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List of Acronyms

ACOFOP	Association of Forestry Communities of Petén
AGEXPRONT	Association of Non-traditional Product Exporters
AGIL	Local Income Generation Support Project
ANACAFE	National Coffee Association
ANAM	National Association of Municipalities
ASOREMA	Non-Governmental Organization Association of Natural Resources and Environment
BID	Inter American Development Bank
BIOFOR/CHEMONICS	Biodiversity and Forest Project/Chemonics Inc.
WB	World Bank
CATIE	Tropical Agronomic Research and Learning Center
CECON	Center of Conservation Studies
CI	Conservation International
CIPREDA	International Center for Preinvestment, Farming and Animal Livestock Development Center
CONAP	Guatemalan National Council on Protected Areas
CONTIERRA	Legal Assistance from the Office of the President on the Resolution of Land Conflicts
CRS	Catholic Relief Service
FAO	United Nations Food and Agriculture Organization
FCG	Guatemalan Conservation Trust
FDN	Defensores de la Naturaleza Foundation
FIPA	Institutional Strengthening in Environmental Policies
FOGUAMA	Guatemalan Environmental Fund
FONACON	National Fund for Nature Conservation
FUNDAECO	Ecodevelopment and Conservation Foundation
FUNDARY	Mario Dary Foundation
GEF	Global Environmental Fund
ICTA	Agricultural Science and Technology Institute
IDAEH	Anthropology and History Institute
IDEADS	Environmental Rights and Sustainable Development Institute
INAB	National Forest Institute (1996 to present)
INAFOR	National Forest Institute (1976 to 1987)
INGUAT	Guatemalan Tourism Institute
MAGA	Ministry of Agriculture, Livestock and Food
MARN	Ministry of the Environment and Natural Resources

MIRNA	Integrated Natural Resource Management Project in the Western Highlands of Guatemala
MOSCAMED	Project to control and eradicate the Mediterranean Fly
NPV	Naturaleza para la Vida Foundation
PA/USAID	**PROARCA II Regional Environmental Program/USAID**
PAFG	Guatemalan Forestry Action Plan
GDP	Gross Domestic Product
PINFOR	Forestry Incentive Program
UNDP	United Nations Development Programme
PRODEFOR	Cuchumatanes Forestry Development Program
MBR	Maya Biosphere Reserve
RECOSMO	Sarstún-Motagua Conservation Region
SHARE	Self Hope and Resource Exchange
SIGAP	Guatemalan Protected Area System
TNC	The Nature Conservancy
UNIPESCA	National Fishery Unit
URL	Rafael Landívar University
USAC	University of San Carlos
USAID	United States Agency for International Development
UTJ	Technical Juridicial Land Unit
UVG	University del Valle of Guatemala
WCS	Wildlife Conservation Society
ZUM	Multiple Use Zone

Preface

This assessment on the state of biodiversity and tropical forests in Guatemala was prepared for the United States Agency for International Development (USAID) /Guatemalan Mission, and addresses the requirements set forth in Sections 118 and 119 of the 1961 Foreign Assistance Act (FAA) that establish the guidelines concerning the issues of tropical forests and biodiversity. These regulations are presented in **Annex A**.

An exhaustive compilation of the literature pertaining to Guatemalan biodiversity and tropical forests forms the basis of this report. Additional information was obtained from specialists, government authorities, non-governmental organizations (NGOs) and bilateral and multilateral donors. The report is presented in five sections. Section One characterizes Guatemalan biological diversity and tropical forests. Section Two describes the main threats to biodiversity and tropical forest conservation, as well as the consequences of such threats. Section Three analyzes the obstacles that must be reduced, mitigated or decreased to reach conservation objectives. Section Four synthesizes the diverse efforts presently being implemented in biodiversity and tropical forest conservation and, above all, describes the impacts of investments made in this area. Lastly, Section Five compares activities considered to be necessary for Guatemalan biological diversity conservation and the actions presently implemented in this sector by USAID's current strategy in the country. Likewise, this Section analyzes the country's investment opportunities in this sector, derived from an analysis of opportunities in relation to USAID's comparative advantages in Guatemala.

Executive Summary

Guatemala, as part of Mesoamerica, has been identified as part of one of the planet's richest and highly threatened biodiverse regions, making it one of the world's top 25 biodiversity conservation hot spots. Mesoamerica is the world's second ranking priority hot spot when species diversity *and* endemism are considered. Likewise, it is ranked fifth among all hot spots in terms of plant and animal endemism.

The Republic of Guatemala is a small country characterized by large contrasts and a special biogeographic location. Guatemala acts as a land bridge between two of the world's greatest biogeographic realms, the Neartic and the Neotropical. Actual topography is the result of multiple geologic periods and plate tectonics, resulting in the ancient *Cuchumatanes* and *Sierra de las Minas* mountain ranges and the more recently formed territory in the Peten. The altitudinal ranges in Guatemala vary from sea level to the highest point in Mesoamerica, 4211 meters, while annual precipitation varies from the driest region in Mesoamerica with 500 mm to regions with 6,000 mm in Ixcan, Quiche. These contrasts and special location between biogeographic realms have produced conditions for significant levels of biological diversity, incorporating important ecoregional, ecosystem, endemism, and species richness elements of biodiversity.

In Central America, Guatemala ranks first in ecoregional diversity, with 14 ecoregions, and ranks second only to Costa Rica in the number of vertebrate and plant species richness, when compared to El Salvador, Honduras, Nicaragua, Belize and Costa Rica. In addition, Guatemala ranks first in Central America in species endemism, with more than 13% of plant and vertebrate species registered as endemic. This finding is particularly important for the flora, since more than 15% of the recorded species in the country are considered endemic. Guatemala harbors 9,069 plant and vertebrate animal species and has the world's largest diversity of lungless salamanders (the Plethodonitiadae family), with 33 species. Approximately 20% of Guatemala's avifauna are migratory species. Guatemala has four Ramsar sites, wetlands of international importance, which occupy an extension of 502,707 has.

The threats to biodiversity loss have both direct and indirect causes. Four of the five principal direct threats to the conservation of global biodiversity are considered to be the most important causes of the loss of biological resources in Guatemala and include habitat loss/degradation/fragmentation, over-exploitation of living and non-living resources, invasion by introduced species, and pollution/contamination. However, these proximate causes to biodiversity loss in Guatemala are not the root of the problem. The root causes to biodiversity loss in Guatemala will need to be addressed if progress towards conserving biological diversity is to be achieved.

Natural resource exploitation, especially between 1992 and 1998, has had a strong impact on biodiversity and tropical forests, reflected in the loss of 50% of the pine forests, 29% of the mangroves and an average loss of 15% of the national forest cover. As a result of the threats to the biodiversity and tropical forests, Guatemala has two globally recognized

and critically endangered ecoregions, three endangered forest ecosystems that are important for the country's development, as well as more than 300 threatened and endangered species of flora and fauna registered in CITES.

The obstacles to reducing and/or mitigating the threats for biodiversity conservation and tropical forest management in Guatemala are largely interrelated and include the productive and economic structure of the country, the lack of land use planning and regulation, the land tenure structure, migration and population growth, poverty, weakness in environmental management and inadequate governmental policies. Many of these indirect threats are of a structural nature and therefore the actions required to reduce them fall on the Guatemalan government, the USAID Mission in Guatemala and on other organizations.

The Guatemalan environmental institutional arrangement has facilitated the development of an environmental policy framework (MARN), a forest policy focused on production (INAB), a biodiversity strategy (MARN, MAGA, CONAP), and a protected areas policy focused (CONAP). However, these institutions are hindered by substantial financial limitations, which limits the implementation of policies issued by the same institutions. The allocated budgets are practically applied to institutional operations, while the resources obtained from external sources are designated for investment. At the same time, the lack of financial resources is due, in large measure, to the little political importance given to environmental management in the country, evidenced by national budget allocations that do not exceed 1%, in stark contrast to other sectors.

Three complementary lines of action are identified that incorporate a multi-sectorial focus at various geographic scales permitting the development of successful sustainable development models. These points include strategic ecosystem management for national development, the consolidation of management processes where USAID comparative advantages exist, and environmental management and productive competitiveness. The crux, and principal focus of the proposed opportunities, are based on the appropriate management of tropical, cloud and coniferous forest ecosystems. These are noteworthy not only because of their composition, function, and their current conservation status in Guatemala, but also for their comparative advantage as the foundation of sustainable production systems. These forests, if properly managed, can provide a sustained flow of resources essential to the economic growth of Guatemala, as well as valuable genetic resources for Guatemala and the rest of the world.

1. Biodiversity in Guatemala

Guatemala, as part of Mesoamerica[1], has been identified as part of one of the planet's richest and highly threatened biodiverse regions, making it one of the world's top 25 biodiversity[2] conservation hot spots [3]. Mesoamerica is the world's second ranking priority hot spot when species diversity *and* endemism[4] are considered. Likewise, it is ranked fifth among all hot spots in terms of plant and animal endemism.

Guatemala, as well as the rest of Mesoamerica, is the result of geographic and geologic circumstances that have created the conditions for high biodiversity levels in a small geographic area. These high levels are in part attributable to Mesoamerica's geographic location. The Mesoamerica biogeographical realm functions as a land bridge between two continents, and as early as 5 million years ago, this land bridge allowed the first faunal and floral interchange between continents. Species from North America migrated south and species from South America migrated north. Speciation in this broken landscape resulted in high levels of endemism. As a result of these circumstances, Guatemala's highlands and mountain chains are home to endemic plant and animal species, long isolated from adjacent valleys and low lying plains. These combinations of habitat, climate, altitude and natural communities are characterized by ecoregions[5] and ecosystems[6]. Guatemala has 14 ecoregions, 66 ecosystems, and 9,069 plant and vertebrate species, of which 1,221, or 13%, are considered endemic.

Tropical forests can be defined broadly as all forests occurring between the Tropic of Capricorn and the Tropic of Cancer, regardless of altitude or forest type. Under this definition, all forests in Guatemala could be regarded as tropical. However, for the purposes of assessment, Guatemalan tropical forests are defined as humid lowland, broadleaf forests occurring below an altitude of 1000m and 1200m on the Atlantic and Pacific slopes, respectively. There are approximately 19,276 km^2 of tropical forests in Guatemala.

1.1 Guatemala's Natural Characteristics

Guatemala shares its borders with Mexico to the North and West; with Belize, the Caribbean Sea (Atlantic Ocean) and the Republics of Honduras and El Salvador to the East; and with the Pacific Ocean to the South, in an area of 108,889 km^2. Guatemala is located between the latitudes of 13°44' and 18°30' N. and the longitudes of 87°30' to 92°13' W. The Republic is organized in provinces and these, in turn, in municipalities.

[1] Mesoamerica is the region between Tehuantepec, Mexico, to the western side of the Panama Canal.
[2] Biodiversity is the variety of life forms, their ecological roles, and their genetic variations.
[3] Mittermeier, R., et al. 1999. Hot Spots : Earth's biologically richest and most endangered terrestrial ecoregions. Agrupacion Sierra Madre, S.C., México. Guatemala's hot spot is denominated Mesoamerica.
[4] Species diversity is the number of species per unit of measurement, usually at a regional or national level. Endemism describes species that are native to a particular geographic area or continent.
[5] Major habitat types, composed of ecosystems, that have a relatively uniform climate that harbor a characteristic set of species and natural communities.
[6] An ecosystem is an interacting system of living organisms and their physical environment.

The country's 12 million inhabitants reside in a topographically diverse landscape among 22 departments and 331 municipalities (**Figure 1**).

The Pacific and the Atlantic hydrographic regions are clearly defined in Guatemala. The Pacific Region covers 17 watersheds and comprises an area of 23,990 km^2 (22% of the country.) The Atlantic Region is divided in two other watersheds. The watershed that drains into the Gulf of Mexico covers 50,803 km^2 (47% of the country), two main basins and 10 sub-basins. The Caribbean watershed has an extension of 34,096 km^2 (31% of the country) and includes seven first-order basins and five sub-basins. Guatemala has seven lakes, 365 lagoons and 779 small lagoons, totaling 460 km^2. The country´s 37 volcanoes are all aligned along the mountain chain that runs parallel to the Pacific Coast. Guatemala's topography is varied, ranging from sea level to 4211 meters above sea level on the Tajumulco volcano, the highest point in Central America.

The physiography, associated with altitudinal characteristics, favors the development of a wide variety of microclimates. The average national relative humidity varies between 70 to 80% and the average annual rainfall is 2,034 mm, ranging from 500 to 6,000 mm and generating an annual hydric supply of 127 km^3 of water. The northern trade winds are the predominant winds, crossing Guatemala from a north–northeastern to south–southeastern direction. However, winds originating in the Pacific Ocean have a predominant effect over the southern part of the country, entering from a south-north direction. Guatemala, situated within the tropical latitudes[7], does not experience marked seasons based solely on temperature changes, rather, the seasons are divided into summer/dry, from November through April, and winter/rainy seasons, from May through October.

1.2 Ecoregional Diversity

There are seven physiographic regions[8] in Guatemala, based on the variety of terrestrial and edaphic formations. These physiographic regions include the Volcanic Highlands, Northern Limestone Highlands, Northern Limestone Lowlands, Pacific Coastal Plains, Northern Flood Plains, Metamorphic Lands, and Piedmont Volcanic Lands. These physiographic regions have been categorized in 14 terrestrial ecoregions [9] and each of these ecoregions are further organized in different ecosystems. The geographic distribution of Guatemala's ecoregions is presented in **Figure 2** and a brief description of each is synthesized in **Chart 1**.

[7] Tropical latitudes are between 23.5° N and 23.5° S.
[8] Instituto Nacional de Bosques. 2000. Manual para Clasificación de Tierras por Capacidad de Uso. INAB, Ed. Guatemala. 96 p. (National Forest Institute. 2000. Land Classification Manual Based on Capacity of Use.)
[9] Olson, D. M. 2001. Terrestrial ecoregions of the world: a new map of life on earth. BioScience Vol 51, No. 11. Novembre 2001.; and from Terrestial ecoregions of the world: a new map of life on Earth, en www.worldwildlife.org/ ecoregions/ index.

Figure 1: Guatemala's political-administrative division

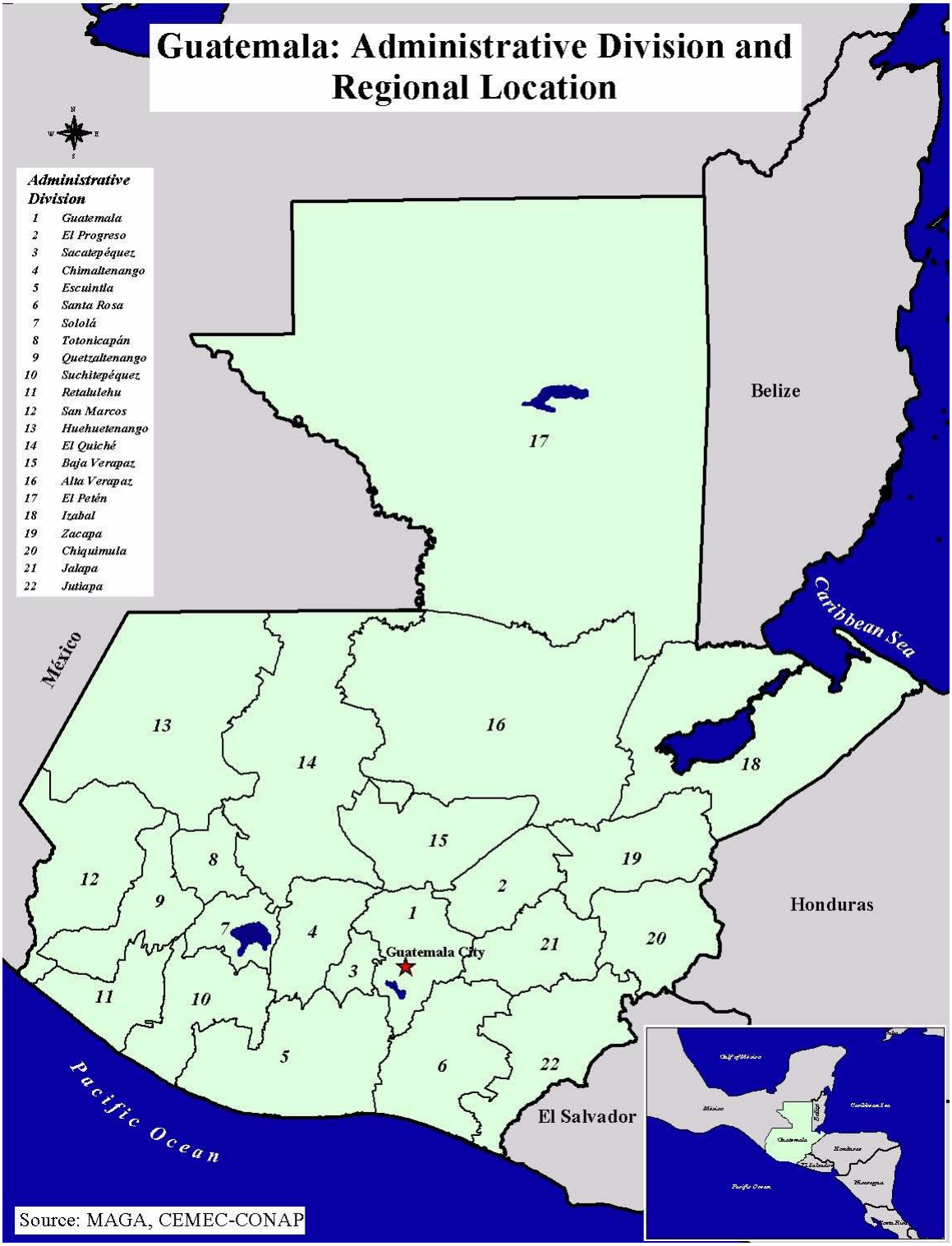

Figure 2. Guatemala's Terrestrial Ecoregions

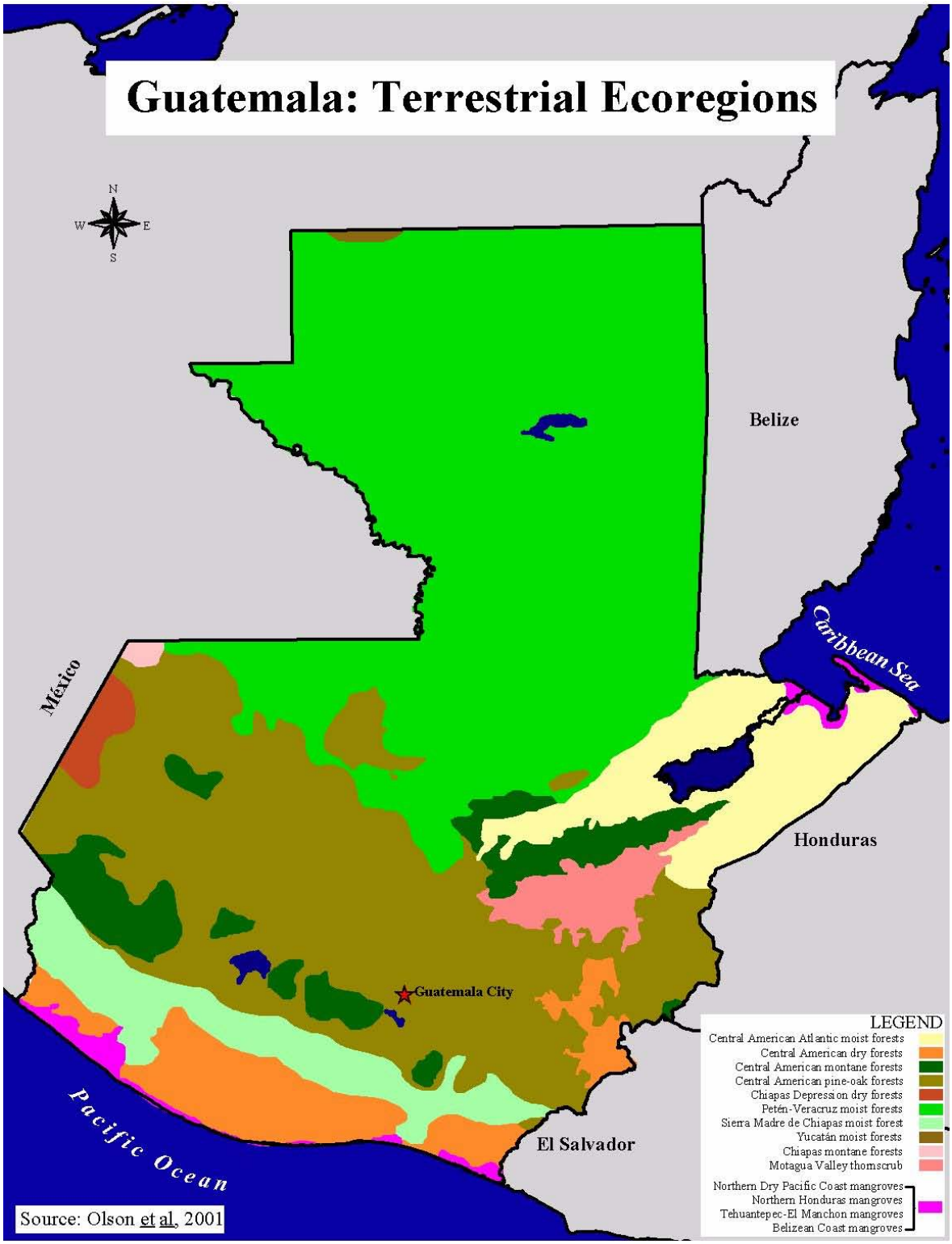

Chart 1. Synthesis of terrestrial ecoregions in Guatemala.

Ecoregion	
Peten-Veracruz Humid Forests	These tropical humid broadleaf forests occur in an extension of 47,876 km^2 and are found in the Northern Limestone Lowlands (90%) and Northern Limestone Highlands (10%). This ecoregion is considered to be the most extensive wooded tropical formation in Mesoamerica and functions as the natural northern boundary for tropical vegetation. The most significant impacts on this ecoregion are evident in the extensive areas of forests that have disappeared, mainly due to agriculture and livestock raising activities.
Central American Pine-Oak Forests	This ecoregion is composed of mixed forests in an area of 29,195 km^2. It covers several physiographic regions, among them the Volcanic Highlands (46%), Northern Limestone Highlands (24%), Northern Limestone Lowlands (2%), Metamorphic Lands (24%), and the Piedmont Volcanic Lands (4%). Plant endemism levels are high in this ecoregion. This ecoregion is rich in conifer species, with at least seven pine species registered to date. This ecoregion is dominated by a pine-oak association, and is considered the southern limit of the group of plants of North American origin. Generally, the trees are covered by bromeliads, lichens, ferns, and epiphytes. Orchids, which are particularly diverse in this area, stand out among the epiphytes. This ecoregion, considered an area of high bird endemism, is an important migratory route, especially for the Yellow cheeked warbler (*Dendroica chrysoparia)* a critically threatened species in the United States. It is also an important habitat for bird and insect species that require migration between high and low altitudes during certain times of the year. This area is being threatened by habitat destruction and fragmentation, mainly due to the expansion of human settlements and agricultural production areas. Other threats are fire, livestock raising, forestry exploitation, and agriculture. If the current rates of deforestation persist, it is estimated that around 600 to 800 species of the Compositae family may be lost.
Central American Atlantic Humid Forests	These are tropical humid broadleaf forests, covering 7,800 km^2. This ecoregion constitutes part of the Northern Limestone Highlands (42%), Northern Limestone Lowlands (6%), Northern Flood-plains (28%), and Metamorphic Lands (24%). This ecoregion is considered as an important center of biodiversity, contains a mixture of Nearctic and Neotropical plants and animals, and forms part of one of the greatest migratory bird routes between North and South America and between montane and lowland forests. The once extensive Atlantic lowland forests have been seriously fragmented during recent years. The low lands have been turned into areas of banana plantation development, while the swamp areas have been drained and are used for livestock raising and agriculture. Other threats are urban growth, road building, human settlements, and hunting.
Central American Dry Forests	This ecoregion, composed of dry forests, covers 6,520 km^2, and forms part of the Volcanic Highlands (16%), the Pacific Coastal Plains (79%), and the Piedmont Volcanic Lands (5%). These forests extend from southeastern Mexico to Nicaragua. They are considered transitional forests among the pine oak forests and the xeric habitats, being of vital importance to the migratory routes and life cycles of many species. Generally, these forests are small in structure and simple in composition, especially when compared to the neighboring humid forests. Few forest stands in this ecoregion remain intact. The soils of these forests are considered excellent soils for agriculture; therefore, they have been turned into pastures and croplands. Forest fires, agricultural expansion, and the incorporation of exotic species are some of the threats impacting this ecoregion.
Sierra Madre of Chiapas Humid Forests	The forests of this ecoregion cover an extension of 5,680 km^2 and form part of the Volcanic Highlands (5%), Pacific Costal Plains (51%), and Piedmont Volcanic Lands (44%). Fires, forest exploitation and agricultural practices are degrading this ecoregion.
Central American Montane Forests	This ecoregion covers an extension of 5,670 km^2 in Volcanic Highlands (52%), Northern Limestone Highlands (17%), Metamorphic Lands (26%), and Piedmont Volcanic lands (5%). The forests of this ecoregion are present in a mosaic of isolated patches, due to the altitude at which they are found. They are considered temperate forests, where the presence of oaks, conifers, orchids and bromeliads prevail, and are the habitat of unique and endangered animal species such as the Horned guan (*Oreophasis derbianus)* and the Resplendent quetzal *(Pharomachrus moccino).* Many areas of this ecoregion have been seriously modified due to subsistence agriculture, basic grain and coffee cultivation, livestock raising and fuel wood use.
Motagua Valley Thornshrub	This ecoregion is characteristic of the group of ecosystems with desert and xeric vegetation and is only found in Guatemala, with an area of 2,323 km^2. It is located entirely in the Metamorphic Lands (100%) physiographic region. Considered the driest area in Central America, the native vegetation in this ecoregion is dominated by cactus, thornshrub and acacia trees. The approximate annual rainfall is 500 mm, while temperatures reach 41º C (105º F) at certain times of the year. Approximately 75 bird species are found in this ecoregion. The most significant impacts on this region are evident along the Motagua River. Intensive agriculture and livestock raising are some of the main activities that affect the stability of the ecoregion.
Chiapas Depression Dry Forests	These forests are composed of dry broadleaf species and cover an area of 910 km^2 in Guatemala. They belong to the physiographic region of the Northern Limestone Highlands (100%). This ecoregion is part of the high basin of the Rio Grijalva area. This altitudinal variability supports habitat diversity and approximately 1000 species, adapted to dry conditions, are found. The climate is warm and dry. In areas where humidity and altitude are greater, the forests are higher and less prone to seasonal changes. Most of this ecoregion has been affected by the development of pasture for livestock and agriculture.
Tehuantepec – El Manchón Mangroves	Covering an area of 853 km^2 , these mangroves are located in the physiographic region of the Pacific Coast Plains (100%). This ecoregion has the tallest mangroves in Guatemala, which serve as shelter to an enormous diversity of plants, birds, fish, and crustaceans. Annually, thousands of migratory birds arrive from the cold regions of Canada and the United States to spend the winter and feed on fish and invertebrates. The mangroves of this region are gradually being eliminated due to the need of fuelwood from the neighboring communities, which overexploit the typical natural resources of the area . An additional problem in the area is water pollution caused by agriculture waste, which also endangers the survival of many mangrove-associated species.
Belizean Coast Mangroves	This ecoregion is shared with Belize and covers an area of 385 km^2 in Guatemala. It is part of the Volcanic Highlands (65%) and the Northern Flood-Plains (35%) physiographic regions. This ecoregion is intimately related to the Mesoamerican coral reef barrier, as well as to marine grass flats and coastal lagoons of this area.

	Besides the keys, islets of this ecoregion are important habitats for diverse species of migratory birds, as well as fish and reptiles, especially marine turtles, crocodiles and iguanas. A feature species of this ecoregion is the West Indian manatee (*Trichenchus manatus*). Threats on the ecoregion include the overexploitation of natural resources and environmental degradation.
Chiapas Montane Forests	This ecoregion include humid broadleaf forests with an extension of only 201 km^2 in Guatemala, but extends into Mexico. It is located in the Northern Limestone Highlands (100%). The climate of these forests is extremely humid and fog is almost always present. Cloud forests occur in this ecoregion. The forests harbor many rare and endemic species reported especially in Mexico, but that are also present in Guatemala. In Mexico, no other ecoregion is being destroyed as quickly as the Chiapas Montane Forests.
Yucatan Moist Forests	In Guatemala, these forests are tropical humid broadleaf forests, covering an area of 166 km^2. This ecoregion is part of the physiographic region of the Northern Limestone Lowlands (100%). These forests form a biological corridor for the exchange of species between the Northern Yucatan Dry Forests in Mexico and the Peten Veracruz Humid forests. The temperature in this ecoregion remains almost constant throughout the year and endemic plant species are common. This ecoregion has been largely impacted by forest exploitation, agriculture and extensive livestock raising, as well as sport hunting and illegal wildlife trade.
Northern Dry Pacific Coast Mangroves	In Guatemala, this mangrove ecoregion has an area of 150 km^2 and is located in the Pacific Coastal Plain (100%) physiographic region. Estuaries and saline swamps characterize this ecoregion. The climate is seasonal with a dry season between the months of November and April. Annual rainfall is approximately 1,700 mm. At least 200 bird, reptile and mammal species may be found in the coastal areas and estuaries. Many, like the marine birds, are seasonal visitors, since mangroves provide them with nesting areas. Mangroves are also fundamental for the life cycle development of a large number of fish and crustaceans. The shrimp industry, agriculture, livestock raising, and fishing are some of the activities that have a major effect on ecosystem destruction. Deforestation, excessive livestock raising, soil erosion, as well as sedimentation , fertilizer, pesticide, and solid and liquid waste deposition are becoming serious problems for the stability of the ecoregion.
Northern Honduras Mangroves	In Guatemala, this ecoregion has an area of 23 km^2 and is located in the physiographic region of the Northern Flood-Plains (100%). This region has a tropical climate, with annual rainfall ranging between 2000 - 3000 mm, is affected by tropical storms and by approximately two hurricanes per decade. Mangroves dominate the coast line, but plains, prairies and humid forests are found inland. This ecoregion is considered a natural shelter for migratory birds, and for mammals, such as the ocelot, anteaters, howler monkeys, spider monkeys and dolphins. The threats in this ecoregion are evident through the destruction and fragmentation of habitats, overexploitation of natural resources, and environmental degradation. Actions that favor the development of these threats are the expansion of agricultural areas and pastures, forest fires, wetland draining, the increase of sedimentation indices, pollution caused by agrochemical and other industrial waste, and over fishing and hunting.

Source: Olson, D.M.; et al. 2001. Terrestrial ecoregions of the world: a new map of life on earth. Bio Science 51(11): 933-938.

1.3 Ecosystem Diversity

The vegetative ecosystem map of Guatemala[10] is the most detailed ecosystem analysis that exists for the country, and includes 34 forest, seven shrub, four herb, and 15 agricultural/agroforestry classifications. In this study, 66 ecosystems were identified, 41 of which are natural ecosystems, and the rest are ecosystems modified by anthropogenic activities or that have other characteristics**.** **Chart 2** presents a synthesis of the ecosystem groupings.

Chart 2. General Ecosystem Groupings in Guatemala.

Type of Ecosystems	Area (km^2)	%
Natural	57,839.6	53.1
Anthropogenic	49,284.2	45.3
Aquatic	1,364.4	1.2
Others	400.8	0.4

Source: INAB. 2001. Map of Vegetative Ecosystems of Guatemala. Department of Information Systems, National Forest Institute. Guatemala. Compact Disc.

[10] Instituto Nacional de Bosques. 2001. Mapa de ecosistemas vegetales de Guatemala. Departamento de Sistemas de Información, Instituto Nacional del Bosques. Guatemala. Disco compacto.

The largest ecosystem in Guatemala is of anthropogenic type, covering approximately 15,230 km^2 or 13.9% of the country, composed of agricultural productive systems, with significant stands of native broadleaf forests. Other large ecosystems in Guatemala are the tropical humid broadleaf lowland forests (11,500 km^2), productive systems with significant stands of mixed native forests (7,000 km^2) and the tropical very humid broadleaf forests (6,560 km^2). None of the remaining 62 ecosystems exceed 5% of the national territory.

With the exception of the mangrove ecosystems, the smaller natural ecosystems all include pine species as a basic element of their classification. The smallest natural ecosystem in Guatemala is the mixed semi-deciduous lowland and/or foothill forests, with a predominance of pine. Following in increasing size are the semi-evergreen and evergreen lowland and/or foothill pine forests and the sub-montane semi-evergreen and evergreen pine forests.

To simplify the classification of Guatemalan ecosystems, and produced only for this report, the 66 ecosystems described by INAB were grouped into 20 simplified types. These ecosystems are listed in **Chart 3** and their distribution is presented in **Figure 3**.

Chart 3. A simplified grouping of ecosystems in Guatemala.

Ecosystems of Guatemala	Area (km^2)	%
Sub-montane and Lowland Broadleaf Forest	32,189.20	29.49
Agroforestry Systems	31,957.30	29.28
Single species agricultural crop systems	9,470.70	8.68
Upper and Lower Montane Mixed Forest	6,792.30	6.22
Anthropogenic caused shrub lands	6,720.30	6.16
Natural Shrubs	4,181.20	3.83
High-montane Mixed Forest	3,036.20	2.78
Deciduous and Semi-deciduous Forest	2,770.10	2.54
High-montane Coniferous Forest	2,290.20	2.10
Upper and Lower Montane Broadleaf Forest	2,220.60	2.03
Upper and Lower Montane Coniferous Forest	1,454.80	1.33
Aquatic Ecosystems	1,367.70	1.25
Sub-montane and Lowland Mixed Forest	1,023.50	0.94
Natural Grasslands	888.60	0.81
Anthropogenic Grasslands	841.70	0.77
High-montane Broadleaf Forest	631.10	0.58
Single species agroforestry crop systems	412.30	0.38
Others	401.80	0.37
Mangroves	360.00	0.33
Submontane and Lowland Coniferous Forest	140.40	0.13
TOTALS		**100.00**

Source: INAB. 2001. Map of Vegetative Ecosystems of Guatemala. Department of Information Systems, National Forest Institute. Guatemala). Compact Disc.

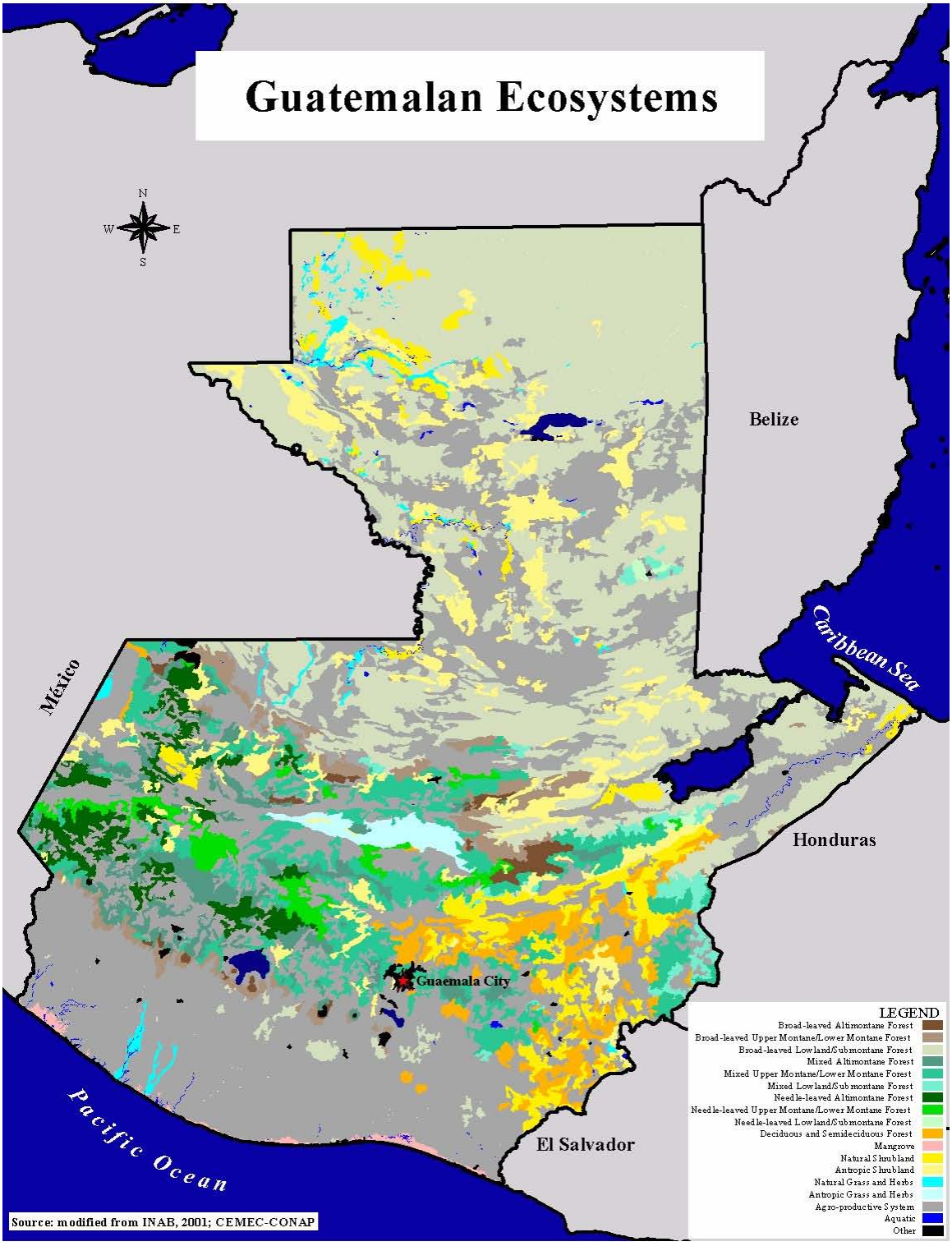

Figure 3: Simplified Grouping of Terrestrial Ecosystems in Guatemala

1.4. Special Ecosystems

Cloud Forests: Cloud forests are one of the most endangered ecosystems in the tropics and provide critical ecosystem services in the form of water quality and quantity, nutrient cycling, and prevention of natural disasters such as mudslides and flooding[11]. Communities down stream from cloud forests are dependent on these services and are directly impacted once cloud forests are altered. Several endemic, endangered and rare species occur in cloud forests. In Guatemala, there are approximately 8,177 km^2 of cloud forests, representing 20.9% of the country's forests.

Cloud forest conservation prioritization studies have been carried out in Guatemala using Passalid beetles as indicators of endemism[12]. These studies encountered more than 60 species of passalid beetles in 32 cloud forests and prioritized conservation of these forests using passalid species richness, endemism, similarity and cloud forest protection. Three cloud forest sites are of particular importance given high endemism levels and the current assault on these forests by local communities and by interests located outside of the local communities. These areas include the San Marcos and Cuchumatanes cloud forests.

Tropical Forests: There are 19,276 km^2 of tropical humid and very humid broadleaf forests in Guatemala, representing 49.4 % of the country's forest cover. These forests occur principally in Peten, Izabal and Alta Verapaz Provinces. The majority of the country's tropical forests occur in the Peten, and of these, the Maya Biosphere Reserve is the largest protected area providing sanctuary for a myriad of species.

***Conifer Forests*:** Conifer forests provide valuable ecosystem services including the regulation of water flows and quality, and prevention of soil erosion mitigating localized disasters such as mud slides. There are 8,500 km^2 of conifer forests representing 21.8 % of the county's forest cover. This type of forest can be found in 14 of Guatemala's 22 provinces. Huehuetenango has 33% (74,500 ha) of the Republic's coniferous forests, followed by San Marcos and Quiche.

Guatemala is one of the few regions of tropical highlands in which conifers are extensively present[13], with seven genera and 17 species of conifers [14]. There are no other regions at such low latitudes (14 to 17º N, approximately) with such a large variety of conifer taxa.

1.4.1 Wetlands

Guatemala has four wetlands of international importance, acknowledged by the RAMSAR Convention. The largest of the Guatemalan wetlands is located in the Laguna

[11] Núñez S., O. M. 1996. Bosques de altura de Guatemala, su importancia y futuro. Revista Forestal Centroamericana. No. 17, Año 5. CATIE, Turrialba, Costa Rica.
[12] Schuster, J.; Cano, E.; Cardona, C. 2000. Un método sencillo para priorizar la conservación de los bosques nubosos de Guatemala, usando Passalidae (coleóptera) como organismos indicadores. Acta Zoológica Mexicana (n.s.) 80: 197 – 209 (2000).
[13] Veblen, T.T. 1977. Las coníferas de Guatemala. Unasylva 118: Leña para quemar. Vol 29. pp 25 – 30.
[14] Perry, J. P. 1991. The pines of Mexico and Central America. Timbre Press. Portland, Oregon. 231 p.

del Tigre National Park (335,080 ha), a core protected area of the Maya Biosphere Reserve. Other Guatemalan Ramsar sites are the Punta de Manabique Wildlife Refuge, in Izabal (132,900 ha), the Manchón – Guamuchal wetland, located in San Marcos (13,500 ha) and the Bocas del Polochic Wildlife Refuge in Izabal (21,227 ha).

1.4.2 Caves and Underground Ecosystems

Karst towers, dry sinkholes, water filled sinkholes, hummocks, underground rivers and cave systems are common in the Northern Limestone Highlands. Unfortunately, there is a paucity of information available to document the biodiversity of the Guatemalan cave ecosystems and these unique formations. However, Reddell's review of the cavernicole fauna in Mexico, Guatemala and Belize highlights the importance of this region's biodiversity as one of the richest in the world based on the extensive cave systems found in varying habitat types, harboring approximately 2000 species and 279 troglobites. In Guatemala, Reddell[15] cites collections from 74 caves among 8 departmentes, with the majority of the caves occurring in Alta Verapaz and Huehuetenango. Urquizu[16] listed some plant species that occur in caves to include *Chidoscolus multilobus*, *Sabal mayarum*, *Crysophila argentea*, *Chaeaedeorea oblongate* y *C. elegans*. Fauna that has been documented to use Guatemalan caves include the jaguar, paca, and rodents such as *Peromyscus maniculatus*. Catfish (*Arius* spp.), and cavern fish (*Anoptichthys jordani*) have also been observed in Guatemalan caves.

Bats, in terms of species diversity and biomass, are among the most important occupants of caves, and where large numbers of bats are found, they tend to be insectivores, consuming enormous quantities of insects. The Candelaria, El Zotz and Lanquin caves are considered to harbor large populations of bats[17]. In El Zotz cave, broad-eared Free-tailed species from the Molossidae family have been observed and preliminary population estimates for *Nyctinomops laticaudatus* and *Natalus stramineus* are over 200,000 individuals. In the Lanquin cave, the principle species are from the leaf-chinned, mustached and naked-backed family (Mormoopidae), including *Mormoops megalophylla*, *Pteronotus davyi*, *P. parnellii* and *P. personatus*[18].

In small caves, a wide variety of species and feeding guilds are found, such as *Pteronotus parnelli* (insectivore), *Glossophaga soricina* (nectivore), *Artibeus spp*. (frugivores), *Desmodus rotundus* (sangrivore), and *Noctilio leporinus* (piscivore). In the Rio Dulce caves it is common to encounter a regionally endemic bat from the sheath-tailed family Emballonuridae, *Balantiopteryx io.* The status of this species is unknown[19].

1.4.3 Freshwater Reef

[15] Redell, J. R. 1981. A review of the cavernicole fauna of Mexico, Guatemala and Belize. Texas Memorial Museum publication. University of Texas. Austin, Texas. 327 p.
[16] Urquizú S., M.C. 1996. Una aplicación metodológica para la recuperación e interpretación de rasgos culturales en cuevas. Tesis de Licenciatura. Área de Arqueología de la Escuela de Historia de la Universidad de San Carlos de Guatemala. Guatemala. 72 p.
[17] Sergio Perez, Museo de Historia Natural. Personal communication.
[18] Jones, J., Knox, J. 1966. Bats from Guatemala. University of Kansas Publications. Mus. Nat. Hist.: 439 – 472.
[19] Emmons. L. 1990. Neotropical Rainforest Mammals. A field guide. Chicago University Press.

A recent rapid biological assessment carried out by Conservation International and local institutions discovered a rare and unique fresh water reef in the Rio San Pedro, east of the town of Naranjo, in the Peten. This molluscan reef is considered to be uncommon in the Neotropics and appears to be rare[20] in the region.

1.5 Species Diversity

1.5.1 Flora

Guatemala has a total of 7,754 registered plant species and 1,171, or 15%, are endemic. The *Magnoliophyta* and *Pinophyta* plant divisions represent the largest numbers of Guatemalan species, with 75 orders and 206 families. The plant families with the most species are *Asteraceae, Papilionaceae* and *Orchidaceae* with 611, 553, and 734 species, respectively[21].

1.5.2 Fauna

The National Strategy for the Conservation and Sustainable Use of Biodiversity in Guatemala[22] presents information on the Guatemalan fauna. This information differs from that provided by Villar[23]. The information obtained by both sources is presented in **Chart 5**.

Chart 5. Vertebrates in Guatemala, according to two authorities.

Faunal Group	# Species according to Villar	# Species According to Strategy	Endemic Species Villar
Fish	435	651	
Amphibians	106	112	28
Reptiles	209	214	18
Birds	688	738	1
Mammals	213	251	3
TOTAL	1,651	1,966	

Sourcess: *Villar A., L. 1998. La fauna silvestre de Guatemala. Editorial Universitaria. Universidad de San Carlos de Guatemala, Guatemala. 64 p., y Consejo Nacional de Áreas Protegidas. 1999. Estrategia nacional para la conservación y el uso sostenible de la biodiversidad y plan de acción para Guatemala. CONAP, Guatemala. 143 P.*

1.5.3 Migratory birds:

Approximately 20% of the Guatemalan avian fauna is composed of migrant species. Guatemala is an critical destination and/or stop over area for approximately 184 migrant

[20] Herrera, K., Bailey, A.C., Callisto, M., and J. Ordóñez. 2000. The aquatic habitats of Laguna del Tigre National Park, Peten, Guatemala: Water quality, phytoplankton populations, and insects associated with the plant *Salvinia auriculata*, in B.T. Bestelmeyer and L.E. Alonso (eds.): A Biological Assessment of Laguna del Tigre National Park, Petén, Guatemala. RAP Bulletin of Biological Assessment # 16. Conservation International, Washington, D.C.

[21] Villar A., L. 1998. La flora silvestre de Guatemala. Editorial Universitaria, Universidad de San Carlos de Guatemala. Guatemala. 100 p.

[22] Consejo Nacional de Áreas Protegidas. 1999. Estrategia nacional para la conservación y el uso sostenible de la biodiversidad y plan de acción Guatemala. CONAP, Guatemala. 143 p.

[23] Villar A., L. 1998. La fauna silvestre de Guatemala. Editorial Universitaria. Universidad de San Carlos de Guatemala, Guatemala. 64 p.

and 24 stop-over species between the North and South American continents, along narrow routes of travel that converge over the narrow land mass of Central America[24]. Species richness for migratory species has been found to be higher in the Central American Atlantic moist forests and in the Peten moist forest ecoregions, while levels of endemism were found to be higher in Central American pine-oak forest, Central American montane forest and Sierra Madre moist forest ecoregions. The Maya Biosphere Reserve is a sanctuary for the majority of the migratory species.

Altitudinal patterns have been recognized for migratory species[25]. More migratory species are reported from sea level to 500 m. (N=110 spp.), while another large group are found above 900 m. (N=55 spp.), and only 18 species are found between 500 and 900 m.

1.6 Genetic Diversity

Areas in the American continents have been considered as the center of origin for a series of the world's important cultivated plants, with the region shared by Mexico and Guatemala as one of these centers. Guatemala is one of the richest genetic diversity centers in the world. [26]

In 1925, one of the earliest genetic collections in Guatemala included 81 samples of corn (species of the Genus *Zea* and associated species). In addition, other collections were made of bean (Genus *Phaseolus*), amaranth (Genus *Amaranthus*), peanuts (Genus *Arachis)*, cotton (Genus *Gossypium*), squash (species from the Cucurbitaceae family) and chile (Genus *Capsicum*). Different wild plant species such as the wild potato (*Solanum andigenum var mexicana, f. Guatemalense*), among others, were observed. Later expeditions have focused their interest especially on corn and bean though other groups like the avocado (Genus *Persea*), chayote (Genus *Sechium*), gourd cup (Genus *Lagenaria*), jog plum (Genus *Spondias*), and palms (*Arecaceae* family) have been collected. Collections of cacao (Genus *Theobroma*) and cassava (Genus *Manihot*) have been important[27].

[24] Terborgh, J. 1989. Where have all the birds gone? Princeton University Press, Princeton, New Jersey.
[25] Kihn, H.A., Valdez Rodas, O.I., Koenen, M., Wurschy, M.C., and D. Kwan. 1999. Distribución de las aves migratorias en Guatemala, con una evaluación preliminar de la avifauna residente de interés especial para la conservación. Wings of the Americas. The Nature Conservancy.
[26] Estrategia Nacional para la Conservación de la Biodiversidad. 1999. Conservando los recursos genéticos de Guatemala. CONAMA. Guatemala. 38 p.
[27] Estrategia Nacional para la Conservación de la Biodiversidad. 1999. Conservando los recursos genéticos de Guatemala. CONAMA. Guatemala. 38 p.

2. Threats to the Conservation and Sustainable Management of the Biodiversity in Guatemala

The threats to biodiversity loss have both direct and indirect causes. Four of the five principal direct threats to the conservation of global biodiversity are considered to be the most important causes of the loss of biological resources in Guatemala, and include i) habitat loss/degradation/fragmentation, ii) over-exploitation of resources, iii) intoduction of exotic species, and iv) environmental contamination and pollution[28]. However, these proximate causes to biodiversity loss in Guatemala are not the root of the problem. The root causes to biodiversity loss in Guatemala will need to be addressed if progress towards conserving biological diversity is to be achieved. An examination follows of the direct causes that threaten species, ecosystems and ecoregions in Guatemala.

2.1 Habitat Loss, Degradation and Fragmentation

The reduction in the quantity, quality, and connectivity of natural habitat is the greatest direct cause of biodiversity and tropical forest loss in Guatemala, as well as in the world. Habitat damage, especially the conversion of forested land to agriculture land, has a long history in Guatemala, beginning with the Spanish colonization after 1500 in the lowland and mid-elevation forested regions most easily converted to agriculture. The second major wave of assault on the Guatemalan forests began in the 20th century, driven by a combination of factors, including population growth, inequitable land and income distribution, and development policies.

Deforestation is commonly cited as the main cause of global habitat loss, and, this model is also consistent in Guatemala. Between 1992 and 1998, the native forests were reduced by 4.7%, or approximately 5,100 km^2. Broadleaf forests were the most affected during this five year period, with an estimated loss of 3,592 km^2, however, conifer forests which occurred naturally in smaller areas compared to broadleaf forests, lost 1,132km^2, or approximately 50% of the natural stands. The same study reported that mangrove forests lost 29%[29] of the natural stands, with only 124 km^2 remaining.

The tropical forests of Peten, Izabal and Alta Verapaz provinces have experienced heavy deforestation. However, the situation is even more critical in the eastern Guatemalan forests. For example, between 1977 and 1992, Jalapa and Jutiapa lost 79% and 85% of their native forests, respectively. The internal armed conflict retarded the deforestation process in provinces such as Huehuetenango and Quiche, however, since the end of the conflict, the deforestation rates have increased dramatically. Between 1993 and 1997, 82,000 ha of land were deforested, of which 78.5% was caused by shifting agriculture.

[28] Consejo Nacional de Áreas Protegidas. 1999. Estrategia nacional para la conservación y el uso sostenible de la biodiversidad y plan de acción Guatemala. CONAP, Guatemala. 143 p.
[29] Consejo Nacional de Áreas Protegidas. 1999. Estrategia nacional para la conservación y el uso sostenible de la biodiversidad y plan de acción Guatemala. CONAP, Guatemala. 143 p.

Shifting agriculture in small land patches is a general mechanism that causes temporary deforestation. The short-term impacts of shifting agriculture, usually caused by local communities, include fragmentation of undisturbed forest patches, local species extirpation, and a change in species composition and abundances. The land is cultivated for a few years until low production and yields drive farmers to abandon these land parcels in favor of other native forest stands. Shifting agriculture in Guatemala has been largely documented for the Peten, Izabal and Alta Verapaz provinces. This deforestation has promoted the development of the anthropogenic bush land and grassland ecosystems, which according to the country's vegetation ecosystem map, account for 7,560 km^2 and forms part of the Central American Pine-Oak Forests and the Peten-Veracruz Moist Forest eco-regions.

In recent years the magnitude of forest and grassland fires has become another element favoring natural habitat destruction and fragmentation, and therefore, a factor that promotes biodiversity loss in Guatemala. These fires are originated by different causes, among them the practice of logging, slash and burn agriculture, intentional fires, hunting, timber and other non-timber forest product harvesting activities. To date, 1998 has been the most critical year for the frequency and extent of reported forest fires, brought about by favorable conditions generated by the El Niño phenomenon. That year, 498 fires affecting an area of 678,795 ha were reported. In 1999, there were 374 fires in an area of 10,623 ha. In 2,000, 944 fires occurred, affecting 53,404 ha, while in 2001, 918 fires occurred, affecting an area of 22,150 ha[30]. Natural forests most affected were located in the core protected areas of the Maya Biosphere Reserve, in Laguna del Tigre and Lacandon National Parks.

Permanent changes to natural landscapes are usually driven by agricultural colonists to clear forests for pasture and agriculture. This permanent deforestation by colonists and large scale land owners has been carried out principally in along the Pacific coast and in the northern part of the country. Permanent land use changes in Guatemala represent 39.9% of the country[31], or 43,317.8 km^2. Coffee (3,931.8 km^2), pasture (4,457 km^2), and sugar cane (2,961.4 km^2) are important causes of habitat disturbance, however, the vast majority of deforested areas are cultivated with basic grains for local consumption and cover 30,348 km^2.

2.2 Over-exploitation of resources

Over-exploitation of resources, which also includes over hunting and harvesting, depletes Guatemala's stock of animal and plant resources, lowering populations and affecting the genetic diversity and increasing the risk of local extirpation and subsequent extinction. Over-exploitation can occur from commercial operations, such as logging, or from local practices, such as medicinal plant harvesting. Over-exploitation has different origins, in some cases the species are persecuted because of their food value, while in others, it is

[30] Plan de Acción Forestal para Guatemala. 2002. Informe de evaluación de los incendios forestales 2001. PAFG, Guatemala.
[31] Ministerio de Agricultura, Ganaderia y Alimentación. 2001. Base de datos digital de la Republica de Guatemala a escala 1:250,000. Proyecto de Asistencia técnica y generación de información del Programa de emergencias por desastres naturales. MAGA, Guatemala, 109 p. + anexos.

due to their commercial value or because they are used in popular medicines. In other situations, it is related with pet and skin trade destined to private or public collections while in others, it is related to destructive extraction practices, such as the use of explosives or toxic substances in fishing activities.

Over-exploitation of fresh water fish populations can occur in a regional context, especially for migratory fish species such as snook (*Cenhoponius undecimalis*) and tarpon (*Megalops atlanticus*). For example, there is an on-going debate about the impact of Mexican harvesting of fish with gill nets, that significantly affects the Guatemalan populations of snook, tarpon and other species that occur in the rivers of the Usumacinta watershed.

The over-exploitation of non-timber products, such as *xate* palms, is recently being studied in Guatemala. This informal industry generates approximately US $2 million annually and the harvesting is carried out principally in the Peten[32]. The leaves of the *Chamaedorea* palm are indiscriminately harvested and are sold in bunches, regardless of the quantity of quality leaves. This lack of incentive for quality leaves in the harvesting of *xate* is reducing native populations, impacting harvesting sites, and generating secondary impacts on local biodiversity, since many of the *xate* collectors hunt wildlife species for animal protein while in their *xate* collection camps. With economic incentives that incorporate environmental considerations, the activity could be environmentally and economically sustainable.

Forest related activities can adversely affect local populations of native species. For example, the *Pinabete* fir, an endangered conifer species endemic to Chiapas and Guatemala, is becoming rare in Guatemala. The aromatic branches of this species are over-exploited during the Christmas season to make Christmas trees. The demand for these "trees" is estimated in 150,000 per season at an average price of US$ 30, generating sales of up to US$ 4.5 million per year[33].

Logging activities, of both broadleaf and conifer species, carried out in Guatemalan forests can be a form of over-exploitation if low impact harvests are not used, and if sustainable management plans are not followed. In many managed forests, the basic silvicultural characteristics of secondary species are not well known, and the harvesting of these secondary species, even at low extraction levels could have an impact on biodiversity. For example, in the Maya Biosphere Reserve, forest concessions approved and recognized by CONAP, allow for the extraction of approximately 20 species of market valuable trees. While Mahogany and Spanish Cedar represent the majority of the trees harvested, and of species studied, the impact of this extraction activity has not yet been measured.

The over-exploitation of wildlife species, such as the endangered Scarlet macaw, can drastically reduce populations, affecting the survival viability of these species. Scarlet

[32] Fortalecimiento Institucional en Políticas Ambientales. 2002. Xate: situación del sistema de recolección y exportación y propuesta para un plan de trabajo. Informe de Consultoría. FIPA-USAID-IRG. Guatemala. 52 p.
[33] Maas I., R. 1999. Estrategia para la protección del Pinabete (*Abies guatemalensis* Rehder). Revista Forestal Centroamericana. No. 27. Julio – Septiembre 1999. CATIE, Turrialba, Costa Rica. p 22-25.

macaw nestlings are taken from their tree cavity nests prior to fledging and are sold on the local market in the Peten for approximately US$250. The natural population of this flagship species is estimated at 250 individuals[34].

2.3 Environmental Contamination and Pollution

Environmental contamination and degradation, caused by air, water and soil pollution, represent major threats to Guatemala's biodiversity and tropical forests. Impacts are caused by sewage discharges into aquatic and terrestrial systems, runoff of misapplied fertilizers and other agricultural control products, gases released by industrial processes and the changes in land use, especially in the elimination of forest cover to agricultural lands.

Approximately 70% of water supply for the 331 municipalities of Guatemala is derived from surface water, such as rivers and lakes. However, only 4 % of the municipalities apply some form of treatment to residual waters, releasing contaminated water back into natural water systems. Contamination levels are high for the majority of the country's water bodies. For example, in the Motagua River watershed and in Lake Amatitlán, organochlorates were observed in levels above 0.56 ug/l for a range of 37 reported herbicides and insecticides, of which 15 were prohibited for use in Guatemala since 1988[35]. It is reported that Amatitlan Lake is more polluted than the Motagua River watershed, however, both areas reach the highest levels of contamination with the onset of the rainy season in the months of May and June[36].

The southern coastal region has higher levels of herbicides and insecticides in the surface water than the northeastern region. The Villalobos River, which drains Amatitlan Lake, is one of the country's most polluted rivers due to high levels of household and garden chemicals, and above all, from herbicides and insecticides that are used in the agriculture areas under intense farming, in the small watershed of the Platanitos River.

Solid waste is a critical problem related to contamination of water sources in the country. In 2001, the annual production of solid waste for Guatemala was estimated in 2,460,000 tons, of which 30% was produced in the metropolitan area, 22% in the other urban areas of the country, and the remaining 48% in rural areas[37]. Even though there has been an increase in the adequate collection of garbage in the metropolitan area, approximately 25% of the area does not have collection services, resulting in the deposition of this waste in the river systems, especially during the rainy season. For example, 175 kg of solid waste was collected from an area of 700m^2 in the Motagua River. This pollution reaches the beaches of the Punta de Manabique.

[34] Claudio Méndez, presentation in the Biological monitoring workshop held in the RBM . Wildlife Conservation Society. Petén, Abril 2002.
[35] Environmental Monitoring Project. 2000. Water quality study in the watershed of the Motagua and Polochic Rivers. CATIE-USAID. Guatemala, 48 p.
[36] Castañeda A., L. A. 2002. Diagnostico Ambiental de Guatemala. Informe de consultoria al PNUD. 42 p.
[37] Siliezar, C. 2002. Solid waste in a garbage dump in Zone 3. Personal communication.

Air pollution is also a major factor affecting biodiversity and tropical forests. For example, in 1990, Guatemala was reported to have emitted 7,489,619 gigagrams of carbon dioxide, 1,995, 556 gigagrams of methane, 20,709 gigagrams of nitrous oxide, and 961,655 gigagrams of carbon monoxide. The transportation sector is the principal producer of $C0_2$, producing 57.3% of the national total. In general, agriculture production does not emit significant $C0_2$ levels, rather carbon is fixed by the plants through crop cycles. However, land use changes to agriculture and timber harvesting generated 3,244,553 gigagrams of $C0_2$ in Guatemala, while the burning of wood biomass emitted 13,197,367 gigagrams of $C0_2$, of which the majority was burned as firewood[38].

2.4 Introduction of exotic species

The introduction of exotic species into natural systems can affect biodiversity and tropical forests in many ways. Exotic species can out compete natural species and replace them in the system, thus reducing the species diversity, lowering genetic diversity, and increasing the homogeneity of the landscape.

Lakes and rivers might be the ecosystems most affected by the introduction of exotic species and the consequent ecological changes in species and community composition. For example, the black bass (*Micropterus salmoides*), which was introduced in Lake Atitlán at the beginning of the 60s, became the dominant species, changing the species composition in the lake. The tilapia (*Oreochromis spp*) is already present in some rivers of Petén and Río Dulce and is now a member among these fresh water communities. Exotic aquatic plants can reduce the biological diversity in streams, rivers and lakes when they dominate these aquatic ecosystems. This phenomenon is becoming evident in Lake Petén Itzá and Lake Amatitlán with the calla lilies (*Eichhornia crassipes*) and with *Hydrilla verticillata* in Lake Izabal and the Río Dulce River.

Africanized bees have invaded the Petén and have started to significantly affect the survival of some species, especially now that they are competing with other bee species and have started to alter the genetic variability in native populations. In addition, the Africanized bees build their hives in natural cavities, especially in tree species that are also used by other wild species. The Scarlet macaw (*A. macao*) is one of the species affected by the presence of these Africanized bees, since it has to compete with them for its natural nesting areas. These nests are even invaded by bees when they are active, causing the Scarlet macaw to abandon the nests.

2.5 Consequences of Threats on Biodiversity

The consequences of these four threats on biodiversity in Guatemala can be measured at the ecoregional, ecosystem and species levels. The following sections highlight threatened and endangered systems and species in Guatemala.

[38] INEGI. 2001. Inventario Nacional de Gases de efecto Invernadero año base 1990. Guatemala, C. A.

Threatened Ecoregions
Priority setting conservation strategies have been carried out on a global level by WWF. These analyses were based on species richness, endemism and threat levels. The result of the analyses was the publication of the Global 200; a short-list of the world´s threatened ecoregions. Two of the 14 ecoregions cataloged for Guatemala are listed on the Global 200 and are considered the most threatened: the Central American Pine-Oak Forests and the Chiapas Depression Dry Forests[39].

The Central American Pine-Oak Forests occupy the central part of the country and they are considered as the richest forests in conifer diversity and especially regarding high levels of endemism, both regionally and locally. In Guatemala, two of the species considered ancestors of corn, *Zea perennis* and *Zea diploperennis*, the Resplendent quetzal (*Pharomacrus mocinno*), the Pinabete fir (*Abies guatemalensis)*, and the Horned guan (*Oreophasis derbianus)* are present in this ecoregion, as well as a great number of endemic orchid species. This ecoregion is also a temporary shelter for a significant number of migratory birds. The Chiapas Depression Dry Forests are located in northwestern Guatemala and harbor high levels of endemism, especially tilansias (*Tillansia*) and thorn bushes.

Threatened ecosystems
According to some experts, all of Guatemala's natural ecosystems are considered threatened. Three ecosystems will be emphasized since these ecosystems are firmly connected to the country's development activities and plans.

Cloud Forests: Habitat loss, degradation and fragmentation are the most serious threats to the conservation of the cloud forests in Guatemala. Subsistence agriculture, the expansion of the agriculture frontier and the use of cloud forest timber for firewood are the principal agents of change in this ecosystem. Firewood collection is carried out local communities for their own use and by intermediaries for commercialization purposes.

Passalid scarab beetle studies[40] have identified 32 priority areas for cloud forest conservation, based on the estimated endemism levels. Of the 32 cloud forests that were identified, Purulha, Laj Chimel, La Union, Sierra Caral, Rio Zarco, and Yalambojoch, were the richest areas in species. The priority areas for the conservation of these habitats are the cloud forests of Sierra Caral, Yalambojoch, La Fraternidad, La Union, Santa Eulalia, Trifinio, and Chiblac. Today, none of these areas is truly being protected.

Coniferous Forests: The most serious threat for the conifer forest genetic resources of Guatemala's highlands is forest conversion for agricultural uses to meet the demand of the growing population in the Guatemalan Highlands. The other serious threat is the selective exploitation of the best conifer genotypes used by the local people, promoting the permanence and reproduction of least desirable phenotypes.

[39] www.panda.org/resources/programmes/global200/pages/endangered.htm
[40] Schuster, J.; Cano, E.; Cardona, C. 2000. Un método sencillo para priorizar la conservación de los bosques nubosos de Guatemala, usando Passalidae (coleoptera) como organismos indicadores. Acta Zoológica Mexicana (n.s.) 80: 197 – 209 (2000).

For the most part, the forest genetic resources of Guatemala's highlands, which are unique due to the coniferous diversity that occur naturally at low latitudes, are still unprotected and in imminent danger of serious reduction. Preserving the surviving natural forests, as sources of seeds for reforestation and promoting the development of the forest sector in Guatemala, are more urgently needed in the high lands of Guatemala than anywhere else.

***Tropical Forests**:* The tropical forests of Guatemala are very complex associations. In Guatemala, these phytogeographical units are represented by the tropical humid forest of Petén, the tropical rain forest of Southern Petén, Izabal and the northern part of the Alta Verapaz, Quiche, and Huehuetenango provinces. The tropical forests of the southern and central portions of the Peten Province have been significantly reduced. The northern forests of the Peten are protected by the Maya Biosphere Reserve.

The principal threats to Guatemala's tropical forests include destruction, degradation and fragmentation, in part caused by forest fires, but principally caused by permanent changes in land-use, induced by the construction of access roads and highways, and the consequent formation of human settlements. Also important are the impacts caused by the overexploitation of some forest resources, particularly the different varieties of mahogany (*Swietenia* sp) and Spanish cedar (*Cedrella* sp).

Threatened Species

The threatened Guatemalan flora and fauna are presented from two lists[41]. The national list is published by CONAP and is referred to locally as the Red List. The international list is published by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The national list is composed of three Categories, while the CITES list is composed of three Appendices.

Flora: The CONAP Red List includes 990 species belonging to 140 taxonomical families. There are 40 endangered species, 560 species of limited distribution, and 390 species that are considered potentially threatened. The CITES list includes three endangered species on Appendix 1, which are *Abies guatemalensis, Balmea stormiae* and *Ceratozamia spp*., and 160 species on Appendix II, including 78 species of orchids, 63 species of cactus, 9 species of arborescent ferns (named *chipes* or *chuctes* in Guatemala), as well as *Swietenia humilis, Cyca revolute, Tillandsia harisii, T. xerographica, Guaiacum sanctum* and *G. Officinale.*

In addition to the CONAP Red List and CITES, Droege and Suchini[42] consider that 143 species pertaining to 13 families of monocotyledons in Guatemala are threatened,

[41] Consejo Nacional de Áreas Protegidas. 2001. Listado de especies de fauna silvestre amenazadas de extinción (Lista Roja de Fauna) y sus reformas y Listado de especies de flora silvestre amenazadas de extinción (Lista Roja de Flora). Documento de Políticas y Normativos. Documento No. 10. CONAP-IDEADS. Guatemala. 56 p.

[42] Droege D., H. A.; Suchini F., A. E. 1998. Plantas monocotiledoneas endemicas y/o amenazadas de Guatemala. Centro de Datos para la Conservación, Centro de Estudios Conservacionistas, Facultad de Ciencias Químicas y Farmacia, Universidad de San Carlos de Guatemala. Guatemala.

including important groups such as the ancestors of corn, grass and orchid species. Alta Verapaz, Huehuetenango, Zacapa, San Marcos, and Quetzaltenango have been reported as the areas with the highest number of endemic and/or threatened monocotyledonous species. Sierra de los Cuchumatanes, Sierra de Las Minas, the Volcanic chain and the Verapaces are the areas with the highest levels of endemism of monocotyledons in the country.

Fauna: The CONAP Red List cites 674 faunal species of 105 families. There are 32 species on Category 1 including the Giant anteater (*Myrmecophaga tridáctila*), the Atitlan grebe (*Podylimbus gigas*), the Yellow-headed Amazon parrot (*Amazona auropaliata*), the Jaribu stork (*Jabirú mycteria*), the Harpy eagle (*Harpia harpyja*), one toad, three butterfly, three lizard, three salamander, five snake, and seven frog species. Category 2 and 3 lists 247 and 393 species, respectively. CITES lists 36 species on Appendix I, 147 species on Appendix II, and nine species on Appendix III.

Migratory and conservation interest species: Kihn[43] points out that 36 migratory bird species in Guatemala have been identified as species for particular conservation interest. These have been determined according to their relative population, distribution areas, threats, and natural population tendencies. *Dendroica chrysoparia*, *Vermivora chrysoptera* y *Dendroica cerulea* are warblers considered high-interest species for conservation. These species are found in at least two of Guatemala's ecoregions, but are mainly located in the Central American pine-oak forests. The Golden-cheeked warbler (*Dendroica chrysoparia*) is one of the Nearctic migratory species that migrates to Guatemala and that is more seriously threatened. This warbler nests in a small area of Texas and spends the winter in the pine-oak forests of Mexico, Guatemala and Honduras. The main threats for these migratory species are the loss and the fragmentation of habitats, as well as hunting and trade.

Flagship species: There are several notable flagship species that represent Guatemala's tremendous diversity and all of these species are listed on Appendix I or II of CITES. These flagship species include the jaguar, spider and howler monkeys, the Resplendent Quetzal, Morelet's crocodile, the Scarlet Macaw, the Baird's tapir, the Horned Guan, the West Indian manatee and the Golden-cheeked warbler.

Monkeys are typically the more conspicuous faunal elements of Guatemala's forests and have considerable ecotourist appeal. There are three species of monkeys in Guatemala, the Central American spider monkey (*Ateles geoffroyi*) and two species of howler monkey, the Mexican Black howler (*Alouatta pigra*) and the Mantled howler (*Alouatta palliata*). Both the Central American spider monkey and the Mexican Black howler monkey are listed on Appendix II of CITES, while the Mantled howler is listed on Appendix I of CITES. The Mantled howler has a very restricted distribution in Guatemala, occurring in the extreme southwestern portion of the country. The Mexican Black howler occurs in forests in the northern half of the country, while the Central American spider monkey's distribution is generalized throughout the entire country.

[43] Kihn, H. et. al. Marzo de 1999. Distribución de las aves migratorias en Guatemala, con una evaluación preliminar de la avifauna residentes de interés especial para la conservación. The Nature Conservancy. 52 pp

The jaguar (*Panthera onca*) is one of the largest bodied flagship species in Guatemala, and is rarely seen in the wild. Although the jaguar's original distribution covered the entire country, the current distribution is disjunct, with observations of this species in the extreme southeastern portion of the country, and a more continuous distribution in the northern portion of the country. In some cases, the jaguar causes damage to farmers livestock, such as the case in Chisec, Alta Verapaz. The jaguar is listed on Appendix I of CITES, along with the other four occurring cat species found in Guatemala. These include the jaguarundi (*Felis yaguaroundi*), the puma (*Felis concolor*), the ocelot (*Felis pardalis*) and the margay cat (*Felis wiedii*). The Wildlife Conservation Society (WCS) has a jaguar conservation program operating in several Latin American countries. In Guatemala, WCS has been conducting interviews and inventories, principally by transect and by camera-trapping, in an attempt to identify areas for jaguar conservation.

Another large bodied flagship mammal is Baird's tapir (*Tapirus bairdii*), with adults weighing between 400 to 600 pounds. In Guatemala, Baird's tapir's distribution is restricted to the northern half of the country. This species is listed on Appendix I of CITES and is avidly hunted for meat.

The Resplendent Quetzal (*Pharomacrus mocinno*) is one of the most beautiful birds in the world and is the national emblem for Guatemala. The quetzal occurs in cloud forest habitat and its distribution in Guatemala is restricted in these endangered habitats along elevations between 500 to 1500 meters above sea level. This species is listed on Appendix I of CITES, and has great value as an ecotourism attraction.

Another avian flagship species for Guatemala's biodiversity is the Scarlet macaw (*Ara macao*), occurring in the Peten, in northern Guatemala. This colorful bird is listed on Appendix I of CITES. This species, along with other large macaws, are used by the private sector as symbols of the tourist trade in Central America. A tri-national effort is underway to study and conserve this species in the Maya forest of Mexico, Guatemala, and Belize. In Guatemala, Defensores de la Naturaleza and ProPeten, together with WCS, have initiated a Scarlet macaw monitoring program operating in the Maya Biosphere Reserve.

The Horned guan *(Oreophasis derbianus*) is a critically endangered monotypic species occurring in high altitude cloud forest in Mexico and Guatemala. This species is an especially appropriate flagship species for cloud forest conservation in Guatemala. There is a paucity of information available for this species, and sightings are reported in the Atitlan and Sierra de las Minas regions.

Morelet's crocodile (*Crocodylus moreletii*) is endemic to the Mesoamerican hotspot, and in Guatemala, and is restricted to rivers in the northern half of the country. Listed on Appendix I of CITES, there is little information available about this species. Laguna del Tigre National Park and Sierra del Lacandon National Park, located in the Maya Biosphere Reserve, are important habitats for the conservation of Morelet's crocodile.

The West Indian manatee (*Trichechus manatus*) is an aquatic mammal that occurs in Lake Izabal and Rio Dulce. The West Indian manatee is listed on Appendix I of CITES. Defensores de la Naturaleza has a manatee monitoring program in the Lake Izabal and Rio Dulce region. The first overflights since 1992 to identify manatees from the air were carried out in May, 2002.

The Golden-cheeked warbler (*Dendroica chrysoparia*) is a typical flagship migratory species of the Central American pine-oak forests. It is found in Guatemala from October through February. This species nests in a very limited area in Texas, which causes this migratory species to be critically threatened. Defensores de la Naturaleza has studied and protected this species in Sierra de Las Minas and in other regions of the country.

3. Obstacles to Reducing Threats

3.1 Economic and Productive Structure of the Country

Farming and livestock production, as economic activities, have obvious implications on natural ecosystems and biodiversity due to changes in land use, resulting in biodiversity loss, ecological unbalance, erosion and pollution. In 1999, the natural resource sector (agriculture, forestry, hunting and fisheries) represented 23% of GDP[44] and 68% of the country's exports[45] . Approximately 81% of these exports were generated from coffee, sugar, bananas and cardamom, while timber and fish resources represented only 1 and 2.3%, respectively. However, farming and livestock production are carried out in approximately 40%[46] of the national territory, while 40% of the economically active population works in the agriculture, forestry and fishery sectors[47].

The present global crisis in the markets of agricultural products such as coffee, banana, and sugar, threatens natural resources, since the unemployed workforce could be engaged in subsistence agriculture due to lack of other work options. This situation is particularly critical in the case of coffee, because this perennial crop can be managed by agroforestry techniques that have some environmental advantages. The present coffee crop crisis endangers an estimated 48% of the more than 65 million annual daily wages earned in the coffee sector. The change from perennial coffee crops to annual crops would endanger 316,000 ha currently under coffee production, and much of this production is shade coffee cultivated in areas of native forest. These forests are located in high water recharge regions and conserve at least 32 million metric tons of soil per year[48].

[44] Programa de Naciones Unidas para el Desarrollo. 2000. Guatemala: la fuerza incluyente del desarrollo humano. Informe de Desarrollo Humano. PNUD, Guatemala.
[45] Banco de Guatemala. Valor de las Exportaciones FOB por principales productos, 1995-1999. Estadísticas en línea: www.banguat.gob.gt
[46] Ministerio de Agricultura, Ganadería y Alimentación. 2001. Base de datos digital de la República de Guatemala (1:250,000). Proyecto de Asistencia Técnica y Generación de Información del Programa de Emergencia por Desastres Naturales. MAGA, Guatemala, 109 pp.
[47] Instituto Nacional de Estadística. 2000. Encuesta Nacional de Ingresos y Gastos Familiares. Disco compacto. Publicación Electrónica del INE. Guatemala.
[48] FIPA-USAID. 2002. Caficultura y ambiente: tendencias, crisis actual y perspectivas del mercado en Guatemala

The insufficient development of other sectors of the economy, such as services, industry and commerce, and the centralization of these sectors in large urban centers (principally Guatemala City), limits access to non-agricultural employment sources in rural zones.

3.2 Inadequate Land Use Planning and Regulation

One of the main obstacles to reduce the threats to forests and biodiversity is inadequate land use planning and regulation, promoting an inappropriate use of the land, and consequently, the erosion of natural resources. The majority of the rural population is settled in the central mountainous zone of the country, with limited agricultural potential, except for the productive inter-mountain valleys dedicated to horticultural production. These lands with shallow soils, steep slopes and nutrient cycling dependent on forest cover, are cultivated for the production of basic grains for subsistence, such as corn and black beans. A similar phenomenon takes place in the northern highlands, a region with very fragile soils of karst origin. As a consequence of internal migrations, these lands are populated at a density surpassing carrying capacity. This situation is aggravated by a total lack, or incipient application, of land use policies and regulation, with limited administrative mechanisms or incentives to promote appropriate land use planning.

From an economic perspective, inappropriate land use for productive activities restricts competitiveness. The country's forestry production is wasted and underdeveloped, basic grain production for subsistence does not fit into a commercial construct (except in rare exceptions), and current commercial crops do not reach their economic potential, thus maintaining poverty levels and pressure on forested lands. Although the present agricultural policy addresses these obstacles, these issues have not been a priority within the Government, and resulting rural development strategies are not coherent and effective.

3.3 Land Tenure Structure

In Guatemala, the land tenure structure is directly related to natural resource and biodiversity degradation. Land distribution is characterized by a pronounced disparity, where 0.15% of producers own 70% of the land, 4% own 10%, and the remaining 20% of the land is spread among 96% of the owners[49]. The majority of Guatemalan farmers are considered infrasubsistence[50] (37%) and subsistence[51] (59%), while 4% and 15% are considered surplus[52] and commercial farmers[53], respectively. All infrasubsistence and

[49] Ministerio de Economía. Tercer Censo Nacional Agropecuario. Guatemala.

[50] Refers to the type of agriculture practiced by farmers who do not obtain by these means the minimum income to cover their basic needs (housing, food, health, education); on the contrary, their income is deteriorated year by year, in addition to their physical surroundings (MAGA, 1998)

[51] Refers to the type of agriculture practiced by farmers that by these means do not obtain the minimum necessary income to cover their basic needs (housing, food, health, education); but that, different from infrasubsistence agriculture, does not deteriorate their income level, although they contribute to the detriment of their physical surroundings (MAGA, 1998e)

[52] Refers to the type of agriculture practiced by peasants that achieve production levels, allowing them an income that guarantees acceptable living standards, and some level of capitalization as result of their participation in agricultural markets.

[53] Refers to the type of productive activity practiced by agricultural "businessmen" that produce in function of the market (MAGA, 1998e)

subsistence farmers produce basic grains in small agricultural plots generally situated in marginal agricultural zones. More than 80% of the land used for basic grain production by these farmers is situated in mountainous zones of land suitable only for forest production, causing an accelerated degradation of natural resources and biodiversity[54].

The agricultural situation is aggravated by the lack of legal ownership certainty which is attributed to a series of historical events (colonization, land dispossession during different periods, the recent internal war), lack of legal acknowledgement in common law, the inexistence of a land registry for taxation purposes, mistakes and poor management of the real estate registry, and mistaken agricultural policies (colonization of Guatemala's northern tropical forested lands without property regulation). The lack of legal certainty has repercussions on the regulation of the land market, for access to credit, for access to incentives (such as the current forestry incentive) and on land management.

3.4 Population Growth and Migration

The increase in population density in poor rural areas, where infrasubsistence and subsistence farming occur, fosters the overexploitation of natural resources and the expansion of the agricultural frontier in forested areas on soils suitable only for forest production. Guatemala has one of the highest population growth rates in the region (2.8%), recently reaching 12 million inhabitants with projections of 21.7 million by 2005. In 2000, 61.4% of the population was rural, with more than 50% of the rural population dedicated to farming and livestock activities. The current average human density is 105 inhabitants/km^2, but by 2025 this will increase to 180 inhabitants/km^2, significantly increasing the current levels of pressure on the country's natural resources[55].

The population density increase in poor rural areas increasingly exerts pressure on natural resources and the lack of non-agricultural economic options forces peasants to look for available land outside their place of origin. This phenomenon has caused massive migrations toward mainly forested national lands, principally in the Petén and where most of the lands are owned by the Government, resulting in the deforestation of more than 30% of the tropical forests in the southern part of this province between 1986 and 2000. The reduction of available land for agriculture has exerted strong pressure on the country's protected areas, again mainly in the Petén. For example, in the Maya Biosphere Reserve, the human population has tripled between 1990 and 2000[56].

3.5 Poverty

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[54] Castro, E. 1997. Temas y prioridades sobre el manejo de los recursos naturales en las laderas de México y Centroamérica. *In:* Scher, S.; Miranda, B y Neidecker-Gonzalez, O. (Eds). Investigación sobre políticas de desarrollo sostenible en las laderas mesoamericanas. p 85-108.

[55] Instituto Nacional de Estadística. Proyecciones de Población (a partir del censo nacional de 1994)

[56] CONAP, CARE, USAID y Cooperación Austriaca. 2001. Censo de Población para dar Seguimiento a la Base de Datos Sobre Población, Tierras y Medio Ambiente en la Reserva de Biosfera Maya. Disco compacto.

Poverty[57] and extreme poverty[58] in rural areas constitute an obstacle for natural resource and biodiversity conservation since subsistence activities are based on the exploitation of natural resources. For example, the transformation of natural ecosystems to corn fields, without considering the potential and appropriate use of the soil, can lead to erosion, degradation of the natural resource base, loss of biodiversity, and ecological unbalance. About 57% of Guatemalan population is poor, and of this amount nearly 50% survives in extreme poverty[59], which means that at the present time 6.5 million Guatemalans are poor and about 3 million live in extreme poverty. Poverty is more evident in rural areas where 39% of the rural population lives in extreme poverty. The indigenous populations are the most critically poor. Thirty of the 41 most important natural ecosystems in the country occur in the 102 municipalities declared as the country's poorest, and where the present Government has concentrated its " Poverty Reduction Strategy" [60].

As a result of the poverty situation, Guatemala has the lowest life expectancy and the highest illiteracy rate for the entire Central American region. Social investments in health and education are among the lowest in the region, as demonstrated in **Chart 8**.

Chart 8. Socio-economic Indicators of the Central American Region

Indicators	Guatemala	El Salvador	Honduras	Nicaragua	Panama	Costa Rica
Life expectancy	67.0	69.6	67.5	68.5	73.2	76.8
Social expenditure in Education: GDP %	2.45%	2.0%	3.7%	4.3%	4.9%	5.3%
% illiteracy	30.6%	21%	29%	23%	11.2%	6.9%
Social expenditure in Health: GDP %	1.34%	1.4%	2,7%	4.2%	6.2%	7.4%

Source: CEPAL, 1997. "Basic Social Indicators of Northern Subarea of Latin America and the Caribbean". Human Development Report 2001. Guatemala: Human Development Financing. United Nations System Guatemala 2001

3.6 Weakness in Environmental Management

Natural resources and biodiversity, as well as all derived environmental services, are both private and public property and their appropriate management and conservation depend highly on the public and private legal and institutional structures in place. Deficient environmental management is evident in the weak rule of law of public institutions, as well as in their counterparts in civil society organizations. In effect, application of the legislation, in general, as well as specifically in the field of the environment, is deficient in Guatemala. In the case of environment issues, this deficiency is due to a series of

[57] A person is poor when their daily income is less than US$2.00. Human Development Report 2001. Guatemala: Human development financing. United Nations Guatemala System 2001.

[58] Extreme poverty is when the daily income is less than US$1.00

[59] PNUD. 2000. Guatemala: la fuerza incluyente del desarrollo humano. Informe de Desarrollo Humano. PNUD, Guatemala.

[60] Program made by the General Planning Office in 2001 and proposed as an instrument to face the country 's social-economic unbalances that define poverty.

factors that include the lack of normative legal instruments, weakness of law enforcement authorities (Nature Protection Service of Civil National Police and the Environmental Prosecution Office), inadequate policies and lack of inter- institutional coordination and cooperation. For example, only 863 cases, of which the majority were linked to fires or to forestry resources, were reported in the Judicial Body for the year 2001. In that same year the Environmental Prosecution Office reported 377 cases, which according to experts, represent a very small fraction of the crimes[61].

In general terms, the issue of natural resources and biodiversity has not been a high priority, nor properly addressed, in the Government. This is reflected by an inadequate budget allocation, a lack of participation in national policies, the lack of specific policies reflecting local realities and needs, and the inexistence or inefficiency of the environmental authorities within different government entities. Section Four contains a more detailed description of the institutional environmental situation.

The lack of importance given to the issue of natural resources and biodiversity is aggravated by the duplication of functions and the lack of coherence among the public institutions. While CONAP is mandated with protected areas and biodiversity, MAGA regulates genetic and fish resources, MARN defines natural resources policies and is the focal institution of international agreements, and INAB has the responsibility of ensuring the protection of the country's watersheds, of endangered forestry species and mangrove ecosystems. The Ministry of Energy, the National Electricity Commission, the National Fishery Unit-UNIPESCA-MAGA), the Guatemalan Tourism Institute, the Ministry of Culture with IDAEH (the Anthropology and History Institute (IDAEH) and the Ministry of Communications are all added to this institutional confusion.

The lack of coordination on environmental issues is also reflected at the local level, where there is an evident lack of acknowledgement by the authorities on local procedures that could allow for better biodiversity management and conservation. This weak coordination also occurs in the opposite sense, since generally at local and municipal levels, little importance is given to forest and biodiversity conservation and it is not clear how local priorities could contribute to national goals.

Natural resources are used by different sectors of the national economy, such as the energy sector (hydroelectric, geothermic), transportation sector (waterways and oceans), forestry sector, fishery sector, and tourism sector. They are also used by the rural population for family consumption and for commercialization (timber, firewood, water, brushwood, soil, flora and fauna, etc.). This great diversity of sectors must participate in resource management, both at decision making and at resource management levels. Currently, representatives of seven public institutions participate on an advisory council through CONAP. This participation is not sufficient to cover the range of interests, the level of depth and the local focus that natural resource management requires. This deficiency is also not covered by civil organizations that work on environmental issues, which generally lack clear strategic orientation, coherence and consistency in their

[61] FIPA-IDEADS-USAID-Cooperación Holandesa. 2002. Diagnóstico esquemático sobre la situación del sistema de justicia ambiental y agenda para su fortalecimiento.

actions. In short, these organizations lack participatory policy making processes and experience in proposing environmental policies, resulting from their limited analysis and proposal generating capacity.

There is an information deficiency regarding Guatemala's biodiversity and the available information is scattered, incomplete or is unavailable to decision makers, managers and biodiversity resource users. This deficiency is the result of the lack of permanent and systematic research programs on biodiversity and available databases for decision making, both in academic and in public environmental institutions.

3.7 Formulation and Application of Environmental Policies

Along with the structural and operative weaknesses of public environmental institutions or those concerned with the environment, is the lack of an adequate concept of the importance of natural resources and their management as an essential factor for the nation's development and stability, that seeks a balance between economic profit, social equity and environmental support. This weakness is apparent in policy deficiencies, either due to their absence or because of inadequate policy formulation that frequently results in inviable proposals. In general, environmental issues are usually ignored, underestimated or inadequately addressed in development policies, frequently disconnected with environmental policies. Some of the main obstacles proposed by some of the policies that are most related with biodiversity and natural resources are identified as follows.

Protected Areas and Biodiversity Policy. The specific goals of the protected areas and biodiversity policy emphasize the importance of conservation through the promotion of strategies on sustainable resource management and use, and underline the importance of strategic watersheds and water recharge areas. The policy instruments to promote conservation and sustainable biodiversity management, as well as the resources for its implementation, are limited. In addition, there is the lack of effective and efficient incentives to assure compliance of policy objectives, as well as the incompatibility with other government policies.

Forestry Policy. The original forestry policy consisted fundamentally of regulating the harvesting and transportation of timber from natural forests. By 1976, policies were unable to value forest activities in detriment of Guatemalan forests and by 1996, the National Forestry Institute (INAFOR), had implemented fiscal incentives with limited impact on national forestry development. In 1996, the new forestry law was approved, as a result of the formulation and consensus work led by the Forestry Action Plan, resulting in the creation of the National Forest Institute (INAB). The specific goals of the forestry policy consider the promotion of natural forest conservation and production, and to allow INAB as a co-administrator for protected areas and to assess the forestry–hydrological link as a source of environmental services. Despite the relative success of the forestry policy, action is needed to guarantee the consolidation of the policy and the coherence of other efforts oriented towards forest conservation and sustainable management.

Agricultural Policy. For many years the agricultural policy promoted territorial colonization and the expansion of the agricultural border. Deforestation was recognized as a land "improvement", a requisite to demonstrate the possession of recently occupied land parcels. The implementation of farming and livestock modernization policies has encouraged the unilateral and indiscriminate use of agrochemicals, the establishment of single species crops, the genetic homogenization of crops and breakdown of the existing ecological equilibrium in traditional agro-ecosystems (associated and staggered crops). This situation has caused contamination, genetic erosion and cultural erosion (of the cultural values associated with traditional productive practices) and a greater susceptibility to pests.

Although the present agricultural policy proposes to contribute to the sustainability of agriculture[62], its implementation is nascent and care must be taken to guarantee that it will not become a threat to the integrity of natural resources and biodiversity. This will require the development of legal instruments to value and guarantee the sustainable use of water resources, sustainable farming and livestock production in suitable geographic areas, income generation, improving the quality of life, and appropriate land use planning. The implementation of this policy should be consolidated to address the agrarian problem through the creation of a clear and stable land market. To date, legal instruments have been developed for the resolution of land property rights, the modernization of the Real Estate registry, and the creation of a national land registry for taxation purposes.

Energy-oil Policy. Activities related to the generation of energy are linked to natural resources in the use of hydrological services of forested areas for hydroelectric production and in contamination generated by hydrocarbon exploitation. The country's largeest oil sources are located in the Maya Biosphere Reserve in the tropical forests of northern Guatemala. Guatemala lacks an explicit energy or oil policy that regulates and directs the exploitation, establishing the link with natural resources and other activities. This deficit promotes decision making that favors generating energy without taking into consideration the consequences and impacts on natural resource and biodiversity conservation. These consequences are manifested in the insufficient management of watersheds (to assure flows for hydroelectric generation), in quite unrealistic environmental impact studies on contamination, and in deforestation derived from oil exploration and exploitation.

[62] Ministerio de Agricultura, Ganadería y Alimentación. Unidad de Políticas e Información Estratégica. 2000. Política Agraria y Sectorial (1998-2030). UPIE-MAGA. Guatemala.

4. Biodiversity Conservation Efforts in Guatemala

4.1. The Guatemalan Protected Area System

The National Council for Protected Areas was created as under the Guatemala Protected Area Law (Legislative Decree 4-89, modified by Legislative Decree 110-96). In this Law, the Guatemalan Protected Area System of Guatemala (SIGAP) was also created. SIGAP has 123 protected areas that were declared for natural ecosystem conservation, protection of scenic beauties, cultural characteristics, or for vegetation or wild fauna protection. These areas cover approximately 31,954 km^2 and represent 29.3% of the national territory (**Figure 4**).

Of the total number of protected areas, 103 (84%) cover less than 10,000 ha and only five surpass 100,000 ha (without including their buffer zones). There are 73 protected areas that are less than 1,000 ha, equivalent to 0.94% of SIGAP. Thirty protected areas have areas ranging between 1,001 and 10,000 ha, and represent 4.12% of SIGAP. Twelve protected areas range between 10,001 and 50,000 ha (13.81%), three are within a range of 50,001 to 100,000 ha (8.31%), and five protected areas are larger than 100,001 ha or more (72.82% of SIGAP). SIGAP's management categories are presented in **Chart 9**.

Chart 9. Guatemalan Protected Area System according to management categories

Categories (a)	Number (b)	Area (ha)	(%)
Category I: Biological and ecological reserves, Biotopes (c)	7	26,488	0.83
Category II: National Parks (terrestrial or marine), Regional Park (d)	26	59,802	1.87
Category III: Natural Monument, Cultural Monument, Historic Park, Natural and Cultural Monument	5	6,399	0.20
Category IV: Forestry Reserves, Prohibited Hunting Zones, Wild Life Refuges, Protected Springs, Private Natural Reserves	77	236,278.85	7.39
Category VI: Biosphere Reserve, Multiple Use Zones	8	1,918,096	60.03
Buffer Zones (e)		948,341	
TOTAL (f)	**123**	**3,112,913.6**	**100.00**
Percent of country covered by SIGAP without buffer zones		20.6 %	
Percent of country covered by SIGAP with buffer zones		29.3 %	

References:

(a) No protected areas have been formally decreed in Category V (Scenic Routes and National Recreational Areas)

(b) Is the total considering independent conservation units. If the MBR is considered as a discrete unit, then the total is reduced to 116.

(c) Category I: the area of Laguna del Tigre, Dos Lagunas, and San Miguel La Palotada Biotopes, is accounted for within the MBR.

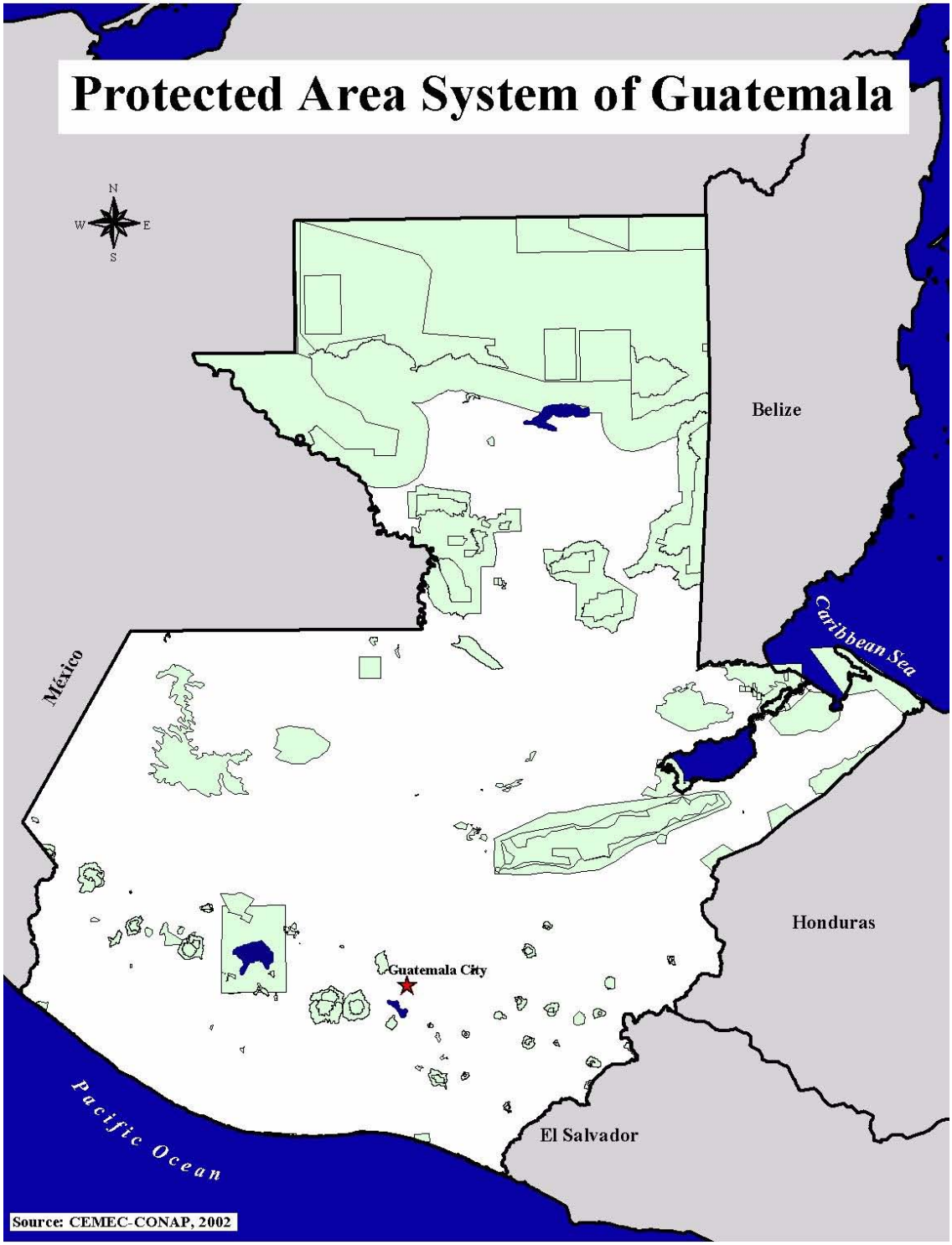
(d) Category II: the area of Sierra del Lacandon, Laguna del Tigre, Tikal, and Mirador Rio Azul National Parks is accounted for within the MBR.
(e) Is the consolidated area of the Zonas de Veda (volcanoes), MBR, San Roman, El Pucte, Chiquibul Montanas Mayas, Xutilja, Sierra de las Minas and Cerro San Gil Buffer Zones.

The total area is estimated, since there are some overlaps between some natural private reserves within larger areas previously declared as other protected categories. However, the error associated with this estimate is not more than 1%.Source: This Study

SIGAP's management categories favor the fulfillment of both strict conservation and the sustained use of natural resources. This combination of purposes is reflected in the Biosphere Reserve concept. It is noteworthy that only 45.18% of SIGAP is considered to be under strict or protected management categories (I, II and III); while 54.82% of SIGAP lands have less strict or multiple use management categories (IV, VI).

In Guatemala there are five Biosphere Reserves, which represent 81.2% of SIGAP's total area. Of those five, the Maya Biosphere Reserve (MBR) represents 67% of SIGAP's total area and is the largest protected area in Central America. The MBR is a biodiversity management system characterized by the participation of different actors under a diversity of co-administration modalities and the implementation of internal zoning that includes Core Areas of strict protection, a Multiple Use Zone with forest management units and biological corridors, and a Buffer Zone that supports the development of farming and livestock activities. The most important cases of community forest management in Central America are carried out in the Multiple Use Zone of the MBR. Currently, there are 557,815.4 ha under management (27% of the MBR and 5% of the national territory) with the participation of about 1,265 rural families (6,031 inhabitants). Of these, 359,561 ha have been internationally certified and accredited before the Forestry Stewardship Council (FSC).

Figure 4: Distribution of the Guatemalan Protected Area System



1.

4.2 Environmental Management Institutions

4.2.1 Description of Institutions

a. Government: The Ministry of the Environment and Natural Resources (MARN) is responsible for national environmental management. It was recently created (December 2000) replacing the Environment and Natural Resources Ministry (2000-2001) and the National Environmental Commission (1987-2001). MARN also assumes responsibilities related with water resources and soil management, previously assigned to the Ministry of Agriculture (MAGA). MAGA retained those responsibilities related to hydrobiological resources. MARN manages an annual average budget of US$ 4.0 million. Although MAGA manages a significantly higher budget (around US$ 50 million), only approximately US$ 300,000 are allocated for hydrobiological resource management.

The National Council of Protected Areas (CONAP) has the management responsibility of the Guatemalan Protected Area System (SIGAP), and is composed of seven entities including the MARN, which presides over the council, the MAG, a representative of environmental NGOs, the Association of Municipalities (ANAM), the Anthropology and History Institute (IDAEH), the Guatemalan Tourism Institute (INGUAT), and the Center of Conservation Studies (CECON). The Executive Secretariat of CONAP assumes the legal representation of the institution, executing council policy decisions and coordinating SIGAP's management.

CONAP is also the entity responsible for the management of environmental international agreements, such as the International Trade of Endangered Species Agreement (CITES), the RAMSAR-Wetlands Convention, and the Biological Diversity Agreement. CONAP is also responsible for managing forestry, mining, tourist, farming and livestock activities inside of protected areas.

CONAP manages an average annual government budget of US$4.0 million of which 25% corresponds to "private income" resulting from airport taxes, fees from the sale of official documents, and taxes from forestry concessions. This budget is insufficient to assure the presence in, and management of, all SIGAP areas. These financial limitations are also evident for other government institutions that manage protected areas, such as CECON, IDAEH and INAB.

The National Forest Institute (INAB) is responsible for the application of the national forestry policy and forestry management outside of SIGAP. INAB is an autonomous institution and is managed by a board of directors formed by seven entities. These include MAGA, which presides over INAB, the Municipalities, Natural Resources and Environmental NGO Association (ASOREMA), the Escuela Nacional Central de Agriculture (ENCA), a representative from the university system, the Public Finance Ministry and the forestry association. INAB manages an average annual public budget of US$ 4.0 million.

Under INAB, forestry promotion mechanisms, which have had positive impacts, were established. One of the most important instruments of the National Forestry Policy that is operating under the management of INAB, is the Forestry Incentive Program (PINFOR). The creation of PINFOR is supported by the Forestry Law (Legislative Decree 101-96), where it is established that the operating budget will be 1% of the Government's ordinary income budget. The average potential allocation for the period of 1999-2001 is equivalent to an annual allocation of US$159.2 million, although the real investment average in the same period has been US$42.3 million. After four years of operation since its creation, this program has established 18,446 ha of plantations and incentives have been granted for conservation and sustainable forestry management of 20,000 ha of native forests. These activities have generated approximately 3.2 million daily wages equivalent to about 12,000 full-time jobs. These jobs, added to the 47,800 jobs generated by forestry activities, correspond to 1.42% of the country's economically active population.

b. National Environmental Funds: There are two environmental funds supported with central government resources and one private environmental fund that promote investments in the environmental field.

The National Nature Conservation Fund (FONACON) invests, on average, US$200,000 annually in biodiversity conservation and sustainable natural resource management projects. Since 1998, FONACON has financed about 80 small projects under US$ 30,000. It is a well managed and technically competent fund. Nevertheless, its main weakness is that it has not attracted significant financial resources from non-government sources.

The Guatemalan Environment Fund (FOGUAMA) began operations in 1997 and is presided over by the MARN, with the MAGA, CONAP's Executive Secretariat, an university representative, ASOREMA and the Finance Ministry conforming the Board of Directors. This fund gives priority to Environmental Sanitation projects and invests US$ 600,000 on average, annually.

The Guatemalan Conservation Trust (FCG) is a private fund and its funding base comes mainly from international organization donations. The Trust operates with an executive secretariat and with a Trust management board. Approximately US$250,000 is invested annually in biodiversity conservation research projects.

c. International Cooperation: External sources of cooperation in the environmental field can be bilateral (for example, important sources include USAID, the Dutch Embassy and the German Government) or multilateral (World Bank, IDB, GEF and the European Union). These entities have agreements with the Government and usually non-government agencies are in charge of program execution. Bilateral cooperation sources predominate among external sources and generally those resources that they contribute are not reimbursable. Compared to these resources, the participation of external non-profit multilateral and private resources is small.

Of the total resources mobilized by external sources (approximately US$20.0 million per year), 75% are from bilateral sources, mainly from countries like the United States, Holland and Germany (jointly representing half of the resources mobilized from abroad). The rest is obtained from multilateral sources, and in a smaller proportion, from private profit or non-profit entities.

d. National and International Non-government Organizations (NGOs): In theory, the national NGOs with environment related activities are organized by, and represented in, ASOREMA. However, this Association has lost its leadership in the environmental field. The individual leadership of many of its members substantially surpasses the leadership of the association itself. Therefore, it is more useful to mention the interventions of the more relevant environmental NGOs.

Perhaps *Fundación Defensores de la Naturaleza* (FDN) is most important national environmental organization. FDN's principal activity is concentrated in the management of four protected areas, by delegation of the Congress of the Republic or under co-administration mechanisms with the Government. Sierra de las Minas Biosphere Reserve is one of these areas and is the second largest protected area in the country, second only in size to the Maya Biosphere Reserve in the Peten. This Foundation manages about US$1.5 million per year, from more than 15 different funding sources. FUNDAECO, Mario Dary Foundation (FUNDARY), *Naturaleza para la Vida* (NPV), and *Fundación Solar* are among the most important other smaller environmental organizations. In general, all of these organizations manage resources obtained from the government, bilateral or multilateral donors, and from national and international fundraising campaigns.

The largest environmental international NGOs are The Nature Conservancy (TNC), Conservation International (CI), Wildlife Conservation Society (WCS) and CARE, although the latter is a development organization that has some experience in environmental programming. The first three operate mainly in the Peten, although TNC has initiated activities in the western highlands, basically because of the broadening of the USAID Environmental Program, which for almost ten years (1990-1999) was concentrated exclusively on the Maya Biosphere Reserve. These organizations' resources basically are generated from the United States.

4.2.2 Some Limitations of the Present Institutional Arrangement

CONAP is the institution with the greatest national biodiversity management mandate. This mandate is carried out through the Guatemalan Protected Area System (SIGAP) and the Wildlife Management System. Nevertheless, after a little more than a decade of operation, this institution presents some limitations that prevent it from reaching the objectives established in the legal framework and stated policies. The main limitations are the following:

- CONAP Centralization: For many years CONAP focused its scarce financial and human resources on the establishment of protected areas in the Peten. Only four years ago (1998-1999) did CONAP began to establish regional offices throughout the country. These offices still lack technical and financial autonomy.
- Conflicts between its policy and administration functions: Upon dedicating itself to managing protected area and conservation projects, CONAP neglected its biodiversity conservation policy development function. Recently CONAP undertook a more protagonistic role as SIGAP's director, but continued to emphasize protected areas, to the detriment of other biodiversity management legal instruments.
- Weak political autonomy: CONAP is an entity legally and politically dependent on the Office of the Presidency of the Republic, which has the authority to appoint the Executive Secretary and the possibility of controlling the Council.
- Scarce financial resources and lack of independence to hire human resources: In the first case the budget is limited and in the second, the salary scales limit the recruitment of qualified personnel.
- Shared competence and jurisdiction overlaps: CONAP is not the only entity responsible for biodiversity conservation. It shares some of its responsibilities with the MAGA, MARN and with INAB.
- Lack of adaptability and flexibility to regions: Under the present arrangement, CONAP dictates national rules and does not have the authority to effectively adapt them to regional and local context. The regional offices of all environmental institutions, CONAP, INAB, MAGA and MARN, respond to central office guidelines and have little technical, and no financial, autonomy.

The national challenge consists in developing an institutional arrangement that surpasses these and other limitations, so that national biodiversity conservation objectives can be met.

4.2. Financing National Environment and Biodiversity Management

It is difficult to quantify investments in biodiversity management in Guatemala, since records are not kept specifically for biodiversity, rather data are available for national natural resource and environmental management, conservation, improvement and restoration. Therefore, estimates are made from available information. The period between 1999-2001 is used as a reference to reach an investment figure. During this time period, public and external sources provided the majority (US$112.5 million) of financial resources to support environmental management, equal to 85.2% of the total amount allocated during that period (US$132.0 million). The remaining support was granted by private institutions, whether of profitable or non profitable origin. Mostly governmental agencies, government-related project executing units, and non-governmental organizations managed these funds. These investments totaled US$44.0 million a year. Estimating that at least 40% of the resources were used for operating expenses of the executing institutions, it is possible to infer that US$79.2 million were directly invested, equivalent to US$26.4 million a year.

A detailed structural analysis of the environmental funding granted demonstrates that at least 50.5% of the support was provided by the government, 49% by external sources, and less than 1% by private sources. At least 70% of the government financing corresponds to the central government's budget, and the additional funding is derived from loans granted by international funding institutions. Forty-five percent of the external funding is granted by bilateral agencies, 30% by multilateral agencies, and the remainder by international funding institutions (23%), foreign private organizations (1.5%), and international academic institutions (0.5%).

National private funding is minimal and limited to resources that are assigned and executed by national non-governmental organizations, universities (URL, USAC and UVG), as well as civil guild organizations such as the Non-traditional Products Exporters Association (AGEXPRONT).

An analysis of the destination of resources demonstrates that priorities and emphasis shift as the financial support goes from the source to the intermediaries, and then to the executors[63]. Consequently, the resources are primarily assigned for sustainable management activities, including the use of natural resources and the environment (84%), for strict biodiversity conservation activities (6%), for threat and environmental impact mitigation management activities (6%), and for institutional strengthening activities (4%). However, the executing institutions prioritize threat and impact mitigation management activities (42%), sustainable management activities (41%), and conservation activities (16%). The remaining resources are for institutional strengthening activities.

Lastly, the annual investments (institutional operation and investment) in environmental management provided by the central government total 0.82% of the average national general budget for the 1998-1999 period (US$2,682 million). The total investment (including all sources) equals 1.6% of the national general budget **(Chart 10**).

Chart 10. Summary of the general environmental management funding situation in Guatemala

HEADING	DESCRIPTION
Main environmental funding sources	Central government and both bilateral and multilateral international cooperation
Main bilateral sources	USAID, Dutch Embassy, GTZ
Main multilateral sources	IDB, World Bank, GEF, European Union
Main financial intermediary institutions	National institutions: FONACO, FOGUAMA, FCG. International: FAO, UNDP, CATIE
	Central government: through MARN, MAGA, CONAP, INAB. National NGOs: FDN, FUNDAECO, FUNDARY, NPV

[63] Based on the comparison of priorities of a series of financial sources, and the analysis of the final execution of resources performed by the executing units that received said resources (FIPA-USAID, 2002. Analysis of environmental investments in Guatemala. Guatemala).

Main implementing institutions	International NGOs: TNC, CI, CARE, Movimundo. Programs and projects with executing units: FIPA-USAID, BIOFOR-USAID, PEP-TNC-USAID, PAFG, PRODEFOR, RECOSMO, MIRNA, *Cuencas Altas*, *Helvetas.* Universities: URL, UVG, USAC Private national organizations: AGEXPRONT
Funding for environmental management during the reference period (1999-2001)	US$ 132 million
Annual average funding	US$ 44 million
Annual funding granted by Governmental sources and International Cooperation (%)	85.2%
Funding structure according to source	Government (50.5%), International Cooperation (49%), Private organizations (05%).
Governmental funding structure	Own resources (70%); Reimbursable resources (30%)
External funding structure	Bilateral agencies (45%), Multilateral agencies (30%); other international funding institutions (23%), private organizations (1.5%), academic institutions (0.5%).
Scope of activities funded	Threat and impact mitigation management (42%); Sustainable management (41%); Conservation (16%); and the remainder in institutional strengthening activities (1%).
The % of the national general budget.	Governmental investments: 0.82% (excluding PINFOR's percentage) Total investments (from the government and other agencies): 1.6%

4.3. Other Strategic Interventions

The financial resources supporting environmental management are used by the implementing institutions (whether public or private) in accordance with the main points of the country's environmental strategy. This strategy is specific on protected areas and forest production, moderately structured on environmental quality issues, or totally inexistent, such as the case with water resources, depending on the management issues in question. Projects are the principal instrument to carry out specific lines of action in the environmental strategy. In this context, the following summarizes the characteristics and impact of the main lines of intervention.

4.4.1 Priority investment agenda for the environment

The 2002-2010 Public Investment Priority Agenda for the Environment[64] has two goals. The first one is to make known consensus reached by the three governmental agencies working on environmental management concerning the most important issues to focus investments. The second goal is to guide and focus the governmental investment efforts on environmental issues. The achievement of both goals will produce more effective and efficient cooperation relations between the government and the international technical

[64] La Agenda fue formulada en el seno del Comité de Recursos Naturales y Ambiente, conformado por MARN, CONAP, INAB y PAFG del MAGA, con el auspicio de FIPA-USAID, como parte de la agenda de trabajo del Foro de Cooperantes para el Ambiente y los Recursos Naturales constituido por el MARN a finales del año 2000.

and financial cooperation, in order to establish a common agenda on investment priorities for environmental issues. A summary of the main issues and strategic lines of action of the investment priority agenda is presented in **Chart 11**.

Chart 11. Investment priority agenda of the principal governmental institutions responsible for environmental management

No.	ISSUES / STRATEGIC GUIDELINES
1.	**Integrated management of the natural heritage**
1.1	Socializing the concept and the importance of environmental management within the government
1.2	Strengthening environmental law and justice
1.3	Strengthening land and other natural resource use /ownership rights
1.4	Encouraging territorial regulation, especially in coastal areas
1.5	Developing environmental services markets
1.6	Mesoamerican Biological Corridor Development
1.7	Encouraging environmental and risk management in strategic watersheds
1.8	Global Environmental Problem Mitigation Program
2.	**Water Resource Management**
2.1	Achieving broad concensus on a national water policy
2.2	Establishing a modern, efficient and decentralized legal and institutional framework
2.3	Establishing a national water resource information system
2.4	Supporting research, development and implementation of new technology
2.5	Water regulated market
2.6	Promoting water culture in the country
3.	**Conservation and sustainable use of biodiversity and protected areas**
3.1	Financial mechanisms supporting protected area management
3.2	Strengthening SIGAP in priority protected area
3.3	Promoting management and conservation of wild fauna and flora
3.4	Genetic resource conservation and management
3.5	Use and assessment of wildlife areas through tourism and recreation
3.6	Developing information, monitoring, research, and training systems and networks
4.	**Forest resource administration and sustainable management**
4.1	Supporting sustainable forest management
4.2	Improving forest production, industry and trade
4.3	Developing a forest education, information and research system
4.4	Institutional development
5.	**Environmental Pollution Prevention and Mitigation (no lines of action)**
6.	**Environmental Management System Development (MSD)**
6.1	Developing human capital for environmental management
6.2	Structural and functional proposal of the MSD
6.3	Strengthening the National Environmental Information System
6.4	MSD's response capacity to globalization

4.4.2 The most relevant programs and projects

There are approximately 20 relevant projects supporting environmental management in Guatemala. Of these, 40% of the projects are of a strategic nature. In short, instead of project specific locations, these projects support management processes within a national scope of action (e.g., PAFG, USAID Environmental Program, and the Technical-Legal Land Unit Project [UTJ]). The rest are focused on specific locations. Practically all projects support the basic management of natural resources, seeking sustainable productive processes. Less than 20% of the projects (e.g., Regional Environmental Program-PROARCA II) analyze the impact of their interventions on biodiversity conservation in a technically supported manner.

Projects focused on a specific location are limited to three large geographic areas: (i) Peten: the largest area and the one with the largest financial resource coverage and allocation, emphasizing the tropical forests of the Maya Biosphere Reserve, (ii) The Northeastern area of the country (Sarstun-Motagua) where protected area management activities are implemented, and (iii) The Highlands, with combined protected area management and natural resource management projects. The area of the Highlands represents the country's largest number of municipalities with the highest poverty indexes and this has motivated the interest of different funding sources to identify, plan and execute rural development projects. From this perspective, the Renewable Natural Resources Integrated Management Project (MIRNA-MAGA-CONAP-INAB-MARN-World Bank), the High Watersheds Management Project (MAGA-BID), and USAID Environmental Program are still in the negotiation process. The focus of these interventions appears to be natural resource management for rural development.

4.4. Summary of the Biodiversity Conservation effort Analysis

The following tendencies concerning national environmental management arise from the above-mentioned information analysis:

- The existing environmental institutional arrangement has fostered the development of an environmental policy framework (MARN), a forest policy focused on production, a biodiversity strategy (MARN, MAGA, CONAP), and a protected areas policy (CONAP). However, these institutions are hindered by substantial financial limitations, which limits the implementation of policies issued by the same institutions. The allocated budgets are practically designated applied to institutional operations, while the resources obtained from external sources are designated for investment. At the same time, the lack of financial resources is due to the little importance given to environmental management in the country in political terms, evidenced by budget allocations that do not exceed 1%, in contrast to other sectors, such as Defense or Communications.

With regards to biodiversity, the little importance given in general to environmental management, both financially and politically, results in weak institutional organization, which also means scarce and unstable technical resources, lack of analysis and proposal

abilities, and consequently, insufficient and fragile achievements in the conservation and sustainable use of the national natural patrimony. Despite all of these limitations, the strategic lines of action that have been established in the country seem to be adequate and are still in force. The challenge is to match, in a more sustainable manner, the efforts to revaluate biodiversity as a strategic element for development.

5. Guatemala's Tropical Forests and Biodiversity Intervention Opportunities

5.1 Intervention Analysis

This section analyzes the current USAID Mission Plan in the context of the current national public policies and legal instruments in place and proposes actions needed to strengthen the conservation and management of Guatemala's biodiversity and tropical forests (**Chart 12**).

The Central America and Mexico (CAM) Regional Strategy, FY 2003-2008, provides the framework for regional and country-specific programs leading to achievement of the overarching regional goal of a ***more democratic and prosperous Central America and Mexico, sharing the benefits of trade-led growth broadly among their citizens***. The new regional strategy narrows the focus of USAID investment to a limited number of results within the three performance "arenas" established in the Millennium Challenge Account (MCA): Ruling Justly, Economic Freedom, and Investing in People. Results selected reflect an explicit prioritization of investments that have greatest potential to have national and regional level impact in these three arenas, thus assisting countries to move along the trajectory toward meeting MCA criteria and put the region on a faster track towards broad-based prosperity. Activities such as NGO service delivery programs with limited geographic outreach, which are not part of a demonstrated host government commitment to bring programs to scale, will no longer be supported. Other examples of activities that will no longer be supported include strengthening of civil society except as a vehicle for achieving other results, support for small-scale stand-alone micro-enterprise lending programs, or protected area management except for critical watersheds and their buffer zones. A Special Objective recognizes the region's vulnerability to natural disasters and the continuing importance of mitigation and disaster preparedness efforts made apparent in the aftermath of Hurricane Mitch, and will enable the Agency to implement programs quickly in response to natural disasters and crises. In addition, the CAM Regional Strategy includes a regional Program Support Objective to accommodate the Performance fund that will award the best performing programs in the region. Programs that fall outside these objectives, but are nevertheless required as a result of other foreign policy priorities, Administration directives, or Congressional earmarks will be supported through Special Objectives.

Current Strategy: The current USAID/Central America-Mexico Strategy contains four Strategic Objectives and associated Intermediate Results (IR):

Central America-Mexico Strategy

Strategic Objective	Intermediate Results	Illustrative Activities
1. More Responsive, Transparent Governance.	1.Strengthened Rule of Law.	• Technical assistance to national authorities, justice center committees and local government officials in the design and implementation of community-based crime prevention and anti-lynching efforts, and constructive collaboration by citizens/local authorities and businesses with the police; • Policy dialogue supported by observational visits, conferences, forums, and workshops to promote key legal and institutional reforms and achieve adequate host country funding and improved functioning of judicial and law enforcement institutions; • Technical assistance and training to further expand use of oral judicial proceedings and administrative reforms to speed up case processing, and increase the number and timeliness of cases resolved, and develop alternative dispute resolution capacity; • Technical assistance to improve investigation and prosecution of charges of corruption; • Support for the Human Rights Ombudsman office and civil society to provide oversight and advocate for additional reforms needed to improve law enforcement, judicial processes, and respect for human rights; and • If Victims of Torture earmarked funds are available, continued support for exhumations of clandestine cemeteries and mental health services for victims of the internal conflict.
	2. Greater Transparency and Accountability of Governments.	• Support for implementation of recent decentralization policy reforms, including participatory planning processes, accountability mechanisms, development of municipal councils, and local control of social services; • Policy dialogue and technical assistance at national and local levels focused on increasing the level of resources available to municipal governments and using available local financial resources more effectively in providing quality services to citizens; • Technical assistance to help key municipalities implement transparency and accountability systems, including the computerized Integrated Financial Management System (*SIAF-Muni*) and public hearings; • Promotion of improved local government-private sector engagement through public-private partnerships for economic development, job creation, and service delivery; • Support for implementation of recommendations of the National Commission on Anti-Corruption and Transparency and elements of the resulting national anti-corruption strategy, including technical assistance for key institutions such as the Comptroller General and the Public Ministry's Anti-Corruption unit; • Support for civil society social auditing efforts at national and local levels, including monitoring of budget implementation and selection processes for key positions (e.g., Supreme Court); • Support for legal and institutional reforms to improve accountability of elected officials, including the Election and Political Parties law, and improved checks and balances (e.g., Congressional oversight of military budget); and • Limited and targeted election activities in preparation for the 2008 elections.
2. Open, Diversified, Expanding Economies.	1. Laws, Policies, and Regulations that Promote Trade and Investment.	▪ Assistance to resolve land conflicts and improve land tenure in rural areas; ▪ Assistance in customs administration that improve the efficiency of moving imports and exports through ports; and ▪ Assistance in tax administration, particularly for Valued Added Tax rebates to exporters;

	2. More Competitive, Market-Oriented Private Enterprises.	▪ Technical assistance to small-scale producers to allow them to engage in higher value production that meets market requirements; ▪ Assistance to enable communities to manage cultural and natural resources; ▪ Forging of more competitive business clusters and improved business linkages; ▪ Support to business associations to promote better business practices and greater transparency; ▪ Formation of business alliances that leverage resources and access to technology and markets; and ▪ PL 480 Title II-funded activities to improve infrastructure in food insecure areas and to help families in these areas become more market-oriented and competitive.
	3. Broader Access to Financial Markets and Services.	▪ Technical assistance to private banks to assist them to develop and manage new financial products and increase their financial service delivery in rural areas for small and micro-businesses, for export financing, and for industry groups; ▪ Increased efficiency in the flow of remittances and their use for business development services; and ▪ Use of the DCA to leverage additional financing for small and micro-businesses.
	4. Improved Management and Conservation of Critical Watersheds	No activities planned within Guatemalan bi-lateral program
3. Healthier, Better-Educated People.	1. Increased and Improved Social Sector Investments and Transparency.	▪ Technical assistance to: improve the capacity of the Ministries of Health, Education and Finance, Congress and other stakeholders to engage in policy dialogue on social investments; strengthen advocacy efforts for increased investments in health and education; improve analyses for sound and cost-effective policy implementation and investments in education and health; and achieve increased and more equitable and efficient resource allocation and prioritization; ▪ Technical assistance to assess and strengthen MOH and MOE technical, administrative and financial management, and performance monitoring systems towards better informed decision making and increased accountability and transparency in the use of sector funds; ▪ Analyses and promotion of best practices that support decentralization of health and education services, including greater community involvement and accountability, and a shift in the function of central ministries toward a more regulatory and normative role; ▪ Technical assistance to the MOE for developing and implementing policies and strategies that will ensure that practices advanced in the education reform are implemented, especially those directed at increasing the number of children who complete early grades on time and with improved knowledge and skills; ▪ Forging public-private partnerships and alliances to help finance increased and improved basic education and health care.
	2. Increased and Improved Basic Educational Opportunities	No activities planned within Guatemalan bi-lateral program
	3. Improved Integrated Management of Child and Reproductive Health	▪ Technical Assistance to expand and improve the quality of reproductive and child heath services, especially family planning, basic essential obstetric care and AIEPI AINM-C ▪ Contraceptive security initiatives and strengthening public sector drug logistics systems ▪ Expansion of coverage of basic health services through MOH-contracted NGOs and leveraging USAID funds for matching funds by MOH ▪ Technical assistance to strengthen a large health NGO network ▪ Integration of targeted supplementary feeding (PL 480) and AIEPI AINM-C

		▪ Assistance to APROFAM to become self-sufficient and graduate from USAID support.
	4. Spread of AIDS and Other Infectious Diseases Controlled	No activities planned within Guatemalan bi-lateral program
4. Timely Humanitarian Assistance and Crisis Response.	1. Disaster/Crisis Prevention and Preparedness	Scenario 1: Major rural and malnutrition crisis Scenario 2: Major earthquake Scenario 3: Uncontrolled Forest Fires Scenario 4: A failed State, coup or other political crisis
	2.Humanitarian Relief and Reconstruction	

In addition to the strategic objectives of the USAID Mission in Guatemala, the Strategic Objective of the Regional Environmental Program, "Improved Environmental Management in the Mesoamerican Biological Corridor", is considered relevant in the discussion regarding biodiversity and tropical forest conservation in Guatemala. The geographical emphasis of the regional program in Guatemala is on the Usumacinta watershed and tributaries to the Gulf of Honduras. The programmatic areas include protected area management, green productive activities, environmental legislation and cleaner production.

Obstacles or indirect threats: The impediments to reducing or mitigating the threats to the conservation of biodiversity and management of tropical forests were laid out in Section Three. These included i) productive and economic structure of the country, ii) lack of land use planning and regulation, iii) land tenure structure, iv) migration and population growth, v) poverty, vi) weakness in environmental management and vii) inadequate governmental policies. These root causes will need to be addressed if progress towards conserving biological diversity and managing tropical forests is to be achieved. Many of these indirect threats are of a structural nature and therefore the actions required to reduce them fall on the Guatemalan government, the USAID Mission in Guatemala and on other organizations. The analysis is limited to those actions directly linked to biodiversity and tropical forests, since an exhaustive multidisciplinary analysis is beyond the scope of the present assessment.

Public Policies and legal instruments: Regarding policies and legal instruments, all proposals related to the environmental policy regime that is in effect in the country were considered. These policies and strategies include the Agrarian Policy, the Agricultural and Livestock Policy, the Environmental Framework Policy, the National Biodiversity National Strategy, SIGAP's National Development Policy and Strategy, the Forestry Policy and the specific programs and instruments related to the same.

OBSTACLE No. 1: PREEMINENCE OF AGRICULTURAL AND LIVESTOCK ACTIVITIES IN THE PRODUCTIVE STRUCTURE OF THE COUNTRY.

PROPOSED SOLUTIONS TO MITIGATE OBSTACLES	PUBLIC POLICIES / RELATED INSTRUMENTS	USAID INTERVENTIONS		OPPORTUNITIES
	Policy/Instrument	Action		
Developing non-agricultural economic activities in the rural area.	Environment Management public policy and strategy proposals exist; nevertheless, implementation experiences are limited. The main activities identified are: • Forestry industry: Forestry policy. • Ecotourism: SIGAP's Development Policy and Strategy . • Environmental Service Market: Public Investment Priority Agenda for the Environment 2002-2010.	SO2 IR 2	Assistance to enable communities to manage cultural and natural resources. Forging of more competitive business clusters and improved business linkages Support to business associations to promote better business practices and greater transparency Formation of business alliances that leverage resources and access to technology and markets.	(i) Encouraging small and medium sized forestry industry. (ii) Identification and development of tourist circuits, and promoting small and medium ecotourism industry. (Cluster tourism reactivation). (iii) Studies on environmental service transaction cases between communities and private companies.
Encouraging the diversification of income yielding agricultural activities and encouraging a sustainable, clear and open land market.	• The Protected Areas policy encourages forestry entrepreneurship in the concessions of the Maya Biosphere Reserve. • Forestry Policy encourages forestry business encounters. • Agricultural and livestock policies support agricultural extensionist network, sub sector groups and competitive clusters The Agrarian Policy 1998-2003 and the Farming and Livestock Policy 2002-2003 approach these lines of action in the following manner: • Encourage and strengthen the PROFRUTA Program. • Generate, systemize and spread strategic information for food production and marketing. MAGA currently promotes the study of four agro-food chains: Lemon, Avocado, Honey and Papaya. • Strengthen the Farming and Livestock Science and Technology Institute (ICTA). • Modernization plan for farming under irrigation. • The Coffee Producer Action Plan supported ANECAFE proposes to diversify the production in coffee farms in sub optimum zones. The plan has not yet been executed .	SO 2 IR 2	Technical assistance to small-scale producers to allow them to engage in higher value production that meets market requirements.	(i) Strengthen and consolidate the forest concessions by diversifying employment generation (non timber, tourism) in the MBR. (ii) Reactivate the forestry cluster. (iii) Reactivate entrepreneurship in those organizations related to natural resources and biodiversity management. (iv) Replicate successful models of community based natural resource management. (iv) Develop competitive cluster : fruits, frozen vegetables. (ii) Manage strategic national and international production and market information. (iii) Strengthen the management of water recharge zones linked to zones of high water demand for irrigation (iv) Institutional strengthening for technology transfer.
		SO 2 IR 1	Rural Diversification: Assistance in customs administration that improves the efficiency of moving imports and exports through ports	
		SO 2 IR 1	Rural Diversification: Assistance in tax administration, particularly for Value Added Tax rebates to exporters	

OBSTACLE No. 2: LACK OF LAND USE PLANNING AND REGULATION

PROPOSED SOLUTIONS TO MITIGATE OBSTACLES	PUBLIC POLICIES / RELATED INSTRUMENTS	USAID ACTIONS		OPPORTUNITIES
Technical and Financial support for Protected Area Management.	SIGAP'S Development Policy and Strategy prioritizes intervention in the Maya Biosphere Reserve and the formulation of the following specific policies: • Human Settlement Policies in protected areas, regulation of natural resource use and land tenure regulation in SIGAP. • The Protected Area Co-Administration Policy, foundation for broadening responsibilities with the civil society in protected area management. The Agrarian Policy 1998-2003 proposes, as the policy's priority line, land use, tenure and ownership which is coordinated through *Fondo de Tierras*, *Oficina para la Resolución de Conflictos de Tierra* (CONTIERRA), *Secretaría Agraria*, *Unidad Tecnico Juridica para el Catastro*, the modernization of the Property Registry and the modernization of the *Instituto Geografico Nacional*.	SO 2 IR 1	Assistance to resolve land conflicts and improve land tenure in rural areas.	(i) Institutional strengthening, instrument development and civil society strengthening for protected area co-administration. (ii) Promotion of natural private reserves and conservation easements. (iii) Institutional strengthening for information management and instrument development that clarify the land market and legalization. (iv) Municipal strengthening to implement municipal land use plans.
		SO 2 IR 4	<u>Regional Environmental Program</u> PROARCA protected area management program (IR 1) ▪ Effective Alliances ▪ Application of management tools ▪ Sustainable financing	
Developing Forestry potential and protecting strategic forest ecosystems.	The Forestry Policy proposes two strategic lines: • Encouraging natural forest management. • Restoring forestry lands through timber plantations SIGAP'S Development Policy and Strategy, and the specific policy instruments, as well as the forestry concessions, propose strategic lines of activity: • Promoting productive management of environmental goods and services according to the technical and legal criteria of each management category. • The Concession Policy proposes forest management strengthening in 500,000 ha in the MBR.	SO 2 IR 1,2,3 &4	<u>Regional Environmental Program</u> Certified Products • Meet market standards • Improve access to markets • Form alliances	(i) Strengthening business management of forestry concessions. (ii) Developing forestry clusters. (iii) Institutional strengthening for the effective application of PINFOR and for designing complementary forest incentives. (iv) Municipal strengthening for Forest management. (v) Encouraging community based natural resource management.
		SO 2 IR 4	<u>Regional Environmental Program</u> Protected Area Management ▪ Effective Alliances ▪ Application of management tools ▪ Sustainable financing	

PROPOSED SOLUTIONS TO MITIGATE OBSTACLES	PUBLIC POLICIES / RELATED INSTRUMENTS	USAID ACTIONS		OPPORTUNITIES
Watershed and Water recharge zone management	SIGAP's Development Policy and Strategy prioritizes the strengthening of the strategic protected area sub-systems for water production. The Forestry Policy prioritizes the management of water-producing forests. The Agrarian Policy proposes the formulation of Integrated Water Resource Management Plan. This plan has been formulated but is not being executed.	SO2 IR4	<u>Regional Environmental Program</u> PROARCA protected area management program (IR 1) for Gulf of Honduras and Middle Usumacinta watersheds: ▪ Effective Alliances ▪ Application of management tools ▪ Sustainable financing <u>Specific Usumacinta activities:</u> • Protected Area management coordination • Fire prevention and suppression at the community level • Archaeological and Ecological tourism development • Hydro gauges • Forest management exchanges • Forest monitoring using remote sensing • Forest monitoring could address various issues including: Illegal logging (White House initiative), advancement of the agricultural frontier, deforestation and wild fire detection.	(i) Institutional Strengthening for the reactivation of the Water Plan. (ii) Strategic information to identify, prioritize and manage the country's strategic watersheds; (iii) Municipal strengthening for the development of viable instruments for water efficient municipal level water management.
Management of socio- environmental vulnerability to natural disasters.	SIG-MAGA has been established under the protection of the 1998-2003 Agrarian Policy, where a natural disaster management information system has been developed. SIG-MAGA has established agreements and has interacted with the *Coordinación Nacional para la Reducción de Desastres* and both have identified susceptible locations and have developed early alert systems.	SpO 4	Timely humanitarian assistance and crisis response to be invoked as necessary, may include infrastructure.	(i) Institutional strengthening for strategic information management and socio- environmental vulnerability management. (ii) Municipal and civil society strengthening for natural disaster management.

OBSTACLE NO. 3: LAND TENURE STRUCTURE: CONCENTRATION AND LACK OF LEGAL CERTAINTY CONCERNING PROPERTY

PROPOSED SOLUTIONS TO MITIGATE OBSTACLES	PUBLIC POLICIES / RELATED INSTRUMENTS	USAID ACTIONS		OPPORTUNITIES
Supporting rural and agrarian conflict regularization process	The 1998-2003 Agrarian Policy, proposes to regulate land use, tenancy and ownership as the Policy's priority line through the Lands Fund; Land Conflict Resolution Office (CONTIERRA); Agrarian Secretaryship; The Juridical Technical Unit for Cadastre; The Property Registry Modernization and the National Geographical Institute Modernization The following is protected under SIGAPs Development Policy and Strategy: Policy of Human Settlements in Protected Areas, basis for the regulation of natural resource use in SIGAP. The Co-administration of Protected Areas Policy, to broaden responsibilities with the Civil Society in the administration of Protected Areas.	SO 2 IR 1	Assistance to resolve land conflicts and improve land tenure in rural areas.	(i) Identifying strategic ecosystems (tropical, conifer and cloudy forests) and municipal strengthening for their management; (ii) Institutional development and strengthening for the diffusion and implementation of the Co-administration Policy
		SO 1 IR 1	Technical assistance to national authorities, justice center committees and local government officials in the design and implementation of community-based crime prevention and anti-lynching efforts, and constructive collaboration by citizens/local authorities and business with the police.	(i) Training to strengthen community entrepreneurship in connection with competitive clusters.(ii) Training community leaders in conflict resolution.
			Policy dialogue supported by observational visits, conferences, forums, and workshops to promote key legal and institutional reforms and achieve adequate host country funding and improved functioning of judicial and law enforcement institutions.	
Developing Open and clear land market	The 1998-2003 Agrarian Policy proposes to prioritize cadastre and registration as the basis for to regulate land markets.			Institutional strengthening for the Strategic Information System management.

OBSTACLE No. 4: POPULATION GROWTH AND MIGRATIONS				
PROPOSED SOLUTIONS TO MITIGATE OBSTACLES	**PUBLIC POLICIES / RELATED INSTRUMENTS**	**USAID ACTIONS**		**OPPORTUNITIES**
Developing non-agricultural economic activities in the rural areas	**Same as those described in Obstacle 1**	SO 2 IR 2	**1.2 Same as those described in Obstacle 1**	**1.3 Same as those described in Obstacle 1**
Supporting the rural property regularization and agricultural conflict resolution process	**Same as those described in Obstacle 3**	SO 2 IR 1	**1.4 Same as those described in Obstacle 3**	**1.5 Same as those described in Obstacle 3**
Technical and financial support for protected area management	**Same as those described in Obstacle 2**			**1.6 Same as those described in Obstacle 2**
Reproductive health	Does not appear on the National Environmental Management System policy proposal	SO 3 IR 3	Family planning ▪ Technical Assistance to expand and improve the quality of reproductive and child heath services, especially family planning, basic essential obstetric care and AIEPI AINM-C ▪ Contraceptive security initiatives and strengthening public sector drug logistics systems ▪ Expansion of coverage of basic health services through MOH-contracted NGOs and leveraging USAID funds for matching funds by MOH ▪ Technical assistance to strengthen a large health NGO network ▪ Assistance to APROFAM to become self-sufficient and graduate from USAID support.	(i) Developing alliances between the environmental management entities and those entities in charge of Health, in order to strengthen domestic level environmental sanitation programs (water management, waste management, energy)

OBSTACLE No. 5: POVERTY AND EXTREME POVERTY				
PROPOSED SOLUTIONS TO MITIGATE OBSTACLES	**PUBLIC POLICIES / RELATED INSTRUMENTS**	**USAID ACTIONS**		**OPPORTUNITIES**
Developing non agricultural economic activities in the rural area	*Same as those described in Obstacle 1*	*Same as those described in Obstacle 1*		*Same as those described in Obstacle 1*
Promoting the diversification of sustainable and income-producing agricultural activities	*Same as those described in Obstacle 1*	*Same as those described in Obstacle 1*		*Same as those described in Obstacle 1*
Food support	The 2000-2003 farming and livestock Policy refers to a low-cost fertilizer distribution program for basic grain production. ICTA develops programs of genetic improvement and generation of varieties of corn, beans and rice adapted for the country's climatic and edaphic conditions.	SO 2 IR 2	PL 480 Title II-funded activities to improve infrastructure in food insecure areas to help families in these areas become more market-oriented and competitive.	(i) Food production under controlled environments (greenhouse and irrigation). (ii) Domestic power energy support. (iii) Institutional strengthening to improve the farming and livestock information and technology transfer programs.
			Integration of targeted supplementary feeding (PL 480) and AIEPI AINM-C	

OBSTACLE No. 6: WEAKNESS IN ENVIRONMENTAL MANAGEMENT				
PROPOSED SOLUTIONS TO MITIGATE OBSTACLES	**PUBLIC POLICIES / RELATED INSTRUMENTS**	**USAID ACTIONS**		**OPPORTUNITIES**
Improving the judicial environmental system	The National Environmental Policy, issued by the Ministry of the Environment and Natural Resources (MARN), establishes actions for the issuance of specific regulations that will improve the environmental justice application processes and will reduce impunity in this area.	SO 1 IR 1	Technical assistance and training to further expand use of oral judicial proceedings and administrative reforms to speed up case processing, increase the number and timeliness of cases resolved, and develop alternate dispute resolution capacity. Technical assistance to improve investigation and prosecution of charges of corruption.	(i) Institutional strengthening for the issuance of specific regulations; (ii) Strengthening the environmental incidence capacity of the Civil Society
Supporting the consolidation and re-structuring of public and private environmentalist entities in capacity building and improvement of its human resource	CONAPs 1999-2001 Institutional Strategic Plan, establishes the need to adapt its institutional structure to the current environmental management needs, seeking greater administrative decentralization and independence. The 2002-2010 Environmental Investment Priorities Agenda defines the National Environmental Management system and identifies management areas lacking institutionalization . Public Policies on the Environment, Agriculture and Livestock, Protected Areas and Forests, identify the need to strengthen local second and third-level organizations.	SO 1 IR 1	Support for the Human Rights Ombudsman Office and civil society to provide oversight and advocate for additional reforms needed to improve law enforcement, judicial processes, and respect for human rights.	(i) Institutional strengthening to administer institutional modernization processes; implementation of the Institutional System of Environmental Management; and environmental management decentralization.
Developing effective and coherent civil society participation in environmental issues	The recently issued Public Policy of Protected Area Co-Administration establishes mechanisms for the Civil Society's participation. Most of the Public Policies related with the environment identify the need to broaden the Civil Society's and academic alliance's participation, but the procedures and instruments to concrete participation are not explicit.	SO 1 IR 1	Policy dialogue supported by observational visits, conferences, forums, and workshops to promote key legal and institutional reforms and achieve adequate host country funding and improved functioning of judicial and law enforcement institutions.	Co-administration of protected areas.(ii) Strengthening the environmental incidence capacities in the Civil Society; (iii) Academic alliances for incidence information management. (iv) Developing capacities to manage international environmental treaties

PROPOSED SOLUTIONS TO MITIGATE OBSTACLES	PUBLIC POLICIES / RELATED INSTRUMENTS	USAID ACTIONS		OPPORTUNITIES
Improving municipal and local capacity to address environmental issues	Environmental laws establish a participatory role for Municipalities in the Board of Directors of environmental institutions, but their capacity to generate proposals is limited. Public Policies prioritizes the municipalities' involvement in Protected Area Management, Forest Management, Territorial Arrangements and Environmental Sanitation, nevertheless, successful cases are still scarce. They still require strengthening and an extension to a more significant scale of municipal involvement.	SO 1 IR 1	Technical assistance to national authorities, justice center committees and local government officials in the design and implementation of community-based crime prevention and anti-lynching efforts, and the constructive collaboration by citizens/local authorities and businesses with the police.	(ii) Supporting the consolidation and broadened coverage of municipal environmental management progressive models.
Supporting and financing natural resource, environment and biodiversity research programs	Research agendas have been issued under Protected Areas, Forestry, and Agriculture and Livestock Policies, but the execution level does not exceed 10% of that planned, and the scarce research performed is scattered. These limitations hinder environmental management feedback and the execution of successful environmental monitoring programs based on reliable information.	SO 2 IR 2	Policy dialogue supported by observational visits, conferences, forums, and workshops to promote key legal and institutional reforms and achieve adequate host country funding and improved functioning of judicial and law enforcement institutions.	(i) Strengthening of Public entities; Civil Society and academic alliances for research, information generation; management, diffusion and utilization in function of national biodiversity and environmental quality Monitoring Systems

OBSTACLE No. 7: WEAKNESS IN THE FORMULATION AND IMPLEMENTATIONF OF ENVIRONMENTAL PUBLIC POLICIES				
PROPOSED SOLUTIONS TO MITIGATE OBSTACLES	**PUBLIC POLICIES / RELATED INSTRUMENTS**	**USAID ACTIONS**		**OPPORTUNITIES**
Financial and technical support for the participative formulation of environmental components in the national policies	The existing public environmental policies include statements that show the intent to harmonize the environmental policies with public policies of other national sectors (i.e.: power, communications, health, education, population, among others). The coordination mechanisms are almost non-existent (The Environmental Cabinet does not operate).	SO2 IR 1	Regional Environmental Program PROARCA IR 3: Harmonized Environmental Regulations	(i) Institutional strengthening for the application of Framework Environmental Policies**.** (ii) Operational policies developed and diffusion. (iii) Strengthening of links between Environmental Policies and other sectors of the national economy; (iv) Capacity development for International Environmental Treaty Management ; (v) Developing water management policies and instruments; (vi) Creating and strengthening environmental units in other State Ministries.
Supporting and financing the design and implementation of policy instruments	The Agrarian, Farming and Livestock, Environmental, Protected Areas, and Forest policies have been created in a sophisticated and very coherent manner, but the application of the implementation instruments is still very limited. In this sense, the impact on environmental management improvement is also limited.	SO2 IR 1	Regional Environmental Program PROARCA IR 3: Harmonized Environmental Regulations	(i) Developing economic, normative and sensitizing instruments for the application of structural and operational policies in a differentiated manner at national, municipal and local levels.
		SO1 IR 1	Policy dialogue supported by observational visits, conferences, forums, and workshops to promote key legal and institutional reforms and achieve adequate host country funding and improved functioning of judicial and law enforcement institutions.	

5.2 Intervention Opportunities

Guatemala is a relatively small territory that harbors biological wealth and diversity of regional and world importance. However, there are many threats to biodiversity and tropical forests in Guatemala, primarily habitat loss due to logging and extensive conversion to agriculture, with permanent deforestation figures approaching 39.9% of the country. This assessment has described several obstacles to reducing the threats to Guatemala's biodiversity and tropical forests, many of which are of a structural nature and which maintain in force the vicious cycle of environmental degradation and poverty. These findings are neither new, nor exclusive, for Guatemala. Guatemala can develop viable paths for sustainable development, just as other countries with similar problems have done in tropical latitudes.

Given this scenario, there are complementary and synergistic activities of medium and long-term duration that can improve the quality of life of the Guatemalan people, while protecting the environment. This will be only possible if these activities are based on the consolidation of solid public environmental institutions that, in a decentralized and inclusive manner, promote responsible environment management. This responsible management could form part of the country's natural resource platform to support competitive production, that in a sustainable manner, satisfies Guatemala's employment and income needs. The consolidation of environmental management and competitive production processes that have been successfully executed will be key in providing feedback for sustainable development policies, plans and strategies for the upcoming years.

Based on these ideas and the results of the opportunity analysis (**Chart 12**), three complementary lines of action are identified that incorporate a multi-sectorial focus at various geographic scales in strategic ecosystems, permitting the development of successful sustainable development models. These points include 1) strategic ecosystem management for national development, 2) consolidation of management processes where USAID comparative advantages exist, and 3) environmental management and productive competitiveness. The main points of action are described in the following and are presented in a schematic manner in **Figure 5**.

5.2.1 Strategic Ecosystem Management for National Development:

The crux, and principal focus of the proposed opportunities, is based on the appropriate management of strategic ecosystems. Tropical, conifer and cloud forests are noteworthy not only because of their composition, function, and their current conservation status in Guatemala, but also for their comparative advantage as the foundation of sustainable production systems. These ecosystems, if properly managed, can provide a sustained flow of resources essential to the economic growth of Guatemala, as well as valuable genetic resources for Guatemala and the rest of the world.

Broadleaf Tropical Forests: These forests are strategically important due to their wealth of biological diversity and forest resources, and exceptional archeological

patrimony of the Maya Civilization. They are an important foundation for community and industrial forestry and for ecotourism development.

Coniferous Forests: These forests are a priority because they form the most complete pine diversity nucleus in the region and are strategically located in high water recharge areas. The conifer forests are vulnerable because of the timber goods and energy services sought by rural demands. However, these forests have tremendous potential as the foundation for the development of competitive national forestry sector (germ plasma for rural employment and income generating forest-industrial nucleus).

Cloud Forests: Cloud forests are centers of endemism, are special habitats within migratory bird routes, are highly threatened, and are vulnerable to disturbances. But if properly managed, they can help to prevent natural disasters. They are particularly strategic for maintaining the regional and local hydrologic cycle and meeting the water resource demands for different uses, among which energy, irrigation farming and human consumption are highlighted. Ecotourism is also a potential development activity for these forests.

5.2.2 Consolidation of Management Processes Where USAID Comparative Advantages Exist

The consolidation of successful management models that are currently being implemented, as well as the incorporation of lessons learned, is key for the development of new multilevel (national, regional, local) and multi-sector (related to other sectors of the economy) environmental management plans.

Ecotourism: This economic activity can be strengthened by means of a "cluster"[65] approach to significantly increase the scale of this sector and to provide resources to local communities. Ecotourism is an economic activity that may be compatible with biodiversity, but can also threaten it if inadequately handled. Efforts must be taken to ensure that the carrying capacity of the natural ecosystems is not surpassed by tourism activities.

Forest Concession Management: Forest management activities should be consolidated, strengthening more stable and viable production systems, under an entrepreneurship concept. Stability, and less dependence on timber production, can be obtained from diversifying economic activities through ecotourism, the orderly and appropriate use of non-timber natural resources, and by adding value to timber products.

Municipal Land Use Planning: Land use planning and management models should be consolidated for the more efficient use of the natural resource base in function of rural production systems and the strengthening and diversification of efficient municipal fund raising mechanisms.

[65] The conglomerate or "cluster" focus developed by Dr. Michael Porter of Harvard University presumes sector interaction surrounding products/services, within a strategically determined geographic area, with the objective of finding the best conditions regarding production factors, adjacent and support industries, demand and rivalry. This integration allows for greater competitiveness derived from innovation capacity, change capacity, and quality of the products/services derived.

Co-administration of Protected Areas: This concerns the development of legal instruments to implement public policies currently in force, the strengthening of the civil society to share biodiversity management responsibilities with the Government and increasing the management effectiveness of the Guatemalan Protected Area System.

Promotion of Private Natural Reserves and Conservation Easements: This seeks compatibility of private interests and collective benefits in conjunction with strategic natural spaces.

5.2.3 Environment Management and Productive Competitiveness:

This concept involves public, municipal and private institutional strengthening in order to direct successful national, regional and local level environmental management models while ensuring competitive production models, based on environmental management guidelines, that generate rural employment and income in a sustainable manner.

Community Based Natural Resource Management: In Guatemala, there are successful natural resource management models where the main actors are organized groups from rural communities. The community of Uaxactun, the cooperatives of Usumacinta and the forest concessions in the Maya Biosphere Reserve, the communal forests of Totonicapán and Quetzaltenango, and the municipal lumber yards in Jupilingo, Chiquimula, are some key examples that demonstrate the effectiveness of programs where conservation purposes are combined with the sustainable use of natural resources. Strengthening and replicating these processes at a greater scale is part of the immediate challenge.

Municipal Environmental Management: The political empowerment of the municipalities converts them into strategic actors to improve the country's environmental management, but with a local focus. The incipient efforts to institutionalize the Municipal Technical Units, complemented with environmental strategic action plans and specific management instruments, are examples of the integral environment management opportunities that exist in conjunction with the country's municipalities, under diverse local realities.

Institutional Strengthening on environmental policies and instruments: Without a doubt, the lack of technical capacity, financial versatility and environmental management continuity are the "great root causes" of the recurring existence of socio-environmental conflicts in Guatemala. Several cases have demonstrated the minimal impact of external cooperation when not linked to government instances. Thus, international cooperation shoulders a double role: that of providing technical and financial resources for the environment, while at the same time ensuring and strengthening their interlocutors' capacity to conveniently, opportunistically and effectively manage these contributions. Guatemala has valuable policy proposals than now require national, regional and local level implementation, and in those concerning biodiversity, should not overlook the ecosystem and inter-sectorial foci.

Managing socio-environmental vulnerability: Guatemala is vulnerable to natural events that can reach disaster dimensions. The probability of disastrous events is a constant and increasing threat. This vulnerability, resulting from natural characteristics and from socio-environmental relations, particularly in locations where activities have exceeded the carrying capacity of ecosystems, is transformed into hunger, material losses and human loss of life, once the disaster occurs. Vulnerability management is a relatively new field in the country, which has multiple facets and, above all, requires a preventive focus. In the environmental field, two of these facets are the timely management of reliable information and the local organization for management of this information. Conifer and cloud forest ecosystems are highly vulnerable to disturbances but are highly effective in preventing disasters when correctly managed.

Developing Competitive "clusters": Generating rural employment and income requires highly competitive synergistic productive processes. Competitiveness, on the one hand, occurs by means of the correct use of natural resources and the environment and, on the other, by alliance configuration in sectors where natural conditions and sector management capacities are combined in an exceptional manner. This focus is particularly promising for the forestry and tourist sectors, where the development platform is essentially rural.

Strengthening in the administration of international treaties: This field is consequently illustrative for those proposals that advocate global thinking and local performance. Effective knowledge of global environmental problems and the management opportunities attended to through these agreements are essential elements to be incorporated into institutional strengthening plans designed to ensure effective management, above all, linked to national legislation.

5.2.4 Activities that will not be continued under the CAM Strategy

In the organizational restructuring to a regional strategy, certain programs will be dropped. Below a summary of the programs to be discontinued is itemized:

HARD CHOICES WE HAVE MADE

Democracy and Governance

- Dropping programs focused on development of civil society as an objective (civil society will be supported only as means to achieve other objectives), no more institutional strengthening of civil society organizations as an end to itself;
- No major citizen participation programs (despite serious issue of exclusion in Guatemala involving indigenous populations); accountability focus is on opportunities for participation and quality of that participation rather than mobilization efforts or broad-based civic education;
- No plans for large-scale electoral support programs;

- No further local government programs focused on small municipalities that lack the potential, collectively, to contribute in some way to a broader national-level impact, whether through a demonstration-effect or percentage of the country's population affected by their improved performance; also, no more exclusive focus on restricted geographic zones, such as the *Zonapaz*, that also will not lead to a national-level impact;
- No further work in civil-military relations or development of civilian intelligence capacity; and
- Limited work focused on past human rights atrocities (with the possible exception of the exhumation program if Victims of Torture funds remain available); focus shifts to due process concerns within criminal justice.

Income and Environment

- No generalized support to protected areas management and biological monitoring;
- No institutional strengthening of the Ministry of the Environment (MARN) or the Protected Areas National Council (CONAP);
- No support for direct microenterprise programs through NGOs or the National Rural Bank (BANRURAL);
- No support for infrastructure unless it relates to industry cluster development;
- No direct financing of land improvements, purchase or titling;
- No trade capacity building efforts with the Government of Guatemala;
- No assistance for the legal and regulatory framework governing trade and investment after FY04;
- Reduction in the numbers of competitive Guatemalan industry clusters that will receive USAID assistance;
- Due to funding constraints, IR1 Laws, policies, and regulations that promote trade and investment and IR3 Broader access to financial markets and services will only be funded during the first year of implementation of the strategy (FY 2004).

Health and Education

<u>Education activities we are dropping:</u>

- University institutional strengthening
- Development, printing and distribution of textbooks and instructional materials in indigenous languages (e.g. dictionaries, grammars);
- Professional development and certification of education promoters;
- Development of alternative teacher training models, institutional strengthening of teacher training institutes, and technology for pre-service teacher training;
- Advocacy training for civil society organizations;
- Adult literacy and workforce skills training, except that carried out to enhance competitiveness under the Economic Freedom SO'
- Early Childhood Education (ages 2-3);

- Pre-primary, primary, secondary, and university scholarships (except through alliances);
- Direct financial assistance to small NGOs for education services delivery (except through alliances).
- Innovative approaches to increase and improve access and quality of preprimary, primary and post-primary education (except through alliances).

Health activities we are dropping:

- Assistance to the Guatemalan Social Security Institute, including contraceptives;
- Direct financial assistance to small NGOs for health services delivery (except through alliances);
- Contraceptive donations and technical and financial support will be phased out to APROFAM and they will "graduate" by the end of the new strategy. Only partial support for contraceptive donations to the MOH with co-financing from the MOH will continue;
- Advocacy training for civil society organizations;
- Reproductive health operations research;
- HIV/AIDS surveillance strengthening and HIV/AIDS prevention (this will be supported by the regional program);
- Water and sanitation or health infrastructure;
- Epidemiology training and infectious diseases earmark-funded activities to address TB, malaria, and dengue.
- Design of new information, education and communication materials (we'll reprint those already designed);

Notable among the biodiversity-pertinent programs to be discontinued are:

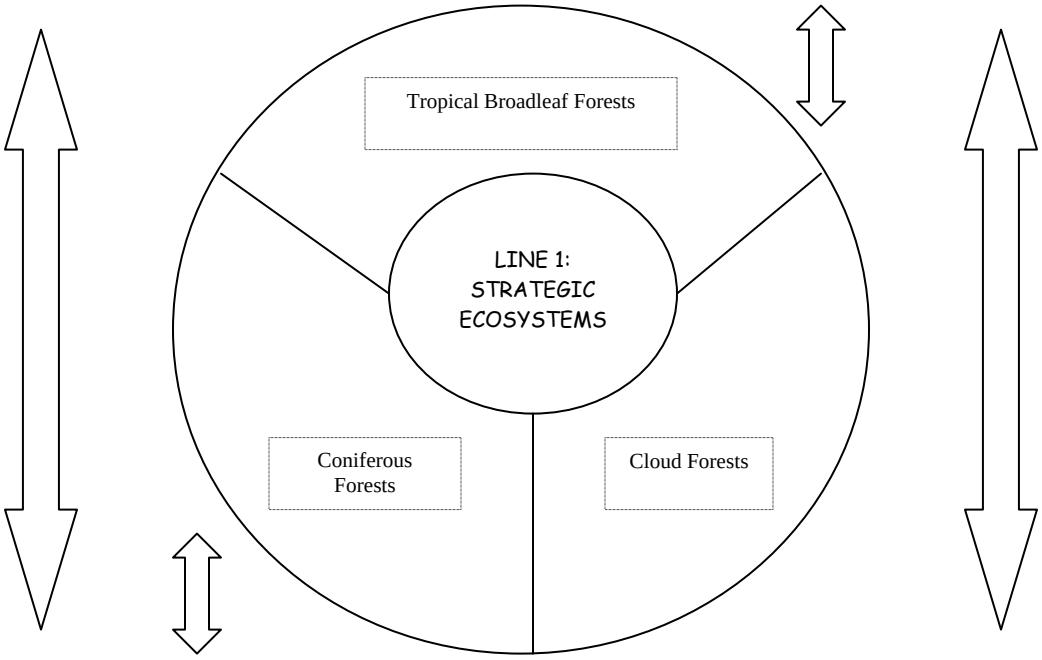
- No generalized support to protected areas management and biological monitoring.
- No institutional strengthening of the Ministry of the Environment (MARN) or the Protected Areas National Council (CONAP).

Water and sanitation or health infrastructure will be discontinued, but infrastructure activities under the PL 480 Title II program will continue as a cross-cutting activity.

MAIN LINES OF SOCIO-ENVIRONMENTAL ACTIONS
(Inter-related by research, information-knowledge and monitoring-evaluation)

LINE 2: CONSOLIDATION OF MANAGEMENT PROCESSES WHERE USAID HAS COMPARTIVE ADVANTAGES

+ Ecotourism
+ Forest Concession Management
+ Municipal Land Use Planning
+ Co-administration of Protected Areas
+ Promotion of Private Natural Reserves and Conservation Easements



LINE 3: ENVIRONMENTAL MANAGEMENT AND PRODUCTIVE COMPETITIVENESS

+ Community Based Natural Resource Management
+ Municipal Environmental Management
+ Institutional Strengthening in Environmental Policies and Legal Instruments
+ Development of Competitive Clusters
+Socio-environmental Vulnerability Management
+ Strengthening in International Treaty Management

Figure 5. The interrelationship among three strategic lines of actions in relation to Guatemala's socio-environmental situation and natural potential.

ANNEX A

Environmental Procedures: Sections 117, 118 and 119

ANNEX B:
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