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Cambodia

**Tropical Forests (FAA 118)
and Biodiversity (FAA 119)
Assessment**

Annex 2
to the
**Environmental Review: Status and Trends in Environmental
Management and Options for Future Action**

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Acronyms

CBD	Convention on Biological Diversity
CBNRM	Community-Based Natural Resources Management
CCD	Convention to Combat Desertification
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DANIDA	Danish International Development Assistance
DG	Democracy and Governance
FAA	Foreign Assistance Act
FAO	Food and Agriculture Organization of the UN
GB	Great Britain
GEF	Global Environmental Facility
HR/DG	Human Rights/Democracy and Governance
IESP	Interim Environmental Strategic Plan
IR	Intermediate Result
ITTA	International Tropical Timber Agreement
IUCN	World Conservation Union
MAFF	Ministry of Agriculture, Forestry, and Fisheries
MARPOL	International Convention for the Prevention of Pollution by Dumping of Wastes and Other Matter
MoE	Ministry of Environment
MRC	Cooperation for the Sustainable Development of the Mekong River Basin
NGO	Nongovernmental Organization
NRM	Natural Resources Management
PDR	People's Democratic Republic (Lao PDR)
RGC	Royal Government of Cambodia
SO	Strategic Objective
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
USAID	United States Agency for International Development
USFWS	United States Fish and Wildlife Service

1. Background

This assessment of tropical forests and biodiversity in Cambodia was conducted for USAID/Cambodia in fulfillment of Sections 118 and 119 of the Foreign Assistance Act (FAA) guidelines for US government agencies working abroad. The tropical forest and biodiversity assessment was prepared for USAID/Cambodia under contract with ARD, Inc. as part of an overall natural resources assessment for Cambodia during August and September, 2001.

Dr. Jim Schweithelm, who also served as natural resource management specialist and CBNRM advisor, led the ARD natural resources assessment team. Other members of the ARD team included biodiversity specialist Dr. Pat Foster-Turley and in-country specialists Andrew McNaughton, Srey Chanthy and Sri Sugiarti. Information for this biodiversity annex and for the full report was compiled by the team from an analysis of existing documents, interviews with relevant government and nongovernmental organization (NGO) officials and specialists, and two field trips, to Siem Reap and the northern Tonle Sap region and to Sihanoukville and the coast.

Dr. Pat Foster-Turley was largely responsible for producing this biodiversity assessment as one part of the overall natural resources management (NRM) report. An attempt was made to present this biodiversity assessment as a self-contained document, but much of the relevant information is covered in more detail in the parent document, *Cambodia Environmental Review: Status and Trends in Environmental Management and Options for Future Action*, and to avoid redundancy, is only summarized here. Likewise, some sections of the parent report contain summarizations of the material presented in this biodiversity document. It is suggested that these two documents be read in synchrony to obtain the fullest picture of NRM and conservation efforts in Cambodia.

2. Executive Summary

Cambodia contains some significant large tracts of forests, among the greatest expanses of some of these habitats in mainland Southeast Asia. In addition to forests, which are the focus of the 118 part of this assessment, there are other significant habitats in Cambodia including the large Tonle Sap lake, stretches of the Mekong River and associated streams, major wetlands of critical importance and coastal mangroves, coral reefs, and seagrass beds. All of these habitats and associated flora and fauna add to the exceptional biodiversity found in Cambodia. Various types of forests and different schemes for managing them are described in this report. Major taxa of plants and animals are also described, along with the fact that in Cambodia, much information on biodiversity is lacking.

Threats to the forests and biodiversity of Cambodia are many and varied, and synergistically impact upon one another. Habitat destruction is a major threat and is manifested in many ways including unsustainable logging, excessive conversion of land to agricultural uses, destructive fishing techniques such as dynamiting reefs, and various other factors. Various species with high economic value are also directly targeted, leading to the purported declines in populations of such globally significant species as tigers, primates, bears and crocodiles, and many others. Fish are a primary source of food for most Cambodians, but overfishing, the use of harmful fishing devices and habitat destruction of major spawning and feeding areas is reducing both catch sizes, and the size of individual fish and in some cases even leading to the disappearance of once common species. In Cambodia these threats are exacerbated by ineffective and often corrupt NRM practices. The policy and management frameworks for natural resources conservation efforts are sorely deficient, although a few relevant natural resources policies have been rewritten and are passing through the adoption process. The government, however, lacks the capacity and/or political will to enforce natural resources laws and regulations. Widespread corruption has led to the misuse of natural resources by large private sector entities that are often from other countries with no long-term commitment to the natural environment of Cambodia. Not only is biodiversity being lost in this way, but so is the quality of life of many poor Cambodians who rely on sustainable natural resources for their own continued survival.

Many donors, NGOs and concerned government officials are working together in Cambodia to correct some of these wrongs. Various approaches being used include developing management plans for protected areas, providing better capacity and tools for law enforcement efforts, the establishment of community-based conservation efforts in various areas, the development and dissemination of environmental education programs and materials, and other initiatives. Based on an analysis of the status and trends in forests and biodiversity conservation, the organizations with a role to play and the actions they are taking to address these threats, a number of recommendations are made in this report. It is hoped that even if only a few of these strategies can be funded, the situation for forests and biodiversity conservation will be improved now and for future years.

3. Major Natural Habitats of Cambodia

3.1 Terrestrial and Aquatic Habitats of Cambodia

Cambodia is a relatively small Southeast Asian country (181,035 km²) abutting the Gulf of Thailand to the south and sharing borders with Thailand, Laos and Vietnam. Cambodia largely consists of lowland areas, including extensive alluvial plains around the Mekong River and the Tonle Sap (Great Lake), even more extensive sandstone plains in the north and northeast, fertile soils of the Battambang plain, and a few other lowland land types. Savannas and savanna woodlands, wetlands and agricultural areas make up much of Cambodia's central plains. Except for the southeast area, where the Mekong River splits into a delta, the lowland heart of Cambodia is surrounded by mountainous areas or plateaus. The Cardamom and Elephant Mountains forming the coastal ranges include the largest upland areas of the country. The eastern border of Cambodia includes the Kontoum Plateau extension of the Annamite mountain chain of Vietnam and Laos and the Chhlong Plateau further south. Finally, the steep escarpment of the Dangrek Mountains defines the border with Thailand to the north. The mountainous areas of Cambodia are sparsely populated with humans and contain some of the last remaining habitats for wild ungulate and predator species.

It is not the mountains and plains that most define Cambodia, however. Most of all, it is distinctive for its water resources, the Mekong River and the Tonle Sap (Great Lake), which together dominate much of central Cambodia. The Mekong River originates in the Tibetan Plateau and travels through a number of countries in the region before entering Cambodia at the Laotian border. In Cambodia, the river flows south through Stung Treng and Kratie, then westward at Chhlong and south again through Phnom Penh and on to Vietnam where it becomes a delta. A number of tributaries enter the Mekong throughout its course. A major feature is the Tonle Sap River, which flows from the Tonle Sap Lake south to join the Mekong River near Phnom Penh during the dry season, and reverses its flow during the wet season. This flow pattern of water and sediments defines the unique character of the Tonle Sap, and provides the basis for Cambodia's major fishery resource. When fully flooded during this season, the lake swells to nearly five times its dry season size, and at approximately 10,400 km², forms the largest lake in Southeast Asia and the largest floodplain lake in the world

Cambodia's largely rural human population is located primarily in the plains in the center of the country and around the Tonle Sap Lake and the Mekong River. Much of the natural vegetation of these parts of Cambodia has been modified for agriculture. Other heavily farmed areas include the Battambang plains and the basalts of the Kompong Cham area. The primary crop in Cambodia is rice, and paddy is estimated to comprise about 90 percent of the agricultural land. Most of the rice crop is rainfed, with little irrigation infrastructure. Other major crops include maize, soybeans, mung beans, vegetables, groundnuts and sesame. Industrial crops such as sugar palm, sugarcane, jute and tobacco are also grown in various regions.

Wetlands cover 30 percent of the country of Cambodia, a proportion second in Asia only to Bangladesh. Much of this wetland area meets internationally accepted standards for wetlands of international importance, and this comprises over five percent of the internationally

important wetlands in Asia. Largely due to this preponderance of aquatic habitats, fish and other aquatic resources provide an estimated 70 percent of the protein for the human population.

Cambodia is also blessed with a diverse coastal zone that includes mangrove forests, seagrass beds, coral reefs and a combination of sandy beaches and rocky shorelines over its 435-km length. A number of rivers flow to the Gulf of Thailand and form estuaries at the coast. There are also more than fifty offshore islands, which are largely wooded with rocky shores and sandy beaches and often ringed by coral reefs. Much of the coastal habitat has been degraded due to a combination of anthropogenic factors, but it still contains large blocks of natural habitats that are among the best preserved in the Gulf of Thailand.

Like everywhere in the world, all of the ecosystems of Cambodia are interrelated and interdependent. Blocks of terrestrial forest areas are bisected by rivers and riddled with freshwater swamps, lakes, and ponds. Coastal mangrove forests back up to paperbark swamps which themselves back up to the steep slopes of the Cardamom and Elephant Mountains. Similarly, the inundated forests of the Tonle Sap back up to agricultural land and then to forests. The fauna of Cambodia often requires access to a number of interrelated ecosystems to fulfill their life cycles. No discussion of biodiversity is possible without considering the diversity of these ecological habitats and the myriad of interrelationships between them.

3.2 Habitats of Global and Regional Significance

Cambodia contains a number of protected areas and other sites that have received global attention. As more attention is paid to the various natural habitats within Cambodia, it is likely that more sites of international importance will be added to this list.

At present there is one **World Heritage Site** in Cambodia, the temples of Angkor Wat and the surrounding area, which has been designated for its cultural significance. Other World Heritage sites, such as the area including the Cardamom and Elephant Mountains are in the works and expected to be officially declared within the year.

A **United Nations Educational, Scientific, and Cultural Organization (UNESCO) Biosphere Reserve** has been declared on Tonle Sap Lake with three core areas: Prek Toal, on the north side of the lake; Moat Klah/Boeung Chhmar on the east side; and Stoeng Sen, a bit further to the south. Management plans are underway for these areas. Prek Toal, near the Siem Reap gateway to the Angkor Wat temples, is already the focus of considerable tourism activity, particularly in the dry season when bird populations are at their peak.

Three **wetlands of international importance (Ramsar sites)** have been designated in Cambodia. Boeung Chhmar has double billing as both a Ramsar site, and a core area of the Tonle Sap Biosphere Reserve. Two other Ramsar sites are Koh Kapik/Koh Kong and surrounding areas along the coast and parts of the middle stretch of the Mekong River north of Stung Treng.

One **globally important species-specific site**, the Sarus Crane Reserve at Ang Tropeang Thmor, was declared by Royal Decree in February 2000. This area is one of the last reserves for large populations of these endangered Southeast Asian cranes. Other sites of major global importance to particular species might similarly be located and declared for protection in Cambodia in the future.

Recent **WWF ecoregional assessments** of habitats in Cambodia, Laos, and Vietnam have determined a handful of priority ecoregions that are found partially within the borders of Cambodia. These include the Cardamom Mountains (already being considered for World Heritage status) and parts of the Mekong River and Tonle Sap floodplains (parts are already included as Ramsar sites). Other priority ecoregion areas in Cambodia that are not covered by other global agreements include the dry forests (deciduous dipterocarp and semi-evergreen forests) found east and west of the Mekong River in Cambodia, and the Annamites, which only marginally enter Cambodia.

Finally, Cambodia also is part of a number of **transboundary natural areas** that may eventually attain global conservation priority status. One of these areas, Virachey National Park in northeastern Cambodia, is currently being investigated as part of a trans-frontier reserve in connection with the proposed Dong Amphan National Park in Lao People's Democratic Republic (PDR) and the Mom Ray National Park in Vietnam. Other initiatives in other parts of Cambodia may follow.

4. Tropical Forests of Cambodia

4.1 Importance of Cambodian Forests

The forests of Cambodia, as elsewhere, serve a variety of ecological and environmental functions including watershed protection, carbon sequestration, and climate modulation. Moreover, Cambodia's forests are a valuable resource and legacy to the people of this nation. An estimated 85 percent of Cambodia's population live in rural areas, most of which are in proximity to forests and forest patches. Most rural people are poor, and depend upon firewood, and various non-timber products they can extract from the forests to fulfill some of their nutritional, health, and domestic needs. Additionally, many Cambodian people have spiritual associations with forests and particular resources therein.

Cambodian forests also have great regional importance. The diverse and extensive forests of Cambodia are presently some of the largest natural tracts remaining in the region. Other neighboring countries have greatly decimated their own forests to the point where a number of forest dwelling animals and plants have virtually disappeared. Some of these species that are extinct elsewhere, such as the kouprey and wild buffalo may still be harbored in Cambodia. The biodiversity associated with tropical forests is covered in this section.

4.2 Forest Types in Cambodia

An estimated 60 percent of Cambodia is covered with forest and woodlands and these natural forests may include some of the largest remaining tracts in continental Southeast Asia. A good detailed review of the many different graduations of forest type throughout Cambodia can be found in Rundel's (1999) *Forest Habitats and Flora in Lao PDR, Cambodia and Vietnam*, prepared for World Wildlife Fund's Indochina Program Office. Some of the major forest types of Cambodia are summarized here.

Wet evergreen forests in Cambodia are primarily found on the south facing slopes of the Cardamom and Elephant Mountains where there is an abundance of rainfall. Historically this forest type extended from the coast up to 700 m in elevation. The canopy of this forest is typically irregular, enabling enough light to penetrate to support a rich understory of palms and lianas. A number of subtypes of wet evergreen forests, including a dwarf forest type, are found at different elevations and on different soil types throughout these mountains.

Semi-evergreen forests are similar to wet evergreen forests and found in areas with less rainfall that is more seasonal. This forest type is highly variable, with a complex and tall canopy structure and extremely rich in species composition. Principle areas of this forest type in Cambodia include the northern slopes of the Cardamom and Elephant Mountains, the central alluvial plains, and the hills of the northeast. It is thought that this forest type was once the predominant landscape type in Cambodia before anthropogenic changes such as fire and swidden agriculture degraded the landscape to primarily savanna and agricultural lands.

Mixed deciduous forests are found where there is seasonally high rainfall over 1,500 mm annually followed by a five to six month drought season. Although teak (*Tectona grandis*) is

often characteristic of this forest type in Southeast Asia, it is not naturally present in Cambodia. These forests are similar to semi-evergreen forests and are found in similar parts of Cambodia.

Deciduous dipterocarp forests, often called **dry dipterocarp forests**, are low in stature and found on arid soils up to about 600 m in elevation. Occasional fires are necessary for these forests to develop, and the widespread distribution of this habitat may be due to anthropogenic factors. In Cambodia, these forests are found primarily in lowland areas north of Tonle Sap and east of the Mekong River and also on the northern and eastern slopes of the Cardamom and Elephant Mountains.

Lowland pine forests include only one species of pine, *Pinus merkusii*, which may be interspersed with other tree species. In Cambodia, these forests are found primarily south of Tonle Sap on the plateau of Kirirom National Park and the southeastern area of the Elephant Mountains.

Montane forests are found above 800 m in Cambodia, where conditions are cool and humid. In Cambodia these forests are found in the Cardamom and Elephant Mountains and in the mountains and plateaus of the northeast.

Flooded forests, often called **seasonally inundated forests** in Cambodia, are found primarily around the Tonle Sap and Mekong River floodplains. Most of these trees are deciduous and lose their leaves when submerged, although a few species remain evergreen throughout the year. These forests are known to be important nursery grounds providing recruits for the extensive fishery of the Tonle Sap. Much of this forest type has been degraded to low shrubby growth by anthropogenic activities.

Mangrove forests cover 85,100 hectares of Cambodia and are found in all coastal provinces, although the primarily rocky coastline and lack of major estuaries limits its distribution. The most pristine mangrove forests remaining are found in Koh Kong Province and also in Ream National Park, and between Kampot town and Kep municipality.

4.3 Management of Cambodian Forests

Although the data keeps changing, there is presently thought to be approximately 11 hectares of forests of various types in Cambodia. Much of this forestland is already degraded to varying degrees. During the many years of war and instability, much of this forestland was preserved from large-scale destruction. In recent years, however, increased domestic stability has precipitated an escalation in both legal and illegal logging practices.

The management of most of the remaining forest land falls with the jurisdiction of the Ministry of the Environment (MoE) in some cases and the Ministry of Agriculture, Forestry, and Fisheries (MAFF) in others. Five basic types of forestland management categories can be discriminated based on a combination of socioeconomic and ecological parameters (Thomas, 2000), as follows.

4.3.1 Concession Forests

The Royal Government of Cambodia (RGC) has allocated nearly half of the forestland in Cambodia to commercial timber concessions, most often representing large firms from throughout Southeast Asia. High-value tree species are logged from these blocks of land, often in an unsustainable manner. Up until now, the use of sustainable logging practices by concessionaires has rarely been enforced by MAFF. Some of the concessions have already been depleted of key economic species and the degraded land is on its way towards agriculturalization. A new management plan system for concessions is now in place, and during September 2001 initial 25-year plans for sustainability will be submitted by all concessionaires and evaluated by a panel of experts overseen by MAFF before new concession leases will be granted.

Community access to concessions varies from concessionaire to concessionaire. Although in theory they have the right to enter the forests to extract non-timber forest products, conflicts often arise. To date, there are inadequate measures in place to ensure community access to these resources that they have traditionally depended on.

4.3.2 Protected Areas

As much as 3.3 million hectares are classified as protected under one of a number of different protected area categories managed either by the MoE (i.e., National Parks) or MAFF (i.e., Protected Forests). The location of these protected areas often stems from historical reasons, and does not correspond to exceptionally high biodiversity or conservation value. Most often there are no protective measures actually in place on the ground, and some of these areas are already heavily degraded with little forestland remaining. Work is being done to develop appropriate management and protection plans for some of these areas and to help ensure appropriate legal access of communities to extract various non-timber forest products from them.

4.3.3 Non-Concession Forests

Some forestland with few commercially valuable trees and little conservation potential falls within the public domain. Communities can and do extract resources from these forests, both for their own use and for sale. Although some communities practice sustainable management techniques, this is not usually the case. In many of these areas, overharvest of key species has led to further degradation. There is a great need to work with communities in some of these areas to ensure sustainability and to slow the degradation.

4.3.4 Flooded Forests and Mangroves

Seasonally inundated forest around Tonle Sap and the Mekong River and coastal mangroves are managed by the MAFF Department of Fisheries for their value as key habitats for the perpetuation of fishery resources. These forests represent a small proportion of the total forestland in Cambodia, only about 85,100 hectares. Although theoretically it is illegal to cut down these forests for firewood, timber or other uses, these rules are rarely enforced. In addition, much of the freshwater flooded forestland has been converted to rice planting and

other agricultural uses. Similarly, many hectares of mangroves have been removed for the establishment of shrimp farms and other commercial uses.

4.3.5 Non-Forest Areas

In addition to the major blocks of forest management types, there are other small pockets of trees and shrubs found within communities, around pagodas, schools, waterways, etc. This land defies large-scale mapping, but is very important to the surrounding communities who often extract firewood and other products on a limited basis for home use. Some of these areas are also socially and culturally important to the communities. Community forestry practices, including tree planting and protection of these resources are sometimes in place.

4.4 Threats to Forests

The basic threats to natural forests in Cambodia stem from three interrelated problems: unsustainable logging practices (both legal and illegal); escalating rates of land conversion; and inadequate policies, laws, and enforcement practices. These problems are exacerbated by the poor state of knowledge and awareness at all levels about the status and trends in forest resource management in Cambodia, and the outside economic factors driving increased timber production. Some specific threats include:

1. Weakness of existing forestry policies and laws

The current system of allocation of timber lands to private concessions come with few regulations concerning sustainable timber extraction. Existing forestry policies and regulations also do not adequately acknowledge the role of communities in maintaining, using, and conserving forest resources. Although a new forestry policy is in the works, it is still weak in these areas. Appropriate rules and regulations are still to come.

2. Illegal logging: lack of enforcement of existing laws

Where appropriate laws do exist, they are rarely enforced. Much logging still occurs outside of approved concession areas, both by concessionaires and by other entities. Logging and unsustainable use of other forest resources also occurs within designated protected areas. There is little or no presence on the ground to enforce existing laws.

3. Legal, but unsustainable logging practices

Short-term economic goals, and not long-term sustainability of natural resources most often drive concessionaires. With few controls on their activities, most are logging at a high rate for immediate profit, then most likely moving on when the forests are depleted of key economic species.

4. Overharvesting of wood for fuel and charcoal production and various non-timber forest products

Communities are usually dependent upon certain forest resources for their domestic use and also, in some cases, for their market value. Increasing human populations in some areas are leading to unsustainable extraction rates for fuel wood and various non-timber forest products. In addition, particular species such as “yellow vine” may be overextracted and processed with chemicals such as sulfuric acid on site, leading to further destruction of the forest habitat.

5. Conversion of logged land to plantations and other agricultural practices

Once a timber concession becomes depleted of key timber species and no longer protected there is much scope for opportunities to convert the logged land to monoculture plantations and other agricultural enterprises. Such activities lead to increased land conversion rates and overall loss of natural forest cover.

6. Swidden (slash and burn) agricultural practices

Swidden agricultural techniques have long been practiced in some areas of Cambodia. The use of fire to clear land is usually a part of this process, leading to degradation of some forest types to savanna land.

7. Development of roads that provide increased access to forested areas

In some cases, the development of logging roads have provided easy access to people who seek to extract other products from the forests, set up villages and agricultural areas.

8. Poor knowledge of status and trends of forest production

Education and awareness programs are lacking in most sectors of Cambodian society. There is an overall poor state of knowledge about forest trends and ecological issues at most levels within Cambodia. The universities are just now regrouping from the dissolution caused by recent historical disturbances. At the primary school levels, little environmental education is taught to students.

A history of war and unstable conditions in Cambodia has helped preserve the forests of Cambodia, not the enforcement of sound forest policies. Now that the domestic situation has calmed, the policy base and legal enforcement capabilities must be strengthened before Cambodia’s forests become as degraded as its neighbor’s. A number of donors are working with the government and NGOs to help speed the process towards sustainable use of forest and forest products in Cambodia. Various NGO and donor actions to address the loss of forests and biodiversity are described in Section 5.

5. Biodiversity of Cambodia

Biodiversity is most often described at the ecosystem, species, and genetic levels, and all told covers all of the diversity within the biological world. The focus of this section of the report is biodiversity at the species level.

Species diversity is in large part dependent upon the integrity and diversity of the natural ecosystems they occupy. In the previous section on tropical forests, the diversity of various forest ecosystems are covered in further depth for the purposes of the FAA 118 portion of this assessment. Cambodia also contains a number of other ecosystems, including such diverse habitats as wetlands, coral reefs, and montane areas. These habitats are discussed further in the parent document, *Cambodia Environmental Review: Status and Trends in Environmental Management and Options for Future Action* and not repeated here.

A third way of viewing biodiversity is to look at the genetic level by considering sub-populations of various species and, on an even finer scale, to consider the diversity of genes within these populations. Such an approach at this time is inappropriate for a discussion of biodiversity within Cambodia. Genetic biodiversity is not well known for most species in Cambodia, a country where even the existence of certain species is problematic, let alone questions of the subspecies and population level differences between them.

The plants and animals described herein occur in a variety of habitats throughout Cambodia, and the conservation threats to them cover both habitat-related issues and those that are more species-specific. As seen below, the main importance of Cambodia to biodiversity conservation efforts is the presence of relatively large tracts of natural forest, wetlands and coastal areas harboring populations of species that have dwindled or even disappeared elsewhere in Southeast Asia, where habitat destruction has progressed to a much larger extent. Added to this are problems of overextraction of particular species with economic importance, and other direct and targeted effects on particular species. Together these problems are tough ones that Cambodia will need to face soon in order to conserve the natural resources that remain.

5.1 Mammals and Birds

As with other parts of the world, in Cambodia the mammal and bird species are the best known of the country's many species. Birds and mammals have much importance for many Cambodians, as sources of food and revenue and in some cases hold great spiritual value as well. These species are often are of great interest to many people outside the borders of the country and also among the most attractive for ecotourism efforts. For these reasons, although mammals and birds make up only a very small part of the species diversity in the world, they have been the most thoroughly studied, and have attracted the most conservation attention.

More than one hundred species of wild mammals (excluding domesticated forms) have been recorded from Cambodia, but there are likely to be more species recorded, particularly of bats, when further surveys are conducted in key areas. Although the World Conservation Union (IUCN) Red List shows 49 mammal species of conservation note in Cambodia, only 35 of these

have actually been found in this country to date. Two species that are included, the Javan rhinoceros (*Rhinoceros sondaicus*) and the kouprey (*Bos sauveli*) are quite possibly extinct in Cambodia at this time. Another species, the Khting Vor (*Pseudonovibos spiralis*), is known only from horns and may not be a true species. A few other mammal species that are listed for Cambodia have not yet even been discovered here although they are found in surrounding countries. The four areas of Cambodia with most importance for the conservation of rare mammals include the northern plains west of the Mekong River, and north and east of Tonle Sap (24 Red List species); the eastern plains in and around Mondulhiri Province (21 Red List species); the southern Annamites (19 Red List species); and the Cardamom Mountains (18 Red List species). Additionally, a number of rare and little known mammals, such as dugongs (*Dugong dugon*) and Indo-Pacific humpback dolphins (*Sousa chinensis*) are found in Cambodia's coastal and offshore waters.

Cambodia's bird fauna is also fairly well known and of widespread importance. There are reported to be more than 500 bird species in Cambodia, but this number continues to increase as more birdwatchers and ornithologists begin to look harder in different areas of the country. Of these, Birdlife International considers 39 species to be globally threatened or globally near threatened. Most of these birds are dependent on the large wetland habitats, especially around the Tonle Sap and also the smaller wetland patches within the northern dipterocarp forest plains. The large aggregations of waterbirds that collect in these areas during the dry season are among the largest groups of such birds still found in mainland Southeast Asia. Although a few important bird species are also found in the coastal areas, the southern Annamite Mountains, and the Cardamom Mountains, these areas are not exceptionally important for bird diversity in Cambodia, or of similar global importance for bird conservation efforts.

Among the bird and mammals species in Cambodia are a number of "flagship" species that capture the world's attention to appropriate conservation action to preserve them and their habitats. Tigers (*Panthera tigris*) and elephants (*Elephas maximus*) are among the most loved animals in many Western zoos, and similarly their conservation as flagship species in Cambodia has much attention, despite the fact that remnant populations of each still remain in the country. Cranes also command worldwide attention and stand as a symbol of wetlands conservation efforts. Although the population of cranes in Cambodia is centered on a single reserve north of Tonle Sap, the numbers are viable and the remaining animals are being protected. The use of charismatic animals like tigers and cranes is universally recognized as one way to protect habitats and this approach should continue to be encouraged in Cambodia.

5.2 Fish, Reptiles and Amphibians

Despite the fact that fish have great economic importance in Cambodia, there is a relative scarcity of information on the diversity of fish species and the life histories of even the most important ones. It is presently estimated that there are upwards of 1000 fish species, although the Fishbase estimates list only 486 for freshwater and 357 for brackish and saltwater habitats. For the most part, the only areas where the freshwater fish have been studied are flooded areas around the Tonle Sap and the Mekong River, both habitats that support an abundance of fish, but not many species. Primarily only the larger economic species have been considered. Little attention has been diverted to other freshwater areas, or to surveys of smaller fish with little if

any economic importance. As more studies are done of the fish species found in areas with known biodiversity such as rapids and riffles on streams and the middle reaches of the Mekong River, and in various small streams and wetlands, many more species are expected. Similarly, although the coastal areas of Cambodia include a number of habitats that most likely support a great diversity of fish species, the appropriate studies remain to be done. A few fish in Cambodia have received international attention however. One of these, the giant Mekong catfish (*Pangasianodon gigas*) with its long known migration along the Mekong River has even been proposed as a flagship species to divert conservation attention to the entire system.

Reptiles and amphibian in Cambodia are even less well known than fish, and surveys on these species are few and include largely old historical records and a scattering of recent surveys in a few protected areas. At present there are 28 species of reptiles on the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) list, however, which shows that even if this taxa is not well known in Cambodia, certain species have economic value and are being traded into rarity. Most well-known reptiles include the Siamese crocodile like the Siamese crocodile (*Crocodylus siamensis*) which is raised in crocodile farms and the mangrove terrapin (*Batagur baska*), which are also called “royal turtles” in Cambodia because they were once considered to be the exclusive property of the royal family. A few endemic reptiles and amphibians are also known to be found in Cambodia but much more work still needs to be done to get a better picture of the biodiversity of these animals in the country.

5.3 Invertebrates

Very little is known about non-vertebrate fauna of Cambodia, although as elsewhere these species make up most of the species diversity of life. Many “shellfish” including crustaceans like shrimp and crabs, clams, oysters, and other mollusks and many other aquatic species are harvested commercially, but are not well studied. Those mollusks, crustaceans, insects, worms, corals, and a myriad of other invertebrate taxa with little economic value have been virtually unstudied. No estimates exist on the biodiversity of these species in Cambodia, but due to the diversity of habitats they are found in, it can be assumed to be very diverse.

5.4 Plants

The plants of Cambodia have been poorly studied and no accurate assessment of the diversity of Cambodian plants is presently available. Although one widely quoted author suggests that there are 2308 vascular plants in Cambodia, other experts claim that the numbers most likely will exceed 3,000 species or maybe even as many as 15,000. It is expected that a number of endemic species of plants exist in areas that are isolated patches of habitats with special environmental conditions, such as high mountains areas, isolated limestone outcrops, peat swamps, and other unique habitats. Obviously much more information is still needed to understand the diversity of plants in Cambodia.

5.5 Significance of Cambodia’s Biodiversity

Cambodia’s great biodiverse resources hold great economic, nutritional, domestic, and social value for the people of this country. Most of Cambodia’s population is rural and poor, and the

vast majority depends wholly or supplementarily on natural resources for their survival. Other species have great cultural or social value to many Cambodians. Still others are harvested for economic gain. All of these factors are considered at length in the parent document entitled *Cambodia Environmental Review: Status and Trends in Environmental Management and Options for Future Action*. The importance of biodiversity to the well being of Cambodians is the principle reason to conserve it.

A number of species in Cambodia have also received international attention. The online 2000 IUCN Red List of Threatened Species (www.redlist.org) lists 149 species that are thought to be endangered, threatened, or otherwise rare enough or suitably unknown to require international attention for conservation efforts. The species listed in the Red List are those that are best known and of most interest to most people, and include primarily mammals, birds, reptiles, some fish, and a few economically important plants. Most of the diversity of species on earth have not been adequately studied and considered in such listings. No doubt Cambodia also harbors a myriad of other species such as insects, mollusks, corals, worms, vascular plants, fungi, etc. that might also be threatened with global extinction and should be listed, if and when such survey efforts are completed and enough data exists to include them.

Since most of Cambodia's key habitats are shared with its neighboring countries there are relatively few species that are considered to be "endemic" and only found in this country. Such species include more than 200 plants, and a few animals such as the Cardamom gecko (*Cyrtodactylus intermedius*), the Tonle Sap watersnake (*Enhydris longicauda*) and a handful of others. More endemic species of plants, small vertebrates, and especially, invertebrates such as terrestrial mollusks and insects, will most likely be found if appropriate studies are ever organized in various limestone outcrops and higher elevation areas where some geographic isolation exists. There are, however, many other regionally endemic plant and animal species in Cambodia that are only found in the geographic area shared with parts of Thailand, Laos, and Vietnam, including some genera and a few families of plants, a number of vertebrate species and subspecies and most likely many more invertebrates as well.

Cambodia's primary importance to biodiversity conservation efforts is not on the national scale focusing on the few endemic species, but instead for the habitat it still contains that harbor a number of species that have disappeared or become exceptionally rare elsewhere in the region. The remaining populations of some bird species in Cambodia are of particular globally significance. The abundance and species diversity of waterbirds that breed and feed in the Tonle Sap area during the dry season forms the largest such aggregation in mainland Southeast Asia and some rare birds, like the Sarus crane (*Grus antigone*) have some of their remaining largest breeding grounds within Cambodia. Cambodia still contains populations of tiger, elephants, wild cattle, otters, dhole and other mammal species and a number of reptiles, like the Siamese crocodile and the mangrove terrapine that are of worldwide interest. A number of economically important freshwater fish require the intact flooded forests of the Tonle Sap or the freshwater riffles of the middle reaches of the Mekong River to feed and spawn. Some of these fish are important long distance migrators travelling to other countries north of Cambodia. Similarly the coastal waters of Cambodia also provide habitat for a number of economically important fish and invertebrate species that populate the fishing nets of fishermen throughout the Gulf of Thailand. The habitats of Cambodia and the wealth of species that live

within them are thus not only a legacy to all Cambodians but also an important contribution to the diversity of the region and the world.

5.6 Threats to Biodiversity

The threats to biodiversity in Cambodia can be considered from both the ecological and from the administrative perspective, and in both views the threats to biodiversity and natural resources in Cambodia are severe. Specific threats to forests that encompass both biological and management factors are provided in Section 4 as part of the “tropical forest assessment” section of this paper. Both of these types of threats are also detailed in the parent document *Cambodia Environmental Review: Status and Trends in Environmental Management and Options for Future Action*. To avoid duplication only the major threats of both types—biological and management—are summarized here.

5.6.1 Habitat Destruction and Unsustainable Use of Key Species

When looked at purely biologically, the two main types of threats include 1) habitat destruction and degradation, and 2) targeted unsustainable use of particular plant and animal species. Both categories of threat are widespread and increasingly leading to loss of animal and plant populations and habitats in Cambodia. Factors leading to habitat degradation and destruction are as varied as the habitats themselves and all stem primarily from various anthropogenic factors. For instance, most terrestrial forested land is subject to logging and large-scale removal of trees, timber, and other forest products. As this land is logged and degraded, some of it is further degraded into agricultural land and village settlement. Similar, mangrove forests are heavily used for firewood collection and charcoal making, and large sections of natural forest have also been converted to other uses such as shrimp farms and salt evaporation pans. Coral reefs and seagrass beds are also faced with a variety of factors that are degrading them and decreasing their biodiversity. Increased sedimentation from logging and agricultural and industrial run-off from coastal areas are contributing to declines in water quality, which in turn have negative impacts on the coral and seagrass habitats and the species who rely upon them. Further outright destruction is caused by harmful fishing practices such as the use of dynamite and the use of bottom-destroying trawlers and large-scale push nets in shallow, fragile waters. Freshwater habitats face their own set of similar problems, which also include the use of destructive fishing gear and the conversion of fish feeding grounds in the flooded forests to other uses. Another potential threat to freshwater biodiversity is beginning to occur with the introduction of exotic species such as water hyacinths (*Eichhornia crassipes*) and tilapia (*Oreochromis niloticus*) fish, which become established in natural areas by displacing other native, but less hardy, species. Although as of yet the increased use of pesticides in agricultural areas surrounding Tonle Sap have not taken a great toll on biodiversity, this undoubtedly will happen if the use increases without appropriate safeguards. These various threats are detailed for different habitats in Section 3 of the parent document.

The second category of biological threat is the direct and unsustainable use and removal of targeted species. Commercial logging targets particular tree species that are rapidly disappearing in Cambodia. Collection of firewood beyond sustainable levels in some areas destroys these target species as well. Even the extraction of some non-timber forest products like yellow vine and rattan has taken its toll in some areas. Hunting and fishing also has a large

impact on the biodiversity of Cambodia. There has been considerable attention paid to the illegal removal of charismatic species like tigers and bears from the forests of Cambodia leading to the disappearance of these species in many areas where they once were present. In some cases, overhunting of food species like various deer wild cattle not only results in the decline of these target species, but also lowers the prey base for the predators that depend upon them. The fishery sector in both freshwater and marine areas also has its overfishing issues, with the stock and fish size showing marked declines and a number of species becoming rarer and rarer. This decline in sought after species has further impact on other species that then become the new fishery targets. Right now, for instance, there is a boom in the collection of water snakes in the Tonle Sap, for export, for feeding to captive crocodiles, and for local consumption by people who can no longer find other fish they can afford to eat. The tonnage of snakes captured in the Tonle Sap is estimated to be the highest extraction of snakes anywhere in the world. Who knows what impact this, too, will eventually have on the biodiversity of the lake.

5.6.2 Administrative and Management Threats

The threats to biodiversity in Cambodia can be viewed from a NRM perspective and not just a biological one. In fact, it is the lack of good management practices within Cambodia that is driving the loss of the diverse and abundant flora and fauna of this once richly endowed nation. These threats encompass five main areas that are somewhat interrelated. These include 1) uncertain land tenure arrangements, 2) a lack of information and awareness about conservation and sustainable use at all levels, 3) a lack of well-founded laws and policies, 4) inadequate enforcement of those laws already in place, and 5) widespread corruption in the use and benefits derived from natural resources. To avoid duplication, details of these basic threats are given in the parent document and only summarized here.

Access to land, fishing grounds, and other natural resources is presently a muddy issue in Cambodia. Large blocks of habitat have been allocated to commercial timber concessions, usually with international interests, and access to communities and other local people is variously restricted. Similarly the best fishing grounds in many freshwater areas have been given to commercial fishing interests with little concern for local fishermen. In coastal areas, although communities have the purported rights to fish in nearshore waters, these waters are increasingly invaded by large commercial fishing boats using destructive fishing practices. For the most part, these large commercial interests in all sectors are not looking towards sustainable management of natural resources, but instead, towards extraction of as much as possible before moving on. The local communities who stand to gain from sustainable use of these resources are left with nearly nothing. Gradually the government policies towards concessionaires and other commercial interests seems to be changing, but it is not likely that this will happen completely until most of the most valuable resources have been extracted.

The lack of information of biological diversity, ecological integrity and conservation practices like sustainable use is also evident in Cambodia. Little information exists at the national level on even the presence of some species, and rarely are life history factors known enough to adequately manage existing stocks of timber, fish, and wildlife. There is also a widespread lack of knowledgeable experts working within the government at all levels, a lack of good public education programs, and a lack of strong institutes of higher learning that could produce such

specialists. Similarly, although much local knowledge traditionally exists in many parts of Cambodia, this information is not enough. The continued presence of military regiments in some areas and the influx of other non-natives to other areas have diluted this knowledge base in many areas where it should be important.

This lack of information and human resources have been factors contributing to the lack of well-founded laws and policies in most natural resources sectors in Cambodia. Other factors include the recent recovery of Cambodia from war and civil unrest that has diverted policy attention to other areas and the lack of political will to make policy changes that might have a negative impact to some in power. This situation is changing now with the drafting of new policies in Wildlife, Fisheries and Land Tenure, etc. Once these policies are approved there is still much work to be done to develop appropriate rules and regulations stemming from them. Without such laws and regulations, biodiversity remains at risk.

Even where there are appropriate laws in place, however, these are rarely enforced. This is largely due to the lack of capacity in both staff and equipment at all levels, and especially in the provincial districts and on-the-ground where most enforcement efforts need to be conducted. Without vehicles and radios, who can patrol the forests? Without boats and motors, who can patrol the waterways? And, when government salary levels are generally \$30/month or lower, who can afford the time?

Finally, one of the most overriding administrative concerns in the management of natural resources in Cambodia is the often silent but usually deadly issue of corruption at all levels of government. If someone is only paid \$30/month, not enough to feed a family, why not look the other way for money if this is offered? And, if someone is in power at higher government levels, why not take some money from a rich international concessionaire in exchange for good fishing grounds or timber lots? Until such rampant practices are revealed and dealt with appropriately, the situation for conservation of biodiversity and natural resources in Cambodia will not be a good one.

6. Tropical Forests and Biodiversity Conservation Efforts in Cambodia

Despite the grim review of threats to Cambodian forests and biodiversity the situation is not completely hopeless. A number of efforts are being taken by a variety of donors, NGOs, and government officials at many levels. Cambodia is a signatory to a number of global conservation conventions and is gradually beginning to fulfill some of the related requirements at an international level. Within the country, too, a solid core of concerned citizens and local initiatives are forming alliances with international organizations and finding resources and impetus for their conservation activities. A fuller account of all of these efforts and all of the players in various natural resources sectors is given in the parent document *Cambodia Environmental Review: Status and Trends in Environmental Management and Options for Future Action*, and only summarized here. But even in this summary, it is evident that in some sectors, at some levels of government, in some geographical areas, the positive impact of various approaches may one day become evident.

6.1 Organizations Playing a Role in Cambodian Conservation Efforts

A variety of organizations and entities are involved in conservation responsibilities and actions within Cambodia and only some of the key ones are listed here. On the government side, biodiversity and tropical forest management matters reside largely within the MoE, which among other things, oversees protected areas, and with MAFF with its related Department of Fisheries, and Department of Forestry and Wildlife, which oversee various natural resources country-wide. Both ministries operate at both the national and provincial levels, with offices and operations in Phnom Penh and out in the provinces. There is a known overlap of responsibilities between these two ministries that sometimes causes conflict between various departments at both national and regional levels. Other ministries and government departments also have some responsibilities relevant to natural resource protection and conservation efforts.

Various donors and multilateral organizations also play a large role in supporting Cambodian conservation efforts. Cambodia receives funding for natural resources conservation efforts from many developed countries including Denmark, Finland, Germany, Great Britain, Japan, the United States, and others. In addition to these bilateral donors, there are a number of multilaterals with interests in various aspects of the environment in Cambodia. These include the World Bank, the Asian Development Bank and various United Nations (UN) organizations such as the UN Environment Program (UNEP), UN Development Program (UNDP), and Food and Agriculture Organization (FAO). Because of the notable biodiversity and other natural resources within Cambodia, there are also a number of Global Environment Facility (GEF) conservation projects within the country and the region. The Mekong River Commission has its regional headquarters in Phnom Penh and supports some projects within Cambodia along with other initiatives within the four countries within its jurisdiction. For the most part, these donors and multilateral organizations have carved out various niches for themselves within the environmental sectors, although there are some overlaps and some donor coordination needs have yet to be addressed.

There are many international, national and local NGOs actively working in various biodiversity and natural resources sectors. Among the most visible international conservation NGOs in Cambodia are the Wildlife Conservation Society, World Wildlife Fund, Wetlands International, Flora and Fauna International, Conservation International, the International Crane Foundation, WildAid, IUCN, Traffic, and some others. A number of national NGOs including Save Cambodia's Wildlife, Mlup Baitong, Osmose, Culture and Environment Protection Organization, and the NGO Forum focus on conservation education, awareness, and networking projects in Cambodia. Finally, many other NGOs work at the provincial and community levels throughout the country. More details on the activities of many of these organizations within a number of natural resources sectors are presented in the parent report to this assessment.

6.2 Cambodia's Involvement in International Conservation Agreements

Cambodia is a party to a number of international conservation conventions but its compliance with these agreements varies greatly in effort and effectiveness. The NGO and donor community in Cambodia is playing an increasingly expanding role in helping Cambodia fulfill the international mandates it has agreed upon in various agreements. A few select examples follow.

Cambodia has ratified the Convention on Wetlands of International Importance (Ramsar Convention) in 1999 and with help from Wetlands International and support from the Asian Development Bank and other donors, has so far officially listed three Ramsar sites in Cambodia. Work is now being done to develop management plans for these areas. Cambodia also protects the Angkor Wat area under the UN World Heritage Convention and is considering the inclusion of other areas, such as the Cardamom Mountains, with help of Conservation International.

Cambodia became a signatory to the Convention on Biological Diversity (CBD) in 1997 and work required under this agreement is progressing in Cambodia, with the preparation of the Biodiversity Prospectus in 1997, and the nearly completed efforts to prepare a Biodiversity Action Plan and Strategy that are being undertaken for the government of Cambodia with support from FAO. Cambodia has been a party to CITES since 1997 but has done little to implement it. Help in this regard should soon be underway now that Traffic has opened an office in Phnom Penh.

Cambodia also became a party to the Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin (MRC) and is now the current home of the MRC Secretariat, which is supported in part by the Danish International Development Agency (DANIDA) and UNDP. Cambodia is also a signatory to other conventions, including the International Convention for the Prevention of Pollution by Dumping of Wastes and Other Matter (MARPOL), the International Convention to Combat Desertification (CCD), the United Nations Convention on the Law of the Sea (UNCLOS), the Framework Convention of Climate Change (UNFCCC), the International Tropical Timber Agreement (ITTA), and others. Various donors and NGOs also are helping to play a role with some of these conventions but much more work is still needed.

One important conservation organization that the RGC, unfortunately, is not a member of is IUCN. Until this situation changes, Cambodia's visibility and role in the important triennial General Assemblies remains limited to the country offices of NGOs like World Wildlife Fund, Flora and Fauna International, Wetlands International, Conservation International and others who are international NGO members of the IUCN.

6.3 Conservation Approaches in Cambodia

Donors, NGOs, and governmental agencies within Cambodia are supporting a number of different approaches to stem the loss of biodiversity and tropical forests. Some of these approaches and representative examples are described here but much more information on this topic is presented in the parent document.

One area that is getting some much-needed attention in Cambodia is that of capacity building within various branches of the government. Different donors are supporting the work of some government-based initiatives such as the MoE Environmental Management of the Coastal Zone project that is supported by DANIDA, and the World Bank Forest Concession Management and Control Pilot Project situated within the MAFF Department of Forestry and Wildlife. Many more such examples exist within appropriate departments and sectors of the national and provincial government. Some NGOs, including the Wildlife Conservation Society, Wetlands International, the NGO Forum are similarly working with government counterparts in the formulation of new Fisheries, Forestry, and Land Laws and are closely watching the progress of these laws through the adoption process. Other conservation organizations in Cambodia have focused on the formulation of various decrees that impact particular species or geographic areas. One example of this approach is the International Crane Foundation's success in spearheading a royal decree that gave official status to the Ang Trapeang Thmor Sarus Crane Conservation Area. Government agencies responsible for enforcement of existing wildlife and forestry laws are also getting some NGO and donor assistance. The Forest Crime Monitoring Unit, in both MoE and MAFF, is variously funded by a handful of donors and works in synchrony with the Global Witness, WildAid, and other NGOs in carrying out its mission. Local law enforcement activities in and around the Cardamom Mountains is similarly supported through efforts of Conservation International and other such activities are no doubt occurring elsewhere in the country.

Another biodiversity and forest-related area that is receiving NGO attention is the design and management of protected areas. Wetlands International is active in developing management plans for the three Ramsar sites within Cambodia and has also worked with DANIDA to develop a better management arrangement for Ream National Park on the coast. Conservation International and Flora and Fauna International are supporting work towards establishment of a Biosphere Reserve in and around the Cardamom Mountains. The Wildlife Conservation Society and World Wildlife Fund are similarly working in northern and eastern areas of Cambodia in various protected areas and reserves. These organizations are also conducting wildlife survey and monitoring studies both within their areas of concern, and in some cases, more widely.

Many of these same organizations and more are working in community-based NRM (CBNRM) in and around the protected areas they are involved in. World Wildlife Fund, for instance, has a community-based conservation program in and around Virachey National Park and in other areas in eastern Cambodia. Wetlands International has been instrumental in setting up a community fisheries organization in Ream National Park. Other organizations also engage in community-based work around the country. Some examples include the work of FAO around Siem Reap, the work of Mlup Baitong around Kirirom National Park, and the work of the Culture and Environment Protection Organization around Stung Treng. Oxfam Great Britain (Oxfam GB), Oxfam US, a number of missionary groups, and many other organizations also work around the country on various community-level projects that have a NRM slant.

The development and facilitation of education and awareness programs also has received support from a number of NGOs throughout Cambodia. Although most international NGOs include some variety of education or awareness activities within their programs, this is an area where national NGOs seem to particularly excel. Mlup Baitong provides educational programs for communities around Kirirom National Park and also collaborates with Save Cambodia's Wildlife in delivering interpretive and educational activities at the Phnom Tamao Zoo outside Phnom Penh. FAO's Gecko Center is another environmental education facility that provides programs for children and teachers in the Siem Reap area. A unique approach to environmental education in Cambodia involves providing monks with a Khmer translation of the Thai *A Cry in the Forest* to enable them to use Buddha's teachings to teach their constituents about environmental concepts. Similarly a Khmer children's book depicting a monk's journey, *A Walk through the Forest*, has been developed by Save Cambodia's Wildlife and widely distributed. Finally, there are also some awareness programs just begun that use different media. WildAid has recently put up wildlife-related banners in English and Khmer throughout Phnom Penh. Mlup Baitong is beginning a radio show with an environmental theme, and initiative are also underway to present relevant material in videos and on television. In this country with poor literacy rates, such use of other media is especially important.

Some other approaches to biodiversity conservation efforts that are often used elsewhere as yet have little applicability to Cambodia. For instance, *ex situ* conservation programs involving zoos and botanical gardens are in their infancy in this country, and such efforts should not be encouraged until upgraded facilities and human capacity are present. Although the government-run zoo outside Phnom Penh provides adequate housing for confiscated species, it presently has no resources or emphasis on research efforts. Aside from this zoo, the situation for the rest of the captive animals in Cambodia is dismal. At present there are also no botanic gardens within Cambodia although one initiative is being considered for the future. Another often mentioned approach elsewhere, that of ecotourism, is not at present a likely candidate for much further support. Few tourists travel to Cambodia as of yet to enjoy the wildlife and parks, since better facilities and opportunities for wildlife viewing and coral reef diving exist elsewhere in the region. One possible area where increased ecotourism might have a role, however, is in Siem Reap, where most tourists to Cambodia pass through on their way to Angkor Wat. An estimated 10 percent of these tourists also visit Tonle Sap. One budding ecotourism program, Osmose, operates boat trips to Prek Toal Biosphere Reserve in this area, and quite possibly these efforts might increase in the years to come, thus providing some private sector revenue for related conservation efforts in this area.

7. Overall Recommendations for Further Biodiversity and Tropical Forest Conservation Actions

Based on the information and analysis in this report and in the parent document, which covers NRM issues more broadly, there are a number of recommended actions that would help to address the loss of forests and biodiversity in Cambodia. Some conditions, including the widespread corruption within relevant government agencies and the economic forces driving the destruction of wildlife and habitats are beyond the role of USAID to address at this time. Similarly, with current congressional restrictions on using USAID funds to provide direct assistance to governmental agencies at the national level, there are other approaches that can not be taken. Despite these limitations there is still much room for USAID to actively address the threats to biodiversity and forests and to have a role in some of the solutions. Some key recommendations are given here for USAID and for other donors. Although it is expected that not all of these can be addressed under the current mission strategy, any attempts to tackle any of these recommendations should have a positive impact on the future of natural resources and biodiversity of Cambodia.

1. Local government agencies at the provincial level need to be strengthened in their efforts to understand and enforce existing natural resources laws and regulations.

The present situation in Cambodia is one of a near total lack of enforcement of laws relating to fisheries, wildlife, and forests. Even in cases where the will exists, relevant agencies and authorities at the provincial level do not have the equipment or expertise to effectively enforce these laws. Providing appropriate tools and training to select provincial fishery and forestry departments could have a strong and noticeable impact towards safeguarding key natural resources in these areas.

2. New policies and laws need to be developed that provide a better framework for conservation and sustainable use of forests and biodiversity.

In many cases the existing natural resources policies and laws are not biologically sound, do not ensure community access to land and natural resources and do not appropriately handle the necessary role of communities in managing resources at the local level. Work needs to be done to strengthen civil society in advocating for changes in these laws and in developing appropriate alternatives.

3. Communities need to be strengthened in their understanding and capacity to sustainably manage the natural resources within their domain.

In some cases, communities already have access to land and natural resources but could benefit from an increased understanding and better tools to use these in a more sustainable manner. In other cases, for instance, in changes in the new fisheries policy, communities are being given access to resources that have formerly been in private hands. In both cases, capacity-building efforts are needed at the community level to ensure their understanding of relevant policies and to help them sustainably use and manage these resources.

4. Appropriate management plans need to be developed and implemented for important protected areas and key resources.

Protected areas in Cambodia have largely been set up for historical reasons and not with a clear understanding of the biodiversity and natural resources contained therein. The entire protected area system in Cambodia needs a full review to ensure that it contains areas that are necessarily rich in biodiversity and natural resources. Particular protected areas also need well thought out management plans and the capacity to enforce them. Strong consideration must also be given to the sustainable use of key natural resources by surrounding communities who have long been dependent on them.

5. CITES efforts need to be strengthened and the trafficking of wildlife species needs to be curtailed.

Although Cambodia is a party to CITES, it has so far not been strong in implementing actions to reduce the trade of wildlife and natural products across its borders. The role of NGOs in monitoring CITES compliance needs to be strengthened along with the relevant government entities charged with enforcement.

6. The management rights of private sector timber concessionaires and commercial fishing block holders must be appropriately defined and enforced to reduce conflicts with local communities and to avoid unsustainable extraction of Cambodia's natural resources.

Within Cambodia, many large blocks of natural resources are allocated to timber and fishery concessionaires. Regulations regarding their management of these resources and giving appropriate access to communities need to be strengthened; sustainable management plans need to be developed; and the concessionaires' compliance with these plans need to be enforced.

7. Capacity-building efforts are needed to strengthen the knowledge base of natural resources managers in government agencies and NGOs and to strengthen Cambodian institutes of higher education to produce graduates with such knowledge.

Cambodia lacks educated and trained individuals in positions of responsibility and authority within its government agencies at all levels, and within the NGO and university communities. More students need to receive training in areas of NRM and conservation so that they can fill some of these gaps. In addition, the national university system requires institutional strengthening to enable it to fulfill its role in educating the future generation of natural resource managers in Cambodia.

8. More information, environmental education and awareness programs about forests and biodiversity are needed in Cambodia at all levels.

Among the Cambodian public, there is limited awareness of the nation's biodiversity riches and conservation needs. More education and awareness programs need to be developed and implemented for targeted audiences ranging from school children, to community groups, to the general public. These efforts need to include all media, such as radio, videos, billboards and in-person discussions in order to have maximum effectiveness in this largely illiterate country.

9. A database of information on species and their occurrence in Cambodia needs to be established and the relevant data collected from the field to enable effective management of biodiversity resources.

At present there is a scarcity of information about the presence, distribution, and life history for many species within Cambodia. As part of institutional strengthening programs, a database of species information needs to be set up and data needs to be collected from the field before Cambodia's biodiversity can be effectively managed and conserved.

10. Geographical focus: Local and provincial level biodiversity and forest conservation activities are especially scarce but critically needed in the dry dipterocarp forests and associated wetlands and river stretches in the northern plains and adjacent highlands.

The northern plains of Cambodia and adjacent highland areas stand out for the convergence of rivers with diverse fish species with some of the largest remaining tracts of dry dipterocarp forests in mainland Southeast Asia. Within these forests are small wetlands that support sizeable populations of large and elsewhere rare waterbirds and large mammals such as wild cattle, elephants, and tigers. This area has not yet attracted much donor attention and needs to be recognized and supported soon before key resources are lost. Community-level work in these areas would have the greatest impact on conservation of globally important biodiversity and important forest habitats. If funding for community- and provincial-level work is limited, it is suggested that it be focused here first.

8. Recommended Actions in USAID/Cambodia IESP: Relationship to Biodiversity and Tropical Forest Conservation

A parallel project to the production of this Tropical Forests and Biodiversity Assessment has been the production of a proposed Interim Environmental Strategic Plan (IESP) for USAID/Cambodia. In this section, in accordance with the clauses of FAA Sections 118 (tropical forests) and 119 (biodiversity) the “extent to which the actions proposed for support by the Agency meet the needs thus identified” is addressed.

The full IESP appears in Annex 1 to the parent document and only the recommendations are repeated here for this analysis. The IESP recommends an Intermediate Result (IR) to be incorporated with the Democracy and Governance (DG) Strategic Objective (SO) 1 with an example of various illustrative activities.

8.1 Proposed IR: Strengthened Local Governance of Natural Resources to Secure Community Control over Resources Critical to Rural Livelihoods

Four “points of entry,” or sub-IRs are suggested, including:

1. **Community-Level Entry Point: Improved community control over management and conservation of forest and fishery resources.**

Illustrative Activities

- Assist communities to develop institutions to manage resources under their control.
- Assist communities to identify, value, map, and plan the management of their resources.
- Strengthen the capacity of communities to advocate for their resource use rights to government and the private sector.

2. **Local Government Entry Point: Strengthened ability of commune councils and other levels of local government to implement new land and natural resource management laws and to reduce natural resource-related conflict and human rights abuses.**

Illustrative Activities

- Provide commune councils with legal and technical training that will allow them to play their intended role in NRM.
- Educate communities and resource users about their rights under new land and NRM laws and how to effectively advocate for recognition of their rights.
- Facilitate cooperation and joint activities between HR/DG and conservation/environmental NGOs and other civil society organizations.
- Assistance to establish land and natural resource conflict prevention and resolution mechanisms to be implemented at the commune and province levels.
- Support NGOs to investigate and publicize natural resource-related human rights abuses.

- Develop and foster mechanisms for inter-level and interagency cooperation with respect to NRM and land use planning.
- Support conservation NGOs, in cooperation with the USFWS, to strengthen the ability of provincial-level government agencies to control the illegal harvest and trade of wildlife and timber.

3. Legal Framework Entry Point: Support civil society to participate in the process of national level consultations to refine and monitor the implementation of the legal framework for land and natural resource management as they relate to CBNRM and NRM governance at provincial and lower levels.

Illustrative Activities

- Disseminate to donors and NGOs lessons learned from natural resources DG activities at the community and local government levels and support NGOs to advocate the incorporation of these lessons into government policy.
- Support NGOs to participate in the process of consultation and review of implementing regulations for soon-to-be approved Land, Forestry, and Fishery Laws.
- Support NGOs to identify illegal activities and corruption related to NRM and bring their findings to the attention of the government and the public.
- Provide public awareness and environmental education to help citizens participate in the political dialogue about NRM and biodiversity conservation.
- Encourage NGOs to develop mechanisms for ENR conflict prevention and resolution.
- Support NGOs to monitor the enforcement of ENR laws.

4. Private Sector Entry Point: Facilitate improved natural resources management by the private sector through recognition of community rights and innovative partnerships with communities and communes.

Illustrative Activities

- Devise and demonstrate incentives and approaches for the private sector to partner with communities and communes to manage and market natural resources.
- Support NGOs to establish forest certification in Cambodia as a private sector-driven means to improve forest management, and in the context of this IR to use certification as a leverage point to gain recognition of community resource use rights by concessionaires.
- Create the opportunity for the growth of small, knowledge-based businesses by giving communities funds and guidance to hire local firms to assist them with natural resources and land use planning as well as environmental and social impact assessment, if warranted. This would create 1) an incentive for the private sector to offer services usually provided by government or NGOs, 2) a new business niche in rural areas, and 3) employment for university graduates in natural resources and agriculture.

8.2 Analysis of Relationship between the Proposed IR and the 118/119 Assessment

The points of entry and illustrative activities suggested in the IESP are closely related to a number of the overall tropical forest and biodiversity conservation recommendations presented in this report. Some of the most salient overlaps are considered here.

The proposed community entry point 1 clearly corresponds to biodiversity recommendations 3 and 8 that involve empowering local people to manage their own resources and providing them with knowledge about them. Community control over their resources is also a factor that can be addressed through policy changes described in recommendations 2, 4, and 6.

Entry point 2, local governments, just as clearly overlaps with biodiversity recommendations 1 and 7 and to some degree with recommendations 2, 4, 6, and 8 as well. In all of these recommendations, it is important that the local government entities be strengthened, empowered, and educated to perform their natural resource-related responsibilities effectively.

Similarly, entry point 3, concerning legal frameworks, closely dovetails with biodiversity recommendations 2, 4, 5, 6, 7, and 8 which all could involve civil society to one degree or another in efforts to learn more about and monitor the enforcement of existing laws and to work on the development of new and more effective ones.

The private sector entry point 4 also closely corresponds to biodiversity recommendation 6 with overlaps in other recommendations as well. Although presently in Cambodia, the private sector presents some of the greatest impediments to biodiversity conservation, this could turn around, and more appropriate involvement of the private sector could be an asset.

If the local- and provincial-level work outlined in all the entry points focus efforts in parts of the northern plains then biodiversity recommendation 10 will be addressed as well.

The only biodiversity recommendation not covered in some way in the proposed IESP is number 9, which requires a scientific perspective most likely beyond the purview of USAID programming. Although implementing recommendation 9 will have long-term positive effects, right now the threats to forests and biodiversity in Cambodia are immediate and severe. Addressing items 1 through 8, with a geographical focus suggested in 10 will go a long way towards facilitating the more immediate and necessary actions.

8.3 Conclusions

As can be seen in this section, the points of entry suggested in the IESP strongly overlap a number of the tropical forest and biodiversity recommendations suggested in Section 7 of this assessment. If any of the illustrative actions are funded in support of these points, then they will also help address the loss of natural resources and biodiversity. The present situation in Cambodia is putting undue stress on remaining natural forests, wetlands, and aquatic ecosystems and to the fish, wildlife and plant species that live within them. Any and all actions funded by USAID to address this situation is sure to help the people of Cambodia who depend upon these resources and will in turn aid international biodiversity conservation efforts.