of fines delivered).
- 4.4 Monitor the status of marine species their habitats and negative impacts (establishment of database; quantity of data included in database).
- 4.5 Improve the technical capacity of Department of Fisheries' staff (number of staff trained)

### **Options**

- Develop the policy and legal framework to facilitate community participation in coastal resource planning and management.
- Identify spawning grounds for commercially important species.
- Reforesting mangroves.
- Identify habitats for molluscs, corals, and seagrasses.
- Preparing and implementing management plans (including land use) for mangrove areas.
- Training for staff in fishery research and management, surveillance and enforcement, and in conducting socioeconomic surveys.
- Providing patrol boats and other equipment for the Department of Fisheries and provincial Fisheries offices.
- Maintain a balance between the traditional and commercial fisheries sectors both in terms of zoning and fishing effort.
- Release pressure on the depleted small pelagic fish resources and motivate traditional fishermen to work in relatively deeper waters.
- Develop fish handling facilities.
- Tighten control measures and enforce the rule of law against contravention.
- Promote the use of more selective fishing devices to reduce by-catch.
- Support and intensify fisheries research and ecological and biological surveys, which improve knowledge about target species, their biomass and their production capacity.
- Continue the application and control of measures taken in closed areas and seasons against fishing of vulnerable species such as the abalone, giant clam, limpet, shrimps and lobsters.
- Take care of environmental aspects and requirements in designing and constructing new fish landing harbors.
- Sign the UN Agreement on Straddling and High Migratory Fish stocks, UN Driftnet Resolution, and FAO Code of Conduct for Responsible Fisheries.
- Train rangers to enforce all aspects of the law and increase public awareness on conservation issues and equip with safety means.
- Develop and manage fish habitat conservation zones
- Promote Community Fisheries Management

- Define specific criteria such as boundaries and depth for family and large scale fishing in the coastal zone

**Priority Actions (coordinating and participating agencies)**

- 4.1 Development of a full Monitoring Surveillance and Control (MSC) Plan for industrial fishing and establishment of a working pilot scheme for MSC of artisan fishery (MAFF & MOE) (incl. awareness and training for artisan fishermen)
- 4.2 Monitoring and management programs for target fish species (MAFF)
- 4.3 Protection of mangrove forests (MOE, MAFF & MLMUPC) (incl. land use plans, local community involvement)
- 4.4 Capacity building and training program for fishery staff (MAFF)
- 4.5 Provision of patrol boats to Department of Fisheries (MAFF)

## **Theme 5. Forest and Wild Plant Resources**

### **Context**

The forest cover of Cambodia is diverse. Different types include mangrove, flood forest, bamboo forest, coniferous forest, dry deciduous and moist deciduous rainforest or moist evergreen forest, moist mountain forest and dwarf evergreen forest. These forest ecosystems occur at varying altitudes or climatic conditions and constitute valuable resources. In addition, the country has valuable non-wood resources (e.g. rattan, bamboo, resin, palm, fruit trees, medicinal plants, etc.) though there are serious gaps in the information pertaining to the distribution and occurrence of wild plant species and wild relatives of crops. It is primarily due to lack of systematic scientific studies of their taxonomic description and delineation.

Together with the volume taken for firewood and charcoal, the current rate both extractions is approximately seven times the sustainable level and can decimate much of the remaining commercial stand within the next 10 years. There are however opportunities to reverse this trend through better monitoring of forest concessions, improved capacity for law enforcement and the establishment of forest plantations with both fast growing species and traditional hardwood varieties. This will not only supplement the country's forest resource but also will also provide gainful rural employment opportunities and increase rural incomes. This could only be achieved through greater participation of local communities and the private sector in forest protection, management and improvement.

The forest policy framework recognizes that long-term benefits from the country's forest resources can only be optimized through proper conservation and management, which have beneficial hydrologic and environmental impacts (i.e. reduction in the frequency and severity of floods, soil erosion, siltation of waterways, degradation of inland fishery resources) and provide long-term sustainable income to the government. Sound forest management will serve also the people living in or near forested areas who depend partly on forests for food, fuel wood, and other non-wood products such as resin, palm, kapok, rattan and bamboo.

### **Key Issues:**

- ⇒ Over-harvesting of trees for timber, firewood and charcoal production.
- ⇒ Concession allocation
- ⇒ Legislation and law enforcement
- ⇒ Poor management of forest harvesting
- ⇒ Infrastructure development (road building)
- ⇒ Watershed degradation
- ⇒ Forest demarcation
- ⇒ Poor knowledge of the status and trends of forest resources

### **Goals**

- Ensure the sustainable protection, use and management of all wild plant, tree species and woodland.
- Improve the efficiency and sustainability of extraction, transformation and use of forest products.



### **Strategic Objectives (indicators)**

- 5.1 Promote reforestation and rehabilitation of degraded forest areas in all provinces (area reforested)
- 5.2 Strengthen law enforcement to prevent all forms of illegal logging (number of fines issued)
- 5.3 Monitor and evaluate concession allocation and management (number of concessions monitored)
- 5.4 Involve local communities in forest protection, management and improvement (number of community based projects established)
- 5.5 Promote environmentally friendly forestry practices (number of concessions reached by awareness or training program)
- 5.6 Monitor the status and trends of forest resources (quantity of data collected)
- 5.7 Delineate a permanent forest estate for conservation, community use and industrial protection (total area delineated)
- 5.8 Delineate the current status of forest through forest inventories and damage assessment (data collected & appropriate action taken)

### **Options**

- Promote transparency in all financial dealings related to natural resource exploitation
- Develop sustainable forest exploitation and management plans taking into account regulations and guidelines ensuring forest protection and sustainable use of biodiversity resources in agreement with relevant institutions
- Implementation of law enforcement for forest management
- Research plant species in Cambodia's forest biodiversity hotspots
- Increase botanical knowledge (update inventory of forest plants and ecosystems)
- Ensure reforestation projects use native tree species naturally occurring within the same ecosystems
- Assess the effect of newly forested areas in relation to environmental protection in different sites including groundwater recharge, flooding, watersheds, riverbanks and biodiversity.
- Promote a National Strategic Plan for forest rehabilitation.
- Develop community pilot projects for rehabilitation in different forest ecosystems.
- Appropriate tree seed production sources to contribute to in-situ conservation.

### **Priority Actions (coordinating and participating agencies)**

- 5.1 Development of a comprehensive national plan for the management of the forest estate (MAFF) (incl. revision and update of present legislation regarding all aspects of forest resources protection in a move towards forest certification according to international norms, protection of the resource tenure rights and practices of indigenous peoples, development of community based forestry, participatory process, development of plantation forestry, etc.)
- 5.2 Development of sustainable forest management plans (MAFF)

- 5.3 Development of environmental impact assessment guidelines for forest exploitation activities (MAFF& MOE).
- 5.4 Forest Concession management and control Pilot project (MAFF)
- 5.5 Community-based forestry management program (MAFF &MOE)(Incl. set of guidelines for community forestry initiatives)
- 5.6 Vegetation survey and assessment of the current status of wood extraction (MAFF)
- 5.7 Extension of the Forest Crime Monitoring Unit (FCMU) Project (MAFF, MOE in collaboration with the NGO Global Witness)
- 5.8 Development of policy and guidelines promoting the use of native species in cultivation and restricting the introduction of introduced species (MAFF).

## **Theme 6. Agriculture and Animal Production**

### **Context**

#### **Cultivation**

Agriculture has traditionally been the most dominant sector in the economy of South-East Asia until very recently. About 90% of the population's livelihoods are still based on agriculture in Cambodia. The Cambodian national economy is also largely agriculture based, mostly rainfed, mono-cropped and mainly under rice based farming system. The agricultural ecosystems utilized in Cambodia can be divided into; rice based systems, shifting agriculture, commercial field crops, homegardens, and perennial systems. Within these agricultural ecosystems other resources can and are being developed, for example rice-fish farming highlights the agricultural and fisheries output from some rice agricultural ecosystems.

Farmers are poor and they live under extreme agro-ecological and socio-economical constraints. Rice constitutes the predominant crop followed by maize. Among legumes, soybean is important followed by mungbean. The oilseed crops include groundnut and sesame. Further, among industrial crops, sugar palm tree, sugarcane followed by jute and tobacco are commonly grown. Vegetables occupy very large area under cultivation; sweet potato is more common whereas cassava is also sparsely cultivated.

Crop cultivation in Cambodia is largely dependent on traditional cultivates, old primitive varieties and land races. In the late 90's almost 80% of the area was cultivated with local, unimproved varieties of rice, maize, sesame, vegetables and sweet potato. Traditionally farmers have been using their own produce as seeds for next crop without any changes. New pests and pathogens have contributed significantly in the loss of land race diversity. The establishment of gene bank and storage facilities and plant genetic resources laboratories at national level are highly desirable and needed for sustainable food production.

Modern agriculture is tending to reduce the diversity of strains crops used and the diversity of species available for use in agricultural ecosystems. There is an increasing emphasis on a few varieties of commodity crops, which may undermine real food security in Cambodia. Real food security is based on diversity of and within crops, the less diversity of and within crops the more vulnerable the crops are. Furthermore, the highest yield of a single crop is often obtained by planting it alone in a field, but while that may produce a lot of one crop, it generates nothing else of use to the farmer. Diversity in the strains and species used in agricultural ecosystems directly attributes to increased food security and helps to support the agricultural ecosystem functions including; adaptation, pollination, soil formation, fertility and pest control.

The increasing and improper use of pesticides and chemical fertilizers has the potential to cause serious impacts to both agricultural and natural ecosystems. In compliance with the International Plant Protection Convention, the Royal of Cambodia Government has established Cambodian National Integrated Pest Management program. A national sub-decree on Standard and management of agricultural Materials (no.69) prohibiting the import of unapproved pesticides and requiring labeling instructions for use in Khmer language was adopted by the Royal of Cambodia Government on 28 October 1998 but enforcement so far has been extremely difficult.

## Animal Production

Over time many animals have been domesticated locally or introduced from other countries for their usefulness. These animals have adapted to their agro-ecological conditions and have lost many of their wild traits. Access to new genetic materials, in the form of live animals, embryos and semen has led to widespread crossbreeding throughout Asia, which may have reduced unique animal genetic resources and sustainability. Cambodia has not experienced the same scale of change with domestic animals as other countries in Southeast Asia, but is currently experiencing very rapid change.

There are several breeds of domestic cattle utilized in Cambodia. The following is a summary of the major varieties. The breeds of cattle come from the domesticated species of Humped cattle and Humpless cattle and Cambodia also has one feral species of cattle known as Burmese Gaur. The Swamp Water Buffalo is also used extensively throughout Cambodia. There are several breeds of domestic pig found in Cambodia, including an indigenous variety known as gondol, a Chinese variety and several European varieties. Cambodia also has a distinctive strain of South-East Asia pony, and domestic elephants are still worked in more remote parts of the country.

Most of the world's poultry are believed to have come from wild species in South East Asia. The following highlights some of the distinctive domestic breeds of poultry known from Cambodia, there are expected to be other newer varieties being introduced to Cambodia however there is limited documentation on these breeds. A few varieties of domestic chicken are considered to be indigenous and as such are well adapted to the local environment. There is also a strain of domestic Goose, and a variety of domestic duck can be both classified as indigenous. A breed of domestic Muscovy duck is also used in Cambodia and there is a fancy breed of domestic Turkey that is now considered endangered.

Worldwide the greatest threat to domestic animal diversity is the highly specialized nature of industrial livestock production. In the industrialized world, commercial livestock farming is based on very few breeds or strains that have been selected for intensive production of meat, milk or eggs in highly controlled regulated conditions. The spread of industrial agriculture in the south places thousands of native breeds at risk from genetic dilution or replacement by imported stocks. Commercial breeds imported from North America and Western Europe are usually unable to sustain high production in less hospitable environments. They require intensive management and costly inputs such as high protein feed, medication, and climate-controlled housing. Introduction of intensive animal production in most areas of the South creates dependency on imported technologies and germplasm; it is neither affordable nor sustainable for poor farmers. Livestock production is still limited in Cambodia but there has been a shift from village level to commercial level production in this sector. Husbandry techniques, sanitary measures, veterinarian services and quality control will have to be developed in order to support this change.

### Key issues:

- ⇒ Land clearance/land use (loss of agriculture land)
- ⇒ Industrial cropping
- ⇒ Slashing and burning
- ⇒ Soil and water pollution by chemical fertilizers, pesticides and herbicides
- ⇒ Human resource development
- ⇒ Cooperation between agencies
- ⇒ Genetic erosion (fewer variety)
- ⇒ Grazing
- ⇒ Mono-cropping

⇒ Deficient husbandry techniques and sanitary measures for livestock production

### **Goals**

- Achieve food security and improve income opportunities for farmers through the sustainable protection, use and management of agricultural resources.
- Conserve ecosystems, wildlife and human beings from negative agricultural practices and minimize the loss of agricultural diversity.

### **Strategic objectives (indicators)**

- 6.1 Protect agriculture land, plant and livestock resources from adverse impacts, biotic stresses and indiscriminate utilization (area of agriculture land lost each year, number of animals covered by sanitation measures)
- 6.2 Ensure technology and information transfer to farmers, livestock producers and fish growers (number of farmers reached by training programs or awareness campaigns)
- 6.3 Reduce chemical fertilizers and pesticide use through proper training and alternate biological means (quantity of chemical fertilizers and pesticides used by farmers)

### **Options**

- Prepare a suitable land use plan for agriculture
- Encourage the development of native natural resource use
- Research the impacts of invasive alien species
- Prepare guidelines for natural resource use based on appropriate technology
- Collect germplasm for all local and wild crop plant genetic resources
- Establish national gene bank for crop varieties
- Develop representative agricultural diversity areas
- Extension based on technically sound recommendations
- Promote the adoption of non-polluting techniques for growing, using and processing agricultural resources
- Enhance and enforce rules related to natural resource exploitation
- Clearly demarcate areas for agricultural exploitation
- Training skills development program for rural communities on animal production
- Training farmer trainers to disseminate extension on appropriate methods that promote agricultural diversity
- Expand programs promoting agriculture diversity across the country

### **Priority Actions (coordinating and participating agencies)**

- 6.1 Farmers' training on improved cultivation and livestock production systems respectful of the environment (MAFF)  
including:
  - mulching and composting processes, to conserve humidity in the soil;
  - the selection of a crop structure that is suitable to the available amount of water;
  - training on proper use of chemical fertilizers and pesticides;
  - use of organic fertilizers instead of chemical ones;
  - the introduction of mixed farming to integrate the animal and plant elements;
  - the production and use of silage from crop residues and green manure;
  - the introduction of crop rotations and pastoral rotational grazing;

- more use of improved seeds;
- the introduction of ecological farming, which integrates crop and animal production with agro-forestry;
- improving irrigation water management and efficiency;
- avoiding deep plowing in shallow soils and planting shelterbelts to prevent erosion, etc.

6.2 Extension of Integrated Pest Management (Farmer Field School) program (MAFF)

6.3 Agricultural diversity promotion program for food security (MAFF)

6.4 Agricultural land protection and land-use program (MAFF)

6.5 Adoption and improvement of sustainable cultivation management systems (MAFF)

6.6 Strengthening research in new and alternative crops (MAFF)

## **Theme 7. Energy Resources**

### **Context**

According to a 1996 MIM/ADB study, less than 18% of Cambodia's energy use is commercial (petrol, gas, electricity). The remaining 82% are from wood (80.5% including charcoal) plus other biomass sources such as crop residues (1.6 %). For 92% of Cambodia's households, wood is the major fuel for cooking with petroleum accounting for less than 2% of household energy use. In rural areas, wood is the major cooking fuel for 95% of households.

In principle, wood is a renewable resource, which can provide household energy needs infinitely. However, wood is often consumed at a greater rate than it is replanted, potentially causing degradation in forest cover, loss of wildlife habitat, soil loss and erosion, loss of soil fertility, downstream flooding, sedimentation and turbidity in water bodies, and a range of other problems. With the population increasing rapidly, fuelwood use is expected to continue to grow thus increasing the pressures on forests and mangroves.

Electricity production is the second major use of petroleum fuel in Cambodia after transport. The constant increase of electricity needs might call for the development of hydropower dams along the Mekong and other rivers. These projects will have to be looked at very carefully considering their potentially negative impacts on the fertility of agricultural lands and the productivity of fish habitat.

Offshore oil and gas exploration activities have been undertaken in Cambodia since the 1960s. Petroleum experts believe that Cambodia has a high potential for natural gas but exploration to-date has not discovered reserves worth developing, for now at the least. Should commercial exploitation begin, care will have to be taken to prevent risks of oil spills and other detrimental impacts of these activities on natural ecosystems.

### **Key issues:**

- ⇒ Deforestation and destruction of mangrove forests for fuelwood production
- ⇒ Potential impacts of energy production on ecosystems

### **Goals**

- Enhance energy efficiency
- Ensure sustainable fuelwood supply and prevent negative impacts of energy development and use on natural ecosystems.
- Promote the use of alternative energy sources to reduce fuelwood use.

### **Strategic Objectives (indicators)**

- 7.1 Reduce the use of fuelwood in wood depleted areas through efficiency measures and the use of alternative energy sources (quantity of fuelwood used by household)

### **Options**

- Study wood fuel flows to assess sustainability of production and use
- Consider wood energy plantations
- More studies on impact of fuelwood on deforestation

- Develop more efficient charcoal production methods
- Promote the use of improved cooking stoves for household and small business... etc)
- Promote the household use of bio-gas digesters in communities where availability of fuelwood is a problem and manure is available
- Complete environmental impact assessments for hydropower and oil exploitation projects

**Priority Actions (coordinating and participating agencies)**

- 7.1 Energy efficiency program for households in areas where fuelwood is limited (MIME, MAFF & MRD) (incl. improved wood stoves, biogas digesters)
- 7.2 Promotion of fuelwood and multipurpose tree plantations at the family and community level (MIME , MAFF& MRD)
- 7.3 Environmental guidelines and impact assessment for energy development projects (MIME & MOE)



## **Theme 8. Mineral Resources**

### **Context**

Mineral deposits in Cambodia can be divided in five categories: fuel minerals, industrial minerals and construction minerals, metals and nonmetal, precious stones and ornamental stones. Minerals, which are used for road and building construction, are quarried in different sites and include basalt, granite, limestone, rhyolite, quartzite, sand stone and marble. Limestone and dolomite, which are used in the cement industry, are quarried and processed in Kampot, and phosphoric deposits, which produce phosphate suitable for fertilizer's production, are located in Battambang and Kampot.

There are two main areas where gems stones are found. The sapphire-ruby-zircon gems of Pailin are heavily exploited, but in Ratanakiri the zircon, gold and sapphire mining is only carried out on a small scale during the dry season. The ornament stone pagodite, from Pursat, is used for the production of Khmer ornaments.

Mineral resource exploration, extraction and processing pose serious threats to natural habitats and wildlife in general. Mining activities destroy landscape and surface vegetation and affect wildlife. Seepage from transformation plants and tailings may pollute fresh water reserves and soil. Rainwater seeping through spoil heaps may become heavily contaminated, acidic or turbid, with potentially devastating effects on nearby streams and rivers. Contaminated water and plants may be toxic or may cause diseases in people and other animals that consume them.

### **Key Issues:**

- ⇒ Destruction and pollution of natural habitats by mining activities.
- ⇒ Lack of consideration for biodiversity protection in mining activities.
- ⇒ Lack of proper mining methods.
- ⇒ Absence of well-defined monitoring program.

### **Goals**

- Reduce the impacts of mining activities on biodiversity.

### **Strategic Objectives (indicators)**

- 8.1 Support mineral resource development activities that have minimum impact on biological diversity (number of mining projects submitted to EIA procedure)
- 8.2 Support measures which minimize the impact of mining-related activities on biological diversity and favor the rehabilitation of affected ecosystems (number of mining sites monitored by ministry of Industry, Mines and Energy)
- 8.3 Promote the rehabilitation of sites affected by mining resource development (area of restored sites)

### **Options**

- Monitoring of mining activities affecting Biodiversity and rehabilitation of habitats and disturbed sites.
- Establish more mining activities that are environmentally safe by conducting comprehensive environmental impact assessment studies and risk assessment evaluation.
- Strict implementation of mitigation measures identified in EIA through regular inspection and monitoring.
- Integrating the protection of biological diversity into energy and mining policies.
- Making sure disposal sites do not contaminate species and ecosystems.
- Integrate environmental management systems within mining activities.

### **Priority Actions (coordinating and participating agencies)**

- 8.1 Study on the feasibility, costs and benefits of correcting existing mining industries for environmental soundness (MIME& MOE)
- 8.2 Development of Environmental Guidelines for Mining Activities (MIME& MOE)
- 8.3 Establish EIA procedures for mining development projects (MIME& MOE)

## **Theme 9. Industry, Technology and Services**

### **9.1 Manufacturing**

#### **Context**

The manufacturing industry in Cambodia is composed of a few thousand large, medium or small-scale enterprises that have either a direct or indirect impact on the environment. More specifically, tanning, textile and garment factories, plastic, rubber and tube factories are likely to have a most serious effect on Biodiversity through the discharge of liquid and solid waste causing water, air and soil pollution.

Most factories do not have any environmental management system in place even if this approach has been proven successful in reducing environmental impacts of industries and improving their efficiency and competitiveness. Although there is legislation, there is no environmental impact assessment procedure in place for new industrial projects. Increasing the environmental performance of this sector would not only improve its efficiency but would also facilitate the selling of industrial products on environmentally sensitive international markets.

#### **Key issues:**

- ⇒ Poor management of hazardous and other waste material
- ⇒ Lack of awareness for environmental issues in the industry sector
- ⇒ Lack of equipment for monitoring and analyzing.

#### **Goals**

- Reduce the impact of manufacturing activities on the environment.
- Restore the sites affected by manufacturing activities.

#### **Strategic Objectives (indicators)**

- 9.1.1 Promote the use of environmentally friendly processes in the manufacturing sector (number of companies reached through awareness campaign).
- 9.1.2 Promote the implementation of Environmental Management Systems (EMS) in medium and large size companies (number of companies using EMS).

#### **Options**

- Control of industrial wastewater discharge in compliance with national and international criteria and standards.
- Control of industrial solid wastes and/or municipal wastes disposal in compliance with national and international criteria and standards.
- Establishment of EIA procedure for new industrial development projects.
- Implementation of EMS in large and medium size industries and manufactures.
- Strengthening Pollution Control and Monitoring on the industrial sector.
- Documentation data and information related to the waste, air and wastewater from industrial sector.
- Promote environmental initiatives that are cost effective

**Priority Actions (coordinating and participating agencies)**

- 9.1.1 Awareness program on Environmental Impact Assessment and Environmental Pollution Control and Monitoring System for the manufacturing sector (MIME, MOE, MAFF & MOC)

## 9.2 Biotechnology and Biosafety

### Context

Humans have been manipulating organisms and exploiting their biological processes and characteristics for thousands of years. The earlier forms of biotechnology -selectively breeding animals and plants and using micro organisms to make, among other things, wine, beer, bread, cheese or soy products- have been adapted by societies around the world and have steadily improved over time. These traditional or conventional techniques are still used today in rural areas and industry alike and differ merely in sophistication and scale. In Cambodia, traditional biotechnology has been in use for hundreds of year for plant and animal selection, beer, soy products and rice and palm wine production.

In the last thirty years, new, more powerful techniques have emerged to supplement the traditional techniques. Some of these new techniques -tissue culture, cell fusion, embryo transfer, recombinant DNA technology and novel bioprocessing techniques- have enabled scientists to grow whole organisms from single cells, fuse, different cell types to create hybrids with the qualities of both parent cells, impregnate animals with embryos from other valuable animals, isolate genes from one organism to insert them into another and process things such as food and waste, more efficiently. Some modern biotechnological techniques are presently being used to help conserve biological diversity and sustainable use its components, in particular, genetic resources.

But to many people genetic engineering is biotechnology. With genetic engineering techniques, a gene for a particular trait from one organism can be directly inserted into another, even if the two organisms are not from the same species. The potential power of genetic engineering has captured the imagination of many, and heightened concern over the ethics of its use, safety for humans and the environment and the socio-economic impact of its product.

Biotechnology potentially offers benefits for human welfare, but many people are concerned that greater use of the products of biotechnology is not without risks to biological diversity and human health. Such risks will have to be identified and appropriately managed or controlled before new product enters the environment (Adapted from IUCN, 1997. Guide to the Convention on Biological Diversity).

The Convention on Biological Diversity and the newly adopted protocol on Biosafety require each contracting party to take steps to regulate, manage or control the risks to biological diversity and human health posed by the use and release of living modified organisms (LMOs) likely to have adverse environmental impacts. Parties may implement a program to address the risks through a hierarchy of measures - regulation, management or other means of control.

### **Key Issues:**

- ⇒ Lack of capacity in the field of modern biotechnology.
- ⇒ Lack of protection measures against living modified organisms.

## **Goals**

- Develop biotechnology education while preventing environmental and health hazards associated with the use and release of living modified organisms.
- Protect indigenous Biodiversity from the introduction and use of living modified organisms.

## **Strategic Objectives (indicators)**

9.2.1 Develop a national strategy on Biosafety (decree adopted by Government).

9.2.2 Develop national capacity in the field of modern biotechnology (number of students or experts reached by training programs)

## **Options**

- Initiate research and studies on microbial Biodiversity.
- Use of biotechnology to reduce the use of chemicals.
- Use of biotechnology to control pollution and to improve environmental health and other aspects of environment.
- Utilize biotechnology to produce protein rich products that could be used as animal feed organic fertilizers, soil conditioners and soil stabilizers.
- Promote sound genetic manipulation to increase fish and crop production.
- Promote the production of biogas, bio-fertilizers, and energy as a by-product of fermentation processes.
- Establish a national directory of human resources working on subjects concerned with biotechnology and Biosafety.
- Development of biotechnology training program.
- Increasing university resources in biotechnology research and development.
- Include in the educational curricula the concept of genetic diversity, its importance and application in genetic engineering and technology.
- Develop a National Code of Ethics and Guidelines for the use of biotechnologies, LMO's and GMO's

## **Priority Actions (coordinating and participating agencies)**

9.2.1 Development and implementation of a Biosafety strategy and action plan in compliance with the international protocol on Biosafety (MAFF, MIME, MOE & MOC)

## 9.3 Tourism

### Context

Tourism represents one of Cambodia's main opportunities for rebuilding its economy and the sector is rapidly expanding. Sustainable development in tourism is dependent on three strategies:

- ◆ the protection and preservation of the socio-cultural and natural environment, and the need to protect the temples and archaeological sites together with other aspects of the cultural heritage of the country;
- ◆ the development of infrastructures and hotels;
- ◆ the development of human resources.

Establishing and properly managing a strong network of protected areas and cultural sites involving local communities will contribute significantly to the development of tourism. As such, Cambodia's potential for eco-tourism and adventure tourism based on wildlife and natural landscape is immense.

Setting up and implementing some controls and guidelines for tourism will help in keeping the environment as healthy and intact as possible. Building of new roads and hotels will require care to be taken in order to prevent the negative impacts of these infrastructures on landscape and integrity of natural ecosystems. Services associated with hotel activities have to be managed to prevent pollution and environmental degradation. Tour operators and guides have the responsibility to promote tourists' responsible behavior and attitude and provide them adequate information on the rules and regulations in use. In coastal areas, for example, scuba divers hunt and collect marine organisms and boat anchors destroy coral reefs; adequate information and proper anchoring techniques can prevent these impacts.

### **Key Issues:**

- ⇒ Pollution and habitat degradation caused by unorganized tourism.
- ⇒ Awareness and training of tour operators and tourism guides.

### **Goals**

- Ensure the development of tourism activities that are respectful of the environment and meet the needs and expectations of local communities.

### **Strategic Objectives (Indicators)**

- 9.3.1 Subject "certain" tourism projects to careful environmental impact assessment (EIA) including social impact assessment before granting any authorization (number and percentage of Tourism projects subjected to EIA procedure).
- 9.3.2 Monitor and manage the impacts of tourism in protected areas in a sustainable manner (number of monitoring and management plans in place)
- 9.3.3 Develop eco-tourism opportunities involving local communities (number of community based eco-tourism projects)

### **Options**

- Set up a national master plan to promote ecological tourism in natural areas.

- Initiate comprehensive environmental studies to identify natural and cultural resources in areas that are potentially considered ecotourism sites.
- Integrate biodiversity conservation concerns in guidelines for sustainable tourism.
- Regularly monitor negative environmental impacts from tourism activities in protected areas.
- Improve management for tourism industry to include management of natural resources.
- Minimize negative impacts from locals and tourists on the biodiversity of tourism attraction areas.
- Build up of ecotourism infrastructure in protected areas.
- Rehabilitate some natural and cultural sites to receive ecotourists.
- Rehabilitate and enhance biodiversity of some areas to add value to the sites.
- Undertake environmental and social impact assessment of tourist activities.
- Promotion of environmentally friendly tourist activities.
- Prepare visitor management plans for all major tourism attractions.
- Develop appropriate designs and technology systems for local inns in environmentally sensitive areas.

### **Priority Actions**

- 9.3.1 Integrating biodiversity conservation and environmental management concerns into tourism policy and development plans and guideline (MOT, MOE, MAFF & MCFA) (incl. mandatory environmental impact assessment for tourism development projects)
- 9.3.2 Village based tourism development program (MOT, MOE, MAFF & MCFA) (incl. inventory of potential projects, guidelines for nature-based tourism development, community approach strategies)
- 9.3.3 Integrating conservation on cultural heritage and nature through the development tourism program in demarcate areas for protected area landscape (MOT, MOE & MCFA).
- 9.3.4 Set up a national master plan to promote ecological tourism in natural areas (MOE, MOT, MAFF, MLMUPC, & MRD)



## **Theme 10 Environmental Security**

### **Context**

Cambodia is one of the fourteen countries in Asia considered by the UN Department of Humanitarian Affairs to be the most prone to disasters. Natural disasters to which the country is subjected include floods, drought, fire, and epidemics of various diseases such as malaria, cholera and dengue fever. Man-made disasters caused by war and civil strife has been a major problem for much of the past 30 years and has resulted in large numbers of refugees and internally displaced persons.

Safety is currently a serious issue in areas where land mines have been planted. The greatest threat to both people and wildlife is anti-personnel mines. About 6-9 million land mines have reportedly been planted throughout the country, which killed or maimed an estimated 100 persons daily according to a World Bank 1994 report. In addition, illegal logging often occurs under armed guards. Ironically, the security problem has in some ways served to protect natural habitats since 1980. While it has not been possible to establish conservation programs in insecure zones, it also has not been possible to undertake large-scale development in these areas - with the significant exception of illegal activities. In working towards demobilization of the militia, the government will seek to improve security and decrease the occurrence of illegal activities.

Environmental security is also concerned with flood prevention and control. In 2000, for example, floods killed 800 people and caused severe human sufferings, serious damage to infrastructure, major disruption of social and economic activities, loss of agricultural land and crops. As flood prevention and rehabilitation measures might have a considerable impact on natural habitats, it is essential to include biodiversity concerns in their planning. For example, the construction of dams and water reservoirs could reduce agriculture productivity and fish production by altering the natural flow of water (see section 3). Deforestation might accelerate soil erosion and increase the occurrence of flash floods. Planting trees on riverbanks and preventing watershed deforestation can reduce significantly the risks of catastrophic flooding, soil erosion and landslide. Similarly, education of rural people on environmental issues, in better farming practices and better health and hygiene practices help reduce the risks of epidemics.

In June 1999, Cambodia established the National Committee for Disaster Management (NCDM) to improve disaster management throughout the country through the collaboration of several organizations and government agencies. Current work by NCDM should lead to the adoption of an extensive disaster management strategy.

### **Key Issues:**

- ⇒ Development of natural resources is impaired by land mines and other security problems
- ⇒ Negative impacts of floods on biodiversity resources
- ⇒ Lack of awareness of disaster prevention measures and the role of biodiversity.

### **Goals**

- Prevent negative impacts of catastrophic events on biodiversity resources through environmentally sound measures.
- Improve security in areas of high biological importance.

**Strategic objectives (indicators)**

- 10.1 Continue clearing of mines in and around protected areas (number of land mines destroyed)
- 10.2 Integrate biodiversity protection measures in flood prevention planning and rehabilitation plans (number of measures integrated in management plans)

**Options**

- Promotion of biodiversity friendly flood prevention measures
- Clearing up of land mines in protected areas
- Public awareness campaign on epidemics prevention

**Priority Actions (coordinating and participating agencies)**

- 10.1 Integrating biodiversity protection measures in flood prevention awareness programs and rehabilitation plans (NCDM, MOE, MOWRAM, MAFF, MRD, MLMUPC & MIME) (Incl. tree planting on riverbanks and foothills, preventing deforestation, etc.)
- 10.2 An important aspect of the vision is conservation and promotion of Biodiversity, Environmental protection and Ecology. The Framework for Action will include the following activities.
- Establishment of an Environmental and Natural Resource Data Base Centre
  - Broad-basing of water quality monitoring functions to include the private sector and NGOs
  - Enforcement of regulatory standards for water and wastewater Discharges.
  - Cleaning up of already polluted water bodies.
  - A Preventive strategy must be introduced into all sectors of the society to minimize pollution impacts of water bodies. It must have a decisive impact on production, consumption, education, research and development, public construction works communication waste management etc. (NCDM, MOE, MOWRAM, MAFF, MRD, MLMUPC & MIME)
- 10.3 Creating environmental security for integrated biodiversity water resources Management and development. (NCDM, MOE, MOWRAM, MAFF, MRD, MLMUPC & MIME) (Incl. Formulation and adoption of a coherent policy for the water sector as whole, water resources use and development planning, economic instrument for water resource management, establishment of protected areas, control of floods, watershed, management, penalties.
- 10.4 Preventing the damage that may occur as a result of flood, drought, watershed, degradation, erosion and sedimentation to protect aquatic and fish resources and other biodiversity. (MOWRAM, MIME & MOE) (Incl. Construction / rehabilitation of bank protection work, dikes, provision of water storage facilities. and Prohibition or licensing of the filling of reservoir and of the obstruction of flow /drainage and prohibition sand mining on the bed and banks of water bodies. Promotion of the involvement of communities in activities aiming at the protection of biodiversity and sustainable use of natural resource within watershed.

## **Theme 11 Land Use Planning**

### **Context**

Human activities are constantly changing and affecting land and the landscape. The construction of cities, villages, roads and the creation of ponds, terraces, dykes, canals are among the most visible changes. Use of land and decisions governing land use are extremely important as many decisions are irreversible and may have major implications for future generations.

In Cambodia, land tenure is governed by the 1992 Land Law. A new Land Law is ratified and promulgated by the National Assembly in 2001. According to the Constitution, Cambodians have access to property rights and have the full right to own and use land for housing and cultivation. Concession land, which is defined as land greater than five hectares, can be allocated for the production of crops "to support the national economy". This concept is further expanded into State Private and Public property in the new Land Law.

Among the problems associated with land in Cambodia are the small number of farmers who hold titles over the land they live and work on; and the fact that priority is often given to business development over farmers. Another area of concern is the reclamation of wetland and forestland for agriculture, housing, transportation or industrial development at the expense of the long-term preservation of land systems and biodiversity. The absence of land use policy framework, inadequate coordination among ministries and departments dealing with natural resources and land use development as well as a lack of accurate information to guide land use allocation are other important issues that the government is facing. Expertise is also lacking in this field within government agencies.

To optimize the use of land resource, the government is seeking to consider social, environmental and economic costs when considering the benefits of new land developments. Any new development should also ensure compatibility of land-use allocation with local communities who use or need access to the same piece of land.

### **Key Issues:**

- ⇒ Expansion of development projects at the expense of cultivable land and natural habitats (especially wetland)
- ⇒ Lack of policy framework and accurate information to guide land use allocation
- ⇒ Lack of effective land use planning capacity
- ⇒ Unclear institutional role and responsibilities

### **Goals**

- Ensure protection and sustainable use of biodiversity rich lands in land use planning schemes.

### **Strategic Objectives (indicators)**

- 11.1 Strengthen institutional capacity in land use plan development and management (number of staff trained)
- 11.2 Develop national & provincial land use master plans that take full account of environmental considerations in the socio-economic planning process and identification of alternatives & priorities (number of land use plans developed)

## **Options**

- Clarification of responsibilities and duties of all institutions involved in land use planning and management as indicated in the legislation.
- Define priorities and establish clear mechanism for land use planning to improve coordination and cooperation among institutions and avoid overlapping in implementation of activities related to land allocations and usage.
- Creation of Inter-Ministerial Committee for integrated land use plan development.
- Training on land use planning.
- Development of technical guidelines for land use planning.
- Collection and analysis of existing information and data from relevant institutions and local authorities.
- Development and promotion of mechanism, principles and guidelines for land use conflicts resolution.
- Development and preparation of regulations and guidelines for effective law implementation.
- Human resource development for the effective implementation of land use plans, legislation, regulations and guidelines.
- Improvement of education and awareness rising on existing laws and circulars.
- Monitoring and evaluation of the implementation of laws, regulations and guidelines related to biodiversity.
- Law enforcement procedures.
- Promotion of local education and extension on land use planning importance.
- Providing rights and opportunities to local people to express their opinions on land use planning within their communities.
- Promotion of land use plan implementation by communities based on guidelines.
- Set up land use policy to include buffer zones around tourism areas.
- Monitor encroachment of development on agricultural land, wetlands & forests.
- Promote Participatory Land Use Planning

## **Priority Actions (coordinating and participating agencies)**

- 11.1 Institutional capacity building program on land use planning (MLMUPC, MRD & MAFF) (incl. manual on participatory land use planning by MLMUPC & MAFF)
- 11.2 Development of national land use master plan and provincial land use plans integrating environmental concerns and community consultation (MLMUPC, MRD, MOP, MOE & MAFF)
- 11.3 Development of community-based land use plans (MLMUPC, MRD, MOP, MOE & MAFF) (incl. manual on participatory land use planning by MLMUPC)

## **Theme 12. Water Resources**

### **Context**

Cambodia is generally considered a "water-wealthy" country, situated in the lower Mekong River basin. In terms of its annual water availability of nearly 50,000m<sup>3</sup> per person, its gross water resource ranks third in Southeast Asia. However, this is only true on average. With a long dry season, many Cambodians face seasonal water shortages and resulting constraints on domestic water supply, hygiene and food production. At the same time, pollution by domestic livestock or human waste, fertilizers and pesticides used in agriculture production and waste discharge from industries is putting considerable stress on water resources, fisheries and aquatic ecosystems.

The construction of dams, navigation channels, irrigation, river canalization and diversions and banded (raised) road networks can reduce fish and agriculture productivity by altering sedimentation patterns, nutriment flow and fish migration. Similarly, the degradation of riverbanks, lakeshores and riparian zones leads to a deterioration of water quality.

### **Key Issues:**

- ⇒ Pollution caused by agricultural, industrial and domestic activities.
- ⇒ Negative impacts of dams, building of harbors, navigation channels, irrigation, river canalization and diversions on fish and agriculture productivity.
- ⇒ Deterioration of banks and riparian zones.

### **Goals**

- Ensure that the water environment is unpolluted and supports healthy fisheries and aquatic ecosystems.

### **Strategic Objectives (indicators)**

- 12.1 Rigorously apply the legal provisions for environmental impact assessment (EIA) and mitigation to water resources development projects and other projects that could have an impact on water resources (number of projects submitted to EIA)
- 12.2 Reserve minimum stream flows and lake levels to protect environmental and fisheries needs (number of days where minimum level is not met)
- 12.3 Make adequate provision for unimpeded fish migration in water resource and waterways development projects (number of projects integrating this provision)
- 12.4 Prevent water pollution from all sources (water quality data)
- 12.5 Ensure adequate protection of river banks, lake shores and riparian areas (total length of protected river banks and shores)

### **Options**

- Assessing objectively the advantages and disadvantages of dams, irrigation channels and other flood control structures and slow down the construction of new dams till the completion of these studies.
- Conducting sewerage water treatment before draining.

- Building of waste water treatment lagoons
- Development of water quality laboratory
- Conducting continuous monitoring of water levels and set up more meteorological and hydro-geological stations.
- Directing government's support to environmentally responsible irrigation and flood control techniques based on priorities that reflect the water situation of the Kingdom's various regions.
- Expanding programs for farmer awareness of modern irrigation technique and riparian zone protection and for urban citizen awareness of water quality protection activities.
- Training farmers in the proper use of fertilizers and pesticides.

**Priority Actions (coordinating and participating agencies)**

- 12.1 Management of water resources program (MOWRAM)
- 12.2 Public water program to improve water quality so as to be able to satisfy present and future demands and ensure that water bodies have the capacity to sustain biodiversity aquatic and fish life, to protect human and animal health. (MOWRAM, MOE, MAFF & MIME)
- 12.3 To ensure the financial sustainability of hydraulic infrastructure program Incl. Introduction of the concept of water use fees, arrangement for the participation of the user in the maintaining, management of rehabilitated and newly constructed irrigation schemes for improving of agriculture sector. (MOWRAM, MAFF, MOE & MIME)
- 12.4 Groundwater monitoring program (MOWRAM, MRD, MOE, MAFF& MOH) in the program include: groundwater quality program, groundwater pumping in order to experiment groundwater discharge, groundwater level, groundwater current, groundwater maintain and groundwater development for modeling and groundwater map.
- 12.5 Water pollution prevention program for industry sector (MOE, MOWRAM & MIME) (incl. regulations for storm water disposal and wastewater management, licensing of wastewater abstractions and discharges, technology development transfer)
- 12.6 Water pollution prevention program for agriculture sector (MAFF, MOE & MOWRAM) (Incl. lakeshore and riverbanks protection and reforestation, guidelines for the application of agro-chemicals, community education programs for economical, low-impact use of agro-chemicals)
- 12.7 Urban waste water treatment program (Local Authority, MOE, MOWRAM, MLMUPC & MIME) (Incl. installation of piped sewerage in urban areas and installation of household and community treatment systems)

## **Theme 13. Climate Change and Biodiversity**

### **Context**

Because of global warming, the average sea level has risen by 10 to 25cm over the past 100 years. Models project that sea level will rise another 15 to 95 cm by the year 2100. This will occur due to the thermal expansion of ocean water and an influx of freshwater from melting glaciers and ice. Even if warming is partly due to natural causes, evidence has showed that the massive production of CO<sub>2</sub> emissions and other green house gases through human activities accelerate this pattern.

Effects of global warming are expected to be particularly devastating in coastal areas and floodplains. As the sea rise, flooding and coastal erosion will worsen and severely impact on fisheries, Aquaculture and agriculture. Other sectors most at risk are tourism, human settlements, and infrastructures. The expected sea-level rise would inundate much of the world lowlands, damaging coastal cropland and displacing millions of people from coastal and small island communities. The average increase in temperature will also modify rainfall patterns and cause changes in the composition and structure of ecosystems as well as in the distribution and abundance of plant and animal species.

Cambodia's ecosystems include low-lying agricultural, wetland and coastal areas, as well as forest and mountainous areas that are vulnerable to the negative impacts of climate change. As Cambodia's economy is largely dependent on agriculture, and its biodiversity, in the form of natural resources, it is likely that the country will be vulnerable to the impacts of climate change.

As a signatory party to the UN Framework Convention on Climate Change, Cambodia is now preparing its first national communication to the Conference of the Parties. Preparation of a Climate Change National Action Plan that will include various mitigation and adaptation measures is currently underway. These measures are based on the mitigation analysis and vulnerability and adaptation assessment in priorities sectors such as agriculture, land use change and forestry, and coastal zone.

Beside potential impacts of climate change (sea level rise, temperature increase, change in precipitation, climate extremes) on biodiversity, mitigation and adaptation measures taken by man will potentially have also impacts on biodiversity). One of the proposed mitigation measures, the establishment of carbon sinks through measures involving the plantation of fast growing trees or the creation of forest reserves, might be positive for biodiversity if the species and areas chosen are carefully selected. Likewise, protection measures against sea level rise and potential flooding including the construction of dikes, dune restoration, wetland creation, and regulations against new coastal development will also have to consider potential impacts on natural ecosystems, fisheries and agriculture production.

### **Key issues:**

- ⇒ Potential impacts of sea level rise, temperature increase and change in precipitation on biodiversity (composition, distribution, survival, etc.)
- ⇒ Potential impacts of climate change mitigation or adaptation measures on biodiversity
- ⇒ Developed countries cause most emissions related to climate change

## **Goals**

- Identify response measures (both mitigation and adaptation) to mitigate impact on biological resources;
- Assess climate change mitigation and adaptation measures to prevent their impacts on biological resources.
- International lobbying to reduce emissions related to climate change

## **Strategic Objectives (indicators)**

- 13.1 Integrate biodiversity conservation and sustainable concerns into the National Climate Change Action Plan (concerns integrated in action plan)
- 13.2 Take into account development objectives of the country while preparing response measures to address climate change impacts on biodiversity.
- 13.3 Statements made by Cambodia on Climate Change

## **Priority Actions (coordinating and participating agencies)**

- 13.1 Integration of biodiversity objectives into the future National Climate Change Action Plan (MOE & MAFF) (incl. conducting of environmental impact assessment for proposed climate change response measures.
- 13.2 Improvement of weather forecasts to ensure timely warning of natural occurrences such as typhoon, floods and drought. Improvement to the meteorological networks (MOWRAM).
- 13.3 Lobby developed countries to decrease emission related to climate change (MOE through Convention)



## **Theme 14. Community Participation**

### **Context**

According to the guiding principles of this strategy, the people of Cambodia have a responsibility for biodiversity conservation and to use biological resources in a sustainable manner. All Cambodians should therefore be encouraged to understand and appreciate the value of biodiversity and to participate in decisions involving the use of water, land, wildlife, agriculture, fisheries, forest and other resources.

Experience has shown that equitable gender representation, involvement and participation of local communities and concerned stakeholders is a prerequisite for successful conservation and sustainable resource use initiatives. Women's participation to decision making processes and to the active management of community resources is known to be essential to the successful development of local communities and households. Likewise, minority groups, communal and religious leaders, non-governmental organizations and the private sector have to be involved in resource planning and management schemes.

In Cambodia, a number of pilot projects are using community-based natural resource management (CBNRM) principles to varying degrees for community management of forestry and fishery resources, in different regions of the country. These projects demonstrated that CBNRM is indeed an extremely valuable option to address problems of rural poverty and environmental degradation. Positive results from these experiences are encouraging the government to expand CBNRM approach in fisheries and in forestry and initiate this approach in other sectors such as land use planning, wildlife management, protected areas, tourism, and agriculture. The government of Cambodia is undertaking a bold fishery reform policy whereby some 500,000 ha of prime commercial fishing grounds are being turned over to local communities for community-based management as of June 2001. Local communities playing the central role in identifying resources, defining development priorities, choosing and adapting technologies and implementing management practices, characterize the CBNRM approach. To ensure the success of CBNRM, support must be provided to build environmental awareness and help people organize their communities. Legal and institutional frameworks are needed that support the community's rights to use and protect their resources.

### **Key Issues:**

- ⇒ Insufficient participation and involvement of the population and private sector to biodiversity resource protection and management.
- ⇒ Lack of trained staff and government capacity to undertake CBNRM
- ⇒ Lack of financial support for CBNRM.

### **Goals**

- Encourage and support the participation of women, minority groups, local communities, religious groups, NGOs and private sector to efforts leading to conservation and sustainable use of biodiversity.

### **Strategic Objectives (indicators)**

- 14.1 Develop community-based natural resource management programs for forestry, fisheries, land use, protected areas, endangered species protection, *ex situ* conservation, wildlife management, and agriculture (number of programs established)

- 14.2 Implement legal, economic and other incentive measures promoting the contribution and participation of the different stakeholders to the conservation and sustainable use of biodiversity (list of incentive measures in place).

### **Options**

- Develop incentives such as national awards and honorary certificates to recognize the contribution of individuals, communities and groups to nature conservation
- Develop guidelines for community based natural resource management.
- Draft guidelines for increased participation from civil society and private sector.
- Set up local biodiversity strategies for the different regions of the country/Kingdom.
- Promote sustainable development and initiate socio-economic projects at the community level (for and with local people.)
- Establishment of National Trust Fund for Environment (under Environment Law)
- Using economic and financial incentives to encourage communities and private enterprises to adopt environmentally sound processes and methods.
- Motivate entrepreneurs, farmers and fishermen to select appropriate production and service technologies without affecting their competitiveness.
- Providing compensatory incentives to those enterprises, which employ relatively less profitable technologies and methods with relatively harmless impacts on the environment.
- Promote the establishment of Village Development Committees, Commune Development Committees and Users Associations.
- Enlist citizen's participation in setting the priorities for the projects of interest to them and in the conservation and management of natural resources.
- Encourage individual voluntary fieldwork, including survey and monitoring, indirect support of ministries and government organizations concerned with biodiversity conservation. Promote liberal democracy in local communities
- Promote liberal democracy in local communities
- Identify and promote positive examples in media promotions and educational materials.

### **Priority Actions (coordinating and participating agencies)**

- 14.1 Strengthening institutional training in community-based natural resource management (for forestry, agriculture, fisheries, (MAFF, MOE, MRD, MLMUPC & MWAV)
- 14.2 Development of community based wildlife protection program (MAFF, MOE, MRD & MWAV)
- 14.3 Development of community based forestry program (MAFF, MRD, MOE & MWAV)
- 14.4 Development of community based agriculture program (MAFF, MRD & MWAV)
- 14.5 Development of community based fisheries program (MAFF, MRD, MOE & MWAV)
- 14.6 Development of community based land use and rural development programs (MLMUPC, MRD, MOP, MPWT, MOE, MAFF & MWAV)

## **Theme 15. Awareness, Education, Research Coordination and Development**

### **Context**

Increasing public awareness and understanding of the importance of biological diversity is an essential element in guaranteeing the effectiveness and goals of the efforts exerted to conserve it and secure its sustainable use. Conservation efforts can only bear fruit when the members of the society understand that this biological heritage is essential to their own livelihood. To be efficient, awareness and education activities have to be supported by adequate scientific research and documentation.

Environmental education in Cambodia has had a relative short history, and in the past been concentrated on NGO activities. The most notable government activities of relevance began with the establishment of the Ministry of Environment and the Inter-ministerial Steering Committee for Environmental Education (IMSCEE) in 1993. In the MOE, the department of Education and Communication is chairing IMSCEE. The Steering Committee is responsible for all environmental education programs for primary, secondary and monk education - the formal education sector. Technical and financial assistance has been provided for environmental education since 1993 by the United Nations and other international organizations. Activities directly or indirectly related to biodiversity include: training seminars and capacity building workshops, production of a manual on environmental education for primary school teachers, TV spots, posters, conducting a national environment day, etc. At the moment however, the Steering Committee is not effective due to lack of funding.

In addition to the initiatives in the formal education sector, different ministries, international organizations, international and local NGOs have carried out environmental activities in the non-formal education sector. One example is the Integrated Pest Management program that has been conducted at the community level with assistance from the Food and Agriculture Organization (FAO). Also a program for monks was initiated in 1998 by an NGO working group under the leadership of Ven. Nhem Kim Teng, one of Cambodia's leading ecologist monks. The program aims to promote community-based environmental learning and activities through the Buddhist Wat communities in the country. Other community-based management pilot projects have developed educational tools promoting better forestry and agriculture practices.

At the Royal University of Phnom Penh a department of environmental sciences was opened in 2001. It is expected that this department will undertake long due research on environmental issues when funding is made available. The specific role of the department relates to the development of Human Resources related to environment.

So far, these initiatives have reached only a limited proportion of the population. These efforts need to be expanded to cover all regions of the country and reach everyone, especially local communities living in areas of high biodiversity, including range areas of threatened species.

Technical training aimed at developing environmentally sound practices contributes to improve the sustainability and productivity of resource based activities. Government staff working in biodiversity related ministries and departments are in need of capacity building. Training activities are much needed at the technical and managerial level in forestry, agriculture, fisheries, wildlife and protected area management.

While the implementation of the Convention on biological diversity necessitates the establishment and maintenance of programs for scientific and technical education and training, there is a growing need for scientific research development and coordination. Ministries, institutions and universities alike have opportunities to undertake research activities concerning biological resources. It is the intention of the government to promote and better coordinate the development of such activities between ministries and university departments.

**Key Issues:**

- ⇒ Lack of awareness and understanding of biodiversity issues among local people
- ⇒ Limited extension services and facilities devoted to environmental awareness
- ⇒ Weak integration of environmental concepts in educational curricula.
- ⇒ Shortage of manpower and expertise in the field of sustainable resource management.
- ⇒ The infancy of basic research in all fields of natural resources protection and sustainable use
- ⇒ Lack of funding for environmental education and research
- ⇒ Lack of environmental training and education materials in Khmer

**Goals**

- Enhance national and local community awareness of the significance of biological resources conservation and sustainable use.
- Improve the technical capacity of national experts in the different fields of biodiversity management.
- Develop national research activities in biodiversity through adequate funding.

**Strategic Objectives (indicators)**

- 15.1 Strengthen programs of environmental awareness, through mass media, publications, exhibitions, seminars and, especially, direct contact with local people in areas of high biodiversity, including range areas of threatened species (number of people reached by awareness campaigns)
- 15.2 Spread environmental awareness among all sectors of the Cambodian society, especially among grass-roots communities (number of communities reached by awareness campaigns)
- 15.3 Reinforce nature conservation and related environmental issues within the school curriculum (integration of environmental issues in educational programs)
- 15.4 Promote technical training and research in the field of biodiversity and resource management (number of technicians trained)
- 15.5 To involve in the dissemination and strengthening the implementation of Environmental law and regulation related to the biodiversity protection and conservation as well as the law on Environmental protection and Natural resources Management that have been entered into force.

**Options**

- Evaluate training course needs (type of training required, time, budget) for identified target groups
- Conduct relevant training course

- Evaluate results from training courses
- Study tour of relevant ongoing projects
- Create a National Biodiversity Information Centre / Library
- Create Community Biodiversity Information Centres
- Develop a Cambodian Information Network for biodiversity
- Conduct a workshop on information exchange
- Develop Internet access
- Collect biodiversity related documents
- Educate, train, and disseminate information about community-based natural resource management (CBNRM)
- Set up community-based committees on natural resource management
- Develop and circulate books, teaching documents, posters and short stories about biodiversity
- Conduct a national biodiversity day
- Organize a workshop on the development of national committee for environmental education (role, duty, title)
- Extension of teachers and monk training
- Encourage Cambodian universities and scientific institutions to include biological resources subjects in their teaching and research agenda.
- Establish environmental training center.
- Encourage, support and carry out field studies and research to identify the distribution of known taxa, and the hitherto unrecorded and described species.
- Promote the participation of local people to field research projects and surveys
- To strengthen the collaboration and cooperation between the Ministry of Environmental and the Ministry Education youth and spot in the Environmental Education Curriculum for primary, secondary and high school, and also for all level of vocational training establishments.
- The development of environmental training and education materials in Khmer

**Priority Actions (coordinating and participating agencies)**

- 15.1 Biodiversity Awareness Program (MOE, MOEYS, MAFF, MIME, MLMUPC, MOH, MCR & MWAV) (incl. biodiversity web site, national biodiversity day, publications, posters, TV and radio spots, in collaboration with national NGOs and university)
- 15.2 National Biodiversity Research, Training and Information Center and Library (MOE)
- 15.3 Integrating environmental and biodiversity issues in school curriculum (IMSCEE, MOEYS & MOE)
- 15.4 Government staff capacity-building program (MOE & MAFF) and relevant agency
- 15.5 Biodiversity research development program at Royal University of Phnom Penh (RUPP)
- 15.6 set up training program on management of natural resource and Environment conservation to the member of community that have biodiversity. (MAFF & MOE)

## **Theme 16. Legislation and Institutional Structure**

### **Context**

Addressing environmental and biodiversity issues is a complex endeavor that requires the concerted efforts of most if not all government bodies including more specifically Ministry of Environment, Ministry of Agriculture, Forestry and Fisheries, Ministry of Finance, Ministry of the Interior, Ministry of Industry, Mine and Energy, Ministry of Tourism, Ministry of Rural Development, Ministry of Planning and Ministry of Water Resources, etc. These ministries must also work closely with the university, agencies, and technical institutes as well as the NGO and the private sector. As it is the case with most governments around the world, their collective action often suffers from jurisdiction overlap, fragmentation and inadequate coordination. Institutional responsibilities between the MOE and MAFF are particularly unclear with respect to conserving biodiversity and managing resources. Lack of interministerial coordination has always been a strong impediment to efficient integrated land use planning and other concerted efforts. However, in April 2001, a National Biodiversity Steering Committee was created in order to promote cooperation and coordination between relevant institutions on biodiversity issues.

Existing legislation concerning biodiversity is currently under revision in Cambodia; for example, by-laws and regulations related to the 1996 Law on Environmental Protection and Natural Resource Management are being prepared. This revision will be done according to the following guidelines:

- clarify ministerial jurisdiction and prevent overlap
- provide legal support to areas related to environment and resources that are not adequately covered (e.g. land property rights, protected areas, endangered species, biosafety, intellectual property, etc.)
- extend the use of environmental impacts assessment
- allow community-based natural resource management in all sectors
- facilitate enforcement through adequate incentive measures.

However imperfect, existing legislation on the environment is not well known in the public, especially in rural areas. There is thus a definite need to better inform the population of their responsibilities regarding the application of biodiversity related legislation and regulations.

Finally, the enforcement of existing legislation is somehow deficient in the country because of unacceptable behavior and lack of accountability by some government representatives. It is the intention of the Government to promote the adoption of a more responsible attitude within the administration.

At the regional level, Cambodia is an active member of the Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin. The Government will continue to cooperate fully with neighbor countries to fulfill common environmental goals in a sustainable development perspective. Internationally, Cambodia is a signatory party of several biodiversity related conventions; the Government is committed to continue to play an active role in the fulfillment of its obligations.

### **Key Issues:**

⇒ Inadequate management standards in the different activity sectors

- ⇒ Overlap, fragmentation and inadequate co-ordination between authorities responsible for the protection, conservation and management of resources
- ⇒ Inadequate legal coverage of biodiversity related issues
- ⇒ Lack of public awareness on legislation related to the environment

### **Goals**

- Ensure the protection and sustainable use of biodiversity and other natural resources through adequate and efficient legislation and management standards.
- Enhance interdepartmental and intergovernmental co-ordination for the protection, conservation and management of resources.
- Confirm and strengthen the Kingdom's commitment to its role, rights and obligation for biodiversity conservation in the regional and international communities.
- Strengthen the process of environmental impact assessment, environmental consultation and project scrutiny, including that of compliance with permit conditions, for all new developments.

### **Strategic Objectives (indicators)**

- 16.1 Adopt legislation, bylaws and regulations related to biodiversity issues, namely protected areas, endangered species, biosafety, water protection, pesticide control, property rights, community-based natural resource management, land-use planning, etc. (list of by-laws adopted)
- 16.2 Support Biodiversity Steering committee and Secretariat with the mandate of coordinating NBSAP implementation (resources made available)
- 16.3 Implement Environmental Impact Assessment guidelines (number of projects subjected to EIA procedure)

### **Options**

- Establish mechanism for national biodiversity management
- Establish a trust fund or endowment to provide long term financing for conservation programs
- Set up Sub-steering Committee for biodiversity research and enforcement (Law decree, sub decree, Prakas - notices- and standard documents)
- Sub-steering committee to report on law enforcement and on biodiversity status
- Develop and promote a long-term vision document for biodiversity law
- Set up environment police (MOE) in collaboration with National Police Department
- Discipline and fine offenders
- National and provincial level workshops on biodiversity topics
- Training to provincial and local civil servant on biodiversity topics
- Study tour inside and outside Cambodia for government staff
- Give incentives to people who protect and manage biodiversity
- Awareness campaign on Environmental law.
- Review and modify environmental impact requirements in the Ministry of Environment to ensure their comprehensiveness and precision in stipulating the requirements of environmentally sound technologies and methods (Application for new projects will have to indicate in clear scientific and technical terms the type of technology to be used, the specific raw materials to employed, the type and quantity of energy and the amount and composition of waste and emissions envisaged.

- Enforce the statutory need for Environmental Impact Assessment (EIA) prior to and during the establishment and operation of a project or a service.
- Draw up sectoral environmental guidelines for development projects, with special references to protected areas and rural areas in general.

**Priority Actions (coordinating and participating agencies)**

- 16.1 Development/Amendment of by-laws and regulations on biodiversity related issues (in order to meet newly identified threats to biodiversity, especially biosafety, species at risk, intellectual property rights; and clarify ministerial roles and responsibilities, etc.) (MOE, MAFF & MOC)
- 16.2 Institutional capacity building project on Environmental Impact Assessment. (MOE)
- 16.3 National awareness campaign on Environmental legislation. (MOE)
- 16.4 Continued implementation of regional cooperation with neighboring countries in joint projects and programs aimed at environmental protection and conservation of common natural resources . (MOE)



## **Theme 17. Quality of Life and Poverty Reduction**

### **Context**

The 1997 Socio-economic Survey of Cambodia indicated that 36% of the population live below the poverty line based on the minimum need of 2,100 calories per person per day. The survey also indicated that the poverty index is 11% in Phnom Penh, 30% in other urban areas and 40% in rural area. nearly 90% of the poor are farmers living in rural areas. The Royal Government of Cambodia is aware of the dire poverty currently prevailing in the country and considers poverty alleviation and the improvement of standards of living as the main priorities.

In Cambodia, an overwhelming majority depends upon agriculture, fishery and forestry as major source of livelihood with most local farmers reliant upon subsistence farming and foraging. The average rural household obtains food and generates income through a combination of activities such as farming, hunting, fishing and gathering wood and non-forest products. Other supplemental sources of livelihood are livestock raising; primary processing of agricultural, forestry and fishery products; odd jobs and vending. It is estimated that crop, livestock, fisheries and forestry production accounted for 40.1% of Cambodia's GDP in 1999.

Despite the continuous efforts of the Government to conserve and protect the environment and the natural resource base, there are serious cases of resources depletion and degradation. Intensive logging and illegal extraction of timber has led in the past thirty years to a reduction of the forest cover from about 90% to less than 50% of the land base. This intensive deforestation has created land erosion problems and higher incidence of floods leading to losses in fertile soils and crops. In the agricultural sector, inappropriate use of pesticides is leading to the contamination of waters and fish habitats, and degradation of other aquatic resources. Over harvesting of wildlife has led to the near extinction of valuable food sources including several species of wild animals and plants. Construction of dams and other water management infrastructure is a constant menace to the integrity of fish habitats. Industrial and urban pollution is threatening the quality of life of the human population.

This National Biodiversity Strategy and Action Plan is highlighting the need for better planning and management of biological resources in order to improve living conditions and reduce poverty. Priority actions aimed at improving the capacity of rural populations to protect and use sustainably their natural resource base must be considered as key contributions to reduce poverty.

### **Key issues:**

- ⇒ Poverty and limited support for alternative livelihoods of rural people
- ⇒ Unsustainable harvesting of key subsistence resources
- ⇒ Degradation of habitats providing staple food and commodities

### **Goals**

- Ensure the equitable sharing of benefits from the protection and sustainable use of biological resources.

### **Strategic Objectives (indicators)**

- 17.1 Reduce poverty in rural communities through appropriate community-based capacity-building programs (poverty rate in rural communities).
- 17.2 Improve living conditions through environmental awareness programs (number of programs).
- 17.3 Increase family income through providing means to farmers improving agricultural productivity (yield, seed, fertilizer, insecticide, intensive agriculture, land extension).
- 17.4 Improving living condition through medical care, hygiene, clean water and sanitation programs (infant/under 5/maternal mortality rates, life expectancy, HIV/AIDS case, family planning).
- 17.5 Promoting opportunity for poor people to access basic education, adult literacy, informal education (number of students in the programs).
- 17.6 Promoting economic facility through infrastructure and micro-credit programs (length of rehabilitated and constructed roads, number of micro-credit programs).

### **Options**

- Increase effectiveness in agriculture production.
- Provide capacity building among rural women on appropriate technologies to achieve food security (integrated pest management, fuel-efficient stoves, composting, garden and livestock management, etc.).
- Increase access to micro-credit in rural areas to improve small-scale agriculture and industry.
- Reduce and erase step-by-step forest concession.
- Environmental awareness campaign in rural communities.
- Create demonstration sites for biodiversity protection, management and sustainable use.
- Education & Adult literacy programs.
- Health education programs (family planning, HIV/AIDS etc.).
- Basic infrastructure development.
- Identify and promote positive examples.

### **Priority Actions (coordinating and participating agencies)**

- 17.1 Community-based natural resource management programs (in agriculture, forestry, fisheries, protected areas, land use, etc.) (MAFF, MOE, MRD, MLMUPC & MWAV) (incl. women's capacity building).
- 17.2 Environmental awareness programs in rural areas (MOE, MAFF, MRD, MLMUPC MOEYS & MWAV).
- 17.3 Poverty monitoring and analysis programs (CSD & MOP).
- 17.4 Poverty reduction strategy formulation (CSD, MOP & MEF).
- 17.5 Participatory Poverty assessment (CSD & MOP).

