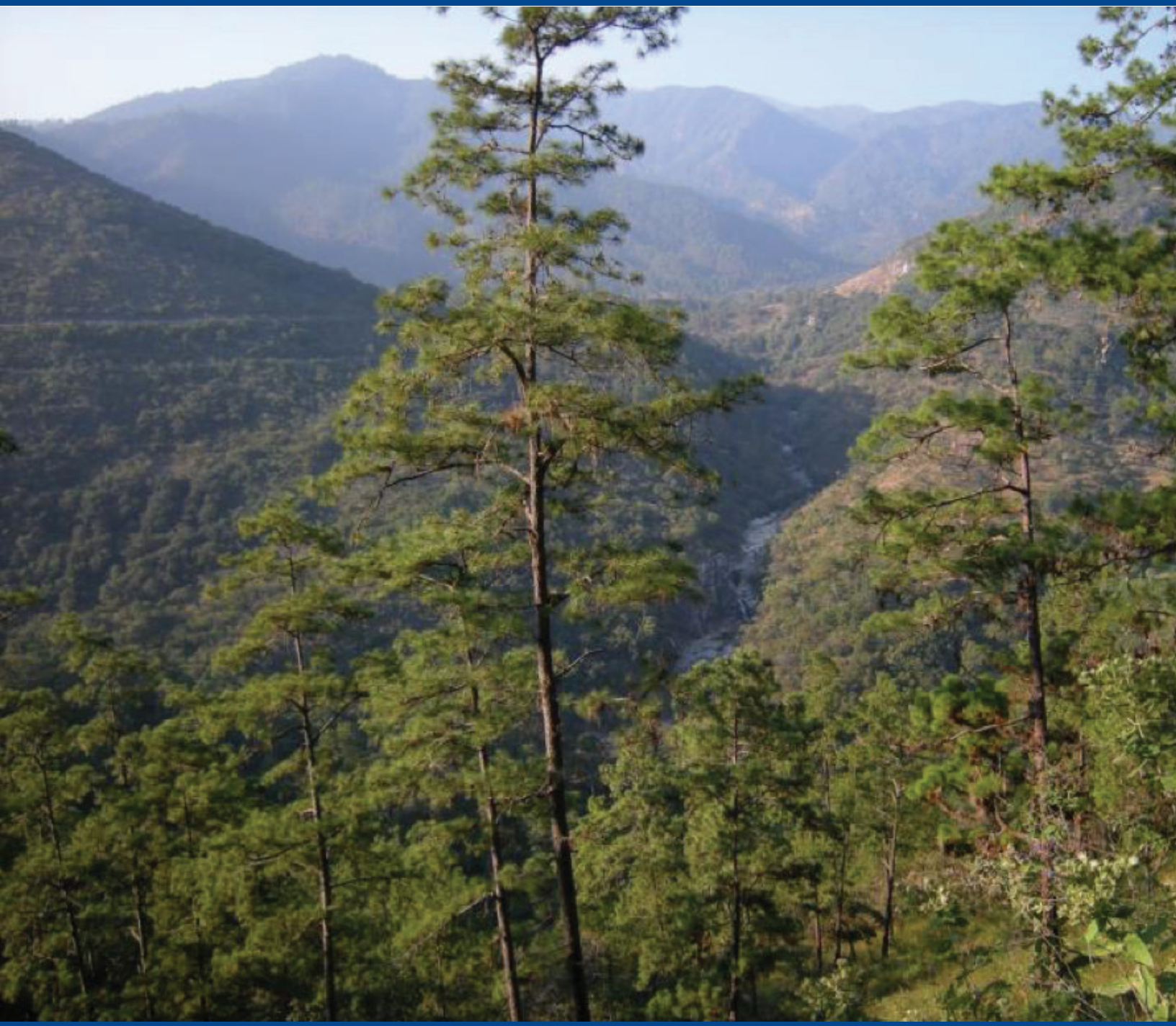
USAID
FROM THE AMERICAN PEOPLE

Monitoring and Evaluation Program

GUATEMALA TROPICAL FOREST AND BIODIVERSITY ASSESSMENT



June 8, 2016

This publication was produced for the review of the United States Agency for International Development. It was prepared by DevTech Systems, Inc. under contract No. AID-520-C-13-00001

MONITORING AND EVALUATION PROGRAM

GUATEMALA TROPICAL FOREST AND BIODIVERSITY ASSESSMENT

Presented to:
Ángel López, Contracting Officer's Representative
USAID/Guatemala
Junio, 2016

Presented by:
DevTech Systems, Inc.
Contrato AID-520-C-13-00001

ACKNOWLEDGMENT:
This document was produced by María Mercedes López-Selva, César Sandoval and Bruce Byers. Photo credit: Sierra de las Minas Biosphere Reserve, B. Byers/DevTech, 2016

Contents

Figures

Tables

Acknowledgment

More than 50 people representing the environmental sector, government officials, residents of rural communities contributed their time to meet with the Evaluation Team and provide their knowledge and opinions, which served to develop this report. During field visits, the team witnessed the success and challenges faced by these individuals daily. The Evaluation Team wishes to thank all those who provided information and viewpoints for this report.

Acronyms

ACOFOP	Association of Forest Communities of Petén
ANAM	National Association of Municipalities
AGEXPORT	Guatemalan Exporters Association
BANGUAT	Bank of Guatemala
DO	Development Objective
CATIE	Tropical Agricultural Research and Higher Education Center
CBD	Convention on Biological Diversity
CDCS	Country Development Cooperation Strategy
CECON	Center for Conservation Studies
CFR	Code of Federal Regulations
CIB	Integrated Forest Account
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CONAP	National Council for Protected Areas
CONRED	National Coordinator for Disaster Reduction
CONESFORGUA	Guatemalan National Council of Forest Management Standards
CNCG	Climate, Nature and Communities in Guatemala
CINR	International Non-Refundable Cooperation
FAA	Foreign Assistance Act
FONCC	National Climate Change Fund
GFP	Growing Forest Partnerships
GHG	Greenhouse Gas
IARNA	Instituto de Investigación y Proyección sobre el Ambiente Natural y Sociedad
ICC	Private Institute for Climate Change Research
IDAEH	Institute of Anthropology and History
INAB	National Forestry Institute
INE	National Statistics Institute
INGUAT	National Tourism Institute
IPCC	Intergovernmental Panel on Climate Change
ITAP	International Technical Assistance Program

LEDS	Low Emission Development Strategies
MAGA	Ministry of Agriculture, Livestock and Food
MARN	Ministry of the Environment and Natural Resources
MBR	Maya Biosphere Reserve
MEP	Monitoring and Evaluation Program
MINDEF	Ministry of National Defense of Guatemala
MINFIN	Ministry of Finance
MITA	Intersectoral committee for Land and the Environment
MEM	Ministry of Energy and Mines
MICIVI	Ministry of Infrastructure, Communications and Housing
OFM	Municipal Forestry Office
PINFOR	Forestry Incentives Program
PINPEP	Incentives Program Small-scale Agricultural and Forestry Land Owners
PNC	National Civil Police
RA	Rainforest Alliance
RECSA	Environmental Evaluation, Control and Monitoring Regulation
REDD+	Reduction of Emissions from Deforestation and Forest Degradation
SEEA	System of Environmental-Economic Accounting
SEINEF	Forest Enterprises Electronic Information System
SIGAP	Guatemalan Protected Areas System
SOW	Statement of Word
TFCA	Tropical Forest Conservation Act
UNCCD	United Nations Convention to Combat Desertification
UNFCCC	United Nations Framework Convention on Climate Change
URL	Universidad Rafael Landívar
USAC	Universidad de San Carlos de Guatemala
UVG	Universidad del Valle de Guatemala
WCS	Wildlife Conservation Society
WWF	World Wildlife Fund

Executive Summary

Purpose and Methods

The purpose of this task was to carry out an analysis of Tropical Forests and Biological Diversity for the USAID/Guatemala Mission, as required by amendments to the Foreign Assistance Act (FAA) of 1961. Sections 118 and 119 of this Act require USAID to identify the actions needed to conserve biological diversity, including forest ecosystems, and measures for the design of programs and projects to meet this requirement.

This report: (1) summarizes the current state of forests and biological diversity of Guatemala; (2) describes the direct threats to biodiversity, forests and the environment and their causes; (3) identifies measures to reduce or mitigate the causes of these threats; (4) summarizes the contributions of USAID/Guatemala to conserve forests and biodiversity, and finally (5) identifies future opportunities to support the necessary actions.

A team of independent consultants (Evaluation Team) was hired to collect the relevant data and to conduct this analysis. The Evaluation Team performed this task through a literature review, interviews and meetings with key stakeholders in the environmental sector, including civil society, government, donors and academia; and field visits to various parts of the country. The team also held a meeting with stakeholders to discuss and validate the findings of this assessment.

Status of forests and biological diversity

Despite being a relatively small country, the topography and geographical location of Guatemala are conducive to great biological diversity at the ecosystem, species and genetic levels. This section provides an overview of wild species, ecosystems and genetic diversity found in the territory, as this is their center of origin (as is the case of various agricultural crops). In addition, as a bridge between North and South America, Central America is the limit to the distribution of various flora and fauna species migrating in both directions.

There are a total of 10 physiographic regions; 7 biomes; 14 ecoregions; 13 life zones and 66 ecosystems described in the Guatemalan territory. With regard to water resources the country has thirty-eight watersheds that drain into three catchment areas of the Pacific Ocean, Caribbean Sea or Gulf of Mexico.

The most recent land use study indicates 33.74% forest cover in Guatemala. In a country with soil eminently suitable for forests, it is evident that land is being used for non-sustainable purposes from the social, economic and environmental points of view.

Economic assessment of forests and biodiversity

Biodiversity provides social and economic advantages through products, services and non-material benefits of the ecosystems. Of the Guatemalan forest ecosystem, wood and firewood have the greatest monetary value. Approximately 70% of households use firewood for cooking and as a heat source. Forest species of high commercial value such as mahogany, cedar and rosewood are exported and represent earnings of USD $7.6 million a year. The products harvested from natural forests are an important source of income for communities. In addition, Artisanal and commercial fishing contributes significantly to the economy and food security.

Ecosystem services include the following: water supply, measured at 90 billion cubic meters per year, which far exceeds the demand originating from agricultural irrigation, households, industry and services;

coffee pollination by wild bees, which increases production by an estimated 10 to 20%; and protection against soil erosion, water catchment and regulation of watersheds provided by forests.

Threats to tropical forests and biodiversity

Threats to biodiversity were identified through the "threat methodology" used by USAID to guide its biodiversity programming. Chapter 4 includes direct threats to forests and biodiversity and their causes or driving forces. In Guatemala, the most important direct threat is the loss and degradation of habitat. The main cause of this loss is the change in land use for agriculture and other activities. Climate change is a potential threat that has been estimated in the country in the medium and long-term. These estimations indicate that by 2080, 80% of the living areas will have changed from high humidity areas to dry areas. Other major threats identified include water, soil and air pollution and overexploitation of forest resources, fisheries and minerals. Causes of these threats include poverty, social and economic inequality and institutional weakness.

The existing legal and political frameworks with respect to the environment and the institutions responsible for their compliance are described in Chapter 5, as well as the main strategy for the conservation of forests and biodiversity that is implemented through the Guatemalan Protected Areas System (SIGAP).

Actions needed to conserve forests and biodiversity

1. Sections 118 and 119 of the FAA specify that evaluations should identify the necessary actions to preserve tropical forests and biodiversity. According to this assessment, the main strategic actions include:
2. Strengthening of institutions responsible for the management of forests and biodiversity
3. Prioritization of strategic territories for conservation and provision of goods and services
4. Definition of public policy frameworks and legal and institutional instruments that contribute to the planning of activities and factors that threaten biodiversity
5. Creation of legislation and regulations concerning water management
6. Strengthening of organizational, empowerment and community capacity
7. Provision of economic alternatives for people who depend on natural resources
8. Development of clean energy alternatives and creation of a sustainable energy culture

Generation and dissemination of scientific information to support decision making

Resilience and adaptation to climate change

The Intergovernmental Panel on Climate Change (IPCC) models predict that the temperature in the country will increase by approximately 2°C by 2050 and rainfall will decrease by 10-20% by mid-century (2046-2065). According to these predictions, Guatemala will have a considerably warmer and drier climate in the coming decades.

Projections of ecosystem changes due to climate change in the country reveal the likelihood that by 2050, the bioclimatic conditions of more than 50% of the territory will have changed and by 2080, more than 90%. The main impacts of these changes will be the expansion of dry and very dry forest ecosystems from 20% to 40% (2050) and later, more than 65% (2080).

Because of the importance of ecosystem goods and services for livelihoods and the economy, a systemic approach to adaptation and resilience to climate change is necessary. Protection of ecosystems that provide water services is of particular interest, given the high percentage of agricultural activities and the growing threat of a hotter and drier climate.

USAID/Guatemala contributions to actions needed

Sections 118 and 119 of the FAA specify that after identifying the necessary actions to conserve tropical forests and biodiversity in the country, the extent to which the proposed support meets the identified needs must be examined.

USAID contributes to the necessary actions identified in this analysis to meet Development Objectives (DO) established in the Country Development Cooperation Strategy (CDCS). DO1 is addressed mainly in Petén, where it strengthens the judicial system to adequately confront environmental issues. DO3 is addressed through the Climate, Nature and Communities in Guatemala (CNCG) Program and the Low Emission Development Strategy (LEDS) Project. In addition, USAID/Guatemala and the United States Government (USG) provide relevant assistance to forests and biodiversity through the International Programs of the US Forest Service and the International Technical Assistance Program (ITAP) of the US Department of the Interior and financing through the "debt for nature" initiatives arising from the Tropical Forest Conservation Act (TFCA). It is clear that through its programs and projects, USAID/Guatemala is making contributions to many of the necessary actions to conserve forests and biodiversity of Guatemala.

Opportunities for USAID/Guatemala

USAID/Guatemala has consistently supported the sustainable management of natural resources in several priority areas of biological significance, including the Maya Biosphere Reserve (MBR), Sierra de las Minas Biosphere Reserve, the Western Highlands and Verapaz. The strategic support has included essential topics to advance sustainable development in the country. However, numerous challenges still exist and there are many opportunities to support the conservation of forests and biological diversity. The strategic categories listed below summarize these opportunities.

Strengthen governing institutions in forest management and biodiversity

In a country where natural resources drive the economy and constitute the primary source of food security, it is essential to have strong institutions that are able to ensure a balance between economic, social and environmental interests. Institutional strengthening can be performed through the training and development of technical staff in needed skills and abilities; modernization of monitoring and control of extractive activities such as the case of the new Forest Enterprise Electronic Information System (SEINEF) implemented by the National Forestry Institute (INAB); and increasing the importance of the sector at the highest political level in order to promote consistent allocation of budgets, placing the responsibility on the institutions.

Prioritization of strategic territories for the conservation of biodiversity and provision of goods and services

Strategic territories in the country are identified by interests (i.e. Hydrological) and the conservation of biodiversity. Currently, USAID/Guatemala carries out activities related to conservation in the MBR and Sierra de las Minas Biosphere Reserve. This subsection describes other priority areas that provide an opportunity for future actions by the Mission.

Definition of public policy frameworks and legal and institutional instruments that contribute to the planning of activities and discharges that threaten biodiversity

Within this area, the priority issues include solid waste management, management of liquid waste, soil conservation programs and estimation and management of greenhouse gas (GHG) emissions.

Creation of water management legislation and regulation

Guatemala is a country with plenty of water whose problems have been the ineffective distribution and administration. Today, problems are beginning to arise from the growing demand for the resource. The country does not have legislation that effectively directs the management of the resource and it is necessary to work at the policy level to reach agreements among the sectors that oppose the approval of proposals that are under discussion.

Strengthen organization, empowerment and community capacity

Examples of community performance as guarantors of resource conservation show that this is an action that should continue in areas that are important for biodiversity conservation and provision of ecosystem goods and services.

Provision of economic alternatives for people who depend on natural resources

The premise that Guatemala is a country rich in biodiversity and ancestral culture should guide all interventions. From there, one can visualize the opportunities that exist to develop the rural economy. To create and maintain a high level of performance, value chains must be developed in sites of biological interest and sites of interest for the provision of services.

Generation of data to catalyze change

There is an opportunity to strengthen institutional data generation, including the collection of relevant data to create baselines that should be periodically reviewed to observe the trends of environmental elements and performance of management tools. This gap is evident in all government institutions related to biodiversity and the environment.

Much of the information that should be generated for decision making (i.e. planning and management of natural resources and territories) depends on expensive technologies that are rapidly advancing and require software acquisition and technicians able to apply and interpret the data. There are considerable benefits from investing in opportunities for short-term training in remote sensing, geographic information systems and spatial data analysis.

Provision of alternate energy sources

The need of firewood as a source of heat and energy for homes and industries, such as bakeries, creates one of the main pressures on forests. The provision of alternative energy sources is still very underdeveloped in the country, especially with regard to low-impact sources that provide energy to rural communities.

Large-scale hydroelectric projects have caused discontent in rural communities that have been harmed by changes in the landscape and the consequences that they bring. There is the opportunity to propose small-scale hydroelectric projects and other forms of clean energy with low impact on the surrounding areas.

1. Introduction

1.1 Purpose

The purpose of this task was to conduct an analysis of Tropical Forests and Biological Diversity in the whole territory of Guatemala for USAID. This was conducted in accordance with the amendments to the FAA, Sections 118 and 119, which require USAID to identify needed actions to conserve biological diversity, including forest ecosystems and the degree to which future USAID programs and projects could support the country to achieve its goals on the issue.

This report provides the following information: (1) summary of the current state of the environment, forests and biodiversity of Guatemala; (2) description of the direct biophysical threats to biodiversity, forests and the environment and a summary of the causes of these threats; (3) measures to reduce or mitigate the causes of these threats; (4) summary of USAID/Guatemala contributions that support the actions needed to conserve forests and biodiversity and (5) potential future opportunities to support the necessary actions.

- This evaluation report contributes to FAA 118-119 by:
- Complying with the legal requirements of Sections 118 and 119 of the FAA.
- Identifying potential opportunities for USAID to contribute to sustainable development by integrating the conservation of forests and biodiversity into its cooperation strategy.
- Alerting the Mission on possible environmental compliance needs arising from the USAID environmental evaluation and compliance with regulation 22 Code of Federal Regulations (CFR) 216, for activities that may directly or indirectly threaten biodiversity or tropical forests.
- Identifying opportunities to use Congressional funds for the conservation of tropical forests and biodiversity.
- Identifying opportunities to increase sustainability across all development sectors, including democracy and governance, economic growth, health, disaster preparedness and conflict management and mitigation.

The last factor is critical for all Mission activities, given that the conservation of biodiversity is related to all development areas. Long-term sustainable development implies conservation of all forms of life and environmental services that forests and biodiversity provide to humans.

1.2 Methods

A team of independent consultants contracted by DevTech Systems, Inc. (see Annex A: Biographical Sketches of the Evaluation Team) collected the information needed to meet the objectives as a product under the Monitoring and Evaluation Project (MEP) of Guatemala. The process for data capture and analysis was based on the threats to biodiversity conservation methods described in the USAID Biodiversity Policy (USAID, 2014) and Biodiversity Conservation: A Guide for USAID staff and Partners (USAID, 2005a). The methodology was based on the guidelines of "best practices" for the Tropical Forestry and Biodiversity (FAA 118-119) Analysis: Lessons Learned and Best Practices from Recent USAID Experience (USAID, 2005b). This report provides all the information requested in the statement of work (SOW) (see Annex A).

- The information was obtained through various sources:
- Review of relevant documents, including the Tropical Forests and Biological Diversity evaluations of 2003 and 2010; Environmental Profile 2010-2012 by Rafael Landívar University; the Fifth National Report – Convention on Biological Diversity (CBD, 2014); project documents from donors; and other reports in scientific literature.
- Interviews with more than 50 actors (see Annex C: Institutions and Persons Contacted) of government sectors, national and international NGOs, private sector, USAID projects and international donors.
- Meetings with staff of the DO offices in USAID/Guatemala;

Visits to MBR, Sierra de las Minas Biosphere Reserve and the Volcanic Chain.

The Evaluation Team analyzed the information collected and identified the extent to which USAID programs contribute to the necessary actions and the opportunities to include conservation of biodiversity within its development portfolio.

2. State of Forests and Biodiversity in Guatemala

The concept of biodiversity encompasses the variety and variability of life in the three organizational levels: ecosystems, species and genes. This section provides a review of the biodiversity of Guatemala at the levels of ecosystems and species and a discussion of the genetic diversity of wild species. Agricultural diversity and genetic variability of agricultural ecosystems is also discussed. This section provides the context for understanding the threats to forests and biodiversity and actions required to address these threats, which are discussed in detail in the following sections of the report.

2.1 Biophysical stage

Guatemala extends over an area of 108,889 square kilometers, in the heart of the Mesoamerican region. As part of the Central American isthmus, it constitutes a fraction of the bridge linking North America with South America, a feature that is responsible for the distinctive richness in biodiversity, which is also accentuated by the altitudinal differences that can be found throughout the mountains of the Sierra Madre and the 37 volcanoes that form part of the territory.

The country's climate is modified by the topography of the mountains and volcanoes and the two adjacent oceans where winds carrying moisture-laden clouds enter the territory and upon hitting other air currents are discharged onto the mountains. Precipitation observed in the country varies from 500-6,000mm.

The average temperature is 24°C. However, temperatures can reach 40°C in dry ecosystems along the Motagua Valley and drop below zero on mountains and volcano peaks. The first snowfall registered in Guatemala occurred on the Tajamulco Volcano in 2012.

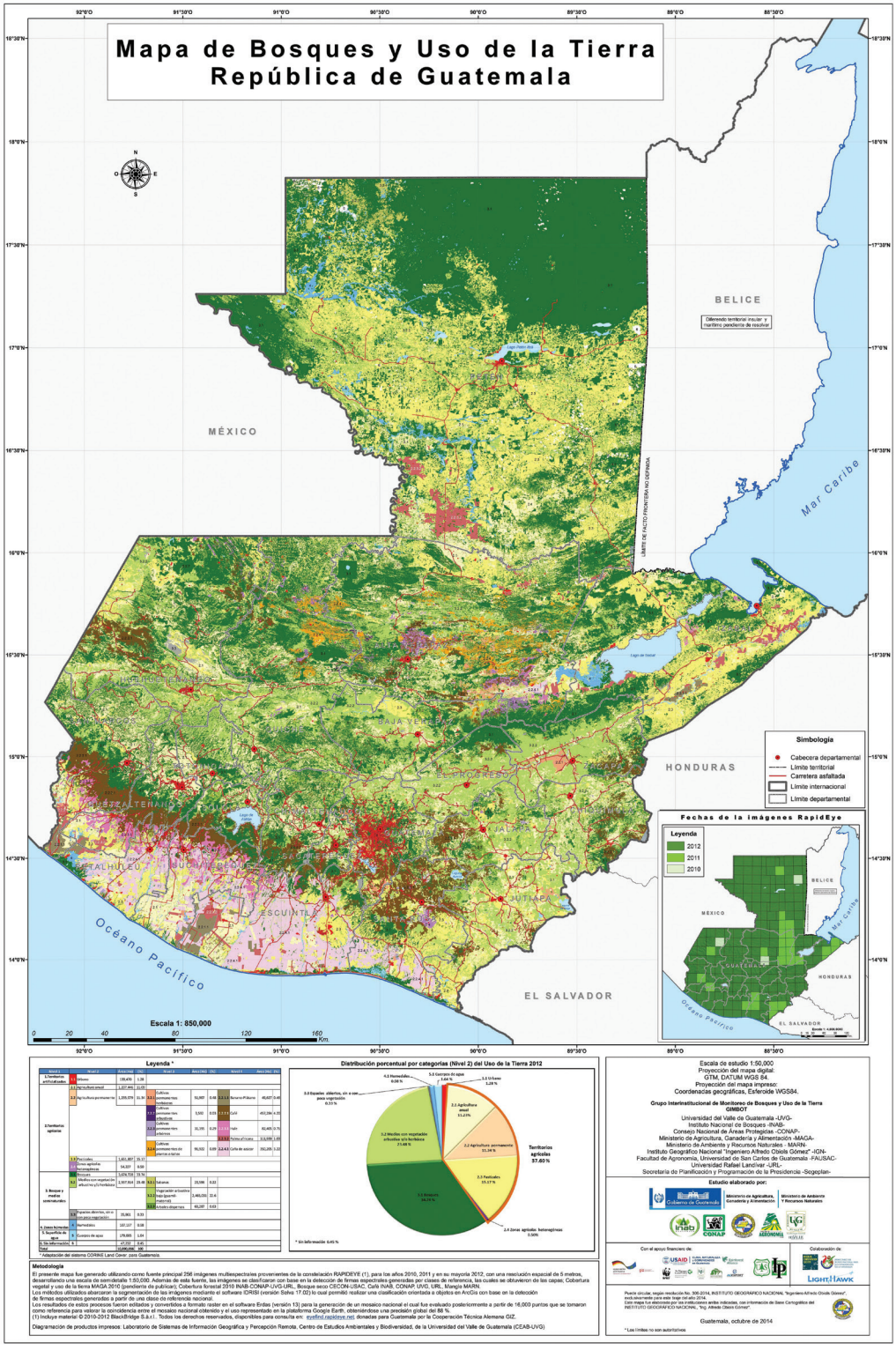
- Different studies and descriptions of landscapes and habitats have identified a total of 10 physiographic regions, 7 biomes, 14 ecoregions, 13 life zones and 66 ecosystems. Although the country is relatively small, Guatemala has geographical, cultural, ecological and land use differences, which are easier to understand if divided into the following 6 regions:
- Northern Petén region: the territory with the greatest forest cover, mostly included within the MBR, a protected area of great archaeological importance and suffering from great pressure for oil exploration, livestock and monoculture farming.
- Western highlands region: a densely populated mountainous region where different ethnic groups live who use their land for small scale agriculture and livestock. Most forests are pine-oak and suffer degradation from intense firewood collection and changing land use.
- Central highlands region: land ranges from high altitude to sea level and has various types of ecosystems including some of the cloud forests in the country, very diverse broadleaf forests and large areas of shade grown coffee.
- Pacific lowlands region: located in the southern part where the most fertile land in the country is used to produce sugar cane with a prevailing tendency to change the use of land for African Palm and banana plantations.
- Caribbean lowlands and Sierra de las Minas Region: landscape includes broadleaf forests, flooded forests near the Caribbean Sea, dry forest in the Motagua Valley, and bands of pine-oak and cloud forests in the highest parts.

Metropolitan Region: originally settled in the *Valle de la Asunción,* this region is constantly growing and extends in all directions. It has remnants of pine-oak forest only in the deep ravines that traverse the entire city.

Guatemala has a 255 kilometer coastline on the Pacific Ocean and 148 kilometers on the Caribbean Sea. Both coasts have a wide range of ecosystems including wetlands with mangrove cover, dry forests, flooded broadleaf forests, sandy beaches, coral reef (in the Caribbean), sea grasses and a very particular sea trench in the Pacific known as the San Jose Sea Trench, which is a habitat for sailfish, tuna and sharks.

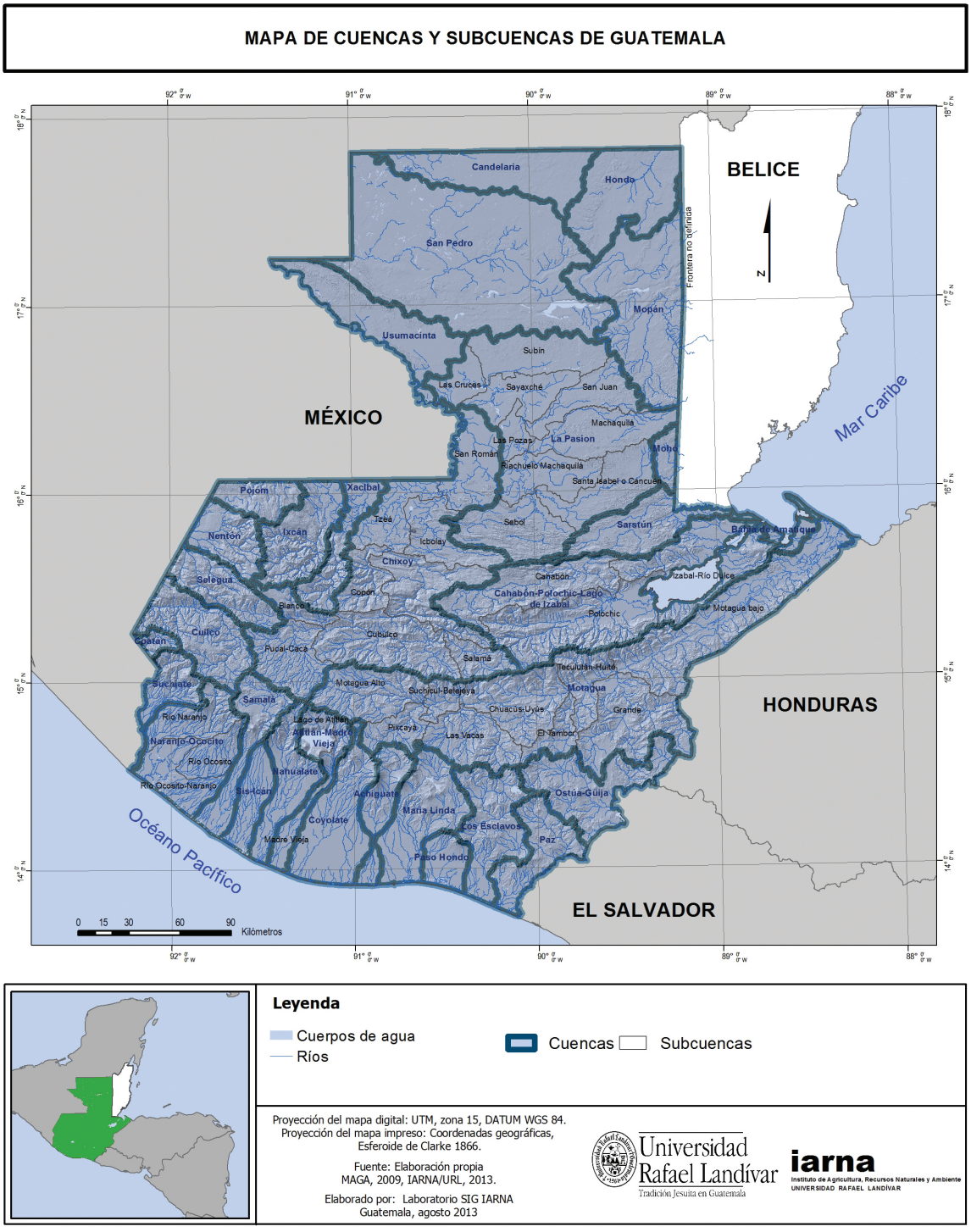
The most recent land use map (see Figure 2.1) shows that there is 33.74% forest cover in the country; 23.48% scrub or grasslands; 11.23% is being used for annual agriculture; 11.34% is used for permanent agriculture (in order of importance: sugar cane, African palm, coffee, banana and rubber). The rest of the territory is covered by urban areas (1.28%), pastures (15%), wetlands and other surface water bodies (2.62%) and the remaining 0.33% consists of open spaces without coverage (Gimbut, 2014).

Figure 2.1 Map of Forests and Land Use



Guatemalan basins drain into three catchment areas (Figure 2.2): the Pacific area covering 22% of the country where 18 watersheds drain; the Caribbean area covering 31% of the country where 10 watersheds drain and the Gulf of Mexico area that covers 47% of the country where 10 watersheds drain (URL/IARNA, 2005).

Figure 2.2 Map of Watersheds in Guatemala



2.2 Ecosystems

The geographical position between two large land masses and between two oceans in combination with the various microclimates that arise from having a variety of altitudes over a small area helps the country creates a particularly rich biodiversity.

2.2.1 Terrestrial ecosystems

Ecoregions, groups of natural communities that have geographic boundaries that share the majority of species, ecological dynamics and environmental conditions and depend on their ecological interactions for long-term survival (Dinerstein, *et al* 1995 cited by Castañeda C. in CONAP 2008), are commonly used to describe terrestrial ecosystems that spread throughout Mesoamerica.

Fourteen (14) ecoregions have been identified in Guatemala; the largest is that of the Petén-Veracruz moist forests considered part of the northern boundary of the tropical vegetation. The southern boundary of vegetation from the temperate North American climate is the Central American pine-oak forest ecoregion. Central montane forests can only be found in isolated patches and are home to unique endemic species such as the horned guan (*Oreophasis derbianus*) and the national bird of Guatemala, the quetzal (*Pharomacrus moccino*). Table 2.1 shows the current extent of the ecoregions and Figure 2.3 shows the potential distribution of each type of ecoregion.

Thorn scrub of Motagua Valley, Lower Teculután River Basin, Zacapa.
Photo: B. Byers/DevTech, February 2016.

Table 2.1 Current area of Guatemalan ecoregions estimated from the Land Use Map (Gimbut, 2014)

Ecoregion	Description	Extension (Hectares)	% Remaining forest
Central American Atlantic Coast Moist Forest	Broadleaf, moist, tropical and subtropical forests; part of northern limestone highlands, northern floodplains, metamorphic lands	235,163	39.69
Central American Montane Forest	Broadleaf, moist, tropical and subtropical forests; part of the volcanic highlands, northern limestone highlands, metamorphic lands, volcanic soils of the coastal openings	285,157	48.02
Chiapas Montane Forest	Broadleaf, moist, tropical and subtropical forests; northern limestone highlands	5,244	28.11
Petén-Veracruz Moist Forest	Broadleaf, moist, tropical and subtropical forests; northern limestone lowlands and highlands	2,231,079	46.74
Sierra Madre de Chiapas Moist Forest	Broadleaf, moist, tropical and subtropical forests in volcanic highlands, land of the Pacific coastal plain and volcanic soils of the piedmont volcanic lands It is considered one of the most biodiverse ecoregions of the Earth	107,230	18.71
Yucatán Moist Forest	Broadleaf, moist, tropical and subtropical forests in northern limestone lowlands	8,397	69.58
Central American Dry Forest	Broadleaf, moist, tropical and subtropical forests in volcanic highlands, land of the Pacific coastal plain and volcanic soils of the piedmont volcanic lands.	76,319	11.55
Chiapas Depression Dry Forest	Broadleaf, dry, tropical and subtropical forests in northern limestone highlands	23,445	26.17
Central American Pine-Oak Forest	Conifer, tropical and subtropical forests in volcanic highlands, northern limestone highlands, northern limestone lowlands, metamorphic lands and coastal volcanic lands of the b piedmont volcanic lands.	1,153,036	39.31
Motagua Valley Thorny scrub Forest	Desert vegetation and xeric scrubs in metamorphic lands, considered the driest area in Central America	129,015	55.42
Belizean Coast Mangroves	Mangroves in the northern floodplain, related to the Mesoamerican coral reef	20,165	57.50
Pacific Coast Dry Forest Mangroves	Mangroves in the Pacific coastal plains	3,771	14.42
Tehuantepec-El Manchón Mangroves	Mangroves in the Pacific coastal plains, tallest mangroves in Guatemala	13,623	15.60
Northern Honduran Mangroves	Mangroves in the northern floodplain	186	9.68

Source: Prepared by evaluation team

Figure 2.3 Potential area of coverage by ecoregion

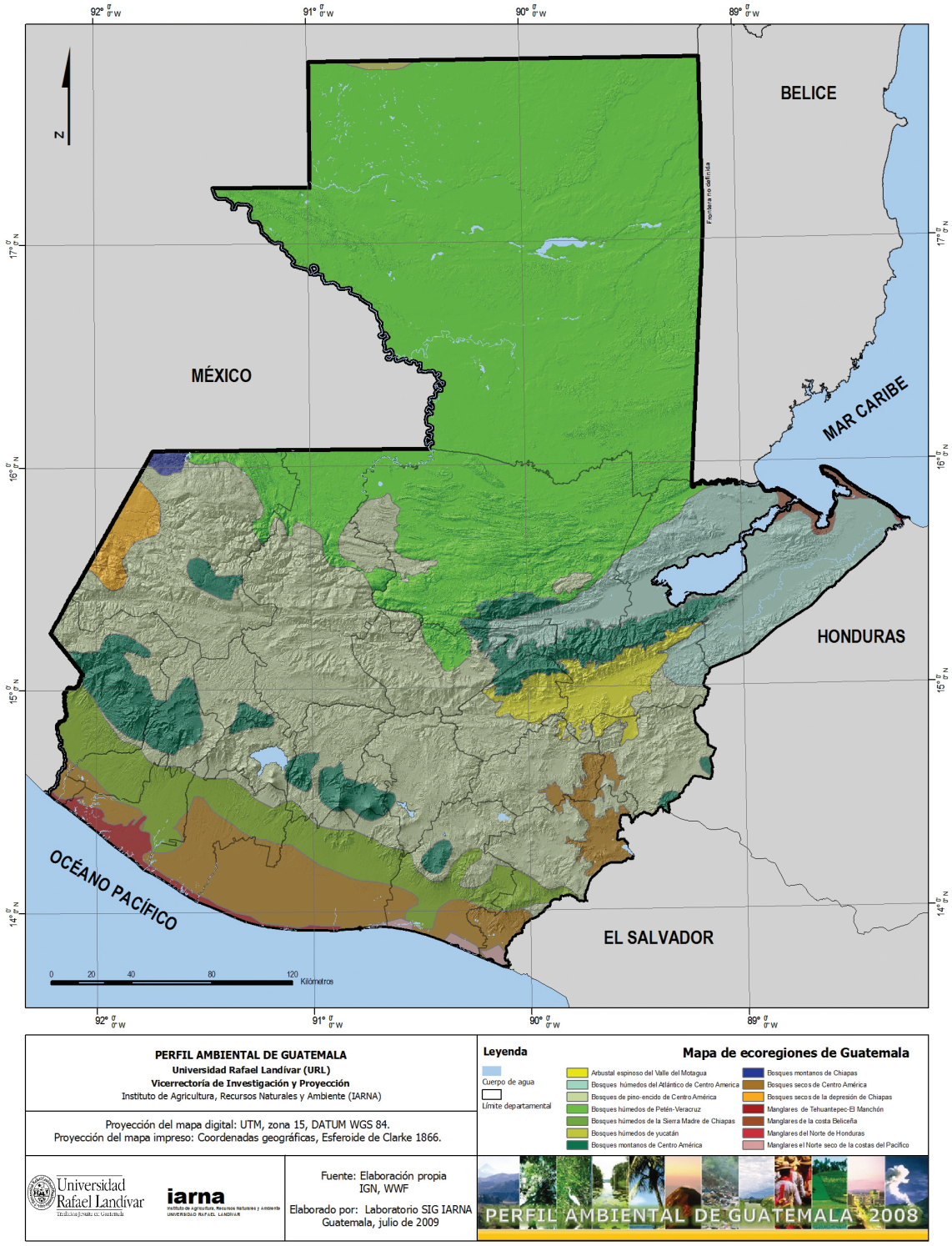
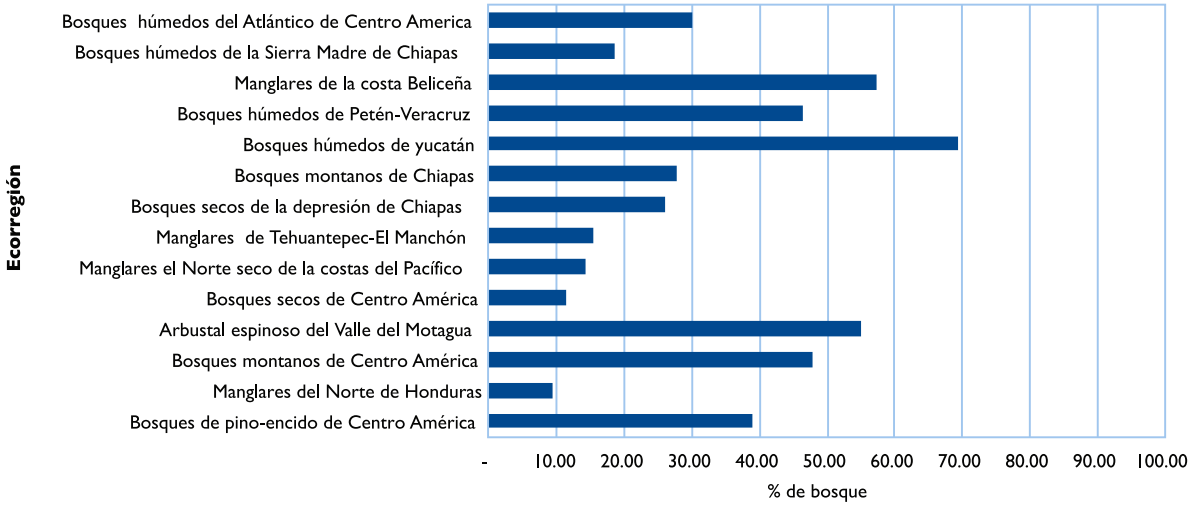


Figure 2.4 (Percentages of remaining forest cover by ecoregion) shows that the Yucatán moist forests, the Belizean Coast mangroves and Motagua Valley Thorn Scrub are still preserved in more than 50% of the potential distribution area. The other 11 ecoregions are below this parameter.

Figure 2.4 Percentage of remaining forest cover by ecoregion



Source: Prepared by evaluation team

2.2.2 Freshwater ecosystems

Freshwater ecosystems include continental hydrological systems of ≤1% salinity. They are bodies of water with or without currents and include rivers and streams. According to the most recent land use map, 1.64% of the country's surface is covered with freshwater (Gimbut, 2014). There are 7 lakes, 49 lagoons, 109 small lakes and numerous rivers in Guatemala (PREPAC, 2005).

Two of the most important lakes, Atitlán and Amatitlán, have volcanic origins. The first, located in the western highlands, is listed as a mesotrophic lake (with an intermediate level of productivity), with increasing levels of phosphorus and nitrogen, poor transparency and seasonal algae growth. Two cyanobacteria (*Limnoraphis* sp. and *Microcsytis* sp.) present in the lake are indicators of contamination (IARNA/URL, sp).

Lake Amatitlán is listed as a eutrophic lake (with high productivity) and has historically received agricultural runoff from the highlands and surrounding villages. The lake was described as beautiful in the past. However, today is not suitable for sport or recreational activities and recreational properties built on its banks have been abandoned.

Water is relatively abundant in the country. The average annual availability of the resource exceeds 90 billion m^3, which translates into an annual availability of 6,000 m^3 per person, an amount higher than international parameters to determine whether a country can meet industrial, agricultural and human demands. However, conflicts over the resource have increased in recent years and shortages often arise (IARNA/URL, 2014).

Several institutions reported that at least 14 major rivers and 4 lakes contain water that is not suitable for human consumption or agriculture due to high levels of pollutants, organic matter, toxic pollutants and carcinogenic elements (MARN-URL/IARNA- PNUMA 2001 cited in IARNA/URL, sp).

Rainfall levels are uneven during the year and throughout the country. Most rainfall occurs between May and October and during those months there is usually no shortage of water. However, during the other half of the year, more than 50% of the country faces water availability problems.

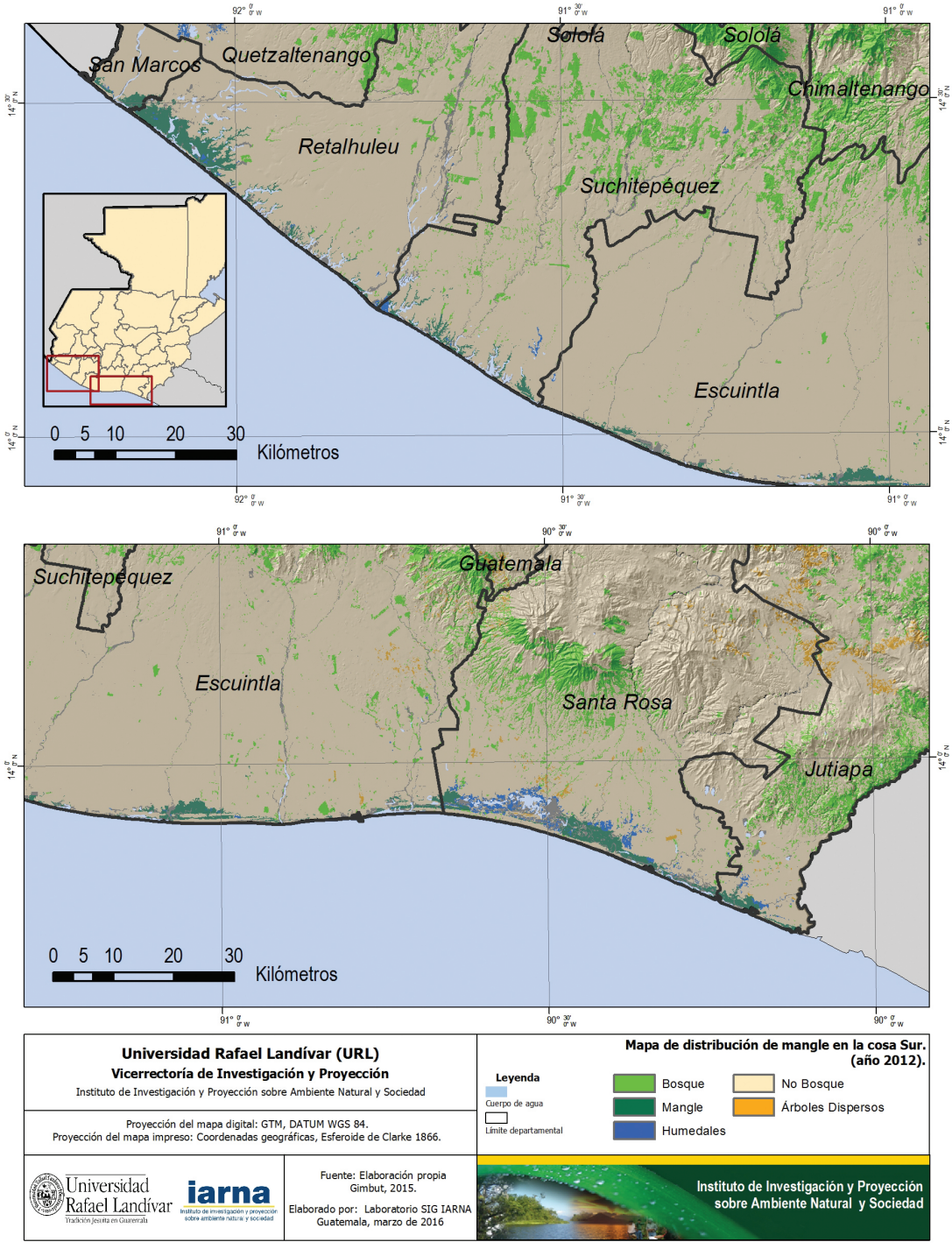
2.2.3 Coastal and marine ecosystems

The Pacific coastal marine area includes mangrove wetlands, dry forests and a marine platform that extends 200 meters offshore and then descends to great depths forming the continental shelf. One area of particular interest in Guatemala's marine territory is the San Jose Sea Trench, a deep marine ravine, which is an important habitat for large species such as marlin, tuna and sharks. There are 4 coastal areas of interest due to mangrove coverage: Manchón-Guamuchal, Monterrico-Hawaii, La Barrona-Las Lisas and Sipacate Naranjo (see Figure 2.5). The latter is a national park where a recategorization study is underway and *Poza del Nance* is found, a widening of the estuary where sea turtles enter, feed and rest. This is one of only two coastal lagoons worldwide where sea turtles can be seen.

The coastal-marine ecosystems of the Caribbean Sea include mangroves, broadleaf forests, sandy beaches, sea grass and coral reef. The biodiversity of the last ecosystems includes reef species such as the queen conch (*Strombus gigas*); 35 species of coral, 3 species of sea turtle including the Leatherback sea turtle (*Dermochelys coriacea*), Hawksbill sea turtle (*Eretmochelys imbricata*) and manatees (*Trichechus manatus*) that migrate to the Río Dulce and Izabal Lake ecosystems.

Coastal-marine areas provide food and employment for neighboring communities and the fishing industry to meet the growing domestic and international demands. These ecosystems provide essential services for the physical welfare of Guatemalans. These services include protection from floods and tropical storms common to the isthmus and filtering of pollutants and sediments flowing into rivers that provide a habitat for numerous fish, mollusks and crustaceans species living in the marshes during the early stages of their lives. The Pacific coast is also an important destination for marlin sport fishing.

Figure 2.5 Landmarks in the Pacific coastal zone



2.3 Species

The various Guatemalan terrestrial and aquatic ecosystems are home to a great number of species. The latest official report on species is summarized in Table 2.2.

Table 2.2 Diversity of Species in Guatemala

Taxon	Scientific Name	Family	Genus	Species
Protist		10	14	20
Fungi				324
Broyophytes				514
Vascular plants		352	2,344	11,350
Invertebrates		*156*	*1,334*	*3,601*
	Mollusca	69	133	123
	Arachnida	12	49	87
	Hymenoptera	6	141	407
	Siphonaptera	6	13	26
	Hemiptera	1	12	39
	Odonata	15	72	213
	Diptera	1	15	40
	Lepidoptera	8	554	1561
	Coleoptera	38	345	1105
Vertebrates		*284*	*1158*	*2524*
	Fish	156	473	1061
	Amphibia	12	36	164
	Reptilia	28	110	273
	Aves	85	402	780
	Mammalia		137	246

Source: CONAP, 2013

In relation to plants, the Orchidaceae family is the most diverse in Guatemala with 819 species described, to date. The departments of Alta Verapaz and Baja Verapaz have the most diverse record of this group and together host 60% of the species that have been described (Dix and Dix, 2006). Forty-one species are endemic to the country.

The greatest diversity of wildlife is found in the mountains of the Sierra del Lacandón, Sierra de Chamá, Sierra de Santa Cruz and part of the Mayan Mountains. Guatemala has the greatest diversity in the world of salamanders without lungs of the Plethodontidae family and there are 41 species found throughout the country, 19 of which are endemic (Mendez, 2008).

The mountainous topography has provided refuge for plants and animals during weather changes over long evolutionary periods, generating high levels of endemism. There are 832 plant species endemic to the region and 538 endemic to Guatemala. Mountainous areas, including Sierra de las Minas, Sierra de los

Cuchumatanes, Xalapán Mountain, Cerro San Gil- Sierra Santa Cruz, Trifinio and the Northern Arc (from Huehuetenango to Izabal Lake) provide shelter to the largest number of endemic plants and thorn scrub ecoregion, which also has a high number of endemic species (Veliz, 2008).

The National Council for Protected Areas (CONAP) publishes and updates the National List of Threatened Flora and Fauna Species of Guatemala (LEA). The latest update includes a total of 2,285 species as shown in Table 2.3.

Table 2.3 Threatened Species by Taxon

Taxon	Number
Fungi	22
Ferns	31
Gymnosperms (conifers)	18
Angiosperms (flowering plants)	1522
Mollusks	3
Arthropods	138
Freshwater fish	29
Saltwater fish	2
Amphibians	93
Reptiles	160
Birds	194
Mammals	73

Source: CONAP, 2013

The family of plants with the largest number of species included in the red list of plants is the Orchidacea family, followed by Asteraceae, Piperaceae, Cactaceae and Rubiaceae. The red list of wildlife includes five species of felines, three species of monkeys and five species of sea turtles. Some bird species such as the harpy eagle, horned guan and quetzal are threatened and can only be seen in specific patches of isolated forests (see Annexes for the list of threatened species).

Among the flagship species that can be used to protect large areas of marine habitats are the humpback whales (*Megaptera novaeangliae*) and Bryde's whale (*Balaenoptera edeni*) and species of large fish such as sailfish (*Istiophorus platypterus*) and blue marlin (*Makaira mazara*). Terrestrial flagship species include scarlet macaws (*Ara macao*) and the jaguar (*Panthera onca*), both residents of the MBR and the latter is also present in the Sierra de las Minas Biosphere Reserve.

2.4 Genetic diversity

Genetic diversity within a species allows adaptation to environmental changes over time. This manifests itself in the genetic differentiation of populations that exist throughout the distribution range of a species. For example, in subspecies, population genetic studies are often required to reveal genetic diversity. To conserve biodiversity, especially amid environmental changes from global warming, it is important to maintain a wide range of genes that allow species to survive, adapt and evolve.

Guatemala, as part of the land bridge that connects North and South America, presents species of plants and animals found in their northern and southern distribution limits. An example is the maple cloud

forest (*Acer saccharum skutchii*), which can be seen in Sierra de las Minas (Vargas-Rodriguez, 2005; 2010). This is a subspecies of North American maple that produces maple syrup, which can be found at 50°N latitude of southeastern Canada.

Other species of trees in the northern hemisphere that have their southern border in Guatemala are Taxus globosa; Acer negundo; 10 species of pine; and hemlock, Abies guatemalensis, an endemic species of a genus widely distributed in North America. Examples of flora and fauna of the northern limit of the southern hemisphere in Guatemala include the tree species *Podocarpus guatemalensis*, *P. matudae* y *P. oleifolius* and birds like the harpy eagle and the scarlet macaw.

The conservation of these species in Guatemala, in the northern or southern boundaries of their geographical distribution, is very important because they contain unique genes that have evolved from the country's environment and can be useful for species to adapt to new conditions resulting from climate change.

Maple (Acer saccharum skutchii), Upper Teculután River Watershed, Zacapa.
Photo: B. Byers/DevTech, February 2016.

Another example of important species is the scorpion lizard, *Heloderma horridum*, one of four species of venomous lizards in the world, believed to be distributed between Guatemala and southern Mexico. However, genetic studies determined that the population in Guatemala is a different species, *Heloderma charlesbogerti*, and endemic to the dry forest of the Motagua Valley.

2.5 Agrobiodiversity

Agrobiodiversity is defined as the diversity of cultivated plants and livestock species and their genetically distinctive varieties such as semi-domesticated, wild food and medicinal plants. Mexico and Central America are one of eight global centers of origin of domesticated plants. Maize (*Zea mays L*), Mexican teosinte (*Euchlaena mexicana*), common bean (*Phaseolus vulgaris*), tepary bean (*Phaseolus acutifolius*), papaya (*Papaya carica*), vanilla (*Vanilla planifolia*) and chayote (*Sechium edule*) originated in this region. Wild relatives can still be found in the woods.

In Guatemala, 130 species are cultivated and a third of the production corresponds to traditional crops: corn and beans being the two most important. Other important crop varieties distributed throughout the territory are cocoa, gords, avocados and chilies.

3. Economic Assessment of Forests and Biodiversity

Biodiversity provides three different types of social and economic advantages: products or goods, services and non-material benefits (USAID, 2005a; CONAP, 2014). This section emphasizes the most important benefits that Guatemalans receive from forests and biodiversity.

Table 3.1 lists the most relevant products and services of Guatemalan terrestrial ecosystems.

Table 3.1 Ecosystem goods and services

Type of Ecosystem	Elevation and Topography	Ecosystem goods and services
Broadleaf, montane, moist forest (i.e. Cloud forest)	Upper part of the watershed	- Hydrological services through the capture and infiltration of water - Ornamental fern and moss species - High recreational and tourism potential for wildlife watching and orchids
Pine and pine-oak forest	Middle part of the watershed	- Hydrological services through the capture and infiltration of water - Soil protection and erosion control - Wood products for construction and fuel - Wood products for furniture production
Broadleaf, moist forest	Lower part of the watershed	- Carbon capture and storage - Local and global climate control - High value wood - Non-timber forest products
Deciduous dry and scrub forest	Mountainsides and lower part of the watershed	- Soil protection and erosion control - Materials for construction and fuel
Mangroves	Coastal area	- Filtration of contaminated water - Regulation of floods - Protection against tropical storms - Nutrient sedimentation - Carbon capture - Nursery for shrimp and fish larva - Wood for construction, agriculture tutors and fuel for households

Source: Prepared by evaluation team

3.1 Ecosystem goods

Ecosystem goods are direct benefits obtained from the harvest of species or their parts to provide food, plant material, fuel, timber and medicinal plants.

The estimate of the economic value of the primary production of goods reflects that timber products are those that contribute most to the bulk of the production supply. In 2006, timber production reached more than five billion quetzals, while non-timber totaled one billion quetzals (IARNA/URL, 2015).

According to the Integrated Forest Account (CIB) of the System of Environmental-Economic Accounting (SEEA)[1], an inventory of forest land for 2010 resulted in 3.72 million hectares, with a physical asset of 603.9 million m^3, equivalent to Q118 billion. The use of forest products had an increasing trend from 29.9 million/m^3 in 2002 to 35.5 million/m^3 in 2010. In 2010, wooden logs intended for use in construction and furniture represented 3.1 million m^3; meanwhile, 26.3 million m^3 (73.68%) was used as fuel in industry and households (INE and IARNA-URL, 2013a).

With regard to species of high commercial value, such as, mahogany (*Swietenia macrophylla* King), Spanish cedar (*Cedrela odorata* L.), and Honduras Rosewood (*Dalbergia stevensonii* Standl), exports in the last 10 years reached an average of USD $7.6 million (CBD, 2014).

Jorge Soza, ACOFOP concessions coordinator.
Photo: B.Byers/DevTech, January 2016.

1 *SEEA of Guatemala; the system is linked to the System of National Accounts (SCN) that combines economic and environmental information in the country, and describes the impact of this on the environment. The ICB is the result of collaboration between academia and the public sector; a pioneering effort in Latin America and the Caribbean of implementation and harmonization of concepts and definitions to measure the reciprocal influences between the economy and the forest and describe the inventory of assets and their variations.*

Table 3.2 presented below summarizes the estimated value of the most important ecosystem assets.

Table 3.2 Value of ecosystem products

Product	Annual Value
Timber and timber products (INE, BANGUAT, and IARNA, 2013a)	
Firewood	1,423,000 Q $185,000 USD
Wood for construction and furniture	355,750 Q $46,250 USD
Precious woods (i.e. Mahogany, cedar, rosewood)	$7,600,000 USD
Non-timber forest products (CONAP, 2014)	
Ponytail palm	$1,800,000 USD
Epiphytes	$1,300,000 USD
Spineless yucca	$385,000 USD
Xate	$882,000 USD
Allspice	$256,000 USD
Ramon	No data
Fish and Seafood (INE, BANGUAT, and IARNA, 2013b)	
Fish	292,000,000 Q $37,960,000 USD
Shrimp and lobster	163,000,000 Q $21,190,000 USD
Shellfish, crabs and others	8,000,000 Q $1,040,000 USD

Source: Prepared by evaluation team Note: Exchange rate used: US$1 = Q7.69

Non-timber forest products are an important source of income for Guatemalan businesses and some rural communities. CONAP estimated the value of non-timber exports in 2014 as USD $3.8 million. The main goods exported are decorative plants of the following species: *Beucarnea* spp (ponytail palm); *Tillandsia sp*. (airplant); *Yucca gigantean* (spineless yucca); *Chamaedorea* spp (xate) and *Pimenta dioica* (allspice).

Fish and shellfish are another important category of ecosystem products. Production from 2001-2010 was estimated at 22.6 million tons/year and USD $7 million (INE, BANGUAT and IARNA-URL, 2013b).

Private forest industry

In Guatemala the main forest products are wood for sawmill and firewood for domestic fuel. Authorized lumber production was 2.1 million m^3 in 2015, of which 81% fell under license-exempt use.

The area of natural forests managed by authorities was drastically reduced from 22,060 hectares in 2006 to 7,782 hectares in 2010 and 5,680 hectares in 2015. The volume of use in these areas ranged from 515,397 m^3 in 2006 to 276,036 m^3 by 2010 with a slight increase to 397,330 m^3 in 2015. The reduction

of area under natural forest management could be due to the increased use of plantations (established voluntarily or with incentives and required to meet the commitments under a forest management license) and agroforestry systems or to a reduction in the availability of the remaining forests and poor access for their management (IARNA-URL, 2012).

The number of species processed in the timber industry is low and 52% of total exports in 2014 corresponded to species of the genus *Pinus*. The export market offered 21% lumber and 8% pallets or platforms (IUCN & IARNA-URL, 2015). Other products reported as finished furniture include doors, floors and boards, which is indicative of the added value that is generated for export. The main trade partners of Guatemalan exports from 2003-2013 were the United States, Mexico, El Salvador and Honduras.

Of the broadleaved species, about 88% of precious wood exports over the last 10 years came directly from the forest concessions in the MBR, with an average of 5,950 m^3 of timber exported at an annual value of USD $7.6 million (CONAP, 2014th)[2].

As for the domestic market, 48.5% of the species harvested in 2014 corresponded to the genus *Pinus spp*., 15.4% to *Quercus spp*., 3.9% to *Cupressus lusitanica*, and the rest corresponded to other species (www.sifgua.org.gt).

In June 2013, there were 613 forest enterprises (sawmills and carpentry) and more than 1,000 companies involved in the wood chain to the end consumer (INAB, CONESFORGUA & IARNA-URL, 2015). There is an informal market for the wood industry through small family industries. According to the Technical Institute for Training and Productivity (INTECAP), in the wood and furniture sector, there are 3,423 companies engaged in furniture manufacturing, of which 89% are classified as microenterprises (FAO, INAB & MINECO, 2015).

3.2 Ecosystem services

The ecosystem services provide benefits that result from the functions and processes carried out in ecosystems, such as:

- Nutrient and water cycles (carbon, nitrogen, phosphorus)
- Decomposition of biomass and pollution
- Natural Pest Control
- Soil formation, erosion prevention
- Pollination
- Climate regulation

The benefits of ecosystems for the country are calculated according to the existing 4.2 million hectares of forest, of which 65% contribute to the protection of soil against erosion; 25% contribute to hydrological services; and 10% provide protection against landslides. From 1991-2003, erosion control was valued at USD $47 million (Q1,300 per hectare) (IARNA/URL, 2015).

2 *Mainly of Mahagony, Swietenia macrophylla King; Cedar, Cedrela odorata L.; and Honduran Rosewood, Dalbergia stevensonii Standl.*

Another forest service, water supply, has been measured at more than 90 billion m^3/year, which translates to more than 6,000 m^3 per capita, well above the threshold to meet basic human needs. The largest user of water in the country is the manufacturing sector, followed by agricultural irrigation with the cultivation of sugarcane, African palm, banana and melon (IARNA/URL, 2015).

A study conducted in the Teculután River basin, a tributary of the Motagua Valley, showed that the forest plays an important role in regulating the water cycle. The research, conducted by Tuna and Dimas, 2007, calculated that for every hectare of forest lost, runoff is increased by 16,600 m^3/year. In 2012, Incer studied the water balance in the same watershed and showed that the moist forest plays a central role in the capture and infiltration of water, stabilizing the water flow during the dry season.

Bees, butterflies, beetles, bats and birds provide important services such as pollination, which facilitates the reproduction of plants and helps maintain the diversity and stability of ecosystems. About a third of the crops benefit from pollination, including coffee, which is mostly pollinized by bees. A study in the coffee plantations of San Lucas Tolimán, Sololá, revealed that bees are responsible for pollinating 13% of the crop in this area (Esteban, 2013). According to the National Coffee Association (ANACAFE), coffee production from 2009-2010 was valued at USD $10 million. The necessary pollination service for coffee cultivation should be an incentive for producers to conserve forests near and in the areas of crops (Ricketts *et al*., 2004).

Shade-grown coffee, Los Tarrales Reserve.
Photo: B, Byers/DevTech, January 2016.

Services provided by mangroves include coastal protection against tropical storms; filtering of pollutants and sediment from flowing rivers; improving the quality of flow going into the sea and related ecosystems such as coral reef; nurseries for larvae of many fish and shellfish species important to food security; and carbon sequestration.

3.3 Other benefits

In addition to providing goods and services, natural ecosystems also provide recreational, cultural, spiritual, educational and scientific benefits that contribute to human welfare (USAID, 2005a; USAID, 2014).

In Guatemala, non-natural ecosystem benefits include nature tourism, which is the second most important activity in protected areas (CONAP 2014b), and sites that are considered sacred by indigenous groups.

Recreational activities carried out in natural ecosystems of Guatemala include bird watching, whale watching, and marlin sport fishing and hiking on trails.

Education and scientific research carried out in various areas of SIGAP, contributes to the generation of new knowledge on species and ecosystems and to the training of young researchers.

4. Threats to Tropical Forests and Biodiversity

This evaluation uses the "threat based "methodology" suggested by USAID for biodiversity programming (USAID, 2005a; USAID, 2014). Through the use of a logical framework, direct threats to biodiversity were identified according to the five main categories:

- Transformation, loss, degradation and fragmentation of natural habitats
- Over-exploitation of species
- Non-native invasive species that can damage ecosystems or species
- Pollution that harms natural habitats or species
- Climate change effects that damage natural habitats or species

Climate change is a potential threat of unknown magnitude, which can accentuate other direct threats, especially the loss, degradation and fragmentation of habitat and the invasion of nonnative species.

According to the USAID Biodiversity Policy (USAID, 2014), the immediate causes and drivers of these direct threats are generally classified into one of five categories:

- Demographic factors
- Economic factors
- Socio-political factors
- Cultural and religious factors
- Scientific and technological factors

Having identified the causes of threats to biodiversity, the necessary actions to address, reduce or remove them can be determined (USAID, 2005a; USAID, 2014).

4.1 Direct Threat

The following description of direct threats to biodiversity and forests are summarized in Table 4.1.

Transformation, loss, degradation and fragmentation of natural habitats

The loss and degradation of habitats in Guatemala is the main threat to tropical forests and biodiversity. Deforestation in the country has been measured at 132,000 hectares/year and occurs as a result of the socio-economic demand for land (space), wood and firewood (IARNA/URL, 2012). Demand for land causes changes in its use, resulting in forests being converted to cultivated lands. This can be seen in the current increasing cultivation of African palm, which is considered the fastest growing crop at an annual rate of 20%. USAID agriculture projects (such as RVCP and Food for Peace) follow best practices for farm and vacant land and therefore, do not contribute to forest degradation.

Other sources of deforestation are illegal logging and the use of firewood as the main source of energy. Illegal logging is being addressed by INAB through the creation of SEINEF, which aims to prevent the marketing of illegal timber from natural forests. USAID's CNCG program promotes the certification and sustainable management of natural forests within the RBM in Petén to successfully counter illegal logging within forest concessions.

Another threat is the use of firewood as the main energy source, which degrades the quality of forests. This threat comes not only from the lack of energy options for families in rural areas, but also from cultural origins as many Guatemalans still prefer the use of firewood to other heat sources for cooking.

Mining represents an environmental threat and a source of social conflict. The extraction of metallic ore, non-metallic ore and hydrocarbons was estimated at 40 million tons per year in 2012 (IARNA/URL, 2012).

The loss and degradation of water resources in the country is the result of intensive extraction and the lack of a national water authority. An extractive water model predominates in the country and there are no investments for storage, distribution and recharge to watersheds and groundwater reservoirs. Water management is lacking and only 2.5% of water used for human consumption has some kind of administration. The lack of drainage systems and water treatment result in the pollution of water resources (only 11% of rural households and 44% of urban households have sewage services).

Over-exploitation of species

Communities in Petén and other wooded areas of the country still depend on hunting as a means to obtain the necessary protein for their families. Some groups of wildlife such as the Cracidae family (*Penelopina nigra, Crax rubra, Penelope purpurascens*) are under great pressure. Other species of mammals and birds such as howler monkeys (*Alluata palliata y A. pigra*), spider monkeys (*Ateles geoffroyi*), several species of parrots (*Amazona autumnalis, A. farinosa, A. auropalliata*) and scarlet macaw (Ara macao) are caught illegally to be sold on the black market. CONAP data shows that in 2012, 1,408 specimens were seized from the market.

Marine and coastal wildlife, including fish stocks that are important for food security, are caught without proper management by the national authority and some populations show signs of over use. Several shark species are captured at increasingly smaller sizes as compared to a few years ago. The Pacific shrimp industry, of great economic importance, collapsed during the nineties for the same reason.

The spawning of sea turtles in the Pacific and Caribbean coasts leaves behind thousands of eggs that are largely legally marketed. The marketing of these eggs is legal as long as the harvester delivers one dozen eggs to the hatchery of their community to seed and release the hatchlings back into the sea. This resource management has been in place since the late seventies and a recent audit of the 13-year period (1999-2012), revealed that **1,293,707** eggs were relocated (CONAP, 2013). However, this management has been criticized due to the success of survival of hatchlings because studies conducted with the species *Caretta caretta* (one of the species that spawns in Guatemalan beaches) have shown that the proportion of embryos that survived to adulthood is from 0.0009 to 0.0018 (9/1000 to 18/1000) (Frazer, N. 1986). This low survival rate is reason to change the conservation strategy of these endangered species.

Non-native invasive species

Two non-native invasive species that threaten the balance of the Mesoamerican Barrier Reef System, the lionfish (*Pterois volitans* and *P. milens*) and tiger shrimp (Panaeus monodon) have been detected in Guatemalan marine waters. Both are predators and have already caused problems with wildlife in neighboring countries. Guatemala participated in the development of a regional strategy to control the invasion of lionfish. However, there has been no concrete response from the corresponding institutions regarding the invasion of tiger shrimp, other than a warning from the Committee on Fisheries and Aquaculture of the Guatemalan Exporters Association (AGEXPORT) that recognizes this invasive species as the reason behind the reduction in the size of local shrimp.

During field visits to carry out this assessment, it was found that African palm plantations use a non-native beetle to increase pollination. The species, *Elaedobius kamarunicus*, is incorporated into the plantations and increases fruit production by 20%-30%. No information was found to indicate problems that might arise from this introduction. However, more in depth research is recommended to avoid future surprises.

Discharges and emissions of pollutants that damage natural habitats

The country generates the equivalent of 116.5 million tons of solid waste and of that, 17 million tons are recycled and the rest is emptied into soil and water. The production, processing and preservation of meat makes up for 40% of the total waste (BANGUAT and IARNA-URL, 2011). In addition, there is inadequate waste management of household and economic activities; only 30% of generated waste is handled through available municipal or private services.

Pollution also affects water, 14 of the 38 major rivers in the country are contaminated and 4 of the main lakes are in the process of eutrophication due to excessive nutrient discharges (MARN, IARNA-URL and UNEP, 2009).

Effects of climate change that damage species or natural habitats

CO_{2e} emissions in Guatemala total 48.3 million tons. The majority, 60%, comes from homes due to the use of firewood and the use of hydrocarbons for transportation. Another major source of emissions is the electricity distribution system.

Projections of climate change effects on ecosystems indicate that by 2050, the bioclimatic conditions (temperature and precipitation) of more than 50% of the territory will have changed. According to the scenarios, it is very likely that by 2050, the dry forests will expand and cover 40% of the national territory and moist, wet and rain forests will be reduced to only 60% (IARNA/URL, 2011).

Table 4.1 describes the direct threats to biodiversity and their causes by type of ecoregion.

Table 4.1 Direct threats by type of ecoregion

Ecorregion	Threats	Causes
Petén-Veracruz Moist Forests Belizean Coast Mangroves Northern Honduran Mangroves Central American Atlantic Coast Moist Forests Motagua Valley Dry Scrub Forest	**Loss, fragmentation and degradation** Land use changes (loss of forests for crops, livestock and other uses) Forest fires from agricultural practices Intensive firewood use Mining of hydrocarbons and metals **Overexploitation of species** Hunting of cracidae, lowland paca, wild boar and other game species Cutting of timber of high commercial vale such as mahogany, cedar, rosewood, etc. Capture of parrots (parakeets and macaws), monkeys, felines and reptiles for the illegal pet trade **Contamination** Contaminated water discharged into bodies of water Inefficient or nonexistent solid waste management Agricultural runoff	Lack of governability Institutional weakness reflected in inefficiency to enforce laws and regulations and failure to monitor activities Unavailability of other energy sources and sustainable firewood production Increasing demand for precious wood products and wild animals for pets Inadequate land planning and use Uncertainty, insecurity and overlapping land rights
Tehuantepec-El Manchón Mangroves Pacific Coast Mangroves Central American Dry Forests	**Loss, fragmentation and degredation** Land use changes (loss of forests for crops, aquaculture farms, salt production and tourism development) Intensive firewood use Diversion of riverbeds to benefit aquaculture and monocultures **Overexploitation of species** 4 species of mangroves for housing construction Shark fisheries Use and trade of sea turtle eggs **Contamination** Contaminated water discharged into bodies of water Inefficient or nonexistent solid waste management Agricultural runoff Sugar cane crop burnings	Institutional weakness reflected in inefficiency to enforce laws and regulations and failure to monitor activities Unavailability of other energy sources and sustainable firewood production Increasing demand for fishery products (shark) and collection of sea turtle eggs Inadequate land planning and use

Ecorregion	Threats	Causes
Central American Pine-Oak Forests Central American Montane Forests Chiapas Montane Forest Sierra Madre Moist Forests Chiapas Depression Dry Forests	**Loss, fragmentation and degredation** Land use changes (loss of forest for crops and urban and industrial growth) Forest fires for agricultural practices Intensive firewood use Mining **Contamination** Contaminated water discharged into bodies of water Inefficient or nonexistent solid waste management Agricultural runoff	Institutional weakness reflected in inefficiency to enforce laws and regulations and failure to monitor activities Unavailability of other energy sources and sustainable firewood production Increasing demand for metals and construction materials Inadequate land planning and use Lack of soil conservation programs
Freshwater		
Lakes, wetlands and rivers	**Loss and degredation** Sedimentation Agricultural runoff Conversion to other uses Loss of riparian zone Systemic extraction of water Overfishing **Contamination** Discharges of industrial pollutants Discharges of untreated waste water Discharges of solid waste	Lack of water laws and overlapping responsibilities between institutions Low institutional capacity to monitor activities and ensure compliance with laws and regulations Low capacity of communities to become involved in environmental decision making Degradation of forests in the upper watershed
Marine Habitats		
Pacific Mesoamerican Barrier Reef System marine habitats	**Overexploitation of fishery resources** Overfishing of shark and shrimp Illegal fishing for sailfish Destructive fishing practices Non compliance with whale watching regulations **Contamination** Sedimentation and nutrient and solid waste pollution from coastal and inland activities Invasive alien species Lion fish Tiger shrimp	Lack of institutional capacity of the entities responsible for the management of marine resources (little technical staff, lack of boats and fuel to monitor/ patrol) Failure to comply with regulations on the management of liquid and solid waste discharges

Source: Prepared by Evaluation Team

4.2 Causes and Drivers

Social and cultural

Growing poverty and social exclusion

After threats to the environment in Guatemala, the biggest problem is poverty. The latest Living Conditions Survey (ENCOVI, 2014) revealed that 53% of the population, more than nine million people, lives in poverty and 23.4% live in extreme poverty. The most affected groups are indigenous populations, who constitute 79.2% of the poor and very poor. The majority of the population living in poverty are children under 18 years (68.2% of children live in poor households) and the percentage increases at a younger age (70.2% of children under 10 live in poverty). Poverty has a direct relationship to chronic malnutrition suffered by children in Guatemala.

Economic

Unequal economic growth

Although GDP has grown steadily over the last 10 years (4% growth is expected for 2016), and agricultural trade, financial services, communications and manufacturing industries have benefited from it; such benefits have not been distributed to the majority of the population. The analysis of distribution of wealth in Guatemala shows that 70% returns to capital and 30% is distributed among labor. Clearly, remittances represent a revenue into the country (reaching USD $6.0 billion in 2015) and are becoming a mechanism for redistribution of income.

Policies/Institutions/Governance

Institutional weakness and inadequate budget for public issues

The credibility and public respect for government institutions in the country deteriorated for decades and recent events, which revealed corruption at the highest level, have confirmed that institutions are currently in the worst imaginable state of weakness.

Several institutions, including the Ministry of the Environment and Natural Resources (MARN), CONAP, INAB, the Directorate General of Fisheries and the watershed authorities, address the environmental issue. Many of these institutions have overlapping competencies and the environmental sector recognizes the need to restructure the institutional framework to make it more functional. In addition to these problems, low investment by the country to address environmental issues further undermines the environmental management mandate that lies with the institutions.

5. Policies, Legislation and Institutions related to Biodiversity

The principles that revolve around the production of environmental goods and services, sustainability of forest resources, and the conservation of Guatemalan tropical forests and biodiversity are framed in the following policies: Forest Policy (1999), National Policy and Strategy for the Development of the SIGAP Systems (1999) and the Biodiversity Policy (2011). These are supplemented by other sectoral policies such as the Environmental Policy (2002), Policy on the Conservation, Protection and Improvement of Environment and Natural Resources (2011), Agricultural Policy (2011-2015), Energy Policy (2013-2027) and the National Strategy for Sustainable Production and Efficient Use of Firewood. The following description addresses each of the policies relevant to this assessment:

The **Forest Policy (1999)** aims to increase the socioeconomic benefits of forest ecosystems goods and services and contributes to land management in rural areas, emphasizing forest resources and other associated areas such as biodiversity, water and soil, linking forestry to the country's economy for the benefit of the Guatemalan society. Forest policy can be divided into three main aspects: a) provision and maintenance of environmental services such as watershed management and soil protection; b) productive development of forests; and c) conservation of natural forests.

The **National Policy and Strategy for the Development of Guatemalan Protected Areas Systems (1999)** proposes the protection and sustainable use of the country's natural and cultural heritage, to help increase the quality of life of present and future Guatemalans. It aims to conserve biological diversity and conduct an economic reevaluation of natural resources. It proposes actions such as the restoration of forestry land, the protection of national heritage, and the promotion of investments in protected areas under an effective public administration of the conservation sector.

The **Biological Diversity Policy (2011)** aims to build a guiding framework of state and civil society actions to legislate and ensure the proper and efficient conservation and sustainable use of biological diversity. The policy defines the rights, obligations and attributes of each of the actors and sectors involved, as well as the strategic recognition of biological diversity as a collective heritage.

This policy aims to promote the effective management of Guatemalan biodiversity, emphasizing conservation and sustainable use as a crucial factor in transgenerational human development. It is based on the principles of the common good, intergenerational legacy, sustainability, fair and equitable distribution of benefits, sharing of responsibility, equitable participation, prevention, contemplation and respect for intellectual property.

The **Policy on the Conservation, Protection and Improvement of Environmental and Natural Resources (2011)** seeks to harmonize, define and provide guidelines for the different sectors to improve the environment and quality of life of the inhabitants of the country; to maintain an ecological balance; and to maintain the sustainable use of natural resources. It defines the guidelines to develop effective management to conserve and protect the environment and natural resources, improve the environmental quality of life for Guatemalans, and promote the sustainable use of natural resources. Its implementation has been limited by MARN's lack of capacity to fulfill the political mandates.

The **Water Policy (2011)** aims to ensure the contribution of water to the achievement of the country's economic, social and environmental development goals and objectives. This through the institutionalization of the national water management and governance system to meet as many demands, anticipate future requirements, manage water risks and protect the natural assets, within a framework of social harmony, transgenerational human development and national sovereignty.

Specific objectives include:

a) Improvement of individual and social living conditions

b) National adaptation to climate change through the conservation, protection and improvement of water sources

c) Economic and social development through good governance and effective water management

d) Gradual adoption of a water management system

e) Promotion of justice, security and the common good of the country by implementing the guidelines and principles of negotiation that establish compensation schemes to protect international watercourses

The **Agricultural Policy (2011-2015)** aims to influence sustainable integral human development of the population in rural areas, contributing to land management and the promotion of agriculture, forestry and hydrobiological sectors. The policy prioritizes the promotion of the rural, indigenous and farming economy, promoting equitable access to production means and sustainable use of natural resources and environmental services, in order to achieve food sovereignty and surpluses and incorporation these into the various types of market.

The **Energy Policy (2013-2027)** contains a dimension of the importance of firewood in primary energy production, as well as the protection of biodiversity. The policy calls for respecting SIGAP areas when developing an energy project for proper environmental management of natural resources, especially when developing hydroelectric projects.

5.1 Legislation related to biodiversity

Use and conservation of natural resources is established in the Constitution of the Republic of Guatemala, which declares the natural interest of the conservation of natural heritage and the environment as well as the social interest of reforestation and forest conservation. From there several specific decrees address various issues (see Figure 5.1 for a summary of environmental legislation of the country).

The legislation for the conservation of tropical forests and biodiversity comes from the **Law on Environmental Protection and Improvement (Decree 68-86).** This law aims to *ensure the maintenance of an ecological balance and environmental quality to improve the quality of life of the inhabitants*. For its implementation, environmental instruments were created to prevent and mitigate adverse impacts throughout projects, works and industry that may cause adverse effects to natural resources and the environment. MARN, created by Congressional Decree 90-2000, is the body responsible for implementing this law.

SIGAP is the main tool for the conservation of biodiversity and tropical forests in Guatemala, whose organization and characteristics are established by the **Protected Areas Act (Legislative Decree 4-89 and amendments 18-89, 110-96 and 107-97)**. This law gives rise to the CONAP and regulates the protection of biodiversity.

The Fisheries and Aquaculture Law (Decree 80-2002) aims to regulate fishing and aquaculture activities in order to align them with advances in science, adjusting methods and procedures for the rational use of aquatic resources in public waters. The State is responsible for the development,

promotion and diversification of fisheries and aquaculture, regulation of existing fisheries and protection of the establishment of new fisheries, using a precautionary approach, thus creating the appropriate conditions for the responsible use of aquatic resources for the heritage of all Guatemalans.

The **Forestry Law (Decree 101-96)** establishes guidelines for the management of forests outside protected areas. Their application and exploitation rests with INAB. PROBOSQUE, the forestry incentives law approved in 2015, promotes the restoration, management and protection of forests.

To promote the sustainable and comprehensive use of some priority watersheds, the following Watershed Authorities have been established:

i) Lake Amatitlán Watershed (Decree 64-96)

ii) Lake Atitlán Watershed (Decree 133-96)

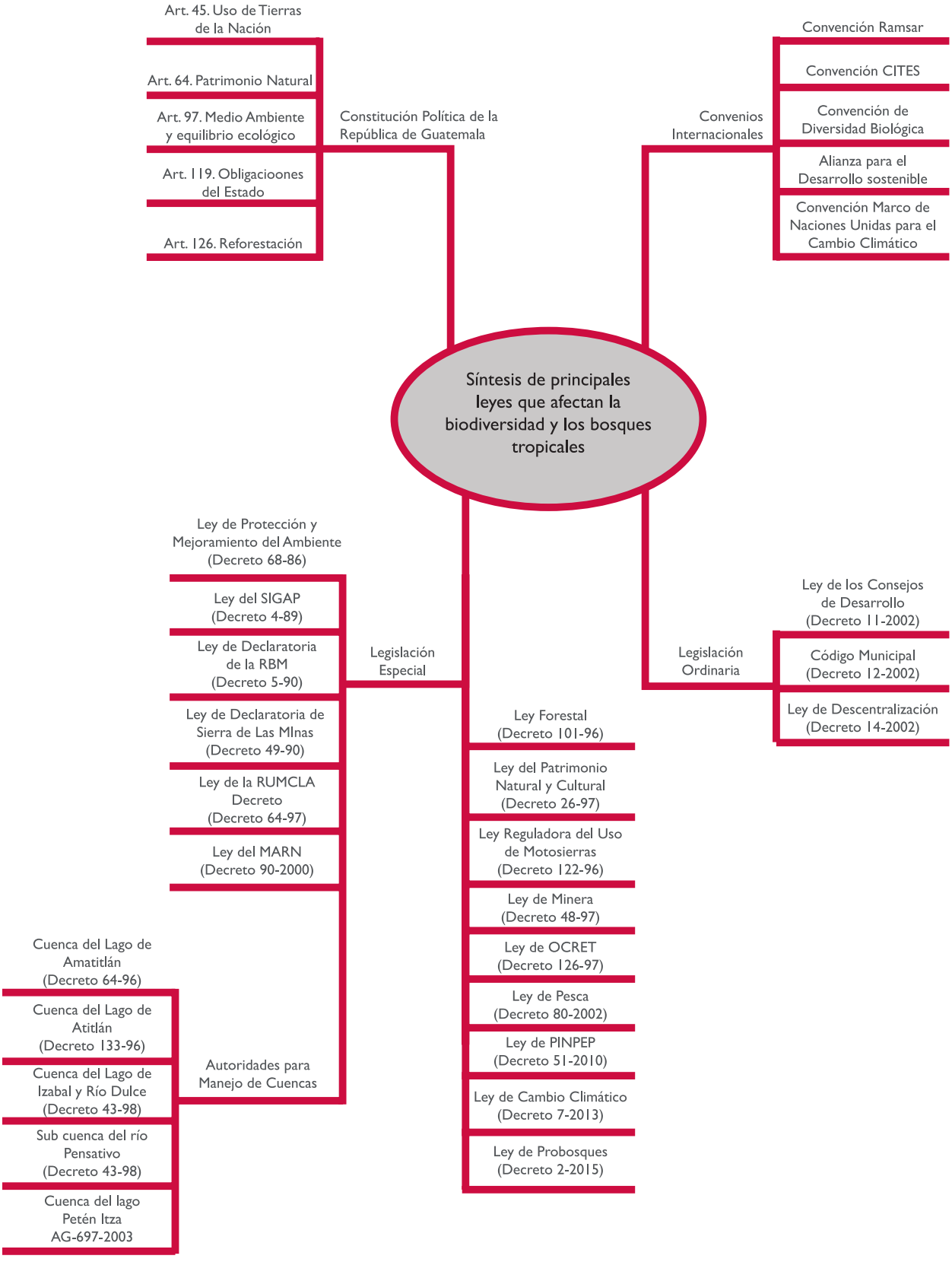
iii) Lake Izabal and Rio Dulce Watershed (Decree 423-98)

iv) Pensativo River Watershed (Decree 43-98)

v) Lake Petén Itza Watershed (AG-697-2003)

The recently approved **Law to regulate vulnerability reduction, compulsory adaptation to the effects of climate change and mitigation of greenhouse gases (Decree 7-2013)** creates the National Climate Change Commission, the National Climate Change Fund (FONCC) and demands the elaboration of a National Plan on the Adaptation and Mitigation to Climate Change.

Figure 5.1 Environmental Legislation of Guatemala



Source: Sandoval, C 2015

5.2 Institutions

The legal and institutional framework governing forests and biodiversity in the country incorporates various institutions created by laws and emerging according to the needs in the country. The institution in charge of forest management, MARN, is the third entity created for this purpose in the history of Guatemala. MARN is the highest authority of environmental issues and is the most recently established institution in this area, replacing the former National Environmental Commission. Each relevant institution and its function are described below (see Annex F for an analysis of the institutions and instruments).

Ministry of the Environment and Natural Resources (MARN)

This ministry coordinates, meets and enforces policies and the legal system concerning pollution, prevention, and environmental conservation, protection and improvement to ensure the rational, efficient and sustainable use of natural resources.

MARN's responsibilities include:

- Coordinate actions for the mitigation and adaptation to climate change
- Manage licenses for activities that may have environmental impacts
- Ensure and verify compliance with environmental legislation
- Evaluate environmental instruments
- Provide follow up on mitigation measures for activities

One regulation of greatest relevance to this ministry is the Evaluation, Control and Environmental Monitoring Regulation (RECSA)[3] modified by Governmental Agreement 20-2016 dated January 12, 2016 and placed into effect on May 12, 2016. The modifications to RECSA have been the subject of controversy between different production sectors who see difficulties in its application due to a number of tools lacking for its implementation (such as public participation, implementation of a strategic environmental evaluation, environmental risk evaluation and cumulative effects evaluation).

The Regulation on Discharge, Reuse of Sewage and Sludge Disposal establishes parameters for the maximum contaminant levels in the discharge.

Under the leadership of MARN, an Institutional Coordination Group (GCI) for the Conservation and Sustainable Management of Natural Resources was formed with the participation of the Ministry of Agriculture, Livestock and Food (MAGA), CONAP and INAB, as the entities responsible for monitoring the actions needed to implement the National Strategy for Reducing Emissions from Deforestation and Forest Degradation (REDD+) in Guatemala. This forum discusses issues to harmonize policies, strategies and programs for the conservation of forests and biodiversity.

MARN's budget for 2015 was Q172.2 million, equivalent to 0.25% of the national budget.

---

3 This Agreement repeals the previous version approved through AG 60-2015 and the Limited List of activities approved through AG 61-2015.

National Council for Protected Areas (CONAP) and the Guatemalan Protected Areas System (SIGAP)

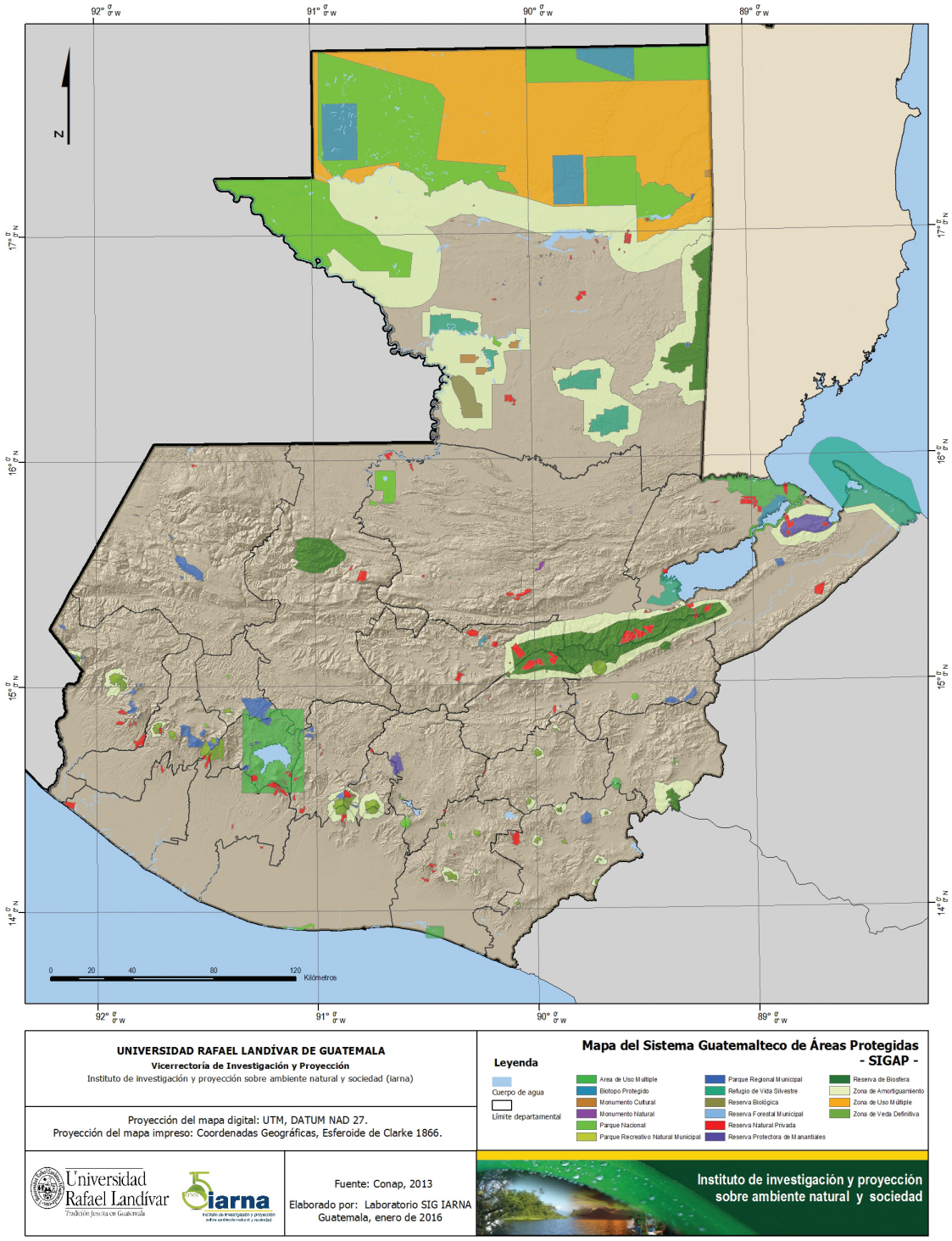
CONAP depends administratively on the Presidency of the Republic, whose highest authority is composed of representatives from the following institutions: MARN (who presides), CECON/USAC, Institute of Anthropology and History (IDAEH), National Association of Municipalities (ANAM), Guatemalan Institute of Tourism (INGUAT), MAGA and a representative of NGOs registered with CONAP and related to natural resources and the environment.

CONAP's budget for 2015 was Q106 million, equivalent to 0.15% of the national budget.

This institution is responsible for the administration of SIGAP and the conservation and management of wildlife (marine and terrestrial) throughout the country. According to the Protected Areas Law, SIGAP consists of all legally declared areas. In 2015, 328 protected areas were reported with an area of 3.44 billion hectares (3.337 billion hectares of land and 102,589 hectares of sea[4]). The territory under legal protection is equivalent to 30.65% of the country (www.conap.gob.gt). Figure 5.2 shows the SIGAP distribution.

4 *These correspond to the marine area of the Manabique Point Wildlife Refuge, located on the Atlantic coast, which reflects the low representation of protected marine areas in the country.*

Figure 5.2 Map of the Guatemalan Protected Areas System



In 2010, SIGAP reported 1.930 million hectare, accounting for 51.9% of the country's forests. Most SIGAP areas are under government administration (80.99%), followed by co-administration agreements mainly established with NGOs.

Table 5.1 presents the representation of ecoregions in SIGAP. The largest area consists of the Petén-Veracruz moist forests (77.662%), followed by the Central American montane forests (7.032%) and the Central American Pine-oak forests (6.435%). CONAP does not report representation in the Chiapas montane forests and the Dry Northern Pacific Coast Mangroves.

Table 5.1 Representation of ecoregions in SIGAP, 2014

Ecoregion	% SIGAP
Petén-Veracruz moist forests	77.662
Central American montane forests	7.032
Central American Pine-oak forests	6.435
Central American Atlantic moist forests	5.813
Motagua Valley thorn scrub forest	1.438
Belizean Coast Mangroves	0.815
Yucatán moist forests	0.335
Sierra Madre de Chiapas moist forests	0.178
Central American dry forests	0.145
Tehuantepec-El Manchón mangroves	0.090
Northern Honduran mangroves	0.049
Chiapas dry forests	0.007
Chiapas montane forests	0.000
Dry Northern Pacific coast mangroves	0.000
Grand Total	**100.000**

Source: www.conap.gob.gt

Effectiveness of Protected Area Management within the USAID Monitoring and Evaluation Program zone of influence

Protected areas management is essential for enhancing the benefits that the areas can provide as biodiversity reservoirs and suppliers of environmental services. Hence the importance of evaluating the effectiveness of such management, whose main goal should be to reach the creation goals of each area.

In Guatemala, CONAP conducts the protected areas management evaluation by means of a methodology based on the combination and adaptation of internationally recognized methodologies such as those developed by IUCN/UNEP, 1990 and De Faria, 1993. The results presented in this report are the result of the analysis carried out by IARNA-URL in 2015, which included the three most recent official measurements carried out by CONAP in 2011, 2012 and 2014.

The methodology applied by CONAP to carry out the evaluation consisted in the measurement of administrative, economic-financial, political-legal, natural and cultural resources and social indicators. Each area grouped criteria describing the administrative capacity that were graded on a scale from 1 to 5 (CONAP, 2010). The sum of this weighted scale resulted in a final evaluation score (given in Quality Management Units or QMU) ranging from unacceptable to satisfactory management (see Table 5.2)

Table 5.2 Interpretation of results from the evaluation on the effectiveness of the protected areas management of SIGAP

Code	Protected Areas Management Level	Quality Management Units
1	Unacceptable	0 - 199
2	Minimally acceptable	200-399
3	Regular	400-599
4	Acceptable	600-799
5	Satisfactory	800-1000

Source: CONAP, 2010.

During the period covered by the analysis, CONAP evaluated management effectiveness in 49 of the 320 protected areas declared within the MEP-USAID area of influence. The data correspond to 15.3% of the declared protected areas, of which the sum of their area represents 43.3% of the total protected area in the 8 departments (IARNA-URL, 2015).

The results are presented below, by department:

Petén

Table 5.3 Results from the evaluation on the effectiveness of protected areas management in Petén

No.	Name	Management Category	Depart-ment	Management Effectiveness 2011	Management Effectiveness 2012	Management Effectiveness 2013-2014	Unit Value (ha)	Administrator
1	Tikal ***	National Park	Petén	640		554	55,005.00	IDAEH
2	Cerro Cahuí	Protected Biotope	Petén		431	473	650.00	CECON/USAC
3	Sierra del Lacandón	National Park	Petén	616	567	593	202,865.00	CONAP/FDN
4	Laguna del Tigre **	National Park	Petén	382	326	307	289,912.00	CONAP
5	Laguna del Tigre -Río Escondido- **	Protected Biotope	Petén		272	274	45,168.00	CECON/USAC
6	Mirador - Río Azul	National Park	Petén	466	476		116,911.00	CONAP
7	San Miguel La Palotada - El Zotz	Protected Biotope	Petén		408	408	34,934.00	CECON/USAC
8	Naachtún - Dos Lagunas	Protected Biotope	Petén		452	441	30,719.00	CECON/USAC
10	Yaxhá - Nakúm - Naranjo **	National Park	Petén	584	589	607	37,160.00	CONAP
12	San Román	Biological Reserve	Petén		139		60,878.00	CONAP
13	El Pucté	Wildlife Reserve	Petén		132		16,695.00	CONAP

No.	Name	Management Category	Depart-ment	Management Effectiveness 2011	Management Effectiveness 2012	Management Effectiveness 2013-2014	Unit Value (ha)	Administrator
14	Petexbatún	Wildlife Reserve	Petén		138		4,044.00	CONAP
15	Aguateca	Cultural Monument	Petén		192		1,683.00	CONAP/IDAEH
16	Dos Pilas	Cultural Monument	Petén		193		3,120.00	CONAP/IDAEH
17	Ceibal	Cultural Monument	Petén		229		1,512.00	CONAP/IDAEH
18	Mayas Chiquibul Mountains	Biosphere Reserve	Petén		416		123,685.00	CONAP
19	Machaquilá	Wildlife Reserve	Petén		371		14,766.00	CONAP
75	El Rosario	National Park	Petén		478		1,105.00	INAB
224	El Mirador	Regional Municipal Park	Petén			476	11.20	Municipality of San Francisco, Petén

Source: IARNA-URL 2015 with official data from CONAP

None of the Petén protected areas displays satisfactory management. Three protected areas, including the Yaxhá-Nakúm-Naranjo, Tikal and Sierra del Lacandón National Parks, have achieved an acceptable level of management. However, two of these, Tikal and Sierra del Lacandón, decreased during the most recent evaluation to the regular management level.

Nine of the 21 areas evaluated are within the regular management level. Four of the areas evaluated are at the minimally acceptable level of management and five areas at the level of unacceptable management.

Verapaces

Table 5.4 shows the results of the 13 evaluations conducted during the period on the 8 protected areas in these two departments.

Table 5.4 Results from the evaluation on the effectiveness of protected areas management in Alta Verapaz y Baja Verapaz

No.	Name	Management Category	Department	Management Effectiveness 2011	Management Effectiveness 2012	Management Effectiveness 2013-2014	Unit Value (ha)	Administrator
73	Mario Dary Rivera	Protected Biotope	Baja Verapaz	634	683	620	1,022.00	CECON/USAC
76	Las Victorias	National Park	Alta Verapaz		394		82.00	INAB
79	Sierra de las Minas	Biosphere Reserve	Alta Verapaz, Baja Verapaz. El Progreso, Zacapa, Izabal	680	674		240,803.00	Sierra de las Minas Board of Directors
88	Laguna Lachuá **	National Park	Alta Verapaz	730	682		14,301.26	CONAP/INAB/MAGA
133	Chicacnab	Private Natural Reserve	Alta Verapaz		454		47.60	BIDAS Association
151	Los Cerritos - El Portezuelo	Municipal Regional Park	Baja Verapaz		565		69.00	Municipality of Salamá, FUNDEMABV
157	Semuc Champey	Natural Monument	Alta Verapaz	351	322		1,714.00	CONAP
160	Las Conchas	Municipal Natural Recreation Park	Alta Verapaz	382			38.28	Municipality of Chahal, Alta Verapaz

Source: IARNA-URL 2015 with official data

Three protected areas, Sierra de Las Minas Biosphere Reserve, Laguna Lachúa National Park and Mario Dary Rivera Protected Biotope were found to have acceptable management. The Semuc Champey Natural Monument, Las Conchas Municipal Natural Recreation Park and Las Victorias National Park were found to be in the minimally acceptable management level.

Western Highlands (San Marcos, Totonicapán y Quetzaltenango)

Fourteen protected areas were evaluated in the Western Highlands region (except Huehuetenango, which was analyzed together with Quiché in the second section. A total of 15 assessments were carried out. Table 5.5 shows the individual results of the assessments by protected area.

Western Highlands (San Marcos, Totonicapán y Quetzaltenango)

Table 5.5 Results from the evaluation on the effectiveness of protected areas management in the Western Highlands

No.	Name	Management Category	Department	Management Effectiveness 2011	Management Effectiveness 2012	Management Effectiveness 2013-2014	Unit Value (ha)	Administrator
40	Chicabal Volcano	Final closure zone	Quetzaltenango	425			1,572.00	CONAP
67	Zunil Volcano	Final closure zone	Quetzaltenango; Sololá		440		3,778.00	CONAP
91	Zunil	Municipal Regional Park	Quetzaltenango			363	4,325.00	Municipality of Zunil
95	San Miguel Totonicapán Highlands	Municipal Regional Park	Totonicapán		360		11,377.00	Municipality of Toton-icapán
175	Astillero Municipal 1 y 2 de San Pedro Sacatepequez San Marcos	Municipal Regional Park	San Marcos		419		285.00	Municipality of San Pedro Sacatepequez, San Marcos
176	Astillero Municipal de San Marcos	Municipal Regional Park	San Marcos		508		860.00	Municipality of San Marcos
209	Sibinal (Canjulá, Tacaná, Los Maijones y Tocapote)	Municipal Regional Park	San Marcos		363		497.75	Municipality of Sibinal, San Marcos

No.	Name	Management Category	Department	Management Effectiveness 2011	Management Effectiveness 2012	Management Effectiveness 2013-2014	Unit Value (ha)	Administrator
211	El Caracol, Los Espinos, Mirasol y Tizate	Municipal Regional Park	Quetzaltenango		333		40.71	Municipality of San Juan Ostuncalco, Quezaltenango
238	Concepcion Chiquirichapa	Municipal Regional Park	Quetzaltenango		506	482	1,158.19	Municipality of Concepcion Chiquirichapa, Quetzaltenango
285	San Cristóbal Cucho Municipal Shipyard	Municipal Regional Park	San Marcos		363		218.50	Municipality of San Cristobal Cucho, San Marcos
287	Municipal Shipyard	Municipal Regional Park	San Marcos		493		1,800.00	Municipality of Esquipulas Palo Gordo, San Marcos
293	El Grande y Quiaquichum Municipal Shipyard	Municipal Regional Park	San Marcos		327		87.00	Municipality of San Antonio Sacatepequez, San Marcos
311	Loma Linda Community Farm	Private Natural Reserve	Quetzaltenango			542	34.86	Agricultural Cooperative Integral "Loma Linda" R.L.
315	Cerro Mano de León (Cerro Sija)	Municipal Regional Park	Quetzaltenango			536	63.45	Municipality of San Carlos Sija, Quetzaltenango

Source: IARNA-URL with official data

Of all of the evaluated areas in the region, eight are at an acceptable management level and six are in the minimally acceptable level.

Northwest Region (Huehuetenango and Quiché)

Seven of the protected areas were evaluated and twelve assessments were carried out. Table 5.6 shows the individual results of the evaluation by area.

Table 5.6 Results from the evaluation on the effectiveness of protected areas management in Huehuetenango and Quiché

No.	Name	Management Category	Department	Management Effectiveness 2011	Management Effectiveness 2012	Management Effectiveness 2013-2014	Unit Value (ha)	Administrator
97	Visis Cabá	Biosphere Reserve	Quiché		76		45,000.00	CONAP
116	La Vega del Zope	Municipal Regional Park	Quiché		417	280	39.00	Municipality of Chinique
153	K'ojlab'l Tze´ te Tnom Todos Santos Cuchumatán	Municipal Regional Park	Huehuetenango	467	440	475	7,255.40	Municipality of Todos Santos Cu-chumatan
297	Aq'oma' Mountain	Municipal Regional Park	Huehuetenango		326	310	291.73	Municipality of Jacaltenango
298	La Vieja Catarina	Municipal Regional Park	Huehuetenango		213	311	97.40	Municipality of Jacaltenango
300	Cerro Mampil	Municipal Regional Park	Huehuetenango		94	303	10.40	Municipality of Santa Ana Huista
316	Häk Yahx Luúm	Private Natural Reserve	Huehuetenango			57	219.41	Yalanhb'ojoch "Awum Te" Forest Association

Source: IARNA-URL 2015 with official data

The majority of the protected areas evaluated in this region were found to be in the minimally acceptable level. Just one area, the Todos Santos Cuchumatán Municipal Regional Park has maintained an acceptable level during all assessments conducted during the evaluation period (2011-2014). Two areas are in the unacceptable level, one of which is one of the three biosphere reserves in the country.

The analysis of the entire MEP-USAID area of influence reveals that the department with the highest average QMU during the period analyzed (2011-2014) was Baja Verapaz, which is located at the level of acceptable management. However, its average score decreased 14 QMU from 2011 to 2014 (see Table 5.7).

The average level of protected areas management in the departments of Alta Verapaz, Quetzaltenango, Petén and San Marcos is regular.

The average lowest levels of protected areas management in the evaluated territory correspond to the departments of Totonicapán and Huehuetenango, both at an unacceptable level.

Table 5.7 Average QMU in the MEP-USAID area

Departament	Average QMU 2011	Average QMU 2012	Average QMU2013-2014
Alta Verapaz	487.67	463.00	
Baja Verapaz	634.00	624.00	620.00
Huehuetenango	467.00	268.25	291.20
Petén	537.60	341.71	459.22
Quetzaltenango	425.00	419.50	480.75
Quiché		246.50	280.00
San Marcos		412.17	
Totonicapán		360.00	
Total	**516.09**	**372.29**	**420.60**

Source: IARNA-URL 2015 with official data

The majority of the evaluated protected areas are at the level of regular and minimal acceptable management.

A review on the effective management of SIGAP areas from 2009-2012, reported that only 12 of the 77 evaluated areas were at an acceptable level of management, representing 58% of the SIGAP area (CONAP, 2014b).

During the period 2012-2013, the first five SIGAP protected areas, all private nature reserves, were cancelled, representing a reduction of approximately 1,111.70 hectares (CONAP, 2014th).

National Forestry Institute (INAB)

INAB is an autonomous institution under the governance of a Board of Directors with the participation of government agencies (MAGA, the Ministry of Finance [MINFIN]) and NGOs related to natural resources and the environment, ANAM, Academic University Sector, National Agriculture School (ENCA) and the Chamber of Industry Union dedicated to wood processing. INAB is responsible for sustainable forest management and conservation through the approval of forest management plans in privately owned forests and recovery of deforested areas through induced reforestation.

Since 1996, INAB has provided incentives for the establishment of 126,199 hectares of plantations, through the Forestry Incentives Program (PINFOR), reaching an investment[5] of more than Q1,327 million by 2014. It has also encouraged the management and protection of 216,235 hectares of natural forests with an investment of Q379 million though 2014. The activity has generated more than 27 million days of employment among 860,533 direct and indirect beneficiaries during its implementation (INAB, 2014).

Following PINFOR actions, the Law to promote the establishment, recovery, restoration, management, production and protection of forests in Guatemala (Decree 2-2015)[6] was adopted with the aim of monitoring reforestation incentives, establishing agroforestry systems and forest conservation.

To complement the PINFOR initiative, the Incentives Program for Small-scale Possessors of Forest or Agroforest Land (PINPEP) was established, with the aim of providing opportunity for small landowners to implement reforestation and forest protection. Through this initiative, from 2007 to 2014, more than 13,000 projects have been implemented in an area of 46,585 hectares, which together reach an investment of more than Q.273 million (INAB, 2014).

As part of the decentralization process, INAB has been implementing a Municipal Forest Management Program through the establishment of Municipal Forestry Offices (OFM) responsible for environmental management in the municipality. Since its creation, the program has focused on creating forest management capacity in municipal governments, establishing 241 OFM. This has allowed municipalities to position themselves regarding integrated natural resources management, facilitating access to forest conservation incentives for marginalized groups.

In 2015 INAB was assigned Q109.2 million corresponding to 0.15% of the national budget for that year (AG 454-2014).

Ministry of Agriculture, Livestock and Food (MAGA)

MAGA is the public agricultural sector institution that contributes to integrated rural development in the country, promotes legal certainty and the transformation and modernization of agriculture, develops productive, organizational and commercial capacities of producers to achieve sovereignty, food security and competitiveness and establishes clear standards for handling products in the domestic and international markets.

Under the direction of MAGA is the Bureau of State Land Reserves (OCRET) established by Decree 126-97 as the institution responsible for promoting the regularization and administration of properties that are located in State Land Reserves through granting leases. State land reserves total between 120,000 and 130,000 hectares and are located on the banks of rivers, lakes and coasts.

---

5 Estimated current value

6 Known as Probosques Law under implementation

MAGA works within the Directorate of Fisheries and Aquaculture (DIPESCA) that is responsible for ensuring compliance with legal regulations for the use of aquatic resources in both marine and inland waters.

In 2015, MAGA's budget was Q1.2756 billion corresponding to 1.81% of the national budget.

5.3 Nongovernmental organizations and academia

Civil society is involved in environmental and biodiversity issues through NGOs. There are several such organizations that contribute to the management and conservation of biodiversity through co-management agreements of protected areas such as Defenders of Nature, FUNDAECO and others (for a complete list and description, see Annex D).

Academia actors linked to data generation concerning the environment and biodiversity include Rafael Landívar University, through the *Instituto de Investigación y Proyección en Ambiente Natural y Sociedad* (IARNA/URL); University of San Carlos of Guatemala through the Center for Conservation Studies (CECON/USAC); and Universidad del Valle through the Center for Environmental Studies and Biodiversity (BEAC/UVG).

5.4 International agreements

As a member of the United Nations System, Guatemala is a signatory to international conventions governing the sustainability of natural resources on the planet, among the most important are: the Convention on Biological Diversity (CBD), the Convention on Wetlands known by the Ramsar Convention, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Convention to Combat Desertification (UNCCD).

Guatemala was officially recognized by the CBD as a Megadiverse country, given its rich biological and cultural diversity. To illustrate this, from 2009-2013 approximately 103 new species were recorded in the country (CONAP, 2014th).

Through the Convention on Wetlands (Ramsar Convention, 1,971) [7], Guatemala has declared seven sites of international importance:

i) Lachuá Ecoregion

ii) *Laguna el Tigre* National Park (PNLT)

iii) *Bocas del Polochic* Wildlife Refuge

iv) *Punta de Manabique* Wildlife Reserve

v) *Manchón-Guamuchal* Special Protection Area

vi) Yaxha-Nakum-Naranjo Park

vii) Sarstún River multipurpose reserve

Through the Convention concerning the Protection of the World Cultural and Natural Heritage, Guatemala has declared three sites: two of archaeological importance are the city of Antigua, Guatemala and Quiriguá Archaeological Park in Izabal; and one site of archaeological interest and forest conservation and biodiversity, Tikal National Park, in Petén.

7 *In 1988 Guatemala ratified the Convention on Wetlands.*

To meet the CITES[8] requirements, the list of species of fauna and flora, known as the List of CITES Species for Guatemala[9], is updated periodically and has developed regulations to manage the incorporation of forest species into the annexes, such as mahogany (*Switenia macroplyla* King y *Switenia humilys* Zuccarini), Rosewood (*Dalbergia* retusa Helms y D. stevensonii Standl) and Guatemalan fir (*Abies Guatemalensis* R.).

To comply with the UNFCCC and carry out national coordination in this field, the Directorate of Climate Change was established in MARN. Other efforts include the National Clean Development Office, the National Agenda on Climate Change and the Sectoral Agendas on Climate Change.

5.5 International cooperation

According to Development Report III (Segeplan, 2015), for the biennium (2103-2014), programs and projects with higher estimates at the bilateral level contributed USD $113.98 million. The majority (94.46%) of the funds correspond to projects implemented with the governments of Taiwan and Germany and the rest of the portfolio comes from the United States (channeled through USAID) and Spain (through AECID).

The detail of the programs and projects implemented within this framework of cooperation for the conservation and protection of tropical forests and biodiversity can be found in Annex E.

8 *Ratified in 1979 by Congressional Decree 63-79, issued on October 2, 1979.*

9 *In March 2009, through Executive Secretariat Resolution No. SC/01-2009, the Official List of CITES species for Guatemala was published. Article 25, Decree 4-89, Protected Areas Law.*

6. Actions Needed to Conserve Tropical Forests and biodiversity in Guatemala

This section describes the actions to strengthen the management and conservation of biodiversity that have been identified through the evaluation process. The analysis takes into account the actions proposed by stakeholders in the environmental sector who were interviewed for the preparation of this document[10], and other environmental analysis, including analysis of relevant publications that have been carried out for status reports and performance evaluations. Table 6.1 presents a summary of actions needed to counter specific threats.

The strategic actions identified are described below, some of which USAID/Guatemala is already addressing:

Institutional strengthening of entities with forest management and biodiversity responsibilities

The institutions created for the conservation and management of biodiversity must meet their objectives, primarily: reduce deforestation in natural forests to stabilize forest cover in the country; 0% deforestation in protected areas; regulate the use of biodiversity products; regulate the emission of greenhouse gases; regulate liquid discharges and disposal of solid waste in soil and water; and control any initiative that threatens the integrity of ecosystems.

In order to meet the mandates specified in the various laws governing the institutions, they must have qualified, appropriately trained and constantly updated staff; infrastructure and appropriate equipment to carry out activities; budget according to their needs; and opportunities for interaction and discussion between institutions to agree on shared issues.

It is essential that the institutions in charge of the use and management of the country's biodiversity have sufficient power and political importance; specifically MARN, INAB, CONAP, Watershed Authorities and the Directorate General of Fisheries under MAGA.

Prioritization of strategic territories for the provision of goods and services and greater ecological integrity

The characterization and prioritization of areas in order to guide conservation efforts and the restoration of forests in Guatemala is based on the concept of functional landscape carried out by IARNA/URL (2012a). After comparing the ecological integrity of areas with higher pressure watersheds resulting from socio-economic development, it is evident that the areas that need more conservation efforts are the protected areas of northern Petén and the core zone of the Sierra de las Minas Biosphere Reserve, for its high level of ecological integrity. The areas included in SIGAP and the ecosystems of interest, which are not yet present in SIGAP and constitute the "conservation gaps", are equivalent to 42% of the country and they have strategic value for conservation.

The strategic watersheds for the provision of goods and services are Lake Cahabón-Polochic-Izabal; María Linda; Naranjo-Ocosito complex; Salamá; Sis-Ican complex; and Suchiate. Most of these areas are in a state of moderate to severe degradation and if settled populations do not take actions to improve and conserve forests, they will increasingly compete for environmental goods and services.

---

10 See annex for a complete list of people and institutions consulted.

The areas of greatest hydrological interest are the upper parts of both the Cuchumatanes and the volcanic chain (Pacific Coast).

Define public policy, legal and institutional instruments that contribute to activity planning and threats to biodiversity

Tools should be developed to guide the actions to halt or reduce threats to biodiversity, particularly those related to the economy and society such as the emission of greenhouse gases and discharge of solid and liquid waste.

Under this action, there is also a need to create a national soil conservation program to oversee the implementation of activities according to the actual capacity of soil resources.

Some legislation relating to the use of natural resources, particularly the Fisheries and the Hunting Laws, requires review and updating.

Creating water management legislation

The issue of water management in the country is becoming relevant as conflicts arise around its use and rights. In a country where water is still abundant, problems are observed related to the pollution of rivers and lakes from industry and agriculture and diversions at riverbeds to facilitate industrial activities.

In particular, the issues of groundwater extraction limits and storage and distribution to meet the needs of a growing population and economy must be addressed.

There is a great need for conducting hydrological studies to determine water availability for key watersheds in order to define proper resource management as well as to make predictions to improve agricultural activities.

Strengthening organization, empowerment and community capacity

Community organizations have proven to be an effective driver for the conservation of natural resources. For example, the 48 communities (*cantones*) of Totonicapán have managed to protect the Guatemala fir forests in the highlands and community groups in Petén in charge of the community concessions have demonstrated a better ability to prevent deforestation than the institution in charge of protected areas.

As communities are empowered, organized and have the required capacity, they will be able to protect the biodiversity on which they depend. It is necessary to increase the educational level of the population and provide educational programs that are specifically aimed at achieving sustainable development.

Provision of economic alternatives for people who depend on natural resources

The predominant productive practices in the country contribute to soil, air, water and forest degredation. There is still much work to do so that farmers and people who depend on timber and non-timber products use sustainable practices and are linked to markets that pay the value of sustainable production. Communities whose livelihoods are based on resource extraction lack other options to acquire daily sustenance and do not take advantage of training opportunities that enable them to diversify their livelihoods. The expansion of existing markets for sustainable tourism and the exploration of other income generating mechanisms, such as payment for environmental services (mainly viable for communities located in the upper watershed) is necessary.\

Ramón (Brosimum alicastrum) collected by a group of women from Ixlú in the MBR for the production of flour, biscuits and drinks.
Photo: B. Byers/DevTech, January 2016

Development of clean energy alternatives and creation of a sustainable energy culture

The use of firewood remains an important source of energy for most of the population. Although there are other options, for cultural reasons, the average Guatemalan chooses wood as an energy source for cooking. Behavior modification, especially in the home, must be addressed alongside the development of clean energy alternatives.

The pressure for wood as fuel is reflected in the supply and use of firewood. The supply of firewood in Guatemala takes place in an informal economy and is the main energy source for rural communities and settled populations in the peripheral areas of urban centers. Estimates from INAB have shown the importance of production linked to the forest, which was around Q9.85 billion in 2010. Of this total, 14% was used for firewood and heat, 71% for the production of wood and wood products and 14% for non-timber products (INE, BANGUAT and IARNA/URL, 2013a).

With regard to the provision of energy, 69.9% of households use firewood to meet their heating needs for cooking, boiling water and heat (INAB, IARNA/URL, FAO/GFP, 2012). 70% of total energy consumption in Guatemala comes from the consumption of firewood (BANGUAT and IARNA/URL, 2011). The balance of supply/demand for firewood represented a deficit of 5.7 million tons (dry basis). This deficit is confirmation that people are turning to the country's forest reserves to meet their needs. (INAB, IARNA/URL and FAO, 2012).

Possible actions identified to modify the pressure exerted on the forests from the use of firewood, include the promotion of the establishment and management of municipal fuelwood plantations that can supply part of the demand. It is also essential to provide households with alternative sources of energy that are within reach of their spending capacity.

Investment in modifications needed to use alternative energy sources can be promoted within high-fuelwood industries through the development of economic analyses that include the loss of ecosystem services and the benefits from using sources such as solar energy. Other alternative energy sources can include, but are not limited to the use of biodigesters that can be fueled by organic matter from agriculture and from slaughter houses.

Generation and dissemination of scientific information supporting decision making

Decision making must be based on the generation of high-quality and current scientific information. One of the information gaps detected during this analysis corresponds to systematic monitoring by the institutions that report on compliance with rules and regulations related to biodiversity.

A monitoring and evaluation program of changes in ecosystems and their implications for human well-being should be established, with the goal of prioritizing specific actions. For example, a gap was detected in the estimation of fish populations and game species; these population estimates are used to authorize quotas for fishing and hunting. In cases where existing monitoring programs already exist, there is a need to strengthen the data analysis capabilities and dissemination of findings in order to get the most out of the information.

Table 6.1 Actions needed to counter specific threats

Threat	Needed Action
Habitat loss, fragmentation and degredation	
Change of land use (loss of forest for crops, livestock or other uses)	Strengthening of municipalities for the implementation of municipal development plans Strengthening CONAP for the management of protected areas and biodiversity Strengthening of INAB for forest management outside of protected areas Strengthening of the Ministry of the Interior and the Public Ministry to restore governance, especially in the departments of Petén and Izabal Strengthening processes of legalization of land rights
Forest fires due to agricultural practices	Strengthening of municipalities for the implementation ofo controlled programs
Intensive use of firewood	Introduction of other energy source Promotion of the establishment of municipal firewood plantations Development of economic analysis that includes the loss of ecosystem services for industries with high consumption of firewood, such as the bakery industry Implementation of a program that promotes behavior change
Mining of hydrocarbons and metals	Strengthening MARN for the approval and monitoring of environmental impact studies Inclusion of strategic environmental evaluation within the requirements prior to the approval of mining activities
Overexploitation of species	
Extraction of parrots, minor felines, monkeys and other black market species	Strengtheining of CONAP and SEPRONA to carry out traffic control operations Review of the operation of confiscated wildlife rescue centers. Strengthening of centers for equipping and training personnel
High value timber logging	Strengthening of INAB in traffic control. Support to the inventory control system of registered companies. Promote the sustainable forest management practices used in the Mayan Biosphere concessions (CNCG´s technical actions)
Overfishing	Strengthening of DIPESCA of MAGA for the management of quotas/licenses based on inventory estimation Strengthening of DIPESCA for the control of fishing of protected species
Contamination	
Discharge of contaminated return water to bodies of water	Review of the operation of installed treatment plants Strengthening municipalities to enforce waste water regulations
Absence of solid waste management	Strengthening municipalities on waste water management
Agricultural run-off	Strengthening MAGA and municipalities to promote and encourage the use of best practices

7. Resilience and Adaptation to Climate Change

This chapter provides a review of climate projections for Guatemala and discusses how biodiversity conservation can have an effect on risk reduction for development.

According to the Economic Commission for Latin America and the Caribbean, Central America is one of the most vulnerable regions to climate change (ECLAC, 2010). Other analysis related to the vulnerability of Guatemala, places the country at number 10 on the Index of Global Climate Risk 2016 (Kreft *et al*., 2016) that relates human and economic losses from extreme weather events during the period 1995-2014.

Guatemala releases a small fraction of global greenhouse gases, calculated at 0.04% of the global CO2 equivalent (UNISDR, 2009). The country cannot base the reduction of their vulnerability on reducing emissions. However, the country's forests act as a carbon sink and mitigate some of the CO2 emitted by other countries, Guatemala's forests sequester carbon, providing an ecosystem service that benefits the stability of the global climate. If these forests were lost, the ecosystem services would also be lost and significant amounts of carbon would be released into the atmosphere.

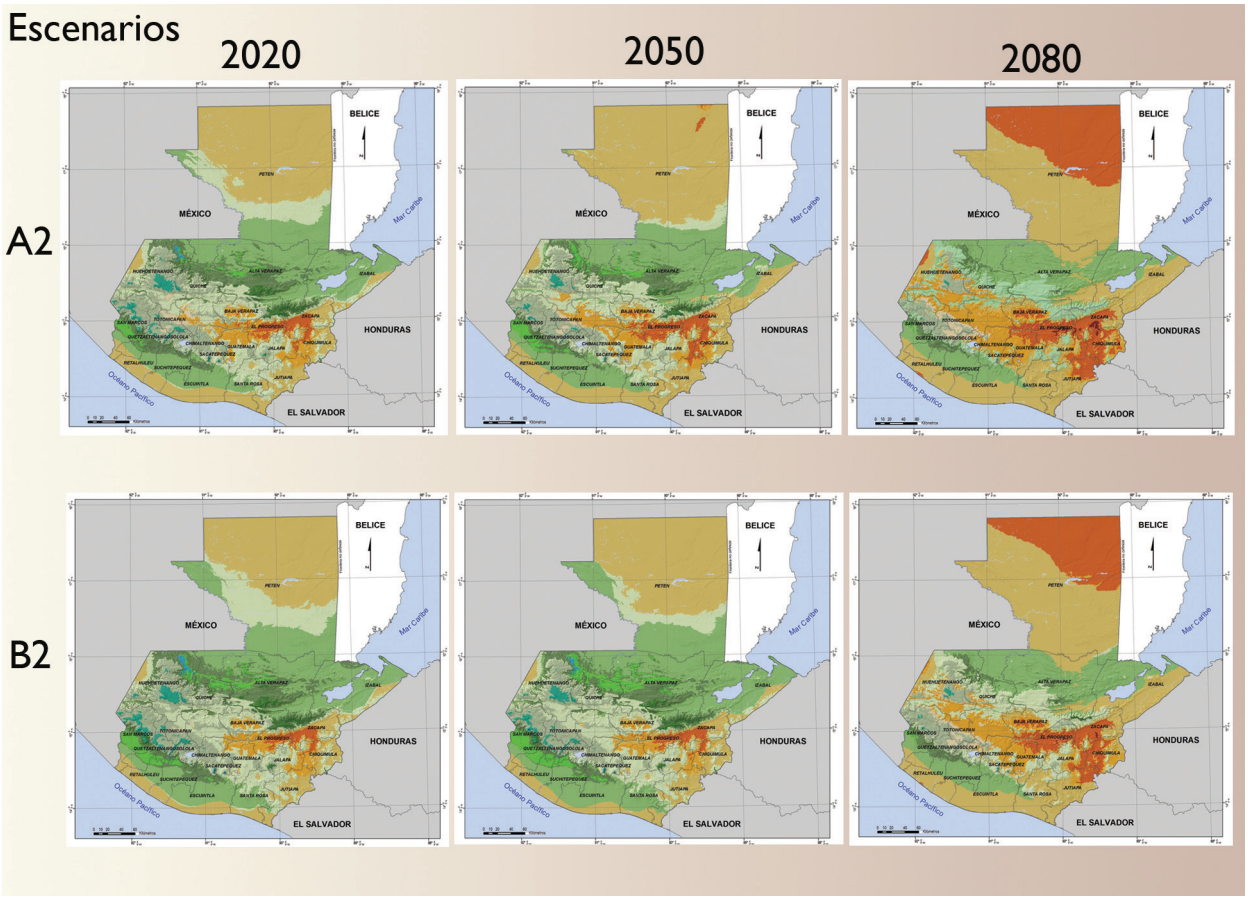
7.1 Climate projections for Guatemala (2020, 2050, 2080)

To identify climate change interactions and their impact on ecosystems, the Institute for Research and Projection on the Natural Environment and Society conducted a model of scenarios based on the global climate platform (Worldclim) and average temperature and rainfall in Guatemala.

The methodology used to develop the scenarios included updating the life zones map with temperature and precipitation records. With this identified, the short-term (2020), medium term (2050) and long-term (2080) scenarios were developed considering the 4 main drivers of climate change: population growth, economic development, technological development, energy and land use (for a full description of the methodology used, see IARNA/URL, 2011)

Using projected temperature and rainfall data, maps were created to illustrate the distribution of living zones according to two different scenarios and time. The results of the projections are presented in Figure 7.1.

Figure 7.1 Projections of living zone distribution according to scenarios A2 and AB (2020, 2050, 2080)



Projections from the scenarios indicate that by 2050 bioclimatic conditions will have changed in more than 50% of the territory and in more than 90% by 2080.

Scenario A2

This scenario shows that by 2050 the temperature could increase by 0.5°C-2.5°C. Rainfall could decrease by 0-10% in the southern region of the western highlands and between 10-20% in the central highlands.

Rain forests could suffer a reduction greater than 40% and the rain forests could be reduced to 50%.

Dry forests would expand along the Motagua River toward Totonicapán, Chimaltenango, Sacatepéquez, Guatemala and southern Quiché.

Scenario B2

If this scenario were to occur, by 2050 temperature would increase by 0.5°C-2°C and precipitation would increase by 0-10% in in most of the territory with the exception of Chiquimula, Zacapa, Izabal, north-east of Alta Verapaz and Petén, where a reduction in rainfall of between 0-15% would be observed.

The moist and wet forests could suffer reductions up to 50% and dry and very dry forests could increase by more than 55%.

Ecological effects

Both scenarios would impact the quality of ecosystem services, resulting in reduced uptake and regulation of water; decreased primary productivity; distribution change and reduction of the biodiversity of economic, food and medicinal products; and release of carbon stored in ecosystems.

Tillandsia sp., bromeliad of the Motagua Valley thorn scrub forest, Lower Teculután River Basin.
Photo: B. Byers/DevTech, February 2016.

Because Guatemala currently has a water surplus, drastic changes in rainfall could have very severe effects not only on biodiversity but also on productive systems and all uses of the water supply for society (IARNA/URL, 2011).

7.2 Climate change and conservation

The relationship between adaptation to climate change and biodiversity conservation is bidirectional given that biodiversity is threatened by climate change and its conservation has positive effects on human adaptation. Attention to biological conservation as a means of adaptation is known as *conservation for adaptation* (ARCC, 2013a).

The conservation of biodiversity is essential for societies to adapt to climate change. Once potential changes due to global warming are identified in ecosystems, adaptation strategies can be defined that include conservation, restoration or revitalization of key ecosystems for their importance in the provision of goods and services.

Resiliency is the ability of a system to absorb disturbance and reorganize to retain its structure and function (Holling, 1973 and Walker et al. 2004). This capability increases as with greater species diversity. Therefore, it is important to achieve the conservation of biodiversity rich areas to increase the resilience of the natural subsystem[11] to the effects of climate change.

7.3 Biodiversity and climate change in the context of USAID

The CBD defined adaptation based on ecosystems as "the use of biodiversity and ecosystem services as part of an adaptation strategy to help people adapt to the adverse effects of climate change" (CBD, 2009). Although adaptation based on ecosystems is not a universal practice, in a country like Guatemala, where there is a high dependence on ecosystem services, it is necessary to use adaptation based on ecosystems to address the main development risks given the climate change predictions and scenarios.

The USAID Biodiversity Policy, 2014 indicates that the ecosystem-based approach for adaptation to climate change can be an efficient way to help the society adapt and protect itself from the strongest impacts. It is vital to maintain the ecosystem protection and production functions to reduce the vulnerability of social groups that depend on them.

The USAID Climate Change and Development strategy has a list of 10 basic principles and one of them is "valuing ecosystem services". This principle provides a strong link between biodiversity conservation and climate change as it recognizes that biodiversity is the source of all ecosystem services (Byers, 2013). The strategy states that despite the fact that ecosystem services are critical for development, they do not have an appropriate market value. USAID policies and guidelines describe adaptation to climate change and biodiversity conservation as crosscutting themes.

The executive memo, "Incorporating Ecosystem Services into Federal Decision Making" (Memorandum M-10-01), issued by President Obama on October 7, 2015, specifies that ecosystem services provide vital contributions to economic and social well-being, including health, security to vulnerable populations and building of resilient communities. However, they are generally overlooked and need to be integrated into decision making to preserve and enhance the benefits provided by ecosystems to society, reduce the likelihood of unintended consequences and promote greater cost efficiency and increase returns on investment.

This memo directs all federal agencies, including USAID, to incorporate the value of natural infrastructure and ecosystem services in planning and decision making (Executive Office of the President, 2015).

The new guidelines for USAID missions in "Climate Change in USAID Strategies:

A Mandatory Reference for ADS Chapter 201" (USAID, 2015) provide a first step in implementing the executive order (EO) 13677 on "Climate-Resilient International Development". This new guideline mentioned that climate variability and climate change are crosscutting issues that may limit the progress in achieving development and increase insecurity in developing countries. At the same time, addressing climate change challenges provides opportunities and incentives to take actions that contribute to development. The new ADS 201 Mandatory Reference describes the process by which USAID strategies can address risks to climate change as well as considerations for their mitigation.

These USAID strategies, policies and guidelines point strongly in the direction of integrating biodiversity conservation to climate change adaptation and mitigation in Guatemala.

---

11 The socio-ecological system developed by Gallopín, 2003 is an analytical framework that facilitates the understanding of the dynamics between the natural, social, economic and institutional subsystems.

7.4 Actions needed for adaptation and resilience

The USAID/Guatemala CDCS 2012-2016 indicates that in 2010, the mission supported MARN for the development of two key documents: Evaluation of Impacts of Climate Change on Biodiversity and Tropical Forests and Recommendations for Mitigation and Adaptation for Guatemala. These documents include several recommendations related to adaptation and mitigation policies and land use planning instruments. The main recommendations highlight the importance of improved protected areas and redesign of national ecological corridors; stopping deforestation; developing financial mechanisms for biodiversity management and climate change adaptation; increasing investment in traditional knowledge and technological development; restructuring environmental sector institutions; and increasing the dissemination of information. In November 2012, the Private Institute for Climate Change Research (ICC) developed and Evaluation on Vulnerability and Climate Change for USAID/Guatemala and the following year, CNCG developed an evaluation on vulnerability specific to the Western Highlands.

During the course of this evaluation, the following recommendations were identified to improve adaptation and resilience. Some of these are already being addressed by CNCG and LEDS, but they are still in the early stages and require greater investments in effort and resources:

1. Strengthen mitigation activities by:
    - Protection of forests, REDD+ projects
    - Restoration and protection of natural forests in upper parts of the watersheds and on riverbanks
    - Development of agroforestry
    - Development of renewable energy initiatives
    - Protection of coastal and marine ecosystems (including the Mesoamerican Reef as blue carbon sources)
2. Strengthen actions to adapt to climate change:
    - Emphasize the importance of water and its proper management and conservation (including upper parts of the watershed recognized as priority sites for their hydrological importance)
    - Facilitate the implementation of and support existing water management models based on payment for environmental services

8. USAID/Guatemala Contributions to Actions Needed

USAID currently contributes to some of the necessary actions identified to reduce threats to biodiversity. The following is a description of how the Mission addresses these threats through its programs and projects.

The goal of the USAID programs in Guatemala is described as, "A more secure Guatemala that fosters greater socio-economic development in the Western Highlands and sustainably manages its natural resources" (note the emphasis on the Western Highlands region where the Mission focuses its development efforts). The three DO of the current CDCS are summarized below and Figure 8.1 shows the geographical coverage of the activities.

DO 1: Greater security and justice for citizens

To create a more democratic, secure and prosperous Guatemala, national institutions must have technical capacity, political will, long-term strategies and an adequate budget to provide security and justice for citizens. Safety is a basic human need and when lacking, inhibits the development of other sectors. DO1 is based on the hypothesis that reduced crime and increased convictions on initiated proceedings will be achieved by increasing the demand for police and judicial reform; strengthening the institutional capacity for strategic, financial and administrative planning; institutionalizing crime prevention strategies; focusing on pilot projects in key areas with high homicide rates; strengthening local governments; and improving the transparency and accountability of key institutions. The DO also works with other US government agencies with CARSI funding and is linked to the US Strategy for Engagement in Central American and the Strategy to Combat Illicit Trafficking.

Some of the results obtained through the support provided include:

- Establishment of six courts that operate 24 hours a day
- Establishment of a High Impact Court to resolve high risk cases
- Establishment of a multi-member court
- Profile raised for administrative and financial procedures by the justice sector institutions to meet international standards
- Reduced vulnerability of high-risk communities to gangs and organized criminal groups
- Development of vulnerabilities mapping in high-risk neighborhoods and plans to reduce crime
- Creation of community-based program for the National Police Academy
- Institutions supported to deal with cases of crimes committed during the armed conflict
- Strengthened Human Rights Unit of the Attorney General, responsible for prosecuting human rights violations associated with the armed conflict
- Provision of services for repatriated persons that includes transportation back to their communities, free telephone communication and job training
- Court personnel trained on issues related to environmental crimes

LGP uses an awareness-capacity-action framework to reduce climate change vulnerability. At the municipal level, LGP performs the following activities: 1) construction of municipal knowledge of climatic stress factors and adaptation measures (awareness); 2) increase the ability of municipalities to select priority adaptation measures, including resource mobilization –OSR, donations, national, etc.– to implement adaptation and risk management measures (capacity); and 3) assist municipalities in developing and implementing individual or integrated adaptation plans into municipal development plans. At the community level, LGP is working to 1) improve knowledge of citizens on climatic stress factors (awareness); and 2) increase the ability of community groups to collaboratively contribute to municipal climate change planning processes.

The Security and Justice Project implemented by Checchi and Company Inc., has a component to address governance in Petén, specifically to improve the investigation and prosecution of environmental crimes and crimes against property committed in the MBR (MBR). To date, an Environmental Court and Environmental Crimes Special Prosecutor have been established in Petén. Technical assistance is provided to improve the research model and case management in these new institutions as well as to connect environmental crimes to organized crime. In addition, training is provided to judicial officers and rangers in order to improve the investigation of crimes and the enforcement of environmental laws in the MBR.

DO2: Improved levels of economic growth and social development in the Western Highlands

The development hypothesis underlying this DO is that improvements in income, health and nutrition and education Guatemala's rural poor will foster the sustainable rural development necessary for social and economic equity. The Western Highlands Integrated Program (WHIP) works with 30 municipalities in the departments of Huehuetenango, Quiché, Totonicapán, Quetzaltenango and San Marcos and integrates three initiatives: Feed the Future (FTF), Global Health Initiative (GHI) and Global Climate Change Initiative (GCCI).

The Feed the Future initiative includes a development component for coffee, handicrafts, vegetables and cardamom value chains, as well as efficient irrigation and home gardens components.

The WHIP initiative works with MAGA on policy issues to favor the thirty municipalities in these departments. This area also benefits from funding from the Global Climate Change Initiative that is used to implement a climate alert system, raise awareness on the issue of climate change and promote the use of climate-smart agricultural practices.

Both RVCP and CNCG project activities promote crop yields on land already engaged in agriculture to reduce the need to expand crops into natural forests and agroforestry practices. The development of value chains, also promoted by both projects, increases economic opportunities and contributes to the reduction of deforestation.

DO 3: improved management of natural resources to mitigate the impacts of global climate change

This DO hypothesizes that "community-based economic incentives for conservation and protection of biodiversity, coupled with improved enforcement of existing environmental regulations and improved national policies, will safeguard the resource base necessary for sustainable rural development and thus contribute to Guatemala's increased prosperity."

This objective is implemented with Global Climate Change Initiative and Biodiversity funds in the Western Highlands. Other regions receiving support through LEDS and REDD+ are the MBR, Sierra de las Minas Biosphere Reserve and Verapaz. The first two regions are priority areas for conservation, as specified in the actions needed section.

Two major initiatives are designed to address DO3:

Climate, Nature and Communities Program in Guatemala (CNCG, 2013-2018), which operates with five components aimed at:

- Provision of assistance to rural communities to conserve biodiversity by supporting small and medium-sized enterprises (SME) for sustainable production of timber and non-timber products
- Strengthening systems for biological monitoring of flora and fauna
- Prevention and control of forest fires
- Promotion of national strategies to reduce deforestation and forest degradation (REDD+) and establish carbon markets
- Strengthening community resilience and capacity to adapt to the effects of climate change
- Strengthening the capacity of national environmental organizations
- Supporting the implementation of a national low emissions development strategy

The program works in the MBR, Sierra de las Minas Biosphere Reserve, the Western Highlands and Verapaz. Rainforest Alliance (RA) leads the consortium that carries out this program and includes the World Wildlife Fund (WWF), The Nature Conservancy (TNC), Universidad del Valle of Guatemala (UVG), Defenders of Nature, and AGEXPORT.

The other initiative that addresses this goal is LEDS (2014-2019). The Framework Law on Climate Change in Guatemala, issued in 2013, allows priorities related to climate change to be addressed, including the reduction of GHG emissions and the implementation of mitigation measures.

Through this project, USAID addresses the following five components that support the fundamental elements required to create a long-term low emissions development strategy in Guatemala:

- Establish reliable science and analytics to strengthen current national greenhouse gas inventories, allowing Guatemala to record and monitor GHG emissions from different sectors of the national economy with practical and internationally accepted methods.
- Strengthen institutional capacities to identify, design and prioritize policies and strategies that promote social, economic and environmental objectives through development with low GHG emissions.
- Develop participatory and transparent processes for the construction of a low emissions development strategy through the dynamic participation of different Guatemalan sectors, promoting technologies and practices that improve competitiveness and reduce GHG emissions.
- Promote implementation through demonstration to coordinate with agribusiness and small and large-scale producers on low emissions development initiatives through technical and financial assistance.
- Support communication and education, as a crosscutting issue, focusing on raising awareness to climate change, mitigation and low emissions development; in addition to disseminating and promoting the benefits and opportunities to adopt mitigation practices and technologies.

This project works at the national level.

Among the important issues identified in the needed actions to counteract the pressures on forests and biodiversity and of which the Mission in Guatemala does not yet include within its programs and projects are the strengthening of fisheries management; strengthening related to soil management and water management. The following section describes some ways to approach the mentioned areas.

9. Opportunities for USAID/Guatemala

There is a wide range of opportunities for USAID/Guatemala to participate in the mitigation and reduction of threats to forests and biodiversity. Some of the potential options can be implemented from programs and projects that are underway and others may emerge as new initiatives from national and regional efforts.

The information presented below is intended to inform on areas and issues that require attention and can serve to frame initiatives to be discussed with partners – appropriate actors evaluated by the Mission.

9.1 Institutional strengthening

The following are specific opportunities to strengthen institutions related to the management and use of biodiversity:

- Increase capacity of institutions to absorb and retain highly skilled and qualified human resources
- Capacity Building and strengthening of MARN human resource in estimating and monitoring emissions of greenhouse gases; monitoring water quality and compliance with COGUANOR standards; monitoring sources of soil pollution; evaluation and monitoring of environmental impact studies;
- Building CONAP capacity and strengthening human resources in monitoring the integrity of priority ecosystems; techniques to control illegal trafficking of biodiversity; and management and reintroduction of confiscated species; continue training personnel related in the management of protected areas and particularly in strategies to address illegal logging.
- Promoting the importance of proper management of fishing resources, understanding they are an important food source in the face of climate change to strengthen food security and raise the political and administrative level of the Directorate General of Fisheries, prioritize the importance of estimating at-risk populations (i.e. several species of shark) prior to authorizing fishing quotas
- Equip and strengthen INAB to implement the PROBOSQUES Law and to administer a Forest Enterprises Electronic Information System as a mechanism to prevent illegal timber trade.

9.2 Strategic territories for the provision of goods and services with socioeconomic demand and areas with greater ecological integrity

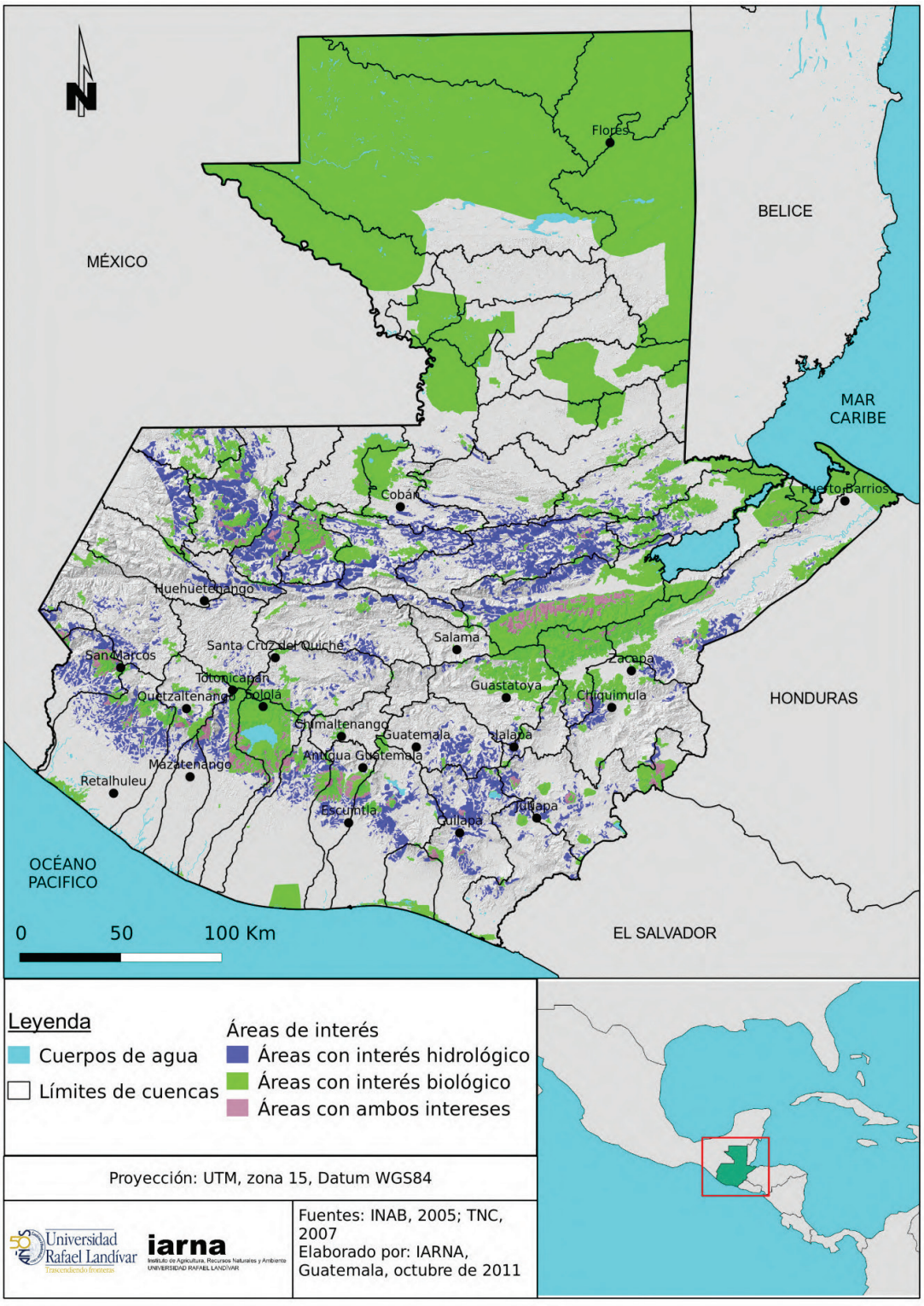
Based on the analysis of functional landscapes as strategic territories (IARNA/URL, 2012) showing the main areas of biological, water and the combination of both interests, the following territories were identified as potential areas for future USAID/Guatemala programs and projects. The territories where the Mission already implements actions to protect and conserve biodiversity are not included (see Figure 9.1 Map of areas of interest):

Areas of biological interest:
Trifinio Biosphere Reserve
Punta de Manabique Wildlife Refuge
Bocas del Polochic Wildlife Refuge
Cerro San Gil Protected Spring Reserve
Chocón Machacas Protected Biotope
Santa Cruz Mountains
Motagua Valley
Manchón-Guamuchal
Sipacate-Naranjo National Park
Monterrico Natural Reserve

Areas of hydrological interest:
Cuchumatanes Massif
Volcanic chain (Pacific coast)

Areas that combine both interests:
Volcanic cones

Figure 9.1 Map of Areas of Interest



9.3 Support the definition of public policy framework, legal and institutional instruments that contribute to the planning of activities and counter biodiversity threats

The specific issues that require attention regarding the creation of management instruments include:

- Soil conservation
- Management of solid and liquid waste
- Emission of greenhouse gases

USAID is addressing the issue of emissions through the LEDS project. There is an opportunity to contribute to issues such as soil conservation and management of solid and liquid wastes.

The climate change adaptation plan is underway but implementation will require accompaniment. There is still the challenge of developing adaptation plans at the municipal level.

9.4 Support the creation of legislation on water management and testing models

Water management is an issue that still requires much effort. It is important to clearly define a law to guide the integrated resource management taking into account the following factors:

- Ensure environmental conditions for the maintenance of the hydrological cycle, especially in the regions of hydrological interest (see Figure 9.2)
- To promote greater efficiency in the use of water resources
- Provide institutional arrangements to ensure water governance and civil society participation in management processes

Integrated management incorporates the participation of all stakeholders related to a particular source. An opportunity is to promote the social organization of one or several watersheds in order to establish management models. Areas of interest can be defined according to the watershed prioritization map (see Figure 9.2 Watershed Prioritization Map).

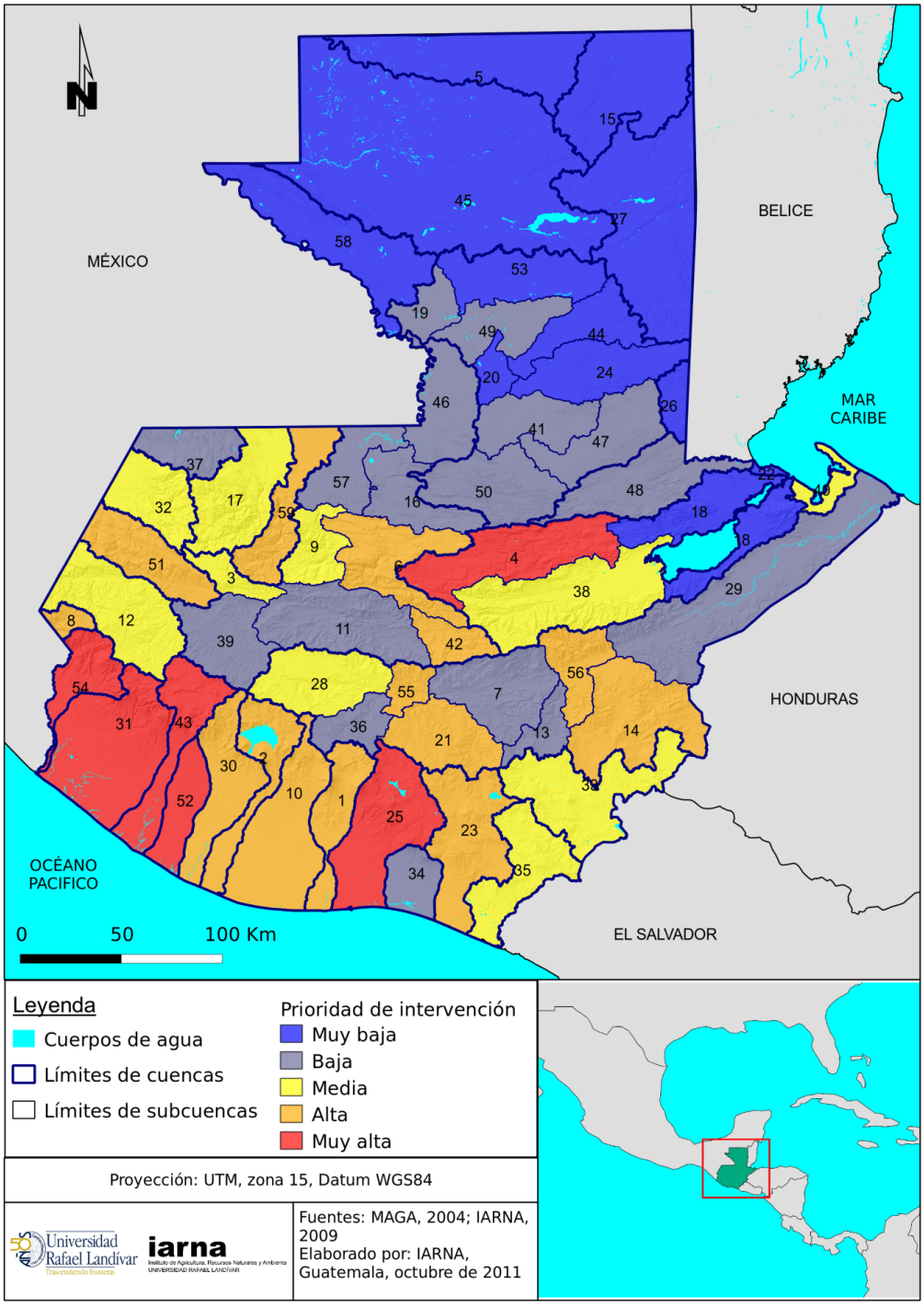
It is a priority to provide assistance and financial support to carry out comprehensive hydrological studies that describe the water situation by basin or micro watershed, to have knowledge about the volumes available, water use and the state in which it is returned. This modeling is useful for defining the proper resource management as well as for making relevant predictions that can guide agricultural activities in the context of adaptation to climate change.

9.5 Strengthen the organization, empowerment and community capacity

Most of Guatemala's population lacks access to education and informal training so this issue is still a valid intervention opportunity, especially in areas where USAID/Guatemala has not intervened and that are of biological significance and relevant to service provision.

Experiences in the country, such as the case of community concessions in the multiple use zone of the MBR, have shown that communities that depend on natural resources are the best managers of the resources, as long as have the capacity to do so. This particular case, in which USAID/Guatemala has invested efforts for several years, exemplifies that strong communities have better conservation outcomes than weakened institutions (for more information see Hodgdon, et.al. 2015. Deforestation trends in the Mayan Biosphere Reserve, 2000-2013).

Figure 9.2 Watershed Prioritization Map



9.6 Provision of economic alternatives for those who depend on natural resources

This issue is closely linked to subsection 9.5 and is the current line of action for USAID/Guatemala. The premise that should guide all interventions in this area is that Guatemala is a country rich in biodiversity and ancestral culture and from the opportunities that exist to develop the rural economy can be visualized. The populations settled on sites of biological interest and sites of interest for the service provision require the development of value chains aimed at creating and maintaining a high level of performance from the provision of goods and services and the environmental points of view. There is opportunity to expand measures already initiated by the CNCG program, to start new value chains and to replicate the successful cases in other priority areas. When developing actions related to the provision of economic alternatives, it is important to avoid that communities depend solely on the extraction of natural resources for their survival.

9.7 Generation and dissemination of scientific information supporting decision making

Although in recent years the country has increased the production of scientific information related to biodiversity and the environment, mainly through the efforts of civil society (NGOs) and academia, dissemination and use is still incipient. There is a disconnect between information generating and decision-making entities that needs to be filled by creating mechanisms to ensure the analysis, dissemination and in many cases, the transformation of information into formats that can be used by decision makers.

There is an opportunity to strengthen institutional data collection, including the data to create baselines that should periodically updated to observe trends of environmental elements and performance management tools. This gap is evident in all government institutions related to biodiversity and the environment.

Priority issues are data collection on stocks or inventories of commercially important fish to base the fisheries management on sustainable crops and estimate populations that are subject to hunting.

Other important issues include: greenhouse gas emissions, groundwater extraction, pollution of rivers and lakes, ecological integrity of ecosystems in protected areas, fish stock estimates, sea level and water pH.

9.8 Promotion of alternative energy sources

Firewood continues to be the main energy source for households in rural areas and a significant part of the industry in both rural and urban areas. There is an opportunity for the USAID Mission, in conjunction with the Regional Program on Climate Change and Energy, to promote alternative energy sources similar to those promoted by the ACCESO project in Honduras, where a micro hydroelectric plant was implemented to provide energy to a small community from the flow generated by irrigation water. Micro hydroelectric plants of this type have the advantage of producing energy at very low cost and also save the beneficiaries the time spent collecting firewood.

Other actions that may accompany such an initiative include the promotion of improved stoves and support programs to promote behavior change that emphasizes the importance of minimizing the risk of firewood smoke for the health of children and the elderly. Also, to address the issue of water pollution and impacts on biodiversity, establishment of biodigesters in communities with slaughterhouses and meat processing plants could provide an alternative sources of energy for both cooking and electricity.

References and Bibliography

ARCC (African and Latin American Resilience to Climate Change Project). 2013a. Integrating Climate Change Adaptation into Biodiversity and Forestry Assessments and Programming.

ARCC. 2013b. Vulnerability and Resilience to Climate Change in Southern Honduras.

BANGUAT y IARNA-URL. 2011. Compendio de cuadros estadísticos del SCAEI, período 2001-2011. Guatemala: Autor.

Barfod, Anders S., Melanie Hagen, and Finn Borchsenius. 2011. Twenty-five years of progress in understanding pollination mechanisms in palms (Arecaceae). Annals of Botany **108** (8): 1503-1516.http://aob.oxfordjournals.org/content/early/2011/08/09/aob.mcr192.full

Batres, Alexis. 2015. Una mirada al tráfico de la vida silvestre en Guatemala. Insigth Crime. Accesado el 26 de febrero de 2016. http://es.insightcrime.org/analisis/mirada-trafico-vida-silvestre-guatemala

Billings, R.F., S.R. Clarke, V. Espino Mendoza, P. Cordón Cabrera, B. Melendez Figueroa, I. Ramon Campos, and G. Baeza. 2004. Bark beetle outbreaks and fire: a devastating combination for Central America's pine forests. Unasylva **217** (55): 15-21.

Byers, B.A. 2012. Defining Ecosystem Services and Designing Mechanisms for Their Conservation. Ecological Society of America presentation, 9 August 2012.

Castañeda, C. 2008. Diversidad de ecosistemas en Guatemala. In: Guatemala y su Biodiversidad: Un enfoque histórico, cultural, biológico y económico. CONAP (Ed). Guatemala: CONAP

CATHALAC: 2008. Potential Impacts of Climate Change on Biodiversity in Central America, Mexico, and the Dominican Republic.

CBD (Convention on Biological Diversity). 2009. Connecting Biodiversity and Climate Change Mitigation and Adaptation: Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change. CBD Integrating Climate Change Adaptation into Biodiversity and Forestry Assessments and Programs Technical Series No. 41.

CEMEC (Centro de Monitoreo y Evaluación CONAP). 2013. Monitoreo de la Gobernabilidad en la Reserva de la Biosfera Maya. (Presentation) http://www.marfund.org/wp-content/uploads/2015/07/marfund_cemec_conap.pdf

CONAP. 2009. Resolución SC No. 01/2009. Guatemala: Author

CONAP (Consejo Nacional de Áreas Protegidas). 2013. Integración de estadísticas e indicadores ambientales oficiales del CONAP año 2013, fase IV. Guatemala: Author

CONAP. 2014a. V Informe Nacional de cumplimiento a los acuerdos del Convenio sobre Diversidad Biológica en Guatemala. Documento Técnico No. 03-2014.

CONAP. 2014b. Informe de la efectividad de manejo de las áreas protegidas del SIGAP 2009-2012. Editado por Ortiz, GA. Diaz, AG. Utrera LP, Gdoy, CE, Guatemala 204 p.

CONAP and WCS (Consejo Nacional de Áreas Protegidas and Wildlife Conservation Society). 2014. Monitoreo de la Gobernabilidad de la Reserva de la Biosfera Maya. (report)

Dix, M.A and M.W. Dix. 2006. Diversity, Distribution, Ecology and Economic Importance of Guatemalan Orchids. En: Biodiversidad de Guatemala. Cano, E (Ed). Guatemala: Universidad del Valle de Guatemala.

ECLAC (Economic Commission for Latin America and the Caribbean). 2010. The Economics of Climate Change in Central America: Summary 2010. ECLAC, United Nations.

Esteban, E. (2013). Impacto de la polinización entomófila por abejas (*Apis mellifera* l.), y el efecto cuantitativo de la producción de cereza de café (*Coffea arábiga* l.), en Sololá, Guatemala, C. A. Tesis de grado para optar al título de Ingeniero Agrónomo en Sistemas de Producción Agrícola, otorgado por la Universidad de San Carlos de Guatemala. Guatemala: Universidad de San Carlos de Guatemala.

Executive Office of the President. 2015. Incorporating Ecosystem Services into Federal Decision Making (Memorandum M-16-01). https://www.whitehouse.gov/sites/default/files/omb/memoranda/2016/m-16-01.pdf

FAO, INAB & MINECO (Programa de las Naciones Unidas para la Alimentación, Instituto Nacional de Bosques, Ministerio de Economía). 2015. Formulación de la Estrategia de Apoyo al Desarrolo Empresarial (de PYMES rurales) a partir del uso sostenible de bosques y fincas. Guatemala: Autor

Franklin, J.F. 1993. Preserving biodiversity: species, ecosytems, or landscapes. Ecological Applications 3: 202-205.

Frazer, N. 1986. Survival from egg to adulthood in a declining population of loggerhead turtles Caretta caretta. In: Herpetologica 42(1), 47-55.

Gálvez, J. 2015. Análisis Sistémico de la Degradación Natural en Petén: Influencia del análisis socio-cultural, económico y político-institucional del país y de las dinámicas que desarrolla en el territorio. Tesis Ad Gradum para optar al título de Doctor en Ciencias de la Facultad de Ciencias Políticas y Sociología de la Universidad Pontificia de Salamanca. España: UPSA.

Gálvez, J. (2012). Ocret y las reservas territoriales del Estado. Artículo publicado en Plaza Pública 8 de junio de 2012

GIMBUT (Grupo Interinstitucional de Monitoreo de Bosques y Uso de la Tierra). 2014. Mapa de Bosques y Uso de la Tierra República de Guatemala.

Grimm, N.B., F.S. Chapin III, B. Bierwagen, P. Gonzalez, P.M. Groffman, Y. Luo, F. Melton, K. Nadelhoffer, A. Pairis, P.A. Raymond, J. Schimel, and C.E. Williamson. (2013). The impacts of climate change on ecosystem structure and function. Frontiers in Ecology and the Environment 11(9): 474-482.

Hodgon, B. et al. 2015. Deforestation trends in the Mayan Biosphere Reserve (2000-2013). Guatemala: Rainforest Alliance.

Holling, C.S. (1973). "Resilience and stability of ecological systems". *Annual Review of Ecology and Systematics* **4**: 1–23. doi:10.1146/annurev.es.04.110173.000245 Accessed 13 Nov. 2012.

Iarna/URL (Instituto de Agricultura, Recursos Naturales y Ambiente-Universidad Rafael Landívar). 2005. Situación del Recurso Hídrico en Guatemala. Documento Técnico del Perfil Ambiental de Guatemala.

Iarna/URL. 2011. Cambio climático y biodiversidad: Elementos para analizar sus interacciones en Guatemala con un enfoque ecosistémico. Guatemala: Autor.

Iarna/URL. 2012. Perfil Ambiental de Guatemala 2010-2012. Vulnerabilidad local y creciente construcción de riesgo. Guatemala. Autor.

Iarna/URL. 2012 a. Análisis de Paisajes Funcionales en el País y su Relación con Propósitos Socioeconómicos. Guatemala: Autor.

Iarna/URL. 2013. Bases técnicas para la gestión del agua con visión de largo plazo en la zona metropolitana de Guatemala.

Iarna/URL 2015a. Aplicaciones de política de las cuentas de agua: un estudio de caso de Guatemala. En Compilación de notas sobre capital natural (pp. 51-61).

Iarna/URL. 2015b. Efectividad de manejo de las áreas protegidas dentro de la zona de influencia del Proyecto de Monitoreo y Evaluación de USAID. Documento borrador.

Iarna/URL. 2016 Gota a gota, el futuro se acota Una mirada a la disponibilidad presente y futura de agua en Guatemala. Publicación de Prensa. No.12

Instituto de Investigación y Proyección del Ambiente Natural y Sociedad- Universidad Rafael Landívar IARNA/URL. Sin publicar (to be published). Perfil Ambiental de Guatemala 2013-2015. ¿Cómo está? Y ¿Cómo vemos el ambiente natural? Guatemala: Autor

INAB, Conesforgua & IARNA-URL. (Instituto Nacional de Bosques, Consejo Nacional de Estándares Forestales para Guatemala, Instituto de Agricultura, Recursos Naturales y Ambiente-Universidad Rafael Landívar). S.p. Estudio de demarcación de la trazabilidad de los productos forestales, priorizándolos e identificando claramente su cadena de mercado. (Actores, productos, volúmenes, flujos, rutas y transacciones). Informe final. No publicado.

INAB (Instituto Nacional de Bosques). 2014. Boletín Estadístico 1998-2014. Departamento de Incentivos. Manuscrito no publicado.

INAB. 2014. Mapa de Incendios Forestales República de Guatemala 2001-2013.http://www.inab.gob.gt/Imagenes/Mapas/Incendios/2013/Incendios_2001_2013_.pdf

INAB, IARNA-URL, and FAO (Instituto Nacional de Bosques, Instituto de Agricultura, Recursos Naturales y Ambiente-Universidad Rafael Landívar, Programa de las Naciones Unidas para la Agricultura y la Alimentación). 2012. Oferta y demanda de leña en la República de Guatemala/Woodfuel Interated Supply/Demnad Overview Mapping.

INE (Instituto Nacional de Estadística). 2014. Encuesta Nacional de Condiciones de Vida.

INE, BANGUAT y IARNA-URL (Instituto Nacional de Estadística, Banco de Guatemala e Instituto de Agricultura, Recursos Naturales y Ambiente de la Universidad Rafael Landívar). 2013a. Sistema de Contabilidad Ambiental y Económica para Guatemala 2001-2010: compendio estadístico SCAE 2001-2010. Tomo I.

INE, BANGUAT y IARNA-URL 2013b. Sistema de Contabilidad Ambiental y Económica para Guatemala 2001-2010: compendio estadístico SCAE 2001-2010. Tomo II. Guatemala. Autor.

Incer, D.J. 2012. Determinación del balance hidrológico del ecosistema del bosque nuboso de la Sierra de las Minas en la microcuenca de Teculután, Zacapa, Guatemala. Tésis para optar al grado de Ingeniero Ambiental de Facultad de Ciencias Ambientales y Agrícolas, Universidad Rafael Landívar. Guatemala: Autor

Intergovernmental Panel on Climate Change (IPCC). 2013. Working Group I Contribution To

The IPCC Fifth Assessment Report (AR5), Climate Change 2013: The Physical Science Basis. IPCC Secretariat, Geneva. Available at: www.ipcc.ch

IPCC Annex I: Intergovernmental Panel on Climate Change. (2013). Atlas of Global and Regional Climate Projections - Final Draft Underlying Scientific- Technical Assessment. IPCC Secretariat, Geneva. Available at: www.ipcc.ch

Kreft, S. D. Eckstein, L. Dorsch, and L. Fischer. 2016. Global Climate Risk Index 2016. https://germanwatch.org/en/download/13503.pdf

López-Selva, M. et al 2008. Biodiversidad acuática. En: Guatemala y su Biodiversidad: Un enfoque histórico, cultural, biológico y económico. CONAP (Ed). Guatemala: CONAP

MARN, Iarna/URL y PNUMA. 2009. Informe ambiental del Estado de Guatemala. GEO Guatemala, 2009. Guatemala: Autor.

MARN. 2009. Política Nacional de Cambio Climatico. http://www.segeplan.gob.gt/downloads/clearinghouse/politicas_publicas/Recursos%20Naturales/Politica%20Nacional%20de%20Cambio%20Clim%C3%A1tico%20Guatemala.pdf

Méndez, C. 2008. Diversidad faunística de Guatemala. En: Guatemala y su Biodiversidad: Un enfoque histórico, cultural, biológico y económico. CONAP (Ed).

Mitton, J.B., and S.M. Ferrenberg. 2012. Mountain Pine Beetle Develops an Unprecedented Summer Generation in Response to Climate Warming. The American Naturalist, Vol. 179, No. 5 (May 2012), pp. E163-171. http://www.jstor.org/stable/pdfplus/10.1086/665007.pdf?acceptTC=true

Nelson, E.J., P. Kareiva, M. Ruckelshaus, K. Arkema, G. Geller, E. Girvetz, D. Goodrich, V. Matzek, M. Pinsky, W. Reid, M. Saunders, D. Semmens, and H. Tallis. (2013. Climate change's impact on key ecosystem services and the human well-being they support in the US. Frontiers in Ecology and the Environment 11(9): 483-493.

Oglesby, R. and C. Rowe. No date. Climate Change Science for Mesoamerican Decision Makers: A Practical Manual. University of Nebraska-Lincoln.
http://www.uncclearn.org/sites/default/files/inventory/idb26.pdf

Oglesby, R. and C. Rowe. No date. Informe Final: Impactos climáticos para Guatemala:

Resultados preliminares de los modelos climáticos regionales y globales IPCC AR5. MARN and BID.

Olson, D. M., Dinerstein, E., Wikramanayake, E. D., Burgess, N. D., Powell, G.V. N., Underwood, E. C., D'Amico, J. A., Itoua, I., Strand, H. E., Morrison, J. C., Loucks, C. J., Allnutt, T. F., Ricketts, T. H., Kura, Y., Lamoreux, J. F., Wettengel, W.W., Hedao, P., Kassem, K. R. 2001. Terrestrial ecoregions of the world: a new map of life on Earth. Bioscience 51(11):933-938. http://www.worldwildlife.org/publications/terrestrial-ecoregions-of-the-world

Plan Regional de Pesca y Acuicultura Regional PREPAC. 2005. Inventario de cuerpos de agua de Guatemala con énfasis en la pesca y acuicultura. Guatemala: OSPESCA-MAGA.OIRSA.

Sandoval C. 2016. Prácticas de buena gobernanza para la administración de recursos forestales en Guatemala, Periodo 1996-2014: el caso de San juan Chamelco, Alta Verapaz. Tesis doctoral para optar el título de doctor en ciencias políticas y sociología. España: Universidad Pontificia de Salamanca

Secretaría de Planificación y Programación de la Presidencia (Segeplan). 2015. III Informe sobre la CINR para el desarrollo: "más allá del 2015 y Alianza Global" 2013-1214.

The Nature Conservancy. 2015. Conocimientos Tradicionales para la Adaptación al Cambio Climático en el Altiplano Occidental de Guatemala, Guatemala. http://www.usaid-cncg.org/wp-content/uploads/2015/03/Conocimientos_tradicionales_ccl_final.pdf

Thomas, J.W., J.F. Franklin, J. Gordon, and K.N. Johnson. 2005. The Northwest Forest Plan: Origins, Components, Implementation Experience, and Suggestions for Change. Cons. Bio. 20: 277-287.

Tuna M., & Dimas, L. (2007). Valoración económica de Servicios Hidrológicos Sub Cuenca Teculután, Guatemala. Compensación equitativa por servicios hidrológicos.

UICN y Iarna/URL (Unión Mundial para la Conservación de la Naturaleza e Instituto de Agricultura, Recursos Naturales y Ambiente-Universidad Rafael Landívar). 2015. Capítulo Introductorio sobre las Generalidades del Sector Forestal. Manuscrito no publicado.

UNISDR (United Nations International Strategy for Disaster Reduction Secretariat). 2009. Global Assessment Report on Disaster Risk Reduction. http://www.preventionweb.net/english/hyogo/gar/report/index.php?id=9413

USAID. 2012. *Climate Change and Development: Clean Resilient Growth: USAID Climate Change and Development Strategy.* January 2012.

USAID, 2014. USAID Biodiversity Policy.

USAID/Guatemala. 2010. Guatemala Biodiversity and Tropical Forest Assessment. Prepared by the International Resources Group, Environmental Policy and Institutional Strengthening Indefinite Quantity Contract (EPIQ).

USAID/Guatemala. 2010. Guatemala Biodiversity and Tropical Forest Assessment. Prepared by the International Resources Group (IRG) in collaboration with Abt Associates.

USAID-Guatemala. 2012. Guatemala Country Development Cooperation Strategy 2012-2016.

Vargas-Rodríguez, Yalma L. 2010. Una población relicta de *Acer saccharum* subsp. *skutchii* (Aceroideae) en el estado de Guerrero, México. Act. Bot. Mex **no.95** Pátzcuaro **abr. 2011.**

Vargas-Rodriguez, 2005. Ecology of Disjunct Cloud Forest Sugar Maple Populations (*Acer Saccharum* Subsp. *Skutchii*) in North And Central America**.** http://etd.lsu.edu/docs/available/etd-07152005-083738/unrestricted/Vargas-Rodriguez_thesis.pdf

Veliz, M. 2008. Diversidad florística de Guatemala. En: Guatemala y su Biodiversidad: Un enfoque histórico, cultural, biológico y económico. CONAP (Ed).

Walker, B., Holling, C. S., Carpenter, S. R., Kinzig, A. (2004). "Resilience, adaptability and transformability in social–ecological systems". *Ecology and Society* **9** (2): 5. http://www.ecologyandsociety.org/vol9/iss2/art5/

Whittaker, R.H. (1975). Communities and ecosystems. 2nd ed. New York: Macmillan.

WWF-Guatemala. 2015. Resumen de Informe técnico de la investigación: Generación y análisis de Información hidrológica, con énfasis en isótopos estables (2H y 18O), para la determinación de sitios críticos de recarga hídrica del acuífero en parte baja de la cuenca del río Pasabien; Zacapa Guatemala.

Annexes:

Annex A: Statement of Work

Statement of Work

Guatemala Tropical Forest and Biodiversity Assessment for USAID/ Guatemala's Country Development Cooperation Strategy (2016-2020)

I. Background

The USAID/Guatemala Country Development Cooperation Strategy (CDCS), covering the period FY2012-2016, is currently in use by the Mission. USAID/Guatemala is required to carry out an assessment to ensure that its CDCS is in accordance with the conservation of the country's biological diversity and tropical forest resources. This assessment is mandated by the U. S. Foreign Assistance Act (FAA) of 1961 Sections 118 and 119, which requires USAID to analyze national needs for conserving biological diversity and potential USAID contributions in response to these needs in all country strategy plans. Specifically, FAA Section 118(e) and 119(d), Country Analysis Requirements states that: "Each country development strategy statement or other country plan prepared by the Agency for International Development shall include an analysis of: (1) the actions necessary in that country to conserve biological diversity, the actions necessary in that country to achieve conservation and sustainable management of tropical forests and (2) the extent to which the actions proposed for support by the Agency meet the needs thus identified. (FAA, Sections 118 (e) and 119(d)."

This assessment will synthesize information available on the biological and forest resources in Guatemala, the current status of these resources, and the recognized pressures impacting them. It will include the actions and potential actions of the overall Mission program. Particular attention will be paid to developmental plans, specifically large scale plans in other sectors in which the Mission works such as the Plan of the Alliance for Prosperity in the Northern Triangle. The goal should not be to simply list species, but to approach the assessment as a way to prioritize eco-regions and watersheds, to determine common conservation challenges affecting them, and to begin to identify whether other sectors of the Mission program can help to address these issues. Attention should also be given to the quality of the existing data and any critical

gaps should be noted.

Guatemala's country analysis will mainly be one of compilation, review, analysis and synthesis of existing information, coupled with corroboration and feedback from major players.

Summary of relevant parts of FAA Sec 118 and 119:

> From Sec 118 Tropical Forests:
>
> (e) COUNTRY ANALYSIS REQUIREMENTS.—each country development strategy statement or other country plan prepared by the Agency for International Development shall include an analysis of—
>
> > (1) The actions necessary in that country to achieve conservation and sustainable management of tropical forests, and
> >
> > (2) The extent to which the actions proposed for support by the Agency meet the needs thus identified.

From Sec 119 Endangered Species:

(d) 85 COUNTRY ANALYSIS REQUIREMENTS.—Each country development strategy, statement or other country plan prepared by the Agency for International Development shall include an analysis of—

(1) The actions necessary in that country to conserve biological diversity, and

(2) The extent to which the actions proposed for support by the Agency meet the needs thus identified.

II. Scope of Work

Under the direction of a team leader, the assessment team shall evaluate biodiversity and tropical forest concerns in Guatemala.

The study is conceptualized in two parts. The first part will result in a written report that follows relevant USAID guidance on Section 118-119 analysis. The second part will involve assistance in drafting an analysis of how and to what extent actions proposed in the country strategic plans meet, or could meet, the tropical forest and biodiversity needs thus identified.

The assessment team will need to review the most recent Guatemala Biodiversity and Tropical Forest Assessment (May 2010), an important reference document to guide them in developing the update.

The assessment team shall perform the following activities:

A. **Data Collection.** The background assessment will in general follow the illustrative outline presented in the attachment, and will synthesize existing data and information on the status of biodiversity and tropical forests in Guatemala. It will provide an overall description of Guatemala's biodiversity and tropical forestry assets, evaluate their current status, and identify the pressures and threats affecting those resources.

Specifically, the team will:

1. Meet with USAID/Guatemala to understand the Mission's program goals and objectives under its strategy. The Mission will provide the team with advice and protocol on approaching USAID partners and host country organizations with respect to this assignment. The team shall be aware of sensitivities related to an assessment exercise (e.g., the potential for raising expectations, and the need to be clear as to the purpose of the assessment) and respect Mission guidance. The team will discuss organizations to be contacted and any planned site visits with the Mission and coordinate as required.

2. The Mission Environment Officer (MEO) will facilitate meetings with other DO Teams at USAID to allow the team to gain a complete understanding of the country program and strategy. The MEO will facilitate an exit briefing with the USAID Mission Director.

3. Obtain, review, synthesize, and analyze existing data and documentation on biodiversity and tropical forest conservation and sustainable management in Guatemala, such as that prepared by government agencies for all sectors considered under the developing Mission Strategy, bilateral and multilateral donors (e.g., GEF, World Bank, FAO, UN, IDB, CABEI), and national and international NGOs active in the country (e.g., Rainforest Alliance, The Nature Conservancy, WWF). This documentation may include the National Biodiversity Conservation Strategies and Action Plan (NBSAP), the Tropical Forest Conservation Act (TFCA), and materials related to the Climate Change Framework Law and evolving emissions reduction programs.

4. Hold meetings with relevant ministries and agencies, donor organizations, NGOs, and other organizations which are involved in forest and biodiversity conservation, sustainable management or cross-cutting issues, and gather relevant information. The assessment team will also hold a workshop with Technical Teams of local and international NGOs and USAID (approximately 40 participants) to discuss and obtain feedback on the assessment findings. The Contractor is responsible to cover the costs of this workshop. Therefore, this workshop has to be included in the work plan as well as in the assessment budget.

5. Conduct one to three priority site visits, only if necessary to supplement the understanding gained from interviews, literature, and other second-hand sources. The site visits must be defined with the USAID Environment Team.

B. **Analysis.** Summarize the status of biodiversity and tropical forests in Guatemala, with particular interest in analyzing information from other sector programs that impact tropical forest and biodiversity outcomes. The assessment will compile, summarize, and analyze available information on the following themes:

The **Policy, Regulatory, and Institutional Framework** for biodiversity and tropical forest resources including: a review of the policy and legislative basis for the protection of biodiversity and tropical forest resources, with attention to decentralization; Guatemala's participation in international treaties and agreements related to conservation; a description and overview of the Government institutions involved in the sector or whose programs directly impact this sector (e.g., Ministry of Agriculture, National Council of Protected Areas, Ministry of Environment and Natural Resources); and an overview of current national level plans to address policy issues related to biodiversity and tropical forest resource conservation (e.g., PINFOR-Programa de Incentivos Forestales-, PINPEP-Programa de Incentivos Forestales para Poseedores de Pequeñas Extensiones de Tierra Vocación Forestal o Agroforestal-, REDD+ - Reducing Emissions from Deforestation and Forest Degradation-, LEDS-Low Emission Development Strategy).

1. An overview of the **Non-Governmental Organization** (NGO) community involved in biodiversity and tropical forest conservation and management activities including a list of the major organizations, the highlights of their program priorities, and an approximate level of financing for their programs.

2. A description of the biodiversity and tropical forest conservation and sustainable management activities and commitments, as well as, descriptions of other major efforts that will impact these resources by other **Donors and Multilateral Organizations** operating in Guatemala, the highlights of their program priorities, and an approximate level of financing for their programs. Particular emphasis shall be placed on plans for environmental impact assessments pursuant to planned large-scale infrastructure investments. If Guatemala has operational partnerships with **other U.S. Government Agencies** related to the environment sector, this section will also list and briefly describe those programs related to or impacting biodiversity and tropical forests (e.g., Tropical Conservation Forest Act-TFCA, U.S. Department of Interior-USDOI, and U.S. Forest Service-USFS).

3. Provide a description of the major biodiversity and tropical forest conservation activities of the **Private Sector** to help identify ways to better foster private sector alliances. Of interest are the norms and standards followed by those commercial entities most engaged in management and use of Guatemala's tropical forests and tracts near protected areas, including, inter alia, major logging companies, tourism developers, and other land development concerns.

4. Provide a description of the **Status and Management of Guatemala's Protected Area System** (SIGAP) including an inventory of all declared and proposed areas (national parks,

wildlife reserves and refuges, forest reserves, private reserves, sanctuaries, hunting preserves and other protected areas), including marine and coastal areas. The inventory will identify the institution(s) responsible for the protection and management of each area, its date of establishment, area, and, as much as possible, list the status of each. This section will also include an assessment of the current effectiveness of protection and management and major challenges facing these areas, as well as, their importance to the country's economy (including productive assets, environmental services, and recreation and tourism opportunities). If applicable, include specific climate change impacts that have been identified in the SIGAP area.

5. An assessment of the **Status and Protection of Endangered Species** in Guatemala, including in its territorial waters. This section should identify particularly important habitat conservation areas and issues and evaluate the pressures on those areas and efforts to mitigate pressures, including the participation and compliance with the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

6. An assessment of the **Status of Conservation outside the Protected Area System**, focused on the different natural resources ecosystems common to Guatemala, including forest resources, rangeland resources, arid/semi-arid resources, coastal/marine ecosystems, wetlands and the sustainability of the agricultural landscape. This section will include a general discussion of the economic, ecological and social importance of each of these ecosystems; with particular attention to the critical environmental services they provide (watershed protection, erosion control, soil and water conservation, and amenity and recreation). Emphasis will be placed on the status of wetlands and desert/arid lands in Guatemala and any threats affecting them, including any specific effects of Climate Change. It will also assess the relationship between current land tenure arrangements and effective conservation in the country.

7. An overview and assessment of the **Impacts of Major Development Projects and Plans** on biodiversity and tropical forest conservation, including an analysis of the current policy and regulatory framework for environmental review and permitting of their projects and plans.

8. An overall assessment of Guatemala programs for **Ex-Situ Conservation and Conservation of Economically Important Species and Germplasm** including as feasible, a list of the programs of natural history museums, zoos, herbariums, botanical gardens, and captive breeding programs and provide a summary of existing conservation databases. It will also provide a description of on-going programs in Guatemala for the conservation of important species and germplasm including gene banks and other efforts to support the sustained production and protection of commercially important wild plant and animal species.

Identify the key direct and indirect threats to biodiversity and tropical forests, including those considered as specific effects of climate change. Identify the actions necessary to conserve and sustainably manage natural resources and biodiversity and tropical forests in Guatemala in the current context, based on analysis of country donor and NGO responses to meet these needs. Prepare a report on the status of tropical forest and biodiversity conservation and sustainable management efforts in Guatemala and implications for USAID or other donor programming and environmental monitoring which shall define the actions necessary for conservation.

C. **Report.** On the basis of the assessment activities specified above, the team will prepare a summary **Guatemala Tropical Forest and Biodiversity Analysis**. This assessment will follow the attached Agency guidance and include an analysis of the needs for building national capacity, both public and private, and an aware and informed public constituency for biodiversity and tropical forest conservation. It will identify particular issues affecting the protected area system and natural

resources protection and management in general. The Consultant(s) will include recommendations regarding USAID's future role in conservation in Guatemala and where U.S. comparative advantages and capabilities are likely to have the greatest impact. As possible, these issues and recommendations should be prioritized to identify those requiring the most immediate attention.

1. Identify the full range of cost effective and implementable actions (including priorities) necessary to achieve sustainable management of tropical forests and the conservation of biological diversity in Guatemala, and

2. Identify the extent to which the actions proposed for support by USAID/Guatemala meet the needs thus identified, and recommend any further actions not described or outlined in the concept papers. Analyze the effects of USAID/Guatemala's entire proposed strategy (FY 2012– FY 2016) on Guatemala's tropical forests and biodiversity. In particular, the proposed strategic objectives of DO3, alternative Development, Food Security, Economic Opportunities, Environment and Natural Resources, and Health should be carefully reviewed.

III. Outline of *Guatemala* Country Analysis of Tropical Forests and Biological Diversity:

The report, approximately 30 to 45 pages in length (excluding appendices), shall include sections covering the following topics:

- Title page/ including the date of completion of the analysis report
- Table of contents
- List of appendices
- List of tables and figures
- - Executive summary

A. Introduction describing the purpose of the analysis and methods used in conducting it, including the timing of the analysis in relation to the timing of USAID strategy development.

B. A review and summary of Legislative and institutional structure affecting biological resources, as well as, donor programs and activities that contribute to conservation and sustainable natural resources management, and an assessment of their effectiveness, strengths, and weaknesses, including:

(1.) Government of Guatemala

(2.) Non-governmental organizations

(3.) International organizations

C. An overview of the status of biodiversity in Guatemala, including terrestrial and aquatic (i.e. coastal/marine) ecosystem (or ecoregion) diversity, species diversity, threatened and endangered species, genetic diversity, agricultural biodiversity, ecological processes and ecosystem services, and values and economics of biodiversity and forests. This overview should include any specific climate change impacts that have been identified. A map of potential natural vegetation and of land use or land/forest cover should be provided if available.

D. Status and management of protected areas and endangered species and forest resources, including an assessment of the direct and indirect threats, root causes or drivers of direct threats (please specify if any of these threats are climate changerelated).

E. A list or description of the actions necessary to conserve biodiversity and forests in Guatemala, logically flowing from the review of the threats, and what is currently being done by government, NGO, and donor programs that address those threats. Recommendations and proposed actions, including review of actions proposed for support by USAID/Guatemala.

F. Conservation outside of protected areas:

(1.) Managed natural systems

(2.) Impacts of development projects

(3.) Ex-situ conservation (e.g., zoos, seed banks)

(4.) Identified impacts caused by effects of Climate Change

G. A review of the current USAID/Guatemala strategy and program, including all DOs, followed by an analysis of the extent to which actions proposed for support by USAID help meet the needs identified in F. This section should also note any threats to biodiversity and forests from activities proposed for USAID support, and suggest mitigating actions. It should also identify opportunities for cross-cutting, crosssectorial linkages with proposed activities (for all proposed DOs) especially those that would be low cost and/or would enhance the effectiveness of the proposed activities. And finally, it should note any current or future impacts as a result of climate change.

H. All references used and cited in the report should be listed; web URLs for information resources should also be provided.

I. Appendices to the report should contain, at a minimum, the SOW for the analysis, biographical sketches of analysis team members, a list of persons contacted and their institutional affiliation, and other background or supporting material, as needed.

(1.) Bibliography

(2.) Biodata sketch of team members

(3.) List of persons contacted

(4.) Other appendices as appropriate

IV. Period of performance

This assessment is expected to be completed no later than January 2016.

V. Reporting, Deliverables

- **Work Plan and Schedule:** The Contractor shall provide USAID with a Work Plan and Schedule within 10 days after the signature of the modification. The Work Plan and Schedule shall be 3-5 pages long, in English, and shall include a week-by-week listing of major activities by location (US, Guatemala City, ecoregions and coastal areas, and any other), including any planned site visits, workshops and shall highlight planned interaction with USAID on no less than a weekly basis. The Work Plan and Schedule shall also include a preliminary report outline.
- **Draft Report:** The Contractor shall submit a Draft Report at the end of the fifth week of the signature of the modification. The Draft Report shall follow the generic outline provided in the attachment to this SOW, as refined during the course of the contract in consultation with USAID. The Report shall not exceed forty-five pages, in English, with suitable annexes

and pertinent figures (maps, institutional charts, tables) and references. Among the expected appendices is a briefly annotated bibliography of the most important current reference materials related to the topic and a contact list for each of the organizations discussed in the Report. USAID/Guatemala will provide its comments on the Report within 5 working days.

- **Final Analysis Report:** The Contractor shall submit a Final Analysis Report for USAID/ Guatemala that examines the biodiversity, tropical forestry, natural resource management, and other related environmental issues, and identifies contributions and/or potential contributions to meeting identified conservation needs by the Mission's current strategy, eight weeks after the signature of the modification. This report should be submitted in English. USAID/Guatemala will provide its comments on the Report within ten [10] working days. The Contractor will then have 10 working days to incorporate the comments and submit the Final Report. The Contractor will furnish both electronic file versions of all submissions (first draft and final report). The final report will then be submitted to USAID/Washington by the Mission for their review. The Contractor shall include in the Consultant LOE a number of days needed to incorporate final comments.

Deliverables:

- 50 hard copies of the document in English, and 50 hard copies in Spanish.

- 100 copies of the documents (in English and Spanish) on CDs, to be included in the hard copy.

- Document to include a map of biogeographic regions of Guatemala

- Document to include a map of protected areas of Guatemala

VI. Illustrative Schedule and logistics

The team will coordinate logistical arrangements with DEVTECH, and will be responsible for identifying and obtaining the majority of the reference materials needed for this study with only minimal interventions on the part of the USAID/Guatemala Team.

USAID/Guatemala will provide a letter of introduction to the Government of Guatemala Agencies and other institutions called upon to collaborate in providing information for this study. DEVTECH will assist the team by providing key references and contacts with USAID/Guatemala's Program Office and will also help facilitate meetings with other Mission Team Leaders or their staff to fully brief the team on USAID's program and future vision for their strategy.

VII. Qualifications of the Assessment Team

The proposed team should include at least two senior specialists: one in sustainable tropical forest management and the other in conservation of biological diversity, both with extensive experience in and knowledge of natural resources in Latin America (specifically Guatemala). The consultants should be fluent in Spanish, as most documentation is in Spanish. However, the consultant should also have finely developed English writing skills to complete a quality report in the allotted time.

1. Tropical Forest Management Specialist – Team Leader

i. In-depth knowledge of environmental programs and procedures in Latin America, ability to lead the country analysis team.

ii. Significant experience with sustainable tropical forest management in Latin America (with at least some experience in Guatemala), and familiarity with Forest Stewardship Council certification programs in tropical areas of LAC.

iii. A strong professional background (Ph.D. or Masters with five additional years of experience) in forestry management disciplines, and at least five years of experience in tropical forest management, research, or training in developing countries of Latin America (preferably including Guatemala).

iv. Fluency and ability to communicate effectively in Spanish and English.

2. Biological Diversity Specialist

i. Knowledge of environmental programs and procedures, preferably in Latin America.

ii. Significant experience with conservation of biological diversity or protected area management in Latin America (preferably including Guatemala).

iii. A strong professional background (Ph.D. or Masters with five additional years of experience) in conservation of biological diversity, protected area management, biology or related disciplines, and at least five years of related experience in countries of Latin America, preferably in Guatemala.

iv. Fluency and ability to communicate effectively in Spanish and English.

VIII. Technical Direction

The activity manager for the performance of the above mentioned tasks will be Regina Soto (Mission Environmental Officer) with Teresa Robles (Alternate Mission Environmental Officer) as her alternate.

Technical and financial approvals for the contract with MEP shall be provided by the official Contracting Officer's Representative for MEP in the Economic Growth Office (EGO), Ms. Josefina Martínez.

Annex B: Biographical Sketches of Assessment Team

Bruce Byers, Team Leader

Dr. Bruce Byers is a practicing ecologist, independent consultant, and writer with more than 30 years of professional experience in more than 40 countries. His work focuses at the interface of ecology and sustainable development, combining his academic background in ecology and evolution with extensive practical experience in applied social sciences. Dr. Byers has served as team leader for many multi-disciplinary and international teams, conducting assessments, evaluations, and strategic planning exercises for USAID and international NGOs, including eleven previous USAID biodiversity and tropical forestry assessments. He was the lead consultant and author of the 2005 USAID publication ***Tropical Forestry and Biodiversity (FAA 118 and 119) Analyses: Lessons Learned from Recent USAID Experience and Guidelines for USAID Staff***. His recent work links biodiversity conservation and climate change adaptation and mitigation.

María Mercedes López-Selva, Biological Diversity Specialist

María Mercedes López-Selva was trained as a biologist and holds a Master's Degree in Sustainable Development and Biological Conservation from the University of Maryland, College Park. She is currently on the staff of IARNA, the Instituto de Investigación y Proyección sobre el Ambiente y Sociedad at Rafael Landívar University. She is currently in charge of *ex situ* orchid conservation there, and conducts research on orchid reproduction and orchids as indicators of ecosystem health. She was a coauthor of the 2010 Guatemala Tropical Forestry and Biodiversity Assessment.

César Augusto Sandoval García, Tropical Forest Specialist

César Sandoval was trained as a forestry engineer and holds a Master's Degree in Public Administration from the Central American Institute for Public Administration in Costa Rica. He is a doctoral candidate in Political and Social Science in the Guatemala Program of the Universidad Pontificia de Salamanca, Spain. He is currently a research staff member and training coordinator at IARNA, the Instituto de Investigación y Proyección sobre el Ambiente y Sociedad at Rafael Landívar University.

Annex C: Institutions and Persons Contacted

Institution	Person(s) Contacted	Contact Information
MARN Dirección de Cambio Climatico	Jacobo Coto, Director Jose Luis Rivera, Technical Assistant	cclimatico@marn.gob.gt
MARN Jefatura de Ecosistemas	Mario Diaz, Director	mdiazcb@marn.gob.gt
PNUD Guatemala Proyecto Marino Costeras	Raquel Sigüenza	Raquel Siguenza@undp.org
CONAP Unidad de Conservación	Dafne Domínguez, Director	ddominguez@conap.gob.gt
CONAP Unidad de Vida Silvestre	Alan Marroquín, Director	amarroquin@conap.gob.gt
INAB	Adelso Revolorio and Josue Morales	arevolorio@inab.gob.gt
Rainforest Alliance & CNCG	Oscar Rojas, COP, and Alejandro Santos, Deputy COP	orojas@ra.org
WWF Guatemala	Maria Victoria Rodríguez, Juan Carlos Rosito, and Sonia Solis	Rodríguez - mporta@wwfca.org
UICN/IUCN	Ursula Parrilla, National Coordinator, Guatemala Office	ursula.parrilla@iucn.org
Defensores de la Naturaleza	Oscar Nuñez, Director	onunez@defensores.org.gt
The Nature Conservancy and FCG	Juan Carlos Godoy, Director	jcgodoy@tnc.org
Engility Proyecto Desarrollo con Bajas Emisiones	Luis Alberto Castañeda, Director	luis.castaneda@dbegt.org
Universidad Rafael Landívar, VRIP	Juventino Gálvez, Vicerrector	jugalvez@url.edu.gt
FUNDAECO	Rolando Gómez, Coordinador Huehuetenango	r.gomez@fundaeco.org.gt
Instituto de Cambio Climático (ICC)	Alex Guerra, Director	Aguerra@icc.org.gt
ACOFOP (Flores, Petén)	Teresita Mansilla, Directora Técnica and Jorge Soza, Concessions Coordinator	Mansilla - direccion@acofop.org
Wildlife Conservation Society (WCS) Guatemala	Roan Balas McNab, Director	rmcnab@wcs.org
CONAP Petén Regional Office	Salvador López, Director Regional	elopez@conap.gob.gt
CONAP-CEMEC	Víctor Hugo Ramos, Director	vhramos@conap.gob.gt
CONAP PN Laguna de Tigre	Vinicio Morales, Director PN Laguna de Tigre and Célica Contreras, Community Relations Specialist, and Juan Carlos Rodas, Community Coordinator, Paso Caballos	Teléfono oficina: 7926 0812 Celular: 4532 6972

Institution	Person(s) Contacted	Contact Information
Cocode de Paso Caballos	Antonio Xo, Presidente de Cocode; Domingo Pop, Comisión de Salud; Vicente Saquij Tzalan; Ramiro Tzalam; Jesús Bernanrdino Cholón Tec; Jorge Alfredo S. C.; Santiago Pooc Cucl; Carlos Pop Caal; Martín Chub Pop.	Teléfono Celular: 4928 8773 arodriguez@wcs.org Teléfono Celular: 5059 0277
Defensores de la Naturaleza, Flores, Petén, Office	Jorge Soza, Director, Programa de Desarrollo Productivo	Teléfono Oficina: 7926 4208
Sociedad Civil El Esfuerzo, Melchor de Mancos	Carlos Humberto Góngora Luna, Presidente y Representate Legal, Roberto Esau Soza Chi, Technico Forestal, and Sergio Ortiz, Tesorero	Teléfono Oficina: 7926 5431
REPSA	Alejandro Chacón, Gestión Ambiental y Sostenibilidad and Eduardo Alfredo Lopez, Area Administrator	Teléfono oficina: 2336 9090
Reserva Los Tarrales	Andy Burge, Owner/Manager and Lester Nehemias de Leon Lux, Naturalist	infotarrales@gmail.com Teléfono Celular 5919 8882
Defensores de la Naturaleza, RB Sierra de las Minas	Danilo Saavedra and Edwin Sosa	Celular: 5301 0504

Annex D: NGOs and Academic Institutions with Biodiversity and Forest Activities

Local NGOs

Name	Activity/Focal Themes
Asociación de Reservas Naturales Privadas de Guatemala	Promotion and management of private natural reserves
Asociación de Comunidades Forestales del Petén –ACOFOP-	Sustainable management of natural forests
Asociación de Silvicultores de Chancol ASILVOCHANCOL	Sustainable forestry management
Asociación para el Rescate y Conservación de Vida Silvestre ARCAS	Wildlife rescue
Asociación de organizaciones de los Cuchumatanes	Sustainable development, environmental and production management
Asociación BALAM	Conservation, policy advocacy, rural development
Centro de Acción Legal, Ambiental y Social de Guatemala -CALAS-	Environmental advocacy
Fundación Defensores de la Naturaleza	Protected area co-management, environmental legislation and policy advocacy
Fundación Solar	Sustainable development, clean technologies
Fundación para el desarrollo integral del hombre y su entorno -CALMECAC-	Environmental education, community organization
Fundación para el eco-desarrollo y la conservación FUNDAECO	Protected area management, environmental advocacy, rural sustainable development, conservation
Federación de Cooperativas de las Verapaces FEDE-COVERA	Sustainable forestry management
Fundación Naturaleza para la Vida FNV	Sustainable natural resources management
Fundación para la Conservación de los Recursos Naturales y Ambiente de Guatemala FCG	Tropical forest conservation

International NGOs

Name	Activity/Focal themes
ARGIDIUS	Effective ecosystem building, poverty reduction
Helvetas	Sustainable rural development
Rainforest Alliance	Environmental conservation, sustainable forestry, market based approach conservation
The Nature Conservancy	Environmental conservation, water conservation, PES approach
World Wildlife Fund	Environmental conservation, watershed and freshwater protection, Mesoamerican reef conservation
Wildlife Conservation Society	Protected area co-management, environmental conservation, MBR monitoring,

Academic Institutions and Research Institutes

Name	Activity/Focal theme
Centro de Estudios Conservacionistas CECON, Universidad de San Carlos de Guatemala	Herbarium, seed bank, protected area co-management, environmental research
Centro de Estudios Ambientales y Biodiversidad, Universidad del Valle de Guatemala	Environmental research focused on climate change, herbarium, entomology research,
Instituto de Investigación y Proyección sobre el Ambiente y la Sociedad IARNA, Universidad Rafael Landívar	Environmental research and outreach. Guatemalan Environmental Profile production, orchid conservation
Instituto Privado de Investigación sobre Cambio Climático ICC	Ecological restoration of intervened areas, climate change research

Annex E: Foreign AID

Nombre Cooperante	Proyecto	Monto de inversión	Ejecutores/ contrapartes	Área Geográfica
USAID	Clima, Naturaleza y Comunidades en Guatemala	Año 2013-2017 US$25 milliones	Rainforest Alliance (RA), World Wildlife Fund (WWF), The Nature Conservancy (TNC), UVG, Defensores de la Naturaleza (DFN), Asociación Gremial de Exportadores (Agexport)	Altiplano Occidental (Totonicapán, Quiché, Huehuetenango, Quetzaltenango , San Marcos) Alta Verapaz, Baja Verapaz, Reserva Biósfera Sierra de Las Minas (RBSM), y RBM en Petén
	Programa de Monitoreo y Evaluación	Ejecución al año 2015 US$302,840	Devtech, Geotecnologica de Centra América, S.A. URL/Iarna	Todo el país
	Proyecto de Desarrollo con Bajas Emisiones	US$ 10,125,594 2014 a 2019	International Resources Group (Engility-IRG)	Todo el país
Cooperación Alemana para el Desarrollo (GIZ) a través del Banco de Desarrollo Alemán (KfW)	Consolidación del Sistema Guatemalteco de Áreas Protegidas (SIGAP)	Q. 100 Millones	CONAP	Huehuetenango
GIZ a través de Ministerio Federal de Medio Ambiente, Protección de la Naturaleza, Obras Publicas y Seguridad Nuclear de Alemania	Modelos de negocio con el sector privado para la restauración de la cobertura forestal	€ 4 millones	Oro Verde – Bosque Tropical- DFN	Parque Nacional Sierra del Lacandón, Bocas del Polochic y en la Reserva de Biosfera Sierra de las Minas.
Cooperación Financiera Alemana – KfW	Adaptación al Cambio Climático en el Corredor Seco.	€ 9 millones	Secretaría de Planificación y Programación de la Presidencia (SEGEPLAN) y MARN	Corredor Seco
Agencia Española de Cooperación para el Desarrollo Internacional (AECDI)	Fortalecimiento al Desarrollo Comercial Concesiones Forestales, Petén, Guatemala	€ 200,000	Fundación Comercio para el Desarrollo-Comercio Justo-ACOFOP	
GIZ	Protección de Cuencas	ND	Comisión Trinacional del Plan Trifinio	Chiquimula y Zacapa

Nombre Cooperante	Proyecto	Monto de inversión	Ejecutores/ contrapartes	Área Geográfica
Noruega	Programa Agroambiental Mesoamericano (MAP)	Monto global del Programa US$ 1.186 millones. Inversión en recursos Naturales 0.118 millones	Centro Agronómico Tropical para la investigación y la Enseñanza (CATIE), Comunidad Copán Chortí, Trinacional del Río Lempa, Centro Universitario del Nororiente (CUNORI)	Chiquimula
	Proyecto de Bosques y Manejo Forestal para América Central	2012 al 2015 US$ 0.604 millones	CATIE	Chiquimula y Zacapa Región del Trifinio y Petén
UE				
FAO-UE	Apoyo a la Sostenibilidad de la Pequeña Agricultura Campesina	USD$ 26.27 millones	MAGA	Nacional.
The Nature Conservancy	Adaptación al Cambio Climático en el Altiplano de Guatemala (National Arbor Day Foundation, Peierls Foundation y UPS)	Q. 395,000	CONAP, MARN, INAB, MAGA,FUNDAECO, ASOCUCH, HELVETAS, CALMECAC, CDRO, COOPERATIVA La Igualdad	Huehuetenango, Quiché, San Marcos, Quetzaltenango, Totonicapán.
	Apoyo para la organización de la Fundación para la Conservación del Agua en la Región Metropolitana de Guatemala (Motta, Fundación FEMSA).	Q. 150,000	ARNPG, Tikonel, ACAX	Guatemala y Chimaltenango.
Cooperación Multilateral				
Fondo Colaborativo del Carbono Forestal (FCPF) del Banco Mundial	Estrategia Nacional para la Reducción de Emisiones por Deforestación Evitada y Degradación de Bosques en Guatemala	USD$3.8 millones	BID – MARN MAGA, INAB y CONAP	Nacional
Fondos para la conservación				
Fondo para la Conservación de los Bosques Tropicales (FCA)	79 proyectos	Del 2008-2014 Q. 70 millones invertidos	ONG´s nacionales e internacionales que ejecutan proyectos de conservación	Reserva de Biosfera Maya; Cadena Volcánica del Altiplano Occidental; Sistema Motagua Polochic y Costa del Caribe; Región de Cuchumatanes.

Annex F: Institutional Assessment

Amenazas	Acción Necesaria	Institución	Componente de políticas, leyes y regulaciones		
			Políticas	Leyes	Regulaciones/ instrumentos
Conversión, pérdida, degradación y fragmentación de hábitats naturales.					
	Promover buenas prácticas agrícolas	INAB CONAP Municipalidades	Política Forestal (1999) Política del SIGAP	Ley Forestal (Decreto 101-96)	Reglamento Forestal (res J.D. 02.43.2005. Art. 37.
	Desarrollar e implementar un plan nacional sobre el uso de la tierra	INAB CONAP MARN MAGA Segeplan	Política Forestal (1999) Política Agrícola 2011-2015 Política Marco de Ambiente y Recursos Naturales Política del SIGAP	Ley Forestal Ley de Protección y Mejoramiento Ambiental (68-86).	Estudio de Capacidad de Uso de la Tierra (ECUT) Evaluación de Impacto Ambiental (EIA). Licencia Ambiental Plan de Ordenamiento Territorial a nivel municipal
	Reducir la demanda de leña a través de la introducción de alternativas de energía limpia Promover el uso de estufas eficientes Promover bosques administrados por la comunidad para leña (astilleros municipales)	INAB CONAP Municipalidades MEM MICIVI SEGEPLAN	Política Forestal (1999) Política Agrícola 2011-2015 Política Marco de Ambiente y Recursos Naturales Política de Hidrocarburos, Política Minera Plan de ordenamiento Territorial	Ley Forestal (Decreto 101-96) Ley de Áreas Protegidas (Decreto 4-89) Ley de Protección y Mejoramiento Ambiental Ley de Hidrocarburos (Decreto 109.97). Ley General de Electricidad	Reglamento de Ley Forestal (Res. JD, 02.03.2005). Estudio de Capacidad de Uso de la Tierra (ECUT) Evaluación de Impacto Ambiental (EIA). Manual de Administración Forestal.
	Promover el manejo forestal sostenible de bosques naturales remanentes; Sistemas Agroforestales y Silvopastoriles.	INAB MARN CONAP MARN	Política Forestal (1999) Política Agrícola 2011-2015 Política Marco de Ambiente y Recursos Naturales Política del SIGAP	Ley Forestal (Decreto 101-96). Ley del SIGAP (Decreto 4-89). Ley del PINPEP (Decreto 51-2010). Ley de Probosques (02-2015).	Manual de Administración Forestal. Reglamento del PINPEP Reglamento de Probosques Estudio de Capacidad de Uso de la Tierra (ECUT)

Amenazas	Acción Necesaria	Institución	Componente de políticas, leyes y regulaciones		
			Políticas	Leyes	Regulaciones/ instrumentos
	Programa de extensión sobre el uso del fuego controlado en bosques de pino-encino.	CONAP MARN	Política Forestal (1999) Política Ambiental Política del SIGAP	Ley Forestal (Decreto 101-96) Ley de Áreas Protegidas (Decreto 4-89)	Reglamento de Ley Forestal Manual Forestal en Áreas Protegidas
	Incluir restauración de bosques en las responsabilidades del sector agrícola.	CONAP INAB MAGA		Ley del PINPEP (Decreto 51-2010). Ley de Probosques (02-2015).	
Ecosistemas frágiles en la zona costera convertidos para turismo, acuacultura y producción de sal					
	Implementar el Plan de Desarrollo Integral del Litoral del Pacífico. Desarrollar e implementar un Plan Integral para el Desarrollo del Litoral Atlántico.	Comisión Intersectorial para el del Plan Desarrollo Integral del Litoral Pacífico. Municipali-dades.		Código Municipal (Decreto 12-2002)	

Amenazas	Acción Necesaria	Institución	Componente de políticas, leyes y regulaciones		
			Políticas	Leyes	Regulaciones/ instrumentos
	Controlar la tala ilegal de manglares.	Grupo de Trabajo Interinstitucional para el Fomento de la Legalidad en el Sector Forestal: INAB, CONAP, Municipalidades, DIPRONA-PNC, Ministerio Público, Organismo Judicial. SAT, MINDEF, MARN, MAGA, ANAM, CONRED Mesa Intersectorial de Ambiente (MITA, sur de Petén) y Mesa Multisectorial de la Biosfera Maya (Norte de Petén), Wildlife Conservation Society (WCS), Gremial Forestal, FAO, UICN, Consejo Nacional de Estándares para Guatemala (CONESFORGUA).	Política Marino Costera Política de Nacional de Diversidad Biológica	Ley Forestal (Decreto 101-96) Ley del SIGAP (Decreto 4-89) Ley de Protección y Mejoramiento del Ambiente (68-86)	CONAP Especies contenidas en los Apéndices de CITES. Listado de especies Rojas de CONAP. Manual de Aprovechamiento de CITES. Manual Forestal en Áreas Protegidas. INAB Acuerdo de Gerencia 52-2001 (que norma el funcionamiento de la VUPE). Acuerdo de Gerencia 034-2007. Reglamento para la Fiscalización de Empresas Forestales Reglamento de Productos Forestales y su Procedencia Lícita (Res JD. 03-12.2014) Reglamento del Mangle Res. JD 01.25.98
	Fortalecer la capacidad de la aplicación de las medidas para la prevención y reducción dela tala ilegal en Guatemala		Plan Institucional para la Prevención y Reducción de la Tala Ilegal en Guatemala. Mesas de Justicia a Nivel Regional, Foro de Justicia en Petén		

Amenazas	Acción Necesaria	Institución	Componente de políticas, leyes y regulaciones		
			Políticas	Leyes	Regulaciones/ instrumentos
Sobreexplotación de especies					
Cosecha ilegal de especies de maderas preciosas, entre ellas caoba, cedro y palo rosa					
	Controlar la tala ilegal	Grupo de Trabajo Interinstitucional para el Fomento de la Legalidad en el Sector Forestal.	Política Nacional de Diversidad Biológica	Ley Forestal (Decreto 101-96) Ley de Áreas Protegidas (Decreto 4-89)	
	Fortalecer el conocimiento para la identificación de especies Laboratorio de la Facultad de Agronomía de USAC para la identificación de especies.	INAB CONAP Facultad de Agronomía/ USAC	Política Forestal (1999) Política del SIGAP	Ley Forestal (Decreto 101-96) Ley de Áreas Protegidas (Decreto 4-89)	
	Facilitar la aprobación de Planes de Manejo Forestal Sostenibles.	INAB CONAP	Política Forestal (1999) Política del SIGAP	Ley Forestal (Decreto 101-96) Ley de Áreas Protegidas (Decreto 4-89)	Reglamento de Ley Forestal Res. JD 01.43.2007 Acuerdo de Gerencia 034-2007 Manual de Administración Forestal
	Establecer una política institucional para la descentralización de las credenciales de consumo familiar (INAB y CONAP)	INAB CONAP Municipalidades	Política Forestal (1999) Política del SIGAP	Ley Forestal (Decreto 101-96) Ley del Áreas Protegidas (Decreto 4-89)	Reglamento de Ley Forestal Res. JD 01.43.2007 Acuerdo de Gerencia 034-2007 Manual de Administración Forestal
	Divulgar el listado de especies de flora y fauna con alguna restricción legal	CONAP DIPRONA	Política del SIGAP Política de Concesiones	Ley de Áreas Protegidas (Decreto 4-89). Ley de Protección y Mejoramiento del Ambiente (Decreto 68-86).	Especies contenidas en los Apéndices de CITES. Listado de especies Rojas de CONAP. Reproducción de especies de fauna en cautiverio.

Amenazas	Acción Necesaria	Institución	Componente de políticas, leyes y regulaciones		
			Políticas	Leyes	Regulaciones/ instrumentos
Comercio ilegal de mascotas en peligro, como guacamayas, loros, felinos, monos, reptiles y anfibios					
	Controlar la caza y comercio ilegal	CONAP, DIPORNA/PNC	Política Nacional de Diversidad Biológica	Ley Forestal (Decreto 101-96) Ley de Áreas Protegidas (Decreto 4-89)	
Tala ilegal de manglares para construcción de viviendas					
	Controlar la tala ilegal de manglares	Grupo de Trabajo Interinstitucional para el Fomento de la Legalidad en el Sector Forestal.	Política Forestal (1999) Política del SIGAP	Ley Forestal (Decreto 101-96) Ley de Áreas Protegidas (Decreto 4-89) Ley Reguladora de las Áreas de Reservas Territoriales del Estado de Guatemala (126-97)	
Frágiles ecosistemas en la zona costera convertidos para el turismo, acuacultura y producción de sal					
	Desarrollas/actualizar e implementar planes municipales para el uso de la tierra	MARN, OCRET, CONAP, Segeplan Municipalidades	Política Costero Marina, Política Nacional de Diversidad Biológica	Ley de Áreas Protegidas (Decreto 4-89) Ley Reguladora de las Áreas de Reservas Territoriales del Estado de Guatemala (126-97)	

Amenazas	Acción Necesaria	Institución	Componente de políticas, leyes y regulaciones		
			Políticas	Leyes	Regulaciones/ instrumentos
Pesca no controlada en ecosistemas de agua dulce y zonas marinas					
	Actualizar ley de pesca Mejorar el manejo de pesquerías a través de evaluaciones de stock y permisos para la pesca basados en el rendimiento máximo sostenible.	DIPESCA/ MAGA), CONAP	Política Nacional de Diversidad Biológica	Ley de Pesca (Decreto 80-2002) Ley de Áreas Protegidas (Decreto 4-89)	
Uso de prácticas de pesca destructivas					
	Hacer cumplir la ley de Pesca y su reglamento	DIPESCA (MAGA)		Ley de Pesca	
Expansión agrícola					
	Desarrollar e implementar un plan para nacional para el uso de la tierra.	MAGA, Segeplan CONAP, MARN	MAGA, SEGEPLAN CONAPY MARN		
	Incluir restauración de bosques en las responsabilidades del sector agrícola Fortalecer el Sistema del Corredor Biológico Mesoamericano Fortalecer el sistema guatemalteco de áreas protegidas				

Amenazas	Acción Necesaria	Institución	Componente de políticas, leyes y regulaciones		
			Políticas	Leyes	Regulaciones/ instrumentos
Minería y desarrollo asociado					
	Integrar protección ambiental en la minería	MEM, MARN			Ley de Protección y Mejoramiento del Medio Ambiente
Degradación de recursos hídricos					
	Aprobar la Iniciativa de la Ley del Agua	Congreso de la República	Política de Agua	Ley de Protección y Mejoramiento del Medio Ambiente Código Municipal Ley Forestal	
	Regular extracción del agua subterránea	Municipalidad	Código Civil		
	Regular descargas de industrias, agricultura y áreas urbanas	MARN	Política Marco de Ambiente y Recursos Naturales		Evaluar el Reglamento de Aguas Residuales 236-2006 y reformas
	Proteger bosques que se encuentren en cuencas y cercanos a cuerpos de agua	INAB	Política Forestal (1999)		
Reducción de la disponibilidad de agua en los ecosistemas y el consecuente cambio en la composición de especies					
	Implementar medidas para la mitigación del cambio climático, incluyendo la reducción de emisiones GhG	MARN MAGA Autoridades de Cuenca CONAP Segeplan	Política Nacional de Cambio Climático Política Nacional de Diversidad Biológica	Ley Marco para regular la reducción de la Vulnerabilidad, la Adaptación obligatoria ante los efectos del Cambio Climático y la Mitigación de gases de efecto invernadero (Decreto 7-2013)	Evaluar el Reglamento de Aguas Residuales 236-2006.
	Implementar medidas de adaptación tales como el manejo de bosques en cuencas aguas arriba y bosques al lado de ríos				

Amenazas	Acción Necesaria	Institución	Componente de políticas, leyes y regulaciones		
			Políticas	Leyes	Regulaciones/ instrumentos
Contaminación					
Emisiones de GhG del transporte					
	Promover el cambio de combustibles por combustibles bajos en carbono y combustibles amigables con el ambiente	MARN MEM MICIVI Dirección General de Transporte	Política Nacional de Cambio Climático	Ley Marco para regular la reducción de la Vulnerabilidad, la Adaptación obligatoria ante los efectos del Cambio Climático y la Mitigación de gases de efecto invernadero (Decreto 7-2013)	Normativa para establecer un programa de incentivos fiscales y subsidios enfocado en el uso de energías limpias para el transporte público y privado
	Revisar / reactivar el plan municipal para transporte masivo de personas, Proyecto Bus Rapid Transit (BRT) in Guatemala City (Municipalidad de Guatemala, 2012).	Municipalidades del Distrito Metropolitano de Guatemala	Política Nacional de Cambio Climático	Ley Marco para regular la reducción de la Vulnerabilidad, la Adaptación obligatoria ante los efectos del Cambio Climático y la Mitigación de gases de efecto invernadero (Decreto 7-2013)	
	Ampliar la expansión de los sistemas de transporte masivo de personas, como el tren de superficie y los sistemas Trans-metro y Trans-urbano.	MARN Municipalidad del Distrito Metropolitano	Política Nacional de Cambio Climático	Ley Marco para regular la reducción de la Vulnerabilidad, la Adaptación obligatoria ante los efectos del Cambio Climático y la Mitigación de gases de efecto invernadero (Decreto 7-2013)	

Amenazas	Acción Necesaria	Institución	Componente de políticas, leyes y regulaciones		
			Políticas	Leyes	Regulaciones/ instrumentos
	Regulación de la importación de vehículos, basado en la eficiencia energética y nivel de emisiones que generen	MARN MINFIN MINECO		Ley de Protección y Mejoramiento del Ambiente (Decreto 68-86).	Se requiere la creación de una normativa específica, ya que actualmente esto no existe
	Establecer un sistema de control de emisiones de los vehículos en el país	MARN		Ley de Protección y Mejoramiento del Ambiente (Decreto 68-86).	
	Promover la creación de redes de transporte de carga en el país, incorporando las líneas del ferrocarril y otros sistemas de carga consolidada.	MARN MICIVI MINECO	Política Nacional de Cambio Climático	Ley Marco para regular la reducción de la Vulnerabilidad, la Adaptación obligatoria ante los efectos del Cambio Climático y la Mitigación de gases de efecto invernadero (Decreto 7-2013)	
Descargas líquidas y sólidas en lagos y ríos					
	Aplicar control de descargas.	MARN Municipalidades Departamento de Tránsito de la Policía Nacional		Ley de Protección y Mejoramiento del Ambiente (Decreto 68-86).	Reglamento de Aguas Residuales 236-2006
Disposición incorrecta de desechos sólidos (rellenos clandestinos y legales)					
	Diseñar nuevos controles para desechos y designar áreas legales para relleno.	MARN Municipalidades Departamento de Tránsito de la Policía Nacional	Política Nacional para el Manejo Integral de los Residuos y Desechos Solidos	Ley de Protección y Mejoramiento del Ambiente (Decreto 68-86).	

Amenazas	Acción Necesaria	Institución	Componente de políticas, leyes y regulaciones		
			Políticas	Leyes	Regulaciones/ instrumentos
Escurrimiento de pesticidas y nutrientes de grandes actividades agrícolas (caña de azúcar, aceite de palma, café)					
	Demandar el uso de buenas prácticas agrícolas.	MAGA	Política Agrícola 2011-2015	Ley de Sanidad Vegetal y Animal (Decreto 36-98) Ley que prohíbe la importación y regula el uso de los cloroflurocarbonados en sus distintas presentaciones (Decreto 110-97).	
				DECRETO LEY No. 43-74 Ley reguladora sobre importación, elaboración, almacenamiento, transporte, venta y uso de pesticidas (Decreto 43-74)	
		MARN	Política Marco de Ambiente y Recursos Naturales	Ley de Protección y Mejoramiento del Medio Ambiente (Decreto 68-86)	
		Municipalidades		Código de Salud (Decreto 90-97)	

Expertos consultados:	
Forestal	César Sandoval
Ecosistemas	Raúl Maas
Agua	Jaime Carrera Campos
	Virginia Mosquera
Biodiversidad	Maria Mercedes López-Selva
Pesca	Erick Villagrán
Cambio Climático	Marco Aurelio Juárez
Desechos sólidos	Raúl Maas
Uso de pesticidas	Ana Cristina Bailey

For more information, contact:

DevTech Systems, Inc.
1700 North Moore St.
Suite 1720
Arlington, Virginia 22209
703-312-6038
www.devtechsys.com