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Rwanda Environmental Threats and Opportunities Assessment (ETOA)

REPLACE IDIQ Task Order # AID-696-TO-14-00002

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Cover photo: Terraced farmland on steep slopes above the Rugezi Swamp, Rwanda's only Ramsar site, Northern Province, September 2014. Credit: B. Byers/ ECODIT.

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ABBREVIATIONS, ACRONYMS, AND DEFINITIONS

ACNR	Association pour la Conservation de la Nature au Rwanda
AEWA	African-Eurasian Migratory Waterbirds
AIDS	Acquired Immunodeficiency Syndrome
ARCC	African and Latin American Resilience to Climate Change
ARCOS	Albertine Rift Conservation Society
ARE	Albertine Rift Endemic
ARECO	Association Rwandaise des Ecologistes
AZE	Alliance for Zero Extinction
BEO	Bureau Environment Officer
CBD	Convention on Biological Diversity
CDCS	Country Development Cooperation Strategy
CEPF	Critical Ecosystem Partnership Fund
CFR	Code of Federal Regulations
CITES	Convention on International Trade in Endangered Species
CO	Contracting Officer
COMIFAC	Commission Ministérielle des Forêts d'Afrique Centrale
COR	Contracting Officer Representative
CSO	Civil Society Organization
DAI	Development Alternatives, Inc.
DG	Director General
DO	Development Objective
DRC	Democratic Republic of Congo
E3	USAID's bureau for Economic Growth, Education, and Environment
EDPRS	Economic Development and Poverty Reduction Strategy
EDPRS II	Second Economic Development and Poverty Reduction Strategy (Rwanda)
EIA	Environmental Impact Assessment
ETOA	Environmental Threats and Opportunities Assessment
EWSA	Energy, Water and Sanitation Authority
FAA	Foreign Assistance Act
FAO	Food and Agriculture Organization
FHA	Forest of Hope Association
FONERWA	Fond National de l'Environnement au Rwanda
GEF	Global Environment Facility
GoR	Government of Rwanda
GVTC	Greater Virunga Transboundary Collaboration
HIV	Human Immunodeficiency Virus
ICCN	Institut Congolais pour la Conservation de la Nature
IDIQ	Indefinite Delivery/Indefinite Quantity
IGCP	International Gorilla Conservation Program
IMCE	Integrated Management of Critical Ecosystems
IR	Intermediate Result
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resources Management
MDGs	Millennium Development Goals
MEO	Mission Environment Officer
MINAGRI	Ministry of Agriculture and Animal Resources
MINIRENA	Ministry of Natural Resources
MODIS	Moderate Resolution Imaging Spectroradiometer

NAPA	National Adaptation Programme of Action
NBI	Nile Basin Initiative
NBSAP	National Biodiversity Strategy and Action Plan
NGO	Non-Government Organization
NP	National Park
NRM	Natural Resources Management
PA	Protected Area
PEPFAR	President's Emergency Fund for AIDS Relief
PES	Payment for Ecosystem/Environmental Services
RDB	Rwanda Development Board
RECOR	Rwanda Environment Conservation Organization
REDD	Reducing Emissions from Deforestation and Degradation
REDO	Rural Environment and Development Organization
REMA	Rwanda Environment Management Authority
REPLACE	Restoring the Environment through Prosperity, Livelihoods, and Conserving Ecosystems
RFTOP	Request for Task Order Proposal
RNRA	Rwanda Natural Resources Authority
SEA	Strategic Environmental Assessment
SEI	Stockholm Environment Institute
SERVIR	SERVIR is a joint venture between NASA and USAID which provides satellite-based Earth observation data to help developing nations improve their environmental decisionmaking
SOW	Statement of Work
SSEE	Smith School of Enterprise and the Environment
TEV	Total Economic Valuation
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USAID	US Agency for International Development
USG	US government
VNP	Volcanoes National Park
WCS	Wildlife Conservation Society
WWF	World Wildlife Fund

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More than 50 people, representing a diverse range of environmental actors and stakeholders, from heads of government agencies to farmers in rural villages, willingly made time to talk to the Environmental Threats and Opportunities Assessment (ETOA) Team and freely shared their knowledge and opinions. During field site visits, the Team met and worked with these actors and stakeholders and witnessed firsthand both the successes and challenges that they face. ETOA Team members would like to express their deep appreciation to all of these individuals, even though we cannot acknowledge each one by name. We received much information and heard many viewpoints from the people we met, and if in any way we have misunderstood or misrepresented their views, the fault is ours.

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EXECUTIVE SUMMARY

PURPOSE OF THE ETOA

The main objectives of the Rwanda Environmental Threats and Opportunities Assessment (ETOA) were to assist USAID/Rwanda to better integrate environmental and conservation considerations in the programs and projects that are to be designed under its new Country Development Cooperation Strategy (CDCS) by:

- summarizing the current state of Rwanda's environment, forests, and biological diversity;
- describing the direct biophysical threats to Rwanda's biodiversity, forests, and environment, and identifying their causes;
- identifying actions needed to reduce and/or mitigate the causes of those threats in the current political, economic, and social context;
- identifying any actions that should be avoided by USAID/Rwanda because they could threaten environmental integrity and resilience; and
- identifying potential contributions to the needed actions by USAID/Rwanda within its proposed CDCS and planned programs.

This assessment fulfills a legal requirement of the Foreign Assistance Act (FAA), which requires that a Tropical Forests and Biodiversity Analysis be conducted in conjunction with the development of new US foreign assistance strategies and programs. It is also intended to identify opportunities to better integrate the mission's portfolio across development sectors by suggesting linkages with economic growth, agriculture, democracy and governance, health, and education activities. In accordance with FAA Section 117, the ETOA notes any possible environmental compliance problems that the mission might face if it develops a strategy that involves activities that might either directly or indirectly threaten biodiversity, tropical forests, or the natural environment.

METHODS

An ETOA Team gathered information for this assessment through a review of relevant documents and web-based information; interviews and meetings with representatives of key stakeholder groups; and field site visits to select locales. We talked to more than 50 people, including staff of the USAID/Rwanda Mission and USAID/Washington; relevant national government agencies; international and national non-governmental organizations (NGOs); international donors; residents of natural resource-dependent communities; and private sector representatives. Our information also came from site visits to Rugezi Swamp, Volcanoes National Park, Gishwati Forest Reserve, Sebeya River watershed, Mukura Forest Reserve, Cyamudongo Forest, Nyungwe National Park, Akagera National Park, and Rweru-Mugesera wetlands complex.

We analyzed the content of our interviews to identify the categories of "actions necessary" for biodiversity, forest, and environmental conservation perceived to be most important by key informants. All information gathered by the Team was synthesized to identify proposed USAID activities that might threaten biodiversity and forests, as well as opportunities for USAID activities to contribute to the needed actions, and to also make appropriate recommendations to the mission.

STATE OF THE ENVIRONMENT

Because the "core" of this ETOA consists of the Tropical Forests and Biodiversity (FAA 118-119) Assessments that are legally required by the FAA, those topics framed our review of the state of Rwanda's environment. The forest, savanna, and wetland ecosystems of Rwanda, and the tens of thousands of species that inhabit them, provide the ecosystem products, services, and nonmaterial benefits on which Rwanda's economy and development depend. Agricultural ecosystems and agro-biodiversity are the foundation for the country's agricultural economy. In Section 2 of this report, we briefly review the state of Rwanda's

ecosystems, species, and protected areas, and we later discuss the economic and other benefits they provide in Section 3. In Section 5, we summarize the laws, policies, and government institutions that guide and implement environmental management and biodiversity conservation in the country. We also summarize the related support and partnerships provided by international donors and NGOs in Annex F.

THREATS AND CAUSES

This ETOA uses the "threats-based approach" that guides USAID's biodiversity programming as the conceptual framework for analysis. As discussed in Section 4, we identified the principal direct threats to Rwanda's ecosystems and species, and traced their immediate and deeper causes or "drivers." The most important direct biophysical threat to Rwanda's biodiversity and environment is the conversion, loss, degradation, and fragmentation of natural ecosystems, especially mountain forests and wetlands throughout the country. These ecosystems maintain the hydrological system of the country. Climate change is a potential threat of unknown magnitude, which may accentuate other direct threats, especially habitat loss and degradation, and the threat from invasive species and pests, pathogens, and diseases. In some ways, climate change falls into a gray area between cause and threat, being itself a cause of some of the other direct biophysical threats to ecosystems and species. Although many diverse activities cause these direct threats, the specific proximate causes appear to be rooted mainly in population pressure, lack of sustainable economic opportunities, and weaknesses in environmental governance.

ACTIONS NECESSARY

FAA Sections 118 and 119 call for assessments to identify the actions necessary to conserve tropical forests and biological diversity, respectively (see Section 7). To distill these necessary actions, the ETOA Team consulted Government of Rwanda (GoR) documents and also pulled from interviews and meetings with representatives of key stakeholder groups. From those interviews, we compiled a list of 131 actions necessary, some of which were mentioned multiple times, by different stakeholders. This technique provides a measure of the perceived importance of needs among key stakeholders. Actions needed that were repeatedly mentioned clustered as "themes"; in fact, 102 of the 131 actions listed by key informants—79 percent—fit into only ten themes. The major thematic categories of actions needed are as follows:

1. Implement and enforce existing environmental policies and laws.
2. Integrate environment and biodiversity conservation into all development sectors.
3. Promote conservation agriculture that links food security and environmental conservation.
4. Emphasize water as an integrating ecosystem service.
5. Protect and restore all remaining natural forests and wetland habitats.
6. Develop financial mechanisms and incentives for conservation of natural ecosystems.
7. Integrate health with environment and biodiversity conservation.
8. Develop off-farm livelihood alternatives in rural communities.
9. Link environmental protection and energy development.
10. Improve climate change resilience.

These actions needed for biodiversity, forest, and environmental conservation are actions that remove or reduce the causes of the threats that were identified.

CLIMATE CHANGE RESILIENCE AND ADAPATION

Climate projections for Rwanda suggest a rapidly warming and increasingly wet climate (Seimon, 2012). Although uncertainties exist, and there is considerable variability among individual models, these projections can be used as the basis for planning activities to improve ecological and socio-economic resilience to climate change. Because of the importance of natural resources and ecosystem services in Rwanda, an ecosystem-based approach to climate change resilience and adaptation is needed. Protecting the ecosystems that provide the eco-hydrological services in watersheds is critical, as is their role in soil

protection and erosion control. Climate change may provide new challenges in human health because of links between climate and diseases. For example, malaria is linked to increased temperatures, and deforestation creates mosquito-breeding sites and favors the most dangerous mosquito vector species. Conversion of wetlands for rice cultivation likewise favors mosquito vectors. Also, cholera is increased by floods, the magnitude of which are related to forest cover, and may increase with increasing precipitation due to climate change. Food crop and forest pests and pathogens may be promoted by climate change, although no studies are currently available on this topic.

POTENTIAL OPPORTUNITIES FOR USAID/RWANDA

FAA Sections 118 and 119 require that we discuss "the extent to which the actions proposed for support by the Agency meet the needs thus identified." The following table suggests opportunities identified by the ETOA Team for USAID/Rwanda to contribute to the actions needed under its new CDCS. We discuss the details of these opportunities in Section 8.

Exhibit 1. Overlap of Thematic Categories of Action and Development Objectives (DOs)

Theme: "Need to…."	USAID Program/DO			
	DO1: Economic Opportunities (agriculture, private sector, NRM, climate change resilience, clean energy)	**DO2: Democratic Processes** (civic participation, social cohesion, conflict reduction)	**DO3: Health and Nutrition** (health systems, reproductive health, water and sanitation)	**DO4 : Education and Workforce Preparation** (literacy, numeracy, employable skills)
1. Implement and enforce existing environmental policies and laws				
2. Integrate environment and biodiversity conservation into all development sectors				
3. Promote conservation agriculture that links food security and environmental conservation				
4. Emphasize water as an integrating ecosystem service				
5. Protect and restore all remaining natural forests and wetland habitats				
6. Develop financial mechanisms and incentives for conservation of natural ecosystems				
7. Integrate health with environment and biodiversity conservation				
8. Develop off-farm livelihood alternatives in rural communities				
9. Link environmental protection and energy development				
10. Improve climate change resilience				

RECOMMENDATIONS

The ETOA SOW tasked us to "Analyze and summarize planned programs of the mission CDCS and assess their potential environmental impacts and provide recommendations to the mission on how to maximize the environmental benefit as the mission is implementing its CDCS." Our recommendations fall into two

categories: 1) recommendations for maximizing environmental benefits of the mission's CDCS through integration and resulting synergies, and 2) recommendations for activities to avoid supporting because of potential negative environmental impacts.

Our major recommendation for USAID/Rwanda is to integrate environment, biodiversity, and climate change into mission Development Objectives (DOs). This would be in line with USAID's Biodiversity Policy (2014) and Climate Change and Development Strategy (2012), both of which describe biodiversity conservation and climate change adaptation as cross-cutting and cross-sectoral. Integrating environmental considerations, including biodiversity conservation and climate change, across its CDCS would also align with the GoR's Vision 2020 and the Second Economic Development and Poverty Reduction Strategy (EDPRS II), and all of the sectoral development policies that flow from them, all of which call for mainstreaming of biodiversity and climate change in development. Specifically, we recommend that USAID/Rwanda:

- develop a plan for integrating of biodiversity and environment into the USAID/Rwanda project design cycle for all its future programs;
- designate an in-house champion to promote and lead the process of integrating environment and biodiversity across the Mission's portfolio; and
- support GoR and other donors' initiatives to restore the Gishwati and Mukura forests and the corridor linking them with Nyungwe National Park, as long as proper social safeguards are followed so that communities already living near these areas are not displaced, and benefit from forest restoration.

If USAID/Rwanda takes advantage of the opportunities we have identified and recommended, it could provide other USAID missions with a model for successfully integrating biodiversity conservation and climate change considerations into development.

Based on our FAA Section 117 review, we provide some recommendations for avoiding possible environmental compliance problems that the mission might later face if it proposes activities that might either directly or indirectly threaten biodiversity, tropical forests, or the environment. In particular, we call attention to the following issues:

- the GoR's proposed development of peat from wetlands as a source of energy for electric power generation;
- development of agricultural activities that lead to conversion or degradation of wetlands, forests, or other natural ecosystems, such as the expansion of irrigated rice cultivation; and
- any kind of development activity (e.g., agriculture, health, education) in the savanna shrublands of the west of Akagera National Park or areas suitable for potential future forest corridor restoration that would link the forests of Gishwati, Mukura, and Nyungwe.

The ETOA Team recommends that USAID/Rwanda avoid supporting these or other related activities because of probable negative environmental impacts.

1. INTRODUCTION

1.1 PURPOSE

The purpose of this task order was to conduct a countrywide Environmental Threats and Opportunities Assessment (ETOA) for USAID/Rwanda, which will inform the Environmental Compliance Annex of the USAID/Rwanda Country Development Cooperation Strategy (CDCS).

The main objectives of the ETOA were to assist USAID/Rwanda to better integrate environment and conservation considerations in programs and projects to be designed under its new CDCS by providing:

- recommendations for linkages and synergies with Mission Development Objectives ("do good if possible");
- advance warning to avoid later environmental impact issues ("do no harm"); and
- Foreign Assistance Act (FAA) Sections 118-119 compliance ("comply with the law").

The ETOA report (1) summarizes the current state of Rwanda's environment, forests, and biological diversity; (2) describes the direct biophysical threats to Rwanda's biodiversity, forests, and environment, and identifies the causes of those threats; (3) identifies actions needed to reduce and/or mitigate the causes of those threats in the current political, economic, and social context; (4) identifies any actions proposed by USAID/Rwanda that could threaten biodiversity, forests, or environmental integrity and resilience; and (5) identifies potential contributions to the needed actions by USAID/Rwanda within its proposed programs.

ETOAs are conducted in accordance with Section 117 of the FAA, which authorizes US bilateral foreign aid programs. Section 117 requires that US development assistance does not harm, and helps to protect and restore, the environment of a host country. There is no legal requirement for analysis or assessment of actions needed for the conservation of the environment and natural resources (unlike Sections 118 and 119, which require analyses of tropical forests and biodiversity, respectively). Instead, it urges that these issues be taken into consideration in implementing development strategies.

The USAID/Africa Bureau has often recommended that missions combine the mandatory FAA 118-119 analyses with a strategy-level "preview" environmental assessment related to FAA 117, in an Environmental Threats and Opportunities Assessment, abbreviated ETOA (USAID, 2005b). This is the approach taken with this task order.

USAID missions benefit from taking FAA 118-119 assessments or ETOAs seriously because these assessments can help to:

- Save time and money by giving a USAID mission a "heads up" about possible environmental compliance problems they would face later under Regulation 22 CFR 216, USAID's environmental assessment and compliance regulation, if they develop a strategy that involves activities that might either directly or indirectly threaten biodiversity, tropical forests, or the environment;
- Identify opportunities for increasing the success and sustainability of a mission's strategic objectives in other sectors (such as health, agriculture, democracy and governance, economic growth, climate change, disaster preparedness, and conflict mitigation and management);
- Help missions to identify opportunities for using funds earmarked by Congress or presidential initiatives for biodiversity conservation, climate change adaptation and mitigation; water, sanitation, and health; and food security and sustainable agriculture; and
- Fulfill legal requirements under the FAA.

USAID/Rwanda last conducted an ETOA in 2008 (USAID, 2008), which updated the previous 2003 ETOA. Since the last assessment, the political and economic situation in Rwanda has changed significantly and USAID/Rwanda is now finalizing a new CDCS for its programs for 2014–2018.

It should be noted that although ETOAs are supposed to identify contributions to actions necessary for conserving tropical forests, biodiversity, and the environment that could be made by USAID missions, and to make related recommendations, they are not intended as project or program design documents, and cannot provide the detailed information and analysis needed for sound project design. ETOAs can only identify opportunities for future programming and suggest where further information may be needed for design.

1.2 METHODS

Information needed to meet the above objectives was collected by a team of consultants (see Annex C: Biographical Sketches of Assessment Team Members) contracted by ECODIT, a small-business holder of the REPLACE IDIQ contracting mechanism. The process of information-gathering and analysis followed USAID guidance on a threats-based approach to biodiversity conservation described in *Biodiversity Conservation: A Guide for USAID Staff and Partners* (USAID, 2005a), and the "best practice" guidelines provided in *Tropical Forestry and Biodiversity (FAA 118-119) Analyses: Lessons Learned and Best Practices from Recent USAID Experience* (USAID, 2005b). This report provides all of the information requested in the Scope of Work (SOW) (see Annex A), to the extent possible.

Information was gathered from several sources, and information from one source was validated by, and supplemented with, information from other sources. Sources included the following:

- Meetings in Washington, DC (USAID/Africa Bureau Environment Officer, Forestry and Biodiversity Office, Africa Bureau Climate Change and Water Advisors, and others);
- Review of relevant documents, including the previous USAID/Rwanda ETOAs of 2003 and 2008; Rwanda's *2014 Fifth National Report to the Convention on Biological Diversity*, and *Revised and Updated National Biodiversity Strategy and Action Plan*; other Government of Rwanda (GoR) documents; donor project documents; reports in the scientific literature; and web-based reports;
- Interviews and meetings with more than 50 people representing key stakeholder groups (see Annex E: List of Persons Contacted), including national government agencies, international and national NGOs, private sector representatives, staff of organizations implementing USAID projects, and international donors;
- Meetings with USAID/Rwanda Development Objectives (DOs); and
- Site visits to:

  Volcanoes National Park
  Gishwati Forest Reserve
  Mukura Forest Reserve
  Sebeya River Watershed
  Rugezi Wetland
  Cyamudongo Forest
  Nyungwe National Park
  Akagera National Park
  Rweru-Musegera Wetlands Complex

The ETOA Team analyzed the content of its interviews to identify the categories of actions necessary for environmental, forest, and biodiversity conservation perceived to be most important. All information gathered by the Team was analyzed to identify proposed USAID activities that might threaten biodiversity and forests; opportunities for USAID activities to contribute to the needed actions; and to make appropriate recommendations to the mission.

2. STATE OF THE ENVIRONMENT

The modern concept of biodiversity encompasses the variety and variability of life at three levels of organization: ecosystems, species, and genes. This section provides an overview of Rwanda's biodiversity at the ecosystem and species levels, and a brief discussion of genetic diversity. We also discuss agro-biodiversity, the diversity of species and genetic varieties that make up agricultural ecosystems. Rwanda's protected area system, the main mechanism for conserving remaining areas of natural ecosystems in the country, is also discussed. This section provides context for understanding threats to the environment, biodiversity, and forests in Rwanda, and actions needed to address them, topics which are discussed in detail in later sections.

Because the FAA Sections 118 and 119 analyses of tropical forests and biodiversity are legally required by the US FAA, we have used those topics to frame the broader discussion of the state of Rwanda's environment. Since Rwanda lies within tropical latitudes, all of its forests are tropical, and they are treated in this report as a component of the biodiversity of the country. In other words, since all of Rwanda's tropical forest ecosystems are part of the country's biodiversity, FAA Section 119 covering biodiversity basically includes and subsumes the narrower Section 118, which deals with tropical forests.

2.1 BIOPHYSICAL SETTING

Rwanda is one of the smallest countries in Africa, geographically located in the highlands of the Albertine Rift, which divides east and central Africa and forms the "continental divide" between the Nile and Congo River Basins. It lies between 1°04' and 2°51' south latitude and 28°45' and 31°15' east longitude. The country has a surface area of 26,338 km², comparable to the US state of Maryland. It shares boundaries with the Democratic Republic of Congo (DRC) in the west, Uganda to the north, Tanzania to the east, and Burundi to the south.

Rwanda's topography is generally mountainous, with hills and ridges dissected by a complex, dense drainage network of rivers, lakes, and wetlands. It has been called the "the land of a thousand hills" ("le pays de mille collines" in French). The highest point in the country, the peak of the Karisimbi Volcano in the Virunga Mountains, is 4,507 meters above sea level, and the lowest point is in the southwest, at 900 meters. The average elevation is 1,250 meters.

Watersheds covering 67 percent of Rwanda's territory flow to the Nile Basin and 33 percent flow to the Congo Basin. The main rivers in Rwanda, the Nyabarongo and the Akanyaru, join to form the Akagera River, which flows into Lake Victoria. Along these rivers are marshes and numerous shallow lakes forming a network of wetlands of national and international importance. Ninety percent of Rwanda's surface water flows into the Nile Basin, contributing 8-10 percent of the total flow of the White Nile (Willets, 2008). Watersheds in the Congo Basin consist of short rivers, including the Ruhwa and Sebeya, that flow into Lake Kivu, with the Rusizi River as its outflow into Lake Tanganyika. Seventy percent of Rwanda's surface waters are said to be captured by the forested watersheds of the Nyungwe Mountains.

Average annual precipitation in Rwanda is 1,400 mm, but that is strongly affected by topography, varying from about 2,000 mm in the northwest to around 700 mm in the southeast. There are two rainy seasons, from March to May and September to December. Average temperatures range from 16°–23°C.

Rwanda's population in mid-2014 was estimated at around 11.1 million people, with a population growth rate of 2.3 percent (Population Reference Bureau, 2014). That population growth rate implies a population doubling time of 30 years. Rwanda is the most densely populated country in Africa, with an average of 421 people per km².

Exhibit 2. Administrative Map of Rwanda

2.2 ECOSYSTEMS

Rwanda has a diversity of natural ecosystems including Afromontane forests, savannas, riparian gallery forests, wetlands, and lakes. Agriculture now dominates the landscape, and natural ecosystems are mainly restricted to the country's five protected areas, which cover around nine percent of the landscape, and to protected or not-yet-converted wetlands. More than 64 percent of Rwanda's forest areas have been lost since 1960, a deforestation rate of more than 1.3 percent per year (REMA, 2009a). Around 56 percent of all wetlands in the country have been converted to agriculture.

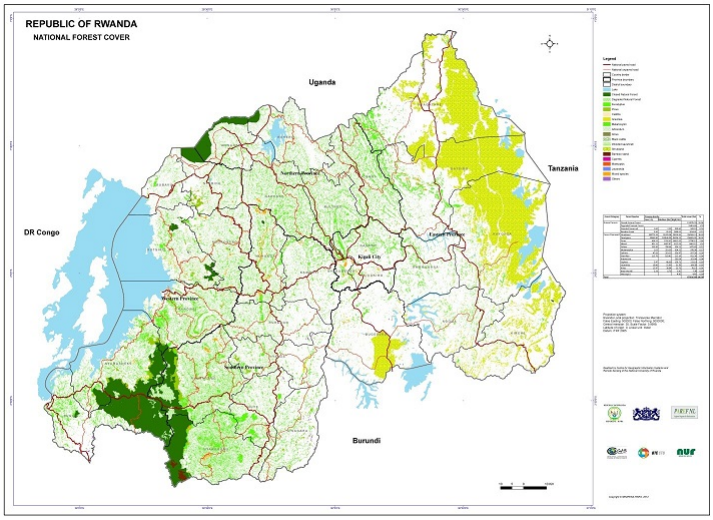
In trying to determine the current state of land cover in Rwanda—that is, the area covered by its natural and agricultural ecosystems—we found that sources of information and maps were difficult to obtain and that information varied widely from one source to the other(see Exhibit 3). While we were able to obtain a copy of the National Forest Cover map (MINIRENA-RNRA, 2012), we could not obtain a copy of the recent Land Cover map produced for Rwanda by the USAID SERVIR project, a joint venture between NASA and USAID which provides satellite-based earth observation data to help developing nations improve their environmental decision-making. That map, based on Moderate Resolution Imaging Spectroradiometer (MODIS) satellite imagery, has supposedly been made available to the Rwanda Environment Management Authority (REMA) (REMA, 2014).

Exhibit 3. Comparison of Land Cover Information from Three Sources

Land Cover Type	**Area (ha); Percent of Total Land Cover** MINIRENA-RNRA, 2012	**Area (ha); Percent of Total Land Cover** MINITERE and CGIS-NUR, 2007	**Area (ha)** USAID, 2008, p. 23
Closed natural forest	112,100	79,800	
Degraded natural forest	11,400	38,000	
Wooded savanna	1,000	3,700	
Bamboo	1,700	4,400	
Total natural forest	**126,200 (4.8 %)**	**125,900 (4.8 %)**	
Eucalyptus plantation	256,100	102,800	
Other plantation forest	30,600	12,100	
Total plantation forest	**286,700 (10.9%)**	**114,900 (4.4%)**	
Forest			316,000 (12%)
Lakes	128,000		
Wetlands	77,000 (2.9%)		77,000 (2.9%)
Rivers	7,300		
Total aquatic ecosystems	**212,300 (8.1%)**		210,700 (8%)
"Shrubland" (= savanna)	**260,600 (9.9%)**		
Savanna			842,800 (32%)
Agric. settlement / Urban	**1,748,000 (66.3%)**		1,237900 (47%)
Total Area of Rwanda	**2,633,800 ha (100%)**	**2,633,800 ha (100%)**	**2,633,800 ha (100%)**

Sources: MINIRENA-RNRA, 2012; MINITERE and CGIS-NUR, 2007; USAID, 2008

Exhibit 4. Forest Cover in Rwanda



2.2.1 TERRESTRIAL ECOSYSTEMS

Terrestrial ecosystems include Afromontane forests, savannas (woodlands with varying degrees of canopy cover and a grass understory), and other types of remnant forests, mostly riparian gallery forests.

Afromontane Forests

These closed-canopy, tropical moist forests are found in the northern and western mountains of Rwanda. The largest area of Afromontane forest is in Nyungwe National Park. In Volcanoes National Park, because of the high elevations of some of the volcanic peaks, some unique montane and alpine ecosystems can be found in zones above the Afromontane forest zone, which surrounds the bases of the volcanoes at elevations of 2,000–2,900 meters. Thickets of the native African mountain bamboo, *Arundinaria albina*, which are the prime habitat for gorillas and golden monkeys, are found mainly in the upper parts of this forest zone between 2,600 and 2,900 meters in elevation. Above the forest zone is the Hagenia-Hypericum zone, named after the two dominant tree species found there, *Hagenia abyssinica* and *Hypericum revolutum*, which extends from about 2,900 to 3,200 meters. From about 3,200 to 3,500 meters, a belt of Afro-alpine vegetation is found, characterized by giant *Lobelias*. Above 3,500 meters, the vegetation is made up of almost only lichens and mosses (USAID, 2003).

Exhibit 5. Afromontane Forest, Nyungwe National Park

Savanna

Savanna ecosystems with varying degrees of tree cover and a grass understory, ranging from woodlands to grasslands, are found in eastern and southern Rwanda, but in their natural condition mainly in Akagera National Park. Savannas at one time covered almost half of the eastern part of the country (USAID, 2003). The most recent national forest cover map (Fig. 2.2) shows large areas of what it labels "shrubland"—this shrubland is a native vegetation formation, shrub savanna, in some cases degraded by grazing or shifting cultivation. According to the map, it still covers approximately half of the Eastern Province (MINIRENA-RNRA, 2012).

Exhibit 6. Savanna Grassland, Akagera National Park

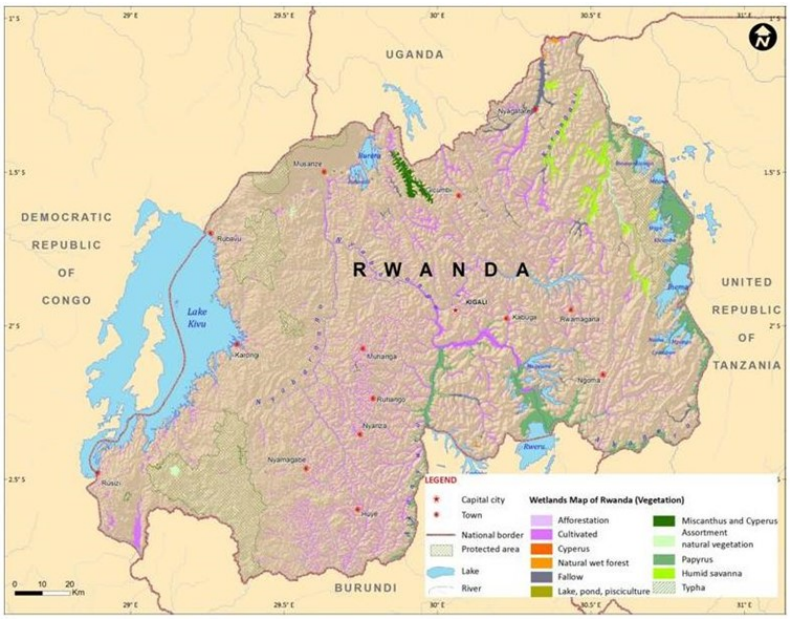
Other Remnant Forests

Many small unprotected forest fragments are found across the country. Most are gallery forests—riparian forest belts along rivers or wetlands. The *Fifth National Report to the CBD* (Republic of Rwanda, 2014a) provides brief status reports on 16 of these forest fragments.

2.2.2 WETLAND AND AQUATIC ECOSYSTEMS

As is true for forests, statistics for the area of wetlands in Rwanda vary widely. The most recent inventory of wetlands was conducted in 2008 by REMA through the Integrated Management of Critical Ecosystems (IMCE) project funded by GEF and World Bank. Based on this inventory, REMA states the following: "A recent inventory of marshlands in Rwanda conducted in 2008 [identified] marshlands, covering a total surface of 278,536 ha, which corresponds to 10.6 per cent of the country surface, 101 lakes covering 149,487 ha, and 861 rivers totaling 6462 km in length" (REMA, 2009b). However, the data from the 2012 land cover assessment by MINIRENA-RNRA provided in Exhibit 3 shows that only about 2.9 percent of the country is covered by wetlands. Sometimes, two dramatically different values for wetland coverage are given even within the same report, for example: "Wetlands (large permanent swamps) and marshlands (seasonal grass swamps, marais) occupy about 10 percent of the country …" (USAID, 2008, p. 5), and "approximately 8 percent of the entire country (210,000 ha) is covered by water: lakes occupy about 128,000 ha, rivers about 7,300 ha, and water in wetlands and valleys accounts for about 77,000 ha" (USAID, 2008, p. 32).

Exhibit 7. Wetlands of Rwanda



The biggest marshlands are associated with and clustered around the rivers. Rugezi and Kamiranzovu are high-altitude wetlands, but most of the others are at lower elevations along major rivers—the Nyabarongo, Akanyaru, and Akagera rivers. Rwanda's wetlands are important as buffers in flood or overflow plains. They reduce maximal flow rates during the rainy season and maintain a relatively high flow rate during the dry season. The 2008 national wetland inventory showed that 41 percent of the inventoried marshlands still maintained natural vegetation, 53 percent had been converted to agriculture, and about six percent had been cleared but were then fallowed and not being actively cropped.

Rugezi Wetlands
The Rugezi Wetlands is a unique high-elevation wetland located in Northern Province, to the east of Lakes Burera and Ruhondo. It has an area of around 6,300 hectares, and fills an uplifted valley perched at an elevation of around 2,050 meters above Lake Burera. The emergent vegetation of the swamp forms a dense mat over floating peat and its deeper waters (Hategekimana and Twarabamenye, 2007).

Rugezi is an internationally important site, despite its rather low diversity, with only 94 species of vascular plants comprising two Albertine Rift Endemic species, 16 species of amphibians comprising two Albertine Rift Endemic species, three species of reptiles, 37 species of birds with one Albertine Rift Endemic species (*Bradypterus graueri*), and two species of mammals. It represents the world's largest population of Grauer's swamp-warbler (*Bradypterus graueri*). Furthermore, it harbors a possibly endemic and undescribed frog, *Phrynobatrachus sp.,* discovered there (Fischer et al., 2011).

Akagera Wetland Complex
The Akagera Wetland Complex constitutes part of the Akagera/Nyabarongo system and its lakes. It is situated south of Akagera National Park, and represents an important extension of its swamp's flora and fauna. The complex harbors a rich and important biodiversity, composed of 77 species of vascular plants, 11 species of mammals, 17 species of amphibians, 13 species of reptiles, and 54 species of birds, representing the highest diversity recorded within all wetlands studied to date (Fischer et al., 2011).

Exhibit 8. Papyrus Swamp Near Lake Mugesera

Rweru-Mugesera Wetland Complex
The Rweru-Mugesera wetland complex is located in Eastern Province, south of Rwamagana. It consists of papyrus swamps and lacustrine and riverine wetlands between Lake Rweru and Lake Mugesera, including Lake Sake, Lake Rumiri, and Lake Gashanga, and the floodplain of the Akagera River. A 2011 biodiversity inventory of key wetlands found 53 species of vascular plants, 14 species of amphibians, six species of reptiles, 40 species of birds, and 16 species of mammals here. A large population of the papyrus gonolek, *Laniarius mufumbiri*, also lives in the swamp (Fischer et al., 2011).

Local community members living next to parts of the Rweru-Mugesera wetland complex report groups of swamp-dwelling monkeys that have not yet been identified as to species, and may represent either an unusual behavioral adaptation of a known primate species, a genetically differentiated subpopulation of a known species, or even potentially a new species.

Lakes
Rwanda's many lakes exhibit a range of ecological conditions and levels of biodiversity. Lake Kivu is a stratified lake with relatively low productivity, and its lower layers contain large volumes of dissolved carbon dioxide and methane. Compared to some other Rift Valley lakes like Victoria, Tanganyika, and Malawi, Lake Kivu supports only low fish diversity. The lake's fossil record shows periodic faunal extinctions that may have resulted from limnic eruptions of the trapped methane and CO_2, which could have killed many aquatic species (Briggs and Booth, 2012). The geological history and physical isolation of the lake may also help to explain its relatively low biodiversity. Lakes Burera and Ruhondo in Northern Province are relatively deep, with low levels of nutrients and productivity, and like Lake Kivu have relatively low aquatic biodiversity. The shallow lakes found with the large wetland complexes of Akagera, Rweru-

Mugesera, and Nyabarongo are high in nutrients and highly productive, supporting relatively high levels of species.

2.3 SPECIES

Because of its location in the tropics, the high productivity of its forest and wetland ecosystems, and its biogeographical position at the Congo-Nile divide, Rwanda has extremely high levels of biodiversity. This diversity of species is found in the natural ecosystems, which, to a great extent, only remain within protected areas. As the *Fifth National Report to the CBD* states, therefore, "the status and trend of biodiversity in Rwanda vary from one ecosystem to another. However, the biodiversity is well conserved and protected within protected areas, whilst out of them, the biodiversity is highly threatened mainly due to human activities" (Republic of Rwanda, 2014a). The report proceeds to describe species diversity and population trends of key species for the five terrestrial protected areas, major wetlands complexes, Lake Kivu islands, and a long list of forest fragments still found outside of the protected area system.

In total, Rwanda has 2,150 species of plants; 151 mammal species, including 16 primates; and 670 different birds (Republic of Rwanda, 2014a). The ETOA conducted for USAID/Rwanda in 2008 provides annexes with the International Union for the Conservation of Nature (IUCN) Red List of Threatened and Endangered Species found in Rwanda, and Rwandan species on the Convention on International Trade in Endangered Species (CITES) Appendices I and II.

Exhibit 9. Golden Monkey, Volcanoes National Park

Rwanda's biogeography gives it a rich mix of species from the Guineo-Congolian forests to the west in the Congo Basin and Sudanian savanna species. Because of its mountainous topography and location at the Congo-Nile crest, climate changes through the millennia have caused the ranges of moist forest and dry savanna species to shrink and expand, causing periodic isolation of populations in "islands" of suitable habitat. This has led to the evolution of a large number of unique species whose ranges are restricted to the Albertine Rift crest, called Albertine Rift Endemics (AREs). The eastern mountain gorilla (*Gorilla beringei*), golden monkey (*Cercopithecus kandti*), L'Hoest's monkey (*Cercopithecus l'hoesti*), the Ruwenzori colobus (*Colobus angolensis ruwenzori*), and Grauer's swamp-warbler (*Bradypterus graueri*) are among the dozens of AREs found in Rwanda.

2.4 AGRO-BIODIVERSITY

Agricultural biodiversity, or "agro-biodiversity," can be defined as the diversity of cultivated and livestock species and their genetically distinct varieties (as well as wild and semi-domesticated food and medicinal plants). Agricultural crop production in Rwanda can be grouped in three categories: food crops (legumes, cereals, roots and tubers, bananas), the traditional cash crops (coffee, tea, pyrethrum), and the new cash or export crops (fruits and vegetables, flowers, spices, etc.). Food crops occupy by far the largest share of the cultivated land and hold a dominant position in Rwandan agriculture. Beans and bananas are by far the principal crops in terms of area planted by farmers, followed by sorghum and Irish potatoes, and then sweet potatoes, cassava, and maize, in that order. The importance of each crop varies by region. Some crops—like bananas, potatoes, and different varieties of wheat, sorghums, and beans—are subject to high commercial trade. Potatoes, beans, cassava, and bananas are present everywhere for the daily diet of the people. The principal agricultural exports are, in order of importance: coffee, tea, hides and skins, and pyrethrum. Coffee and tea have growing international markets, but for the other export products, the

main markets are regional. In fact, as of 2005, only nine percent of exports went to Europe while 41 percent were destined for Kenya and 27 percent for Uganda. Congo and Tanzania represent other significant markets.

A number of traditional crop species are currently cultivated at low levels in Rwanda. These include taro (*Colocasia esculenta*), yam (*Dioscorea quadrata*), pigeon pea (*Cajanus cajan*), finger potato (*Plectranthus esculenta*), and traditional vegetables including woolly nightshade (*Solanum villosum*), isogi (*Cleome gynandra*), isogo (*Solanum nigrum*), imbogeri (*Amaranthus spinosus*), cow pea (*Vigna unguiculata*), and finger millet (*Eleusine corocana*). The replacement of local varieties by improved or exotic varieties and species is the main cause of genetic erosion in agro-biodiversity. In order to conserve the genetic diversity found in traditional crops and varieties, the GoR has invested in a state-of-the-art gene bank facility located at Rubona Research Station (Southern Agriculture Zone Division). This facility will bring Rwanda into compliance with the Nagoya Protocol to the Convention on Biological Diversity (CBD), on access to genetic resources and the fair and equitable sharing of benefits arising from their utilization, as well as requirements of the International Treaty on Plant Genetic Resources for Food and Agriculture.

2.5 PROTECTED AREAS AND CONSERVATION PRIORITIES

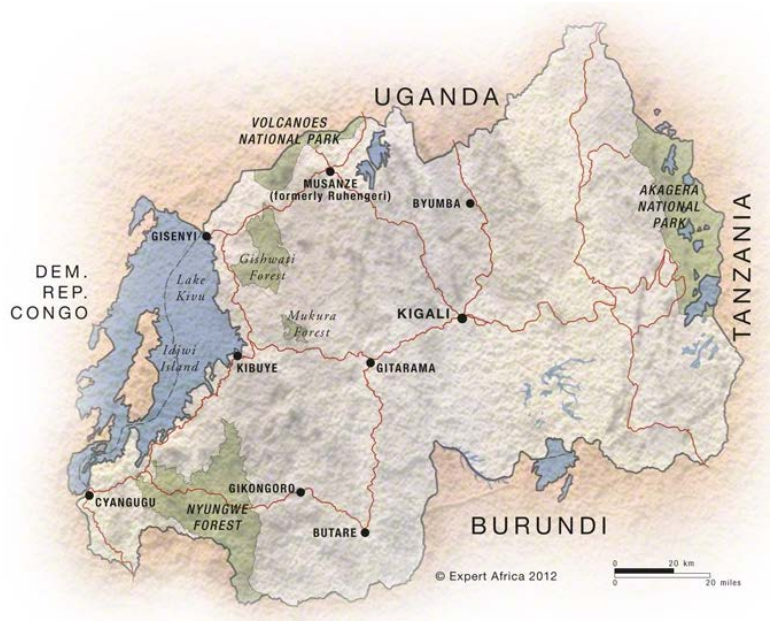
Rwanda's protected areas are the main mechanism for conserving its natural ecosystems and their species with an agriculture-dominated landscape. The responsible authority for the management of the country's three national parks is the Rwanda Development Board; for its two forest reserves, the Rwanda Natural Resource Management Authority, under the Ministry of Natural Resources (MINIRENA). Rwanda's five protected areas are:

- Akagera National Park, established in 1934, with an area of approximately 1,200 km² in eastern Rwanda;
- Nyungwe National Park, established in 2004, with an area of approximately 970 km² in southwest Rwanda;
- Volcanoes National Park, first gazetted in 1925, with an area of 160 km², in northwest Rwanda;
- Gishwati Forest Reserve (recently designated as a national park), with a current area of approximately 15 km² (Inzirayineza, 2014), in Western Province; and
- Mukura Forest Reserve, with an area of about 12 km², in Western Province.

These five areas cover approximately 8.9 percent of the country. A brief summary of each follows.

On Wednesday, October 15, 2014, a Cabinet meeting chaired by His Excellency the President of the Republic Paul Kagame approved the Draft Law establishing the Gishwati-Mukura National Park. Therefore, the two small forest reserves may soon together form Rwanda's fourth national park.

Exhibit 10. Protected Areas of Rwanda



AKAGERA NATIONAL PARK

Akagera National Park covers an area of about 108,500 hectares and is situated in the Eastern Province. It includes savanna ecosystem and riparian gallery forest, and lakes and wetlands along the Akagera River, which forms the border with Tanzania. The park's ecosystems support more than 900 species of plants, 530 species of birds, 90 mammals, nine species of amphibians, and 23 species of reptiles. Most lakes of the Akagera National Park are very rich in biodiversity with phytoplankton, fish species, and ornithological fauna. Wetlands are dominated by the papyrus *Cyperus papyrus*. The introduced invasive water hyacinth (*Eichornia crassipes*) is present and has started spreading, posing a threat to the native biodiversity in some lakes. Akagera supports large populations of hippopotamus and crocodile, and has buffalos, elephants, and lions. Masai giraffe were introduced to the park in the 1980s, although they are not thought to be native to the area. Eleven species of antelope are found in the park, including topi and roan antelope, and the semi-aquatic sitatunga. The marshlands of the park are breeding habitat for the shoebill stork.

NYUNGWE NATIONAL PARK

Nyungwe National Park is located in the southwest of Rwanda along the Congo-Nile divide. The park covers a total area of 1,019 km², and is contiguous with the Kibira National Park across the international border in Burundi. The two parks together form the "Nyungwe-Kibira transboundary landscape," which represents one of the largest blocks of lower montane forest in Africa. The park includes Cyamudongo and Gisakura forests, two isolated forest patches southwest of the main park.

As with other Albertine Rift forests, Nyungwe is a rich center of biodiversity. More than 1,050 plant species have been recorded, including 200 orchids and 250 Albertine Rift Endemic (ARE) species. At least 120 butterfly species are known, with 21 AREs. Nyungwe is one of the most important sites for bird conservation in Africa with around 300 species, 27 of which are AREs. There are 96 mammal species, including 13 primates, two of which are AREs: L'Hoest's monkey (*Cercopithecus lhoesti*) and the Ruwenzori colobus (*Colobus angolensis ruwenzori*).

VOLCANOES NATIONAL PARK

Volcanoes National Park is in northwestern Rwanda bordering the DRC and Uganda. The park covers approximately 160 km² and is contiguous with the Virunga National Park in the DRC, and Mgahinga Gorilla National Park in Uganda. Volcanoes National Park became a Biosphere Reserve under the United Nations Educational, Scientific and Cultural Organization (UNESCO) Man and Biosphere Program in 1983.

Exhibit 11. Gishwati Forest Area in 1970 and 2005

Source: Inzirayineza, 2014

The park, and its transboundary neighbor parks, are famous worldwide because of habituated groups of mountain gorilla (*Gorilla gorilla beringei*) that can easily be visited by tourists. In 2010, a gorilla census counted 464 individuals, and estimated that the total gorilla population was around 480 (Gray et al., 2010). The census showed that the population of gorillas in the Virungas has grown since a census in 1971, which counted 261 individuals and estimated a population of 274.

GISHWATI FOREST RESERVE

Gishwati Forest Reserve is located in Western Province, perched above Lake Kivu, into which its watershed drains through the Sebeya River and its main tributary, the Pfunda River. In 1970, the forest protected in the reserve had an area of 28,000 hectares; it was gradually degraded and reduced in size, but that process accelerated rapidly after 1994 with the return and settlement of refugees after the Genocide, and by 2005 the forest area was estimated at 600 hectares. The forest supports an isolated population of chimpanzees, thought to number between 19 and 29 (Chancellor et al., 2012), as well as golden monkeys and L'Hoest's monkeys. More than 130 species of birds are found in Gishwati, including 14 AREs. Two birds found in Gishwati are listed as vulnerable on 2009 *IUCN Red List*, the martial eagle (*Polemaetus bellicosus*) and grey crowned crane (*Balearica regulorum*).

Because of its high conservation value, a process of forest expansion and restoration began in 2005 under the Gishwati Area Conservation Program, with funding from the Great Ape Trust of Des Moines, Iowa. An initial expansion of 286 hectares was made by 2007, and more protected land was added in 2008 and 2009, when the intact and restoration forest area was up to 1,484 hectares. Since 2012, the Forest of Hope Association (FHA) has been the sole NGO working to engage local communities in conservation of the Gishwati Forest Reserve. In August 2014, FHA received a grant from the Critical Ecosystem Partnership Fund (CEPF) that will strengthen the conservation of the forest by developing a five-year management plan, and establishing Community Forest Protection Initiative Committees. The community committees will be trained in environmental, forest, and mining laws, as well as how to document and report violations of those laws (Inzirayineza, 2014).

MUKURA FOREST RESERVE

Mukura, a highland forest located in the Western Province, extends between Rutsiro (Mukura and Rusebeya sectors) and Ngororero (Ndaro and Bwira sectors) districts, at an elevation value ranging between 2,300 to 2,700 meters. Mukura Forest Reserve was established in 1951 with a total area of 2,000 hectares, but has now been reduced by encroachment of agriculture to about 1,200 hectares. The remaining patch of Mukura forest hosts an interesting biodiversity, including a total of 243 plant species (Republic of Rwanda, 2014a).

Exhibit 12. Illegal Coltan Mine on the Edge of the Mukura Forest Reserve

RAMSAR SITES

Rwanda ratified the Convention on Wetlands of International Importance, the so-called Ramsar Convention, in 2003. It has registered the Rugezi Wetland as a national Ramsar site, and identified other potential sites that will be registered in the future, such as the Rweru-Mugesera wetlands complex, Kamiranzovu Marsh in Nyungwe National Park, and the Akagera Marshes in and around Akagera National Park. Although these wetlands are not considered part of the national protected areas system *per se*, they do fall under various forms of legal protection, as is discussed in Section 5, which covers policy, legal, and institutional issues.

3. VALUES AND ECONOMICS OF BIODIVERSITY

Biological diversity provides social and economic benefits of three distinct kinds: ecosystem products, ecosystem services, and nonmaterial benefits (USAID, 2005a; 2014; Byers, 2012). This section will highlight the most important of these benefits in Rwanda.

Rwanda's recently updated *National Biodiversity Strategy and Action Plan* (NBSAP) (Republic of Rwanda, 2014b) includes a strong discussion of "Values of Biodiversity and Ecosystem Services in the Country and Their Contribution to Human Well-Being," which concludes:

> Actually, in our country, while there is now a good understanding of the linkages between biodiversity, ecosystem services and human well-being, the value of biodiversity is still not reflected in broader policies and incentive structures. In fact, little is still known about the economic cost of biodiversity loss as well as the benefits associated with its utilization and ecosystem services. Until now, many of the benefits associated with biodiversity use have no price, or are undervalued in the market. Thus, without accurate baseline data, it is actually very difficult to conduct an environmental economic analysis.

Exhibit 13. Rwandan Currency Features Its Charismatic Primates

3.1 ECOSYSTEM PRODUCTS

Ecosystem products are direct material benefits derived from species harvested for such things as food, fiber, fuel, building materials, and medicines.

A very interesting attempt to quantify the values of ecosystem benefits was a recent Total Economic Valuation study of the Mukura Forest landscape conducted by Albertine Rift Conservation Society (ARCOS) (ARCOS, 2014). It involved participants from local communities and district-level government offices. The study estimated the values of various ecosystem products, services, and nonmaterial benefits using a questionnaire. It concluded that

> Mukura Forest contributes a lot to the livelihoods of the local communities and in form of ecosystem services that benefit other people beyond the landscape such as water catchment protection and carbon storage and sequestration. The Total Economic Value (TEV) of Mukura Forest was estimated at a total of FRW 981,266,600 equivalent to US$1,443,039. The monetary benefits from Mukura translate in a value of US$803 per hectare per year, a value comparable to most productive forest landscapes.
>
> Notable among the key benefits valued from Mukura Forest was water, which is used for domestic purposes and for livestock watering, and contributes a total of up to FRW477,469,000 (US$702,160). The high value of such a resource is enough justification for investment in the management and conservation of Mukura Forest. Other important resources valued that have very significant importance are wild fruits, vegetables, and mushrooms that do not only contribute to cash income for some communities, but also contribute a lot to food and nutrition security for the local communities.

Exhibit 14 shows a breakdown of some of these benefits. The only questionable estimate is that of the nonmaterial benefit of "aesthetic value/tourism," which was developed using a contingent valuation

methodology, asking respondents "how much would they be willing to pay for …" the benefit. There is no tourism in Mukura now, so estimates based on market prices were not possible. The latter are generally much more credible than those based on contingent valuation.

Exhibit 14. Ecosystem Benefits Valuation for Mukura Forest Reserve (Source: ARCOS, 2014)

Ecosystem Products	Value (US$ estimate)
Firewood	$103,500
Timber	$25,700
Poles for fencing	$16,700
Bean stakes	$12,600
Bushmeat	$9,300
Honey	$9,000
Wild fruits	$8,400
Medicinal plants	$7,600
Ropes and fibers	$4,400
Mushrooms	$3,300
Ecosystem Services	
Water for domestic uses	$576,800
Water for livestock	$125,400
Carbon sequestration	$39,600
Nonmaterial Benefits	
Aesthetic value/Tourism	($647,300)

3.2 ECOSYSTEM SERVICES

Ecosystem services are best defined as the benefits to humans that result from ecosystem functions and processes, such as:

- major biogeochemical and nutrient cycles (e.g., of water, carbon, nitrogen, phosphorus);
- natural pest control by predators in food webs;
- pollination by insects, bats, and birds;
- decomposition of biomass, wastes, and pollution;
- soil formation, retention, erosion prevention, and maintenance of soil fertility; and
- climate regulation.

Biodiversity is the source of all ecosystem services, not an ecosystem service itself, despite much confusion in the literature (Byers, 2012). The diverse species in a given environment interact with each other and the physical environment to create the ecosystem functions and processes listed above. Because biodiversity is the source of ecosystem services, biodiversity conservation is a fundamental requirement for conserving ecosystem services. The role of species diversity in maintaining ecological processes and functions is not well understood scientifically, and is an active topic of scientific research. However, studies often show a positive relationship between the number of species in an ecosystem and the level and stability of ecological processes.

3.2.1 HYDROLOGICAL SERVICES FROM FORESTS

The value of eco-hydrological services from forested watersheds is often very high, as seen in the results from Mukura Forest given in Exhibit 14 above. In a valuation study of Nyungwe National Park (Masozera, 2008), the value of forest ecosystem services for "watershed protection" was estimated to be about US$118 million per year, or about US$1,100 per hectare for the 97,000-hectare park.

3.2.2 ECOSYSTEM SERVICES FOR EROSION CONTROL AND NUTRIENT RETENTION

The recent *National Biodiversity Strategy and Action Plan* update (Republic of Rwanda, 2014b) recognizes the role of ecosystem services to agriculture, stating: "It is a fact, national biodiversity and ecosystem services

have a clear link to supporting our agricultural sector (e.g. water for irrigation, clean water for consummation, soil and pollination services, etc.)."

Almost 50 percent of the agricultural land in Rwanda shows signs of soil erosion, indicating a reduction in agricultural capacity, and one study showed that Rwanda has one of the most severe nutrient depletion rates in Africa (Andrew and Masozera, 2010). An old report from the National Agricultural Commission of Rwanda (CAN, 1991) had already recognized the importance of forest ecosystem services for agriculture, noting the following:

> Forests indirectly support agriculture through the provision of ecological services. The current deficit of wood in the country is affecting agricultural production. The degradation of soil fertility is partly the consequence of fuel wood shortage in rural areas leading farmers to use crop residues as fuel instead of as organic manure. Studies have pointed out that this practice takes 1.7 ha of organic manure per hectare per year. Losses of fertility resulting from such practices at national level are equivalent to 40,000 tonnes of fertilizers and 33,000 of lime.

A recent report from the International Fertilizer Development Center, commissioned by USAID for the Feed the Future Program (IFDC, 2014), also found that

> Results from the estimation indicate that Rwanda must increase its consumption of fertilizer more than four-fold, from the current annual level of 35,000 metric tons (mt) of fertilizer products to 144,000 mt, to meet the agriculture sector growth targets. This increase is expected to strain the capacity of the current value chain.

3.3 NONMATERIAL BENEFITS

Besides providing direct material benefits to humans in the form of ecosystem products, and indirect material benefits in terms of ecosystem services, natural ecosystems and species also provide a range of nonmaterial benefits that are important to human well-being and development. These include historical, cultural, spiritual, recreational, educational, and scientific benefits (Byers, 2012; USAID, 2005a; USAID, 2014). Some examples from Rwanda are summarized below.

3.3.1 NATURE-BASED TOURISM

The *National Biodiversity Strategy and Action Plan* update (Republic of Rwanda, 2014b) informs us that "tourism is one of the fastest growing sectors in Rwanda and has shown significant potential for future growth. Tourism receipts reached US$282 million in 2012 and is estimated to have generated US$293.6 million in 2013." It also says that a national household survey conducted in 2010 and 2011 estimated the number of employees in the tourism sector at 23,000, with many more sectors indirectly benefiting from tourism, including restaurants, transportation services, and retail trade. Tourism has been identified as a priority sector to achieve the country's development goals as set out in Vision 2020. Rwanda has made significant progress in developing and managing its tourism sector in recent years, with tourism revenues increasing from US$26 million in 2005 to US$280 million in 2011.

The Rwanda Development Board (RDB) Revenue Sharing Programme aims to ensure sustainable conservation by contributing to the improvement of community living conditions in the sectors directly adjacent to national park boundaries. Five percent of the tourism fees collected by RDB are allocated to community projects such as schools, health centers, water supply, beekeeping programs, and community-based tourism activities.

A Community Partnership Programme was developed around the three national parks to ensure that neighboring communities benefit from the park and are empowered to achieve sustainable livelihoods through resource use practices beneficial to both the park and the communities themselves. One example of benefits to communities neighboring Nyungwe National Park is the network of 16 cooperatives of

beekeepers, which in 2012 generated sales of 18,000,000 Rwanda Francs. Furthermore, under the Rwandan Concession Policy adopted in 2013, communities living around parks can develop facilities and services under a concession, where they can develop handicrafts, cultural tourism, lodging, and other enterprises. A tourism value chain analysis for Nyungwe National Park conducted in 2012 provides a detailed look at the status and opportunities in that park (DAI, 2012).

Rwandan tourism is mainly based on visits to national parks, and gorilla tourism in Volcanoes National Park is the leading attraction, making Rwanda a world-class, iconic destination. However, Rwanda has many other under-visited attractions to offer nature tourists. The rich biodiversity of Rwanda, including its diverse bird life, provides an opportunity for the expansion of the tourism sector.

3.3.2 CULTURAL AND SPIRITUAL BENEFITS

Some ecosystems in Rwanda have been preserved by local communities because of their cultural or spiritual significance. For example, Buhanga Forest is a small sacred forest located in the Musanze District, Northern Province, which played an important role in ancient Rwanda. Inside the forest, there is a spring called "Iriba rya Gihanga"—every Rwandan king had to bathe in it before his coronation. According to locals, every king, from the first, Gihanga, to the last, Kigeli Ndahindurwa, has bathed in the spring. For hundreds of years, local residents have protected the area around the spring from agriculture and tree-cutting.

Moreover, Rwanda has 20 clans, each with an associated totem, most of which are animals and plants. In the case of animals, the totem has been interpreted as sacred and symbiotically linked to the clan historically, physically, and spiritually. These animals are revered by clan members because of the belief that they represent the soul and the spirit of their progenitor. The totems for these clans are: Abanyiginya/Abasindi/Abatsobe (crested crane), Abagesera (wagtail), Abasinga (black kite), Abungura (robin), Abahinda (squirrel), Abahondogo (tick-eater bird), Abasita (jackal), Abashambo (lion), Abarihira (chameleon), Abongera (deer), Abega/Abakono (frog), Abacyaba/Ababanda (hyena), and Abazigaba/Abenengwe (leopard).

3.4 LINKAGES BETWEEN ENVIRONMENT AND HEALTH

The World Health Organization emphasizes that good human health depends upon ecosystem products and services, such as availability of food, fuel, clean water, and air, among others. "Ecosystem goods and services affect positively human health promotion, diseases prevention and cost of public health management" (Republic of Rwanda, 2014b). In this section, we review some of the evidence for the health benefits of some of these ecosystem products and services.

3.4.1 FORESTS, WATER, AND HEALTH

Access to clean water for drinking and sanitation is clearly linked to the conservation of natural forests and wetlands. In Malawi, a recent study showed a correlation between nearby forest cover and children's health and nutrition (Johnson et al., 2013). Using satellite imagery of forest cover and combining that with data from the *Malawi Demographic and Health Survey*, the study showed that the closer a community was to a forested area, the lower the risk of diarrheal diseases, probably because those communities closer to forests had better access to clean water from forested watersheds. The study also found that "… net forest cover loss over time is associated with reduced dietary diversity and consumption of vitamin A-rich foods among children." The valuation study in Mukura Forest in Rwanda (see Exhibit 14) indicates the importance of wild fruits gathered in the forest to the local community, and it would be expected that these wild fruits would provide vitamins and other nutrients to local children and adults. The Malawi study concluded that "these preliminary findings suggest that protection of natural ecosystems could play an important role in improving health outcomes."

An Africa-wide study of forests and nutrition (Ickowitz et al., 2014) reached a similar conclusion:

If improving nutrition is viewed as central to achieving food security, then the results presented here suggest that landscapes that incorporate substantial tree cover may themselves be important for food security. While much of the concern voiced by scientists decrying the expansion of agriculture into forests centers around loss of biodiversity, our study suggests that deforestation might also have a long-term negative impact on nutrition. Recent evidence that between 1980 and 2000, 95 percent of new land cleared for agriculture in Africa came from land that had previously been covered by forests suggests that further research into better understanding the reasons for the association that we find between tree cover and nutrition is imperative.

Exhibit 15. Broken Water Tap in Community, Cyamudongo Forest

There is a significant overlap between the distribution of the majority of important vectors of human diseases and tropical rain forest ecosystems (Wilson et al., 2002). The degradation of forests for agriculture, mining, and other development projects influences the epidemiology of human parasites. Consequently, changes in land use and expansion of human settlements have created conducive environments for breeding sites of major vectors, and upsurge of diseases such as malaria, lymphatic filariasis, onchocerciasis, and arbovirus diseases.

Most emerging diseases are driven by human activities or climate change, which modify the natural environment or otherwise spread pathogens into new ecological niches (Taylor, 2001). Examples of direct drivers that affect diseases risks include destruction of wildlife habitat through deforestation, conversion of wetlands for agricultural or other purposes, and changes in the distribution and availability of surface water caused by construction of dams or irrigation systems. The management and development of water resources have caused qualitative and quantitative changes in interactions between humans and disease vectors and parasites. Many examples of waterborne diseases illustrate this, including malaria, schistosomiasis, and trypanosomiasis. A study linked the abnormal increase in malaria in Rwanda in the 1980s with the deforestation and reclamation of natural wetlands for agriculture, and the resettlement of people in valleys (Loevinsohn, 1994).

3.4.2 BIODIVERSITY AND TRADITIONAL MEDICINE

The study of ecosystem benefits from the Mukura Forest showed that local people obtain significant benefits from medicinal plants from the forest. Traditional medicine depends on wild plant biodiversity throughout the country. The 2008 USAID/Rwanda ETOA recognized the link between biodiversity conservation and medicine, stating that "from a biodiversity point of view, the most important gallery forest is Ibanda-Makera in the southeastern part of the country. It contains a number of rare endemic plant species, including *Blighia unijugata*, *Grewia forbesi*, *Rhus vulgaris*, and *Ficus spp*. Many of these species are used in traditional medicine, and there is interest in researching their qualities for biochemical extracts

and modern medicine. Commercial exploitation of these species may have negative consequences on Rwanda's remaining gallery forests if no safeguards are put in place" (USAID, 2008).

3.4.3 ANIMAL-HUMAN DISEASE TRANSMISSION

In Rwanda's three national parks, Akagera, Nyungwe, and Volcanoes, human communities and their livestock often interact with wildlife inside or outside the parks. Diseases that can be transmitted among wild animals, livestock, and humans—called zoonotic diseases—are important health issues at this interface. Diseases such trypanosomiasis, tuberculosis, foot-and-mouth disease, anthrax, and rabies are a high priority in these areas (Kock, 2004).

A related concern is that of human disease transmission to gorillas and chimpanzees. Human demographic pressure and gorilla and chimpanzee ecotourism have gradually increased the contact between these closely related species. In Volcanoes National Park, close contact between gorillas and humans also occurs when gorillas are caught in snares and have to be freed and/or treated by veterinarians. Contagious human diseases, such as respiratory infections, could be shared between humans and gorillas or chimpanzees. Monitoring of these diseases by veterinary teams is very important. Intestinal worms are another problem of concern. To prevent such disease transmission, a regular medical checkup is given to all employees working in Volcanoes National Park (porters, truckers, guides, and research teams) by the Mountain Gorilla Veterinary Program and the RDB.

4. THREATS TO BIODIVERSITY AND ENVIRONMENT IN RWANDA

In this ETOA, we have used the "threats-based approach" to biodiversity conservation that guides USAID's biodiversity programming as the conceptual framework for our analysis (USAID, 2005a; USAID, 2014). We first identified the direct, biophysical threats to the environment, biodiversity, and forests in Rwanda, and categorized them according to the following five main types of direct threats to biodiversity recognized by conservation biologists:

- Conversion, loss, degradation, and fragmentation of natural habitats;
- Overharvesting or overexploitation of particular species;
- Pollution or contamination that harms natural habitats or species;
- Introduced non-native species that harm native habitats or species; and
- Macro-environmental change, such as climate change.

Climate change is a potential threat of unknown magnitude, which may accentuate other direct threats already discussed above, especially habitat loss, degradation, and fragmentation, and the threat from invasive species. In some ways, it falls into a gray area between cause and threat, being itself a cause of some of the other direct biophysical threats to ecosystems and species.

We then describe the main causes or "drivers" of those direct threats. Causes can generally be described as one of three types: (1) Social (related to, for example, cultural beliefs, lack of awareness, information, science, or technology); (2) political, institutional, or governance-related; and (3) economic.

Using this logical framework, once the causes of direct threats have been identified, the actions needed to address, reduce, and/or remove them can be determined (USAID, 2005b).

Exhibit 16 (below) summarizes the perceptions of our large and diverse group of key informants about the main direct biophysical threats and their main causes, as revealed by content analysis of our interview notes. In some cases, many informants listed the same or similar threats, such as "forest degradation from tree cutting" or "fires started by honey collectors." We analyzed these responses and identified common categories of perceived threats. The largest category, by far, was the loss and/or degradation of forest ecosystems (29/50 responses, 58 percent), mainly from three activities:

1. Degradation from overharvesting of wood and bamboo for fuel, construction, and other livelihood uses (10/50 responses, 20 percent)
2. Fires started by honey collectors (7/50 responses, 14 percent)
3. Clearing and conversion to agriculture (4/50 responses, 8 percent)

We noted three instances of loss and degradation of wetlands due to draining for agriculture or other purposes.

The second-largest category of perceived threats was "poaching," mentioned eight times by our informants who generally described this as for local subsistence food, not a commercial market, and some indicated that although it was illegal, it was not clear that it really had a large negative impact on wildlife populations. The third-largest category of direct threats, mentioned five times, was pollution or contamination, mainly from mining activities.

In terms of the causes or "drivers" of these threatening activities, the overwhelming perception was that they result from Rwanda's high population and the demand it places on land and scarce natural resources like wood and water, when other livelihood and economic alternatives are lacking. Weak governance was mentioned only once as a "driver" of environmental threats, although as discussed later in Section 7, the most common category of perceived "actions needed" was the strengthening of environmental governance.

Although it is sometimes stated that population growth is a threat to biodiversity and forests, this claim is not technically correct. Population growth is not a direct cause of these biophysical threats, although it acts as a "root cause" or "driver" underlying other social, political, and economic causes of direct threats to biodiversity. If it is not addressed and the population not ultimately stabilized, actions necessary to address the social, political, and economic causes of threats to biodiversity will be all the more difficult to carry out. Rwanda's *Fifth National Report to the CBD* (Republic of Rwanda, 2014a) provides a list of quite specific and often localized threats to biodiversity and forests.

Exhibit 16. Threats and Causes from Content Analysis of Key Informant Interviews (total N = 50)

Threats by Category	Causes/Drivers
Habitat loss/degradation N = 29 • Forest loss from clearing for agriculture (4) • Tree cutting in forest for firewood, charcoal, timber (4) • Tree and bamboo cutting in forest for firewood, construction, timber, or bean trellises (3) • Cutting of vegetation by local people for livelihood uses • Firewood collection in protected areas • Wetland loss from mining peat for energy • Draining/drying of the wetland from channels cut to increase water flow for hydropower • Cultivation of drained wetland areas • Fires started by illegal honey harvesters (7) • Some bamboo cutting • Cattle grazing in forest • Illegal small-scale coltan mining in forest (2) • Akagera's new boundary does not allow the natural seasonal migration of big animals from the eastern lakes section to the Central Valley, which was removed from the original park • Infrastructure development—dams, roads	Demographic pressure (N = 7) Lack of economic options (N = 7) Weak governance (N = 1) Climate change (N = 1) Transboundary issues (N = 1)
Overexploitation or Overharvesting of Particular Species N =8 • Poaching and illegal fishing • Collection of grey crowned crane eggs for food • Snaring/poaching for bushbuck, buffalo, bushpigs, or duiker (sometimes catches gorillas) (3) • Some poaching (but not a big threat) • Poaching for bushmeat and for market • Collection of medicinal plants	
Pollution N = 5 • Methane gas production from Lake Kivu • Mining (2) • Fertilizer use and leaching • Illegal small-scale mining of gold and coltan	
Invasive Species N = 1 • Water hyacinths in Akagera and other lakes	
Climate Change N= 2 • Climate change (2)	
Other N = 5 • Potential threat: transmission of human diseases to animals/ gorillas (2) • Monoculture agriculture • Loss of traditional crop varieties (i.e., agro-biodiversity) • Feral dogs that sometimes kill duikers, golden monkeys	

5. GOVERNMENT POLICIES, LAWS, AND INSTITUTIONS

5.1 STRATEGIES, POLICIES, AND LAWS

In general, the fundamental principles of environmental protection and management are stated in the constitution of the Republic of Rwanda, adopted by referendum on May 26, 2003. The environmental context is highlighted in Article 49, which states that "…every citizen is entitled to a healthy and satisfying environment. Every person has the duty to protect, safeguard and promote the environment. The State shall protect the environment. The law determines the modalities for protecting, safeguarding and promoting the environment."

The political and economic context affecting the environment is also described in national and sectorial development strategies, policies, plans, and laws, most of which have been reviewed and updated in the last 10 years. They currently form the most updated and comprehensive legal framework for environmental management in the Central African Region. They provide a sound basis for the sustainable development of the country and for a potential leadership role for Rwanda in the region. The sections below provide brief summaries of the following key documents and initiatives:

- *Vision 2020* (2000)
- *Economic Development and Poverty Reduction Strategy* (EDPRS) I & II (2013–2018)
- *Land Policy* (2004)
- *Environmental Policy* (2005)
- *National Forestry Policy* (2010)
- *National Policy for Water Resources Management* (2011)
- *National Climate Change and Low Carbon Development Strategy* (2011)
- *Rwanda Biodiversity Policy* (2011)
- *Protected Areas Concessions Management Policy* (2013)

5.1.1 VISION 2020

Vision 2020, adopted in the year 2000, envisions the transformation of Rwanda from a low- to a middle-income country, and natural resources and environment are identified as cross-cutting issues that will contribute to that transformation. The imbalance between population and natural resources has been recognized as a major problem for the sustainable environmental management. In order to avert the cultivation of unsuitable land and resulting soil loss, *Vision 2020* proposes to implement adequate land and water management techniques, and effective biodiversity conservation measures. The GoR's environmental programs are also aligned with the Millennium Development Goals (MDGs), especially MDG 1 and 7, respectively related to alleviating poverty and achieving environmental sustainability. Under these MDGs, the Government of Rwanda wants to increase the land area covered by forest, and increase access to clean water and sanitation.

Vision 2020 was divided into six complementary pillars and three cross-cutting areas. The pillars are:

1. Good Governance and Capable State
2. Human Resource Development and a Knowledge-Based Economy
3. A Private Sector-Led Economy
4. Infrastructure Development
5. Productive and Market-Oriented Agriculture
6. Regional and International Economic Integration

The three cross-cutting areas consist of (1) Gender Equality; (2) Protection of Environment and Sustainable Natural Resource Management; and (3) Science and Technology.

Vision 2020 has fed into most policies now in place, including the *Environmental Policy*, the *National Policy for Water Resources Management*, and the *Land Policy*. To implement *Vision 2020* and its pillars and cross-cutting areas, the GoR translated the *Vision* into medium-term programs of EDPRS I & II.

5.1.2 ECONOMIC DEVELOPMENT AND POVERTY REDUCTION STRATEGY (EDPRS)

The national medium-term strategy is guided by the EDPRS, focusing on poverty reduction and economic transformation. *EDPRS I* (2008–2012) recognized forestry as a strategic area. EDPRS II (2013–2017) has set a target to restore Gishwati and Mukura forests by 80 percent. The current EDPRS II sets a clear focus on pursuing environmentally sustainable development with two key strategic targets, biodiversity conservation and pollution control. The EDPRS is implemented through medium-term sector strategies that will inform provincial and district development plans.

The implementation of the strategy envisions active participation from decentralized entities, non-state stakeholders—particularly NGOs, faith-based organizations, and private sector organizations, including cooperatives. Some of the anticipated challenges of the participatory, decentralized implementation include the following:

- limited implementation of existing environmental policies, laws, strategies and guidelines, which undermines their effectiveness;
- limited "ownership" of environmental sustainability and climate change issues, particularly in the private commercial sector, which reduces the national ability to create a green economy;
- inadequate solid and liquid waste management, particularly in urban areas, which increases costs for public health; and
- limited productivity of agriculture, which undermines economic growth.

5.1.3 LAND POLICY

The *National Land Policy*, developed in 2004, resulted from *Vision 2020 r*ecommendations, in which land use management was seen as a fundamental tool in development. According to the policy, the overall objective "… is to establish a land tenure system that guarantees tenure security for all Rwandans and gives guidance to the necessary land reforms with a view to good management and rational use of national land resources."

The *Land Policy* and subsequent laws and orders have, to a large extent, solved the crucial problem of land ownership and land gender equity. The *Land Policy* also has a good provision for protecting natural ecosystems, wetlands, and marshlands. However, the issue of high population density leading to pressure on land, and the cultural practices of parceling of family agricultural land, remain of concern to the GoR and to Rwandan citizens.

5.1.4 ENVIRONMENTAL POLICY

Developed in 2005, the *Environmental Policy* has fed into several subsequent laws and ministerial orders. The overall objective of the *Environmental Policy* is the improvement of human well-being, the judicious use of natural resources, and the protection and rational management of ecosystems for sustainable and fair development. The *Environmental Policy* includes a comprehensive list of thematic subsectors.

Due to the strong advocacy of the Rwanda Environmental Management Authority (REMA), this policy has helped to prevent, or at least has limited, some negative impacts that would have occurred without it. However, the *Environmental Policy* faces tough challenges; for example, insufficient mechanisms for coordination among the institutions responsible for the diverse aspects of environmental management.

5.1.5 NATIONAL FORESTRY POLICY (2010)

The *National Forestry Policy* is a result of recommendations from *Vision 2020*, *EDPRS*, and the *Environment* and *Land* policies. Because of Rwanda's high population density, farming land per household is shrinking rapidly, leading to high competition for land between agriculture, forestry, and other uses. The overall

goal of the revised policy is to make the forestry sector an important contributor to the national economy and ecology, providing for sustainable benefits to all segments of society. The *National Forestry Policy* was developed after a review of the previous *Forestry Policy of 2004*.

In 2013, a new Forestry Law was put in place for determining the management and utilization of Rwanda's forests. The law specifies forest categories, and mandates forest management plans and management, and forest conservation and protection.

Although the recent *Forestry Policy* and Law have improved practices across the country, some difficult challenges remain in implementing the proposed objectives and actions.

5.1.6 NATIONAL POLICY FOR WATER RESOURCES MANAGEMENT (2011)

The *National Policy for the Water Resources Management* (2011) is a revised version of the *Water Resources Management Policy* formulated in 2004. The policy of 2004 was revised because of its inability to address conflicting challenges, including the pressures of rapid urbanization, changing demands for water uses, degradation of watersheds from unsustainable and inappropriate land use practices, and the uncertainties of climate change. The new 2011 policy aimed to address those challenges. According to the policy,

> The vision of the current Water Resources Management Policy is to have a water resources sub-sector governed by a policy, legal and institutional framework that promotes sustainable use of water resources and which contributes meaningfully to the socio-economic development of Rwanda.

This policy outlines some fundamental principles of water resources management in Rwanda, based upon international water resources management best practices that include the following:

- Water is a finite natural resource;
- Water is a fundamental human right;
- Water resources is an economic good;
- Water is a social good;
- Integrated management of water resources is key;
- Participatory water resources management is also key;
- Catchment-based water resources management is needed; and
- Benefits of international water resources must be equitably shared.

The earlier policy (2004) was the basis of the 2008 Water Law.

Over the last few years, based on this policy, the Government of Rwanda has been introducing reforms in the water sector that have significantly changed the context for water resources management. A stronger focus on, and better protection for, catchment areas, watersheds, marshlands, rivers, and lakes are still needed.

5.1.7 NATIONAL CLIMATE CHANGE AND LOW CARBON DEVELOPMENT STRATEGY (2011)

When Rwanda ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1995, the government committed to confronting the challenge of climate change. The *National Strategy on Climate Change and Low Carbon Development*, sometimes called the *Green Growth Strategy*, describes a vision for Rwanda to be a developed, climate-resilient, low-carbon economy by 2050. The strategy proposes to achieve the following:

- energy security and a low carbon energy supply that supports the development of green industry and services;

- sustainable land use and water resources management that results in food security, appropriate urban development, and preservation of biodiversity and ecosystem services; and
- social protection, improved health, and disaster risk reduction that reduces vulnerability to climate change

The Action Program of this strategy is ambitious, and faces many challenges in implementation.

5.1.8 BIODIVERSITY POLICY (2011)

The purpose of the *Biodiversity Policy* is to provide an overarching framework for the conservation, sustainable utilization, and access to biodiversity resources, and fair and equitable sharing of benefits derived from the resources.

The following eight objectives are stated in the *Biodiversity Policy*:

1. Conserving the diversity of landscapes, ecosystems, habitats, communities, populations, species, and genes in Rwanda;
2. Environmentally sound and sustainable development outside protected areas;
3. Controlling, eradicating, and preventing threats to biodiversity;
4. Integrating biodiversity considerations in other national and regional initiatives;
5. Using biological resources sustainably and avoiding or minimizing adverse impacts on biological diversity;
6. Expanding the human capacity to conserve biodiversity, to manage its use, and to address factors threatening it;
7. Ensuring that benefits derived from the use and development of Rwanda's genetic resources serve local community and national interests; and
8. Creating conditions and incentives that support the conservation and sustainable use of biodiversity.

In 2013, following this policy, a Biodiversity Law was issued for implementing the policy. The Biodiversity Law determines modalities for management and conservation of biological diversity within Rwanda. This includes a set of criteria for developing biodiversity strategies and management plans by government institutions and other stakeholders.

5.1.9 RWANDA PROTECTED AREAS CONCESSIONS MANAGEMENT POLICY (2013)

Taking into account the importance of the tourism sector, the GoR developed the *Rwanda Protected Areas Concessions Management Policy* in 2013. This policy, developed with assistance from USAID through the Nyungwe Nziza Project, is currently the most advanced concession management tool in central and western Africa. The policy allows private sector investment in protected areas to increase tourism, improve the competence and expertise of protected area staff, and provide revenue to the government. It is hoped that this policy will significantly increase the effectiveness of protected area management. The *Concession Policy* provides guidelines and procedures for more effective development and management of visitor facilities and services by the private sector within protected areas, as recommended in the *National Tourism Policy*. Concession guidelines are intended to ensure that concessions are managed in a way that conserves the resources and values of the protected areas, provides a consistent level of visitor services, and serves a diverse set of visitors and citizens.

5.2 INSTITUTIONS

Institutional responsibilities for the protection and management of biodiversity and the environment in Rwanda are summarized in Exhibit 17. This institutional framework provides many opportunities for implementing the strategies, policies, and laws summarized above, but also faces a number of challenges. Although each of these institutions' responsibilities have an environmental component, the major objectives of institutions like the Ministry of Agriculture and Animal Resources (MINAGRI), the Rwanda

Agriculture Board (RAB), RDB, and the Ministry of Environment and Natural Resources (MININFRA) can sometimes be in conflict with environmental conservation. Institutional coordination on environmental protections will require additional effort and resources.

Exhibit 17. Main Rwandan Institutions Responsible for Environmental Management

Institution	Responsibilities
Ministry of Environment and Natural Resources (MINIRENA)	Assume responsibility for overall environmental and natural resources policy; develop and disseminate, regulate, monitor and evaluate the implementation, institutional and human resources capacities, and oversee the institutions under supervision
Ministry of Agriculture and Animal Resources (MINAGRI)	Initiate, develop, and manage suitable programs of transformation and modernization of agriculture and livestock to ensure food security and to contribute to the national economy
Rwanda Environment Management Authority (REMA)	Assume overall authority for coordinating and regulating the protection, conservation, and management of the environment
Rwanda Natural Resource Authority (RNRA)	Lead the management of promotion of natural resources, which are composed of land, water, forests, mines, and geology
Fund for Environment and Climate Change (FONERWA)	Facilitate direct access to international environment and climate finance, as well as to streamline and rationalize external aid and domestic finance
Rwanda Development Board (RDB)	Provide environmental impact assessment (EIA) advice and ensure compliance; manage national parks; support wildlife conservation and tourism
Ministry of Disaster Management and Refugee Affairs (MIDIMAR)	Lead disaster management, including natural disasters
Ministry of Local Government (MINALOC)	Integrate environmental issues into local government Development Plans
Ministry of Infrastructure (MININFRA)	Initiate programs to develop, rehabilitate, and maintain an efficient and integrated national transport infrastructure network, including roads, bridges, airports, railways, and water transportation
National Agriculture Export Board (NAEB)	Improve the balance of payment of Rwanda economy through increased agricultural exports
Rwanda Agriculture Board (RAB)	Develop agriculture and animal husbandry using modern methods in crop and animal production research, agriculture extension, and education and training of farmers in new technologies
Districts	Provide an Environment Officer that is responsible for integrating environmental issues into District Development Plans
Civil society	Engage in and support various aspects of environmental management (more than 40 local organizations now engaged)
Rwanda Bureau of Standards	Work with REMA to ensure that environmental standards are enforced, at all levels
National Institute of Statistics (NISR)	Conduct national surveys, censuses, and other data collection systems that provide technical support in analysis and inference of environmental statistics

5.3 ENVIRONMENTAL MANAGEMENT SYSTEMS

The environmental management systems in Rwanda started with the *National Environmental Policy*. As described in Subsection 5.1.4, an objective of this policy was the protection and rational management of ecosystems for sustainable and equitable development. REMA was created to implement this policy, and a wide range of regulations and sectorial guidelines were developed. The requirements for environmental impact assessment were given in the Organic Law 04/2005, especially in its Chapter IV, Articles 67 to 70.

Since 2009, the screening of EIAs of projects has been carried out by RDB. The approval of strategic environmental assessments, environmental inspections, and environmental audits is still carried out by REMA. Article 70 states:

> An order of the Minister having environment in his or her attributions establishes and revises the list of planned works, activities and projects, and of which the public administration shall not warrant the certificate, approve or authorize without an environmental impact assessment of the project. The environmental impact assessment shall describe direct and indirect consequences on the environment.

The process, roles of stakeholders, and procedures for conducting an EIA are detailed in the *General Guidelines and Procedures for Environmental Impact Assessment* (REMA, 2006). The *General Guidelines and Procedures* divide the aims of an EIA into immediate and long-term objectives. The immediate objective is to inform the process of decision-making by identifying potentially significant environmental effects and risks of development proposals. The long-term objective is to promote sustainable development by ensuring that development projects do not undermine critical resources and ecological functions or the well-being, lifestyle, and livelihood of communities and people who depend on them. In order to achieve these objectives, EIAs first assess project proposals by identifying environmental risks, potential impacts, and mitigation and monitoring measures. Once projects are approved and implemented, the EIA process requires environmental monitoring to assess their ongoing impacts.

The *General Guidelines and Procedures for Strategic Environmental Assessment* (SEA) were published by REMA in 2011 (REMA, 2011b). Strategic environmental assessment is part of a planning process that assesses potential environmental impacts of policies, plans, and programs. SEA has proven an effective tool in restraining environmental degradation at national and global levels, and integrating environmentally sustainable development criteria into decision-making.

Exhibit 18. Comparison of SEA and EIA Processes (Source: REMA, 2011b)

Strategic Environmental Assessment (SEA)	Environmental Impact Assessment (EIA)
Involves multiple institutions	Responsibility of the project developer, whether public or private
Decision-making at policy, plan, or program level	Decision-making at the project level
Proactive, to ensure incorporation of environmental considerations in policies, plans, or programs	Reactive, to ensure to incorporation of environmental considerations in project proposals
Continuous and iterative process	Discrete activity with a clear beginning and end
Focus is on policies, legislation, regulations, and institutions to avoid impacts	Focus is on technical solutions to mitigate impacts
Broad range of alternatives	Narrow range of alternatives
Early warning of cumulative effects	Limited review of cumulative effects
Emphasis on integrating environmental concerns in the policies, plans, and programs	Emphasis on mitigation

The *General Guidelines* determine the roles and responsibilities of different stakeholders in the EIA process, as follows in Exhibit 19.

Exhibit 19. Roles and Responsibilities in the EIA Process

Party	Roles and Responsibilities
Developer (including international donors)	Submit project applications; direct responsibility for the project; should provide necessary information about the project at all stages of the EIA process
RDB	Screening of project applications to determine potential impact level
REMA	Organize the EIA process throughout guiding developers, screening, conducting public hearings, reviewing EIA reports, and making decisions on approval or disapproval of proposed projects; REMA is also responsible for monitoring

	implementation of environmental protection/mitigation measures recommended by EIA studies
Lead agencies	Government ministries or departments have the responsibility to take part in EIA of projects under their sectors; they provide technical information to EIA experts during EIA studies and are involved in the review process
EIA Experts	Professionals registered with REMA to undertake environmental impact studies
Public/ communities	Communities have a right to take part in the EIA process; public participation allows important social and environmental problems to be identified and consensus to be developed on the nature and adequacy of proposed mitigation measures and recommendations
Academic institutions	Commonly invited to serve on EIA technical committees; requested to institutionalize environmental education in their curricula

The goal of the EIA process is the sustainable use of the environment. It is meant to ensure that projects take the necessary steps to prevent environmental damage. The process has to incorporate interests of public and private stakeholders, and communities. In 2010, a set of practical tools for sectoral environmental planning covering eleven themes were developed, and this led to an increase in the number of EIA certificates issued annually. An effective environmental inspection and compliance regime has been put in place, in collaboration with other national agencies like the National Police. EIA applications have now been integrated in investment licensing procedures, applications with financing institutions, and local government project development clearances.

The main challenges reported are related to the capacity of district-level Environment Officers to ensure the monitoring of implementation of Environmental Management Plans of approved projects, and the capacity of citizens and communities to participate during the EIA approval process.

5.4 INTERNATIONAL CONVENTIONS AND TREATIES

The GoR has signed a large number of international conventions and protocols. Although considerable progress has been made in implementing the obligations of these treaties, beyond the required reporting, much remains to be done. The conventions and treaties that are most relevant to this ETOA are the following:

- Convention on International Trade in Endangered Species of Wild Fauna and Flora, signed at Washington, D.C., on March 3, 1973, and amended at Bonn, on June 22, 1979
- Convention on the Conservation of Migratory Species of Wild Animals, 2003
- United Nations Framework Convention on Climate Change (UNFCCC), 1995
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 2005
- Kyoto Protocol to the UNFCCC, 1998
- The Montreal Protocol on Substances that Deplete the Ozone Layer as either adjusted and/or amended in London, 1990; Copenhagen, 1992; Vienna, 1995; Montreal, 1997; Beijing, 1999
- Vienna Convention for the Protection of the Ozone Layer
- Convention on Biological Diversity (CBD)
- The Cartagena Protocol on Biosafety to the Convention on Biological Diversity
- Agreement on the conservation of African-Eurasian Migratory Waterbirds, 2013
- Agreement on the Nile River Basin Cooperation Framework, 2010
- Law on the accession of Rwanda to the International Union for Conservation of Nature (IUCN)
- Treaty on the Conservation and Sustainable and establishing the Central African Forest Commission (COMIFAC)

Rwanda has also entered into sub-regional and transboundary agreements with neighboring countries for the management of shared ecosystems. Some of these agreements are summarized below.

NILE BASIN INITIATIVE

The Nile Basin Initiative (NBI) is "a regional intergovernmental partnership that seeks to develop the River Nile in a cooperative manner, share substantial socio-economic benefits and promote regional peace and security." It was launched in 1999 by ministers in charge of water affairs in the riparian countries of the Nile Basin: Burundi, DRC, Egypt, Ethiopia, Kenya, Rwanda, Sudan (and now including South Sudan), Tanzania, and Uganda. Eritrea participates as an observer. The NBI provides a regional platform for multi-stakeholder dialogue, information sharing, and joint planning and management of water resources in the Nile Basin. Rwanda's watersheds form the upper reaches of the White Nile and contribute an estimated 8–10 percent of the water in that branch of the Nile.

GREATER VIRUNGA TRANSBOUNDARY COLLABORATION

Greater Virunga Transboundary Collaboration is "a mechanism for strategic, transboundary, collaborative management of the Greater Virunga Landscape." Its origins lie in ranger collaboration to protect mountain gorillas in Mgahinga (Uganda), Bwindi (Uganda), Virunga (DRC), and Volcanoes (Rwanda) national parks in 1991. Formally established by the respective parks management authorities in Rwanda (RDB), Uganda (Uganda Wildlife Authority), and DRC (*Institut Congolais pour la Conservation de la Nature*, ICCN) and their partners, it has expanded in scope, now working on tourism, community conservation, research, and monitoring.

LAKE VICTORIA BASIN COMMISSION

Under its membership to the East Africa Community, Rwanda is part of the Lake Victoria Basin Commission, whose members also include Burundi, Kenya, Tanzania, and Uganda. Established in 2001, the Commission is a mechanism for coordinating the various interventions on the Lake and its Basin, and a center for information sharing and promotion of investments.

CENTRAL AFRICAN FOREST COMMISSION (COMIFAC)

Rwanda is a member of the Central African Forests Commission, Commission des Forêts d'Afrique Centrale (COMIFAC). COMIFAC was established by a Treaty on Conservation and Sustainable Management of Forest Ecosystems in Central Africa, signed in Brazzaville, Congo, in 2005. Rwanda accelerated its international integration to major global conservation programs and organizations with the establishment of a National Man and Biosphere Committee under UNESCO in 2010, and its very recent accession as a full member state to IUCN (World Conservation Union).

5.5 CONCLUSION

Twenty years after the war and the genocide that devastated Rwanda, the country has been able to put in place ambitious environmental policies, laws, and regulations that are shaping environmental governance. The political resolve behind these policies is hampered, however, by some important challenges that include a lack of human resources and capacity; insufficient coordination and communication across sectors, as well as between central and local government entities; the need for more tools and guidance on how to effectively mainstream cross-cutting issues like environmental conservation into plans and budgets; and the need for an integrated monitoring and evaluation (M&E) system. MINIRENA is aware of these challenges and, with support from UNDP, is engaged in a five-year project on Strengthening the Institutional Capacity of the Ministry of Natural Resources in Rwanda (2014–2018).

From a comparative African perspective, Rwanda has adopted good and complete biodiversity standards and has opened up to regional and international treaties and organizations, accessing main conservation organizations and programs. This is a very positive aspect for its participation in the harmonization of policies and standards in Africa. Rwanda may even prove to be a role model as far as environmental law is concerned in Africa.

6. ACTIONS NEEDED TO CONSERVE BIODIVERSITY, TROPICAL FORESTS, AND THE ENVIRONMENT

As discussed in the Introduction to this report, this ETOA wraps together the strategic environmental review aspects of FAA Section 117 and the analyses of tropical forests and biodiversity mandated by FAA Sections 118 and 119. Here we provide an integrated analysis of actions necessary to conserve Rwanda's environment and biodiversity—which includes its tropical forests and other ecosystems. The language of FAA Sections 118 and 119 calls for identifying the actions necessary in a country to conserve tropical forests and biological diversity. Those actions necessary address and reduce the proximate and "root" causes of threats to biodiversity, including tropical forests, which were summarized in Section 4 of this report. Although those are the legal requirements underlying this ETOA, we have also identified all types of actions needed to protect Rwanda's environment.

6.1 GOVERNMENT PERSPECTIVE

The ETOA Team took as one of its starting points Rwanda's official view of what actions the GoR considers necessary to conserve biodiversity in the country from the *Fifth National Report to the Convention on Biological Diversity* (Republic of Rwanda, 2014a). The report lists 19 "national targets" (pp. 61–63), defined in line with the CBD's "Aichi Targets," and these national targets correspond approximately to thematic categories of "actions needed."

Another source of actions necessary according to the Government of Rwanda is the *2011 National Strategy for Climate Change and Low Carbon Development, Green Growth and Climate Resilience* (Republic of Rwanda, 2011a). The "programmes of action" listed in this document provide a list of general, high-level actions necessary for integrating environmental and biodiversity considerations into sustainable, climate-resilient economic development. The *Green Growth Strategy* describes these needs as integrated and cross-sectoral, consisting of the following:

1. Sustainable intensification of small-scale farming
2. Agricultural diversity for local and export markets
3. Integrated water resources management and planning
4. Sustainable land use management and planning
5. Low-carbon mix of power generation for the national grid
6. Sustainable small-scale energy installations in rural areas
7. Green industry and private sector investment
8. Climate-compatible mining
9. Efficient, resilient transport systems
10. Low-carbon urban settlements
11. Ecotourism, conservation, and Payments for Ecosystem Services (PES) promotion
12. Sustainable forestry, agroforestry, and biomass energy
13. Disaster management and disease prevention
14. Climate data and projections

Finally, the 2011 *National Strategy for Water Resources Management* discusses many "actions necessary." These strategies and reports show that there is no shortage of good, actionable ideas within the GoR.

6.2 KEY INFORMANTS' PERSPECTIVES

The ETOA Team gathered information about actions necessary to conserve biodiversity and tropical forests from the diverse sources described in the introduction to this report. From our interviews and meetings with more than 50 key informants (see Annex E: Persons Contacted), we compiled a list of 131 actions necessary as perceived by these environmental experts and stakeholders. The actions needed for biodiversity, forest, and environmental conservation are those actions that remove or reduce the social, political, and economic causes of the threats to biodiversity.

Our analysis assumes that our diverse group of informants—professionals and experts working on biodiversity conservation and natural resources management in Rwanda—know more about these issues than anyone else. Many of them have contributed to the development of the GoR's strategies and policies summarized in the previous section.

Content analysis of our interviews showed that some actions needed were mentioned many times, by different informants and stakeholders. These themes and their rankings by frequency are provided in Exhibit 20. For a full list of how the proposed actions needed sorted into these thematic categories, see Annex D.

Similar actions needed that were mentioned repeatedly can be clustered as "themes"; in fact, 102 of the 129 actions listed by key informants (79 percent) fit into only 10 thematic categories. This technique provides a measure of the perceived importance of needs among key stakeholders. A comparison of these themes with those found in the various GoR documents summarized above shows many overlaps.

This method provides a way of ranking the relative importance of many possible actions needed according to the perceptions of key informants. While this analytical approach is not perfect, we believe that it is less biased and more informative than other non-quantitative methods of trying to develop such a list. Although the frequency with which they were mentioned by key informants provides a measure of the perceived importance of the many actions needed, frequency cannot necessarily be equated with priority. In general, prioritization is a very tricky concept because it depends on the values and objectives of those doing the prioritizing, and criteria can vary widely among stakeholders.

Exhibit 20. Themes for Actions Needed from Key Informants

Theme: "Need/Need to…."	**# of mentions**
1. Implement and enforce existing environmental policies and laws	15
2. Integrate environment and biodiversity conservation into all development sectors	13
3. Promote conservation agriculture that links food security and environmental conservation	13
4. Emphasize water as an integrating ecosystem service	12
5. Protect and restore all remaining natural forests and wetland habitats	11
6. Develop financial mechanisms and incentives for conservation of natural ecosystems	10
7. Integrate health with environment and biodiversity conservation	9
8. Develop off-farm livelihood alternatives in rural communities	8
9. Link environmental protection and energy development	7
10. Improve climate change resilience	6
Subtotal	104/131 (79%)
Other	27/131 (21%)
• Develop approaches for working with historically marginalized communities	4
• Strengthen transboundary collaboration	3
Other	20
Total	**131/131 (100%)**

The key issues and topics encompassed in these main themes are summarized below.

6.2.1 IMPLEMENT AND ENFORCE EXISTING POLICIES AND LAWS

We heard repeatedly that Rwanda has good policies and laws on the books, but institutional and human capacity to implement and enforce them is weak. According to one government agency informant, this is a weakness in the "Accountable Governance" pillar of the EDPRS II.

Most of our informants believed that government, civil society, and the private sector all have roles to play in strengthening implementation and enforcement of laws and policies. A needed action under this theme is to "harmonize responsibilities for various aspects of environmental management now scattered among various ministries." More capacity for implementation and enforcement of policies and laws is needed at a decentralized level, in districts.

Exhibit 21. Illegal Rice Cultivation Encroaching on Protected Papyrus Swamp, Mugesera Wetland

When we visited some sites, we often found a lack of awareness and/or livelihood alternatives. Examples: a) alternative income sources besides coltan mining in Mukura Forest; b) lack of awareness or enforcement of rice cultivation encroaching in a protected wetland near Lake Mugesera; c) lack of awareness or enforcement of 10-meter buffer zone along the Sebeya River, as required by law.

6.2.2 INTEGRATE ENVIRONMENT AND BIODIVERSITY CONSERVATION INTO ALL DEVELOPMENT SECTORS

Many key informants mentioned the need to integrate and mainstream biodiversity conservation and environmental protection into all development sectors. This message is in line with some of the official policies of the GoR. For example, *Rwanda's Fifth National Report to the CBD* (Republic of Rwanda, 2014a) states one target as follows: "By 2020, the values of biodiversity and ecosystems' services have been integrated into planning processes, poverty reduction strategy and into national economy." The Director General of REMA, Dr. Rose Mukankomeje, emphasized this point to us:

> Environment is cross-cutting. USAID has to make sure they are mainstreaming environment and biodiversity in all their sectors. This is what we are trying to do in the Government of Rwanda. You will be wasting your investment in development if you don't mainstream environment, because the development won't be sustainable.

Fortunately, this view is in line with USAID's new *Biodiversity Policy*, released in March 2014, which has two goals: (1) Conserve biodiversity in priority places; and (2) integrate biodiversity as an essential component of human development (USAID, 2014). The Policy recognizes that "biodiversity loss can be driven by unsustainable development, that there are trade-offs between biodiversity conservation and development goals that must be understood and managed, and that biodiversity conservation itself can be a critical tool for achieving sustainable development." The central implication of the Policy is that biodiversity conservation (and environmental protection) are not a development "sector"; rather, they should be seen as a fundamental foundation for any and all sustainable development. Biodiversity and environment are

cross-cutting in the same way gender is; both must be mainstreamed. People are part of ecosystems, both depending on and affecting them. A key principle of ecology is that everything is connected to everything else, so all actions have multiple effects throughout the ecosystem. Thus, all environmentally sustainable development must integrate environment and development.

6.2.3 LINK FOOD SECURITY AND ENVIRONMENTAL CONSERVATION

The fundamental elements of "conservation agriculture" (i.e., "green" agriculture) are: minimum or no tillage to reduce soil erosion; use of perennial and tree crops when possible; mulching with crop residues to control weeds and maintain soil moisture; crop rotation with legumes to maintain soil fertility; use of manure from cattle and small livestock on fields; use of higher-yielding but climate resilient crop varieties; and, where necessary, use of small amounts of herbicides to control weeds and inputs of inorganic fertilizer. These farming practices significantly increase yields and reduce labor on the same area of land, and thereby reduce pressure to clear new land for agriculture. Use of tree crops and on-farm woodlots can also provide fuel wood for cooking, reducing pressure on forests. Some other considerations for conservation agriculture include the following:

- Large areas of single-crop monocultures increase the risk of pests and pathogens, which may be increased by climate change.
- Maize and beans, important for food security and nutrition, are often planted on extremely steep, inappropriate slopes throughout the country. Under those conditions, they are contributing to soil erosion and watershed degradation, and cannot be considered sustainable agriculture.
- Manure from dairy production is important for maintaining soil fertility and preferable to non-organic inputs when available.
- For bean production, on-farm growing of bamboo or other woody species for trellis sticks is needed to reduce pressure on wild bamboo and other forest sources.
- On-farm fruit trees and farm woodlots for fuel wood, timber, and other materials should be promoted.
- Tea and coffee are tree crops and help protect soil.
- Planting of indigenous trees on farms should be promoted where appropriate.
- Conserving traditional crop varieties and native agro-biodiversity is important for climate change resilience.
- PES mechanisms may provide a source of funding for conservation agriculture in certain circumstances.

Exhibit 22. Crop Field on Steep Slope with Erosion Gullies near Mukura Forest Reserve

There is competition for land between Irish potatoes and pyrethrum production in Musanze and Rubavu districts, and the economics of the pyrethrum industry do not seem very promising. In the dairy sector, for most rural families, dung is more valuable than milk because it can be used as a fertilizer, but milk can be important for nutrition. There is a need to expand the processing and transformation of excess milk into such products as packaged milk and cheese that can be stored and transported. Maize can be stored much better than potatoes, bananas, cassava; and it provides better nutrition, so it is important to food security.

6.2.4 EMPHASIZE WATER AS AN INTEGRATING ECOSYSTEM SERVICE

Water links upland forest and riparian zones of watersheds, activities on agricultural lands, and wetlands and lakes downstream. Uses of water include water for domestic consumption and sanitation, industry, irrigation, and hydroelectric power. We frequently heard that protection of entire watersheds, from uplands to lowlands, is needed. Mechanisms for managing watersheds and water in an integrated fashion need to be developed and/or strengthened.

These views from key informants echo the Government of Rwanda's 2011 *National Policy for Water Resources Management* (Republic of Rwanda, 2011b):

> Water is a cross-cutting resource phenomenon, affecting and affected by multiple sectors, including domestic consumption, agriculture, commerce, industry, transport and energy as well as ecological functions for environmental conservation such as forests, fisheries and wildlife. The management of water resources is consequently best undertaken within a framework that provides for decision making in an integrated and holistic manner, referred to as Integrated Water Resources Management (IWRM).

6.2.5 PROTECT ALL REMAINING NATURAL FORESTS AND WETLAND HABITATS

Most of Rwanda is an overwhelmingly human-dominated landscape, with such a low proportion of remaining natural ecosystems that all should be protected for their social, economic, and ecological benefits. Rwanda's five protected areas conserve significant areas of Afromontane forest ecosystems. Any remaining patches of gallery and riverine forests should be conserved, as should all remaining wetlands, especially lowland papyrus swamps.

Exhibit 23. Sebeya River near Rubavu after a Rain

6.2.6 DEVELOP FINANCIAL MECHANISMS AND INCENTIVES FOR CONSERVATION OF NATURAL ECOSYSTEMS

Payment for Ecosystem Services (PES) mechanisms may be appropriate for financing conservation activities that maintain or restore natural forests and other permanent land cover in watersheds. We heard frequently that a national policy or framework for PES is needed. Possible examples of such mechanisms could include voluntary public-private partnerships with tea factories or breweries that depend on eco-hydrological services for their operations. Reforestation funded by such mechanisms should be with indigenous trees when possible. Plantation monocultures of exotic species (e.g., Eucalyptus) are at risk of forest pests and pathogens, which may be increased by climate change, and loss and degradation of plantation forests would decrease their ecosystem services value.

Sharing revenues and other benefits from national parks with neighboring communities is another type of financial mechanism that can provide incentives for improved conservation. The appropriate level of revenue sharing is an issue still under debate among those we interviewed. Partnerships with private

sector nature-tourism operators may be another model of securing the financial resources needed for protected area management. The model being tested in Akagera National Park, now managed by the Akagera Management Company, a joint venture between the RDB and African Parks Network, should provide some useful lessons for sustainable financing of Rwanda's protected areas.

6.2.7 INTEGRATE HEALTH WITH ENVIRONMENT AND BIODIVERSITY CONSERVATION

Key informants told us repeatedly that health programs should integrate environmental and biodiversity conservation to improve outcomes. This echoes Target 13 of Rwanda's *Fifth National Report to the CBD*: "By 2020, all ecosystems that provide essential services to human well-being and contribute to health as well as livelihoods are restored and safeguarded, taking into account the needs of local communities especially the vulnerable groups." Active integration of environmental components into health activities is needed, but even passive linkages, such as co-locating health and conservation activities in the same communities, is recommended for "win-win" synergies.

Health programs are helping to hasten the demographic transition in Rwanda through improved access to maternal-child health and family planning services. Improved sanitation and nutrition activities also reduce death rates in children, another factor important in the transition from large families. Health, sanitation, and nutrition programs thereby help to reduce fertility rates and rapid population growth, a main driver, or cause, of threats to the environment and biodiversity.

The conservation of natural forests and wetlands is clearly linked to access to clean water for drinking and sanitation in Rwanda, as elsewhere around the world. A recent study in Malawi found that:

> In Malawi, net forest cover loss over time is associated with reduced dietary diversity and consumption of vitamin A-rich foods among children. Greater forest cover is associated with reduced risk of diarrheal disease. These preliminary findings suggest that protection of natural ecosystems could play an important role in improving health outcomes. (Johnson et al., 2013)

Another recent study in 21 African countries showed that "… children in Africa who live in areas with more tree cover have more diverse and nutritious diets" (Ickowitz et al., 2013).

Nutrition issues are linked to poaching for bushmeat around Nyungwe, Volcanoes, and other protected areas in Rwanda, according to the Community Conservation Wardens at both Nyungwe and Volcanoes National Parks. Potentially serious diseases (e.g., Ebola, HIV) can emerge into humans from eating bushmeat. On the other hand, transmission of human diseases to other primates, particularly chimpanzees and gorillas, are a potential threat to those species.

6.2.8 DEVELOP OFF-FARM LIVELIHOOD ALTERNATIVES IN RURAL COMMUNITIES

Off-farm employment opportunities are urgently needed in rural Rwanda. These can be linked to particular crops, but involve processing, distribution, or marketing jobs along their value chains. As mentioned earlier for the dairy sector, processing milk into dairy products, and transporting and marketing those, would be one example.

The nature-tourism value chain could provide a certain level of local employment other than agriculture in communities bordering national parks. Communities around both Volcanoes and Nyungwe National Parks already benefit from employment as park guards, guides, and trackers; in handicraft production and cultural tourism; and in the lodging and transportation industry associated with nature tourism. In most cases, these activities supplement farming to support livelihoods. In some cases, however, especially in communities near Volcanoes National Park, some families depend mainly on such nature-tourism activities.

6.2.9 LINK ENVIRONMENTAL PROTECTION AND ENERGY DEVELOPMENT

Some opportunities exist for renewable, low-carbon, "green" energy development. Two avenues seem most promising: (1) improving the sustainability and efficiency of wood energy use; and (2) developing hydroelectric energy with appropriate environmental safeguards. Wood fuel is currently the largest source of energy consumed in Rwanda, and its sustainable management is essential for the protection of forests and the ecosystem services they provide. Wood is a completely renewable, carbon-neutral energy source if managed properly, and should not be viewed as outmoded or old-fashioned. There are significant opportunities to improve the efficiency of wood and charcoal fuel use through improved cook stove designs, and to increase the efficiency of charcoal production. Hydroelectric power already provides a significant fraction of Rwanda's rapidly growing demand for electric energy, and there is significant potential for increased production from both small and large-scale facilities. Water for hydropower is an eco-hydrological service of upland forests, and so integrated watershed management is a key to sustainable hydropower production. Hydropower production could be linked to PES mechanisms for financing the integrated watershed and forest management needed. Appropriate EIA procedures for the siting and design of hydroelectric facilities, and attention to the protection of downstream environmental flows, will be needed for environmentally sound hydropower development.

Exhibit 23. Turbine at Gisenyi Hydropower Plant

Methane from Lake Kivu, with appropriate environmental safeguards, is a potential transition fuel for electricity generation, cooking, and even transportation in the future. Biogas from animal manure or other biomass is less promising than many other energy options, especially given the tradeoffs between using those feedstocks for energy or for crop fertilization. Proposals to develop peat energy in Rwanda were frequently met with skepticism by the environmental experts we interviewed. Peat is not a renewable energy source, but is in fact a young fossil fuel. In general, its combustion is much more "dirty" than even low-grade anthracite coal, and its energy content is not high. In addition, peat is found in wetland ecosystems, whose eco-hydrological value is likely to exceed the value of the energy gained by disrupting those wetlands. From an environmental point of view, peat energy is not a sound option.

6.2.10 IMPROVE CLIMATE CHANGE RESILIENCE

Climate projections for Rwanda suggest a rapidly warming and increasingly wet climate. Although uncertainties exist, and there is considerable variability among individual models, these projections can still provide a basis for planning activities to improve ecological and socio-economic resilience to climate change (Seimon, 2012).

Because of the importance of natural resources and ecosystem services in Rwanda, an ecosystem-based approach to climate change adaptation is needed. Protecting the ecosystems that provide the eco-

hydrological services in watersheds is critical, as is their role in soil protection and erosion control. Climate change may provide new challenges in human health because of links between climate and diseases. For example, malaria is linked to increased temperatures, increased precipitation, and deforestation, which create suitable mosquito breeding sites and favors the most dangerous mosquito vector species. Conversion of wetlands for rice cultivation likewise increases the abundance of mosquito vectors. Also, cholera is increased by floods, the magnitude of which are related to forest cover. Food crop and forest pests and pathogens may all be promoted by climate change, although no studies are currently available on the topic.

In Section 6.2.3 above, we discussed the need to develop conservation agriculture because of its benefits in conserving ecosystem services – for soil, water, and nutrient conservation. Through those mechanisms, conservation agriculture also increases the resilience of agriculture in the face of climate change, whether to more, and more intense, precipitation, or to increased water stress caused by increase in temperature and the associated increase in evapotranspiration.

6.2.11 OTHER

In addition to the 10 thematic categories of actions necessary discussed above, about 21 percent of the 131 actions needed given by our key informants did not fall into clusters. Two other needed actions were mentioned by several key informants, however, and they are:

1. The need to develop approaches for working with historically marginalized communities, and
2. The need to strengthen transboundary collaboration.

Members of historically marginalized communities often live on the edges of remaining forests protected in national parks and forest reserves, and are often blamed for illegal activities such as "poaching" and firewood collection in those areas. Poverty rates in these communities are among the highest in Rwanda, and health indicators are among the lowest. Several key informants mentioned the importance of initiatives to work with these communities through development activities.

Many threats to forests and biodiversity have a transboundary dimension in Rwanda—for example, poaching, fishing (Akagera), mining (Nyungwe); bamboo-cutting (Nyungwe, Volcanoes). The country's three national parks are all located on borders with neighbors, and two of three border transboundary parks in neighboring countries. We heard from several key informants about the importance of strengthening mechanisms—such as the Greater Virunga Transboundary Collaboration, Lake Victoria Basin Commission, and Nile Basin Initiative, discussed in Section 5.4—for communication and coordination of efforts to address transboundary issues.

7. CLIMATE CHANGE RESILIENCE AND ADAPTATION

7.1 CONTEXT

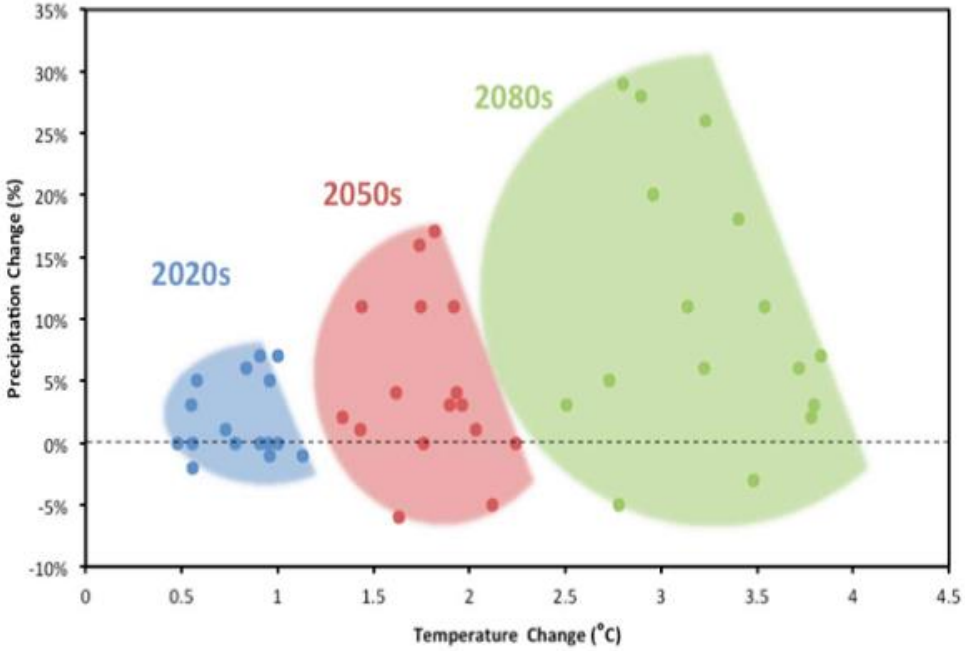
In the context of this ETOA, we assessed situations in which biodiversity, forests and environment are clearly linked with climate change resilience and adaptation. We did not attempt to assess climate change risks and opportunities for adaptation across USAID-Rwanda's proposed CDCS Results Framework. A 2013 report by the USAID ARCC Project titled *Evaluation of Organizational Capacity and Opportunities for Climate Change Adaptation Investments in Rwanda* (Sommerville, 2013) assessed opportunities and constraints for USAID-Rwanda for climate change adaptation programming in key sectors, including agriculture, water, and health. In developing future activities under its new CDCS, USAID/Rwanda may find that a full climate change vulnerability assessment will be needed to adequately explore the risks and opportunities in a particular development sector in which it plans to work.

In this section, we briefly review climate change projections for Rwanda, and discuss ways in which conserving biodiversity and using ecosystem-based approaches to climate change adaptation can address key risks to development, such as in agriculture and food security, flood protection, domestic and industrial water supply, and health.

7.2 CLIMATE PROJECTIONS AND RISKS

Rwanda's climate is complex, with significant geographic differences across the country and very strong seasonality, although it is less variable than much of East Africa (SEI, 2009). Climate projections for Rwanda suggest a rapidly warming and increasingly wet climate. Although uncertainties exist, and there is considerable variability among individual models, these projections can be used as the basis for planning activities to improve ecological and socio-economic resilience to climate change (Seimon, 2012).

Exhibit 24. Climate Projections for Rwanda, 2020 to 2080



Source: Seimon, 2012, from McSweeney, 2011

Climate change in Rwanda is expected to increase risks in many key development sectors. For example, according to the *Baseline Report on the National Strategy on Climate Change and Low Carbon Development for Rwanda*,

> Rwanda is highly vulnerable to the impacts of climate change although lack of sufficient data means that regional climate change projections are uncertain. Agriculture, the source of employment for 80 percent of the population, is most at risk. Rwanda is currently dependent on hydropower for 50 percent of its electricity, making it vulnerable to changes in rainfall. Regional planning of hydropower plants has based maximum capacity on current river flows, which are likely to change. As temperatures rise, diseases will spread posing health risks to the predominantly poor population. Planning for the future in Rwanda needs to take all these changes into account to become climate-resilient. (SSEE, 2011)

In the health sector, according to the Stockholm Environment Institute (SEI) report on the *Economics of Climate Change in Rwanda*:

> In the absence of adaptation, the study estimates that there could be a potentially large increase in the health burden of malaria in Rwanda. This arises because a large part of the rural population lives at higher elevations, where the disease is currently restricted by temperature. The study has applied a new malaria risk model, based on altitude, and finds that climate change could increase the rural population at risk for malaria by 150 percent by the 2050s. The increase in the disease burden is significant and could lead to full economic costs that are over fifty million dollars/year. These effects are raised as a future priority area for consideration. (SEI, 2009)

For the agricultural sector, that same report concluded that

> Under some futures and with certain models, modest impacts on agriculture are predicted in the medium term (with some regions even experiencing increased agricultural yields). However, under other scenarios and other models there are economic costs projected for the sector. A range of additional factors are also important, which are not included in these assessments, including the effects of extreme events, pests and diseases, etc. (SEI, 2009)

7.3 USAID BIODIVERSITY AND CLIMATE CHANGE CONTEXT

The concept of ecosystem-based approaches to adaptation springs from the fact that "biodiversity…helps people to adapt to climate change through providing the ecosystem services which reduce their vulnerability and enhance their adaptive capacity to change" (IUCN, 2011). The CBD has defined ecosystem-based adaptation as "the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change" (CBD, 2009). Although ecosystem-based adaptation is not a sufficient prescription for climate change adaptation everywhere and in every sector, in a country like Rwanda that is so heavily dependent on ecosystem services such as hydrological benefits in watersheds, and ecosystem products such as wood fuel, ecosystem-based approaches are needed to address key risks to development, as discussed in Section 6.2.10.

The recently-released USAID *Biodiversity Policy* states that ecosystem-based approaches to climate change adaptation, which take into account the value of biodiversity in providing ecosystems services,

> … can be a cost-effective way to help people adapt to climate change and buffer from climate-related shocks, while providing livelihood benefits that increase social resilience to such shocks. For vulnerable people dependent on ecosystem goods and services, ensuring that the protective and productive functions of ecosystems are maintained is

> crucial to successfully adapting to climate change. As a result, factoring in climate change and taking more adaptive approaches to conservation is becoming increasingly important to achieving conservation results and reducing people's vulnerability. (USAID, 2014)

USAID's *Climate Change and Development Strategy* lists 10 "Guiding Principles" (USAID, 2012), one of which is "value ecosystem services." This principle provides a strong link between biodiversity conservation and climate change because biodiversity is the source of all ecosystem services (Byers, 2012). The *Climate Change and Development Strategy* states that

> Although these [ecosystem] services are critical to development, they are often not valued appropriately in the marketplace. For example, forests offer more than just timber for harvest… [they store] carbon; … reduce erosion, improve the quantity and quality of water. Strategic investments in ecosystem services can mitigate the impacts of climate change. (USAID, 2012)

7.4 ACTIONS NEEDED FOR ADAPTATION AND RESILIENCE

As discussed in Section 6, our key informants identified the need to improve climate change resilience as one of the top ten issues facing Rwanda. Actions needed for climate change adaptation from these informants and other sources that we analyzed include the following:

- integrate climate change across all GoR sectoral policies;
- effectively implement Rwanda's *National Climate Change and Low Carbon Development Strategy*;
- mainstream ecosystems-based approaches to climate change adaptation;
- increase public awareness of climate change issues;
- promote renewable energy with appropriate environmental safeguards; and
- promote conservation agriculture that contributes to climate resilience.

USAID/Rwanda, through the Rwanda Integrated Water Security Program, supported a study of methods for assessing climate change vulnerability and identified actions needed for improved resilience (RIWSP, 2012).

8. OPPORTUNITIES FOR USAID/RWANDA

In the Introduction to this ETOA report we explained the legal requirement for the FAA 118-119 analyses that is included here. The language of FAA Sections 118 and 119 require that after we have identified the actions necessary for conserving tropical forests and biodiversity in Rwanda, we then examine "the extent to which the actions proposed for support by the Agency meet the needs thus identified." To fulfil this requirement, we now discuss the "actions proposed" by USAID/Rwanda in its new Country Development Cooperation Strategy (CDCS), and compare them with the long list of actions needed that we presented in Section 7.

8.1 OVERVIEW OF USAID/RWANDA'S PROGRAMS

The ETOA Team reviewed the Results Framework developed by USAID/Rwanda for its CDCS, which was in the final stages of approval at the time of this analysis. The four Development Objectives (DOs) stated in the Results Framework are:

DO1: Economic Opportunities (agriculture, private sector, natural resources management (NRM), climate change resilience, clean energy)

DO2: Democratic Processes (civic participation, social cohesion, conflict reduction)

DO3: Health and Nutrition (health systems, reproductive health, water and sanitation)

DO4: Education and Workforce Preparation (literacy, numeracy, employable skills)

8.2 OVERLAP BETWEEN USAID'S PROPOSED PROGRAMS AND ACTIONS NEEDED

The language given in Sections 118 and 119 of the FAA, with which this ETOA report must comply, requires that we discuss "the extent to which the actions proposed for support by the Agency meet the needs thus identified." The following table suggests which of the current and proposed programs at USAID/Rwanda are contributing, or could contribute, to some of the main kinds of actions needed, identified in Section 7. We discuss the ways in which each DO is relevant to each of the main themes in the subsections below.

Exhibit 25. Actions Needed and Potential Contribution of USAID/Rwanda Programs

Theme: "Need to…."	USAID Program/DO			
	DO1: Economic Opportunities (agriculture, private sector, NRM, climate change resilience, clean energy)	**DO2: Democratic Processes** (civic participation, social cohesion, conflict reduction)	**DO3: Health and Nutrition** (health systems, reproductive health, water and sanitation)	**DO4 : Education and Workforce Preparation** (literacy, numeracy, employable skills)
1. Implement and enforce existing environmental policies and laws				
2. Integrate environment and biodiversity conservation into all development sectors				
3. Promote conservation agriculture that links food security and environmental conservation				
4. Emphasize water as an integrating ecosystem service				

5. Protect and restore all remaining natural forests and wetland habitats				
6. Develop financial mechanisms and incentives for conservation of natural ecosystems				
7. Integrate health with environment and biodiversity conservation				
8. Develop off-farm livelihood alternatives in rural communities				
9. Link environmental protection and energy development				
10. Improve climate change resilience				

8.2.1 OPPORTUNITIES FOR ECONOMIC DEVELOPMENT ACTIVITIES (DO1) TO CONTRIBUTE TO ENVIRONMENTAL PROTECTION AND BIODIVERSITY CONSERVATION

As discussed in Section 5 of this ETOA, Rwanda's economic and social development strategies and plans very clearly assign environmental protection and sustainability a central role. From *Vision 2020* to EDPRS II, and from the *Green Growth Strategy* to the *Water Resources Management Policy*, Rwanda aspires to integrate environmental conservation and climate change resilience into its development. Significant opportunities exist under USAID/Rwanda's DO1 to assist Rwanda's government, communities, and private sector in realizing their national vision of environmentally sustainable, low-carbon development. As indicated in Exhibit 25, we believe that the Economic Opportunities DO under the new CDCS can contribute in some way to each of the 10 main categories of actions necessary identified in our analysis.

One of the main actions needed mentioned by our key informants was to "implement and enforce existing environmental policies and laws." DO1 deals with Economic Opportunities, and many GoR policies and laws dealing with agriculture, water, forestry, tourism, climate change resilience, clean energy, and private sector investment affect economic opportunities. It obvious that USAID programs and activities under DO1 will have to understand and implement under those GoR environmental policies and laws.

One of the actions needed mentioned most often by our key informants was to "promote conservation agriculture that links food security and environmental conservation" (see Section 7). Opportunities exist within the CDCS Results Framework's Intermediate Result (IR)1.1, "increased productivity and nutrition outcomes," and especially Sub-IR 1.1.2, "improved capacity to manage natural resources and respond to climate change." The ETOA Team sees this part of the CDCS as the vehicle for promoting conservation agriculture (see Subsection 6.2.3 for a description of conservation agriculture and specific actions needed). We were told that the mission is thinking of supporting maize, beans, dairy, and pyrethrum and their respective value chains, as well as perhaps high-nutrition foods (e.g., livestock, poultry, fortified crops) and horticulture.

The ETOA Team believes that there are opportunities to apply the principles of ecosystem-based adaptation to climate change in some of all of these crop value chains. For example, in the production of maize and beans, such conservation agriculture practices as minimum tillage, mulching with crop residues, increasing the number of on-farm trees, crop rotation, intercropping, and use of livestock manure for fertilizer will have the effect of reducing soil erosion and nutrient loss under the more intense precipitation predicted by climate change projections. These techniques will also have beneficial effects in terms of retaining soil moisture for these crops under increased temperatures, which will increase the potential evapotranspiration from these crops. Finally, conservation agriculture techniques generally have beneficial effects in minimizing crop pests and pathogens, especially use of intercropping and Integrated Pest Management techniques (which minimize the use of insecticides).

Food processing, transportation, and marketing of crops and products supported under USAID/Rwanda Feed the Future activities could also contribute to the action-needed theme of "develop[ing] off-farm livelihood alternatives in rural communities" (see Subsection 6.2.8).

Finally, we believe that Sub-IR 1.2.3, "enhanced capacity for energy resources management," could give USAID/Rwanda an opportunity to contribute to one of the main actions needed, that of "link[ing] environmental protection and energy development." We presented some of the dimensions of this theme in Subsection 6.2.9, where we mentioned that sustainable wood fuels, environmentally sensitive hydropower development, and methane from Lake Kivu all provide opportunities for energy production that may have environmental benefits. We also stated our view that the development of peat energy was not an environmentally sound strategy.

Another theme besides environmental sustainability that emerges strongly in *Vision 2020*, EDPRS II, and other policies and laws is an emphasis on the role of the private commercial sector in the country's development, and on government's role in facilitating private investment in the country. This private sector theme raises the question of the adequacy of GoR environmental management systems, especially strategic environmental assessment (SEA) and environmental impact assessment (EIA) procedures, to avert and/or mitigate potentially irreversible environmental impacts from poorly planned or unsustainable development activities. We discussed GoR environmental management systems in Subsection 5.3. We believe that this need to strengthen and support these systems within the GoR is an opportunity—and an obligation—of USAID/Rwanda as part of DO1: "Economic opportunities increased and sustained" in general. Private sector investment is both an economic opportunity and a governance issue, of course, because the policies, laws, and regulations governing that investment are part of governance.

8.2.2 OPPORTUNITIES FOR DEMOCRATIC GOVERNANCE ACTIVITIES (DO2) TO CONTRIBUTE TO ENVIRONMENTAL PROTECTION AND BIODIVERSITY CONSERVATION

According to our content analysis of interviews of key stakeholders, the most commonly perceived category of actions needed was to improve the implementation and enforcement of existing policies and laws relating to forests, biodiversity, and the environment (see Subsection 6.2.1), with 15 actions needed proposed under this theme (see Annex D for a list of these actions). This category of "action necessary" falls squarely under the theme of governance.

Exhibit 26. Community Meeting of Ecotourism Cooperative, Cyamundongo Forest

Opportunities exist within the CDCS Results Framework's IR 2.1, "increased civic engagement and consultation in decision-making at all levels," and especially its Sub-IR 2.1.1, "improved performance and engagement by CSOs and GoR entities." Most of our informants believed that government, civil society, and the private sector all have roles to play in strengthening implementation and enforcement of laws and policies, echoing the theme of this Sub-IR 2.2.1. The ETOA Team sees DO2, the Democratic Governance support under the USAID/Rwanda CDCS, as a vehicle for contributing to the most commonly mentioned action necessary for protecting Rwanda's environment and biodiversity.

DO2 activities aim to strengthen democratic processes in Rwanda, including civic participation, social cohesion, and conflict resolution. Many environmental issues provide opportunities for strengthening such democratic processes. For example, in order to emphasize water as an integrating ecosystem service (Theme 4 in Exhibit 25 above), democratic participation down to the level of water-user committees and associations at the local level will be required for smooth implementation of water policies and laws from national to local levels, and in the management of water conflicts. Another example of how DO2 can contribute to actions needed for conserving biodiversity, forests, and environment relates to the need to develop financial mechanisms and incentives for conserving natural ecosystems (Theme 6 in Exhibit 25). Developing public or public-private financial mechanisms is a governance challenge, and requires resolving disputes among competing uses of natural resources and developing and equitable "benefit sharing." Creating sustainable financial mechanisms requires civic participation and conflict resolution.

The first of the six "pillars" of *Vision 2020* is "Good Governance and Capable State." The weakness in implementing Rwanda's relatively strong policies, laws, and regulations for environmental conservation is a weakness of good governance and state capacity. If serious about supporting Rwanda's own development vision, USAID, and other donors, should take an interest in assisting the GoR to strengthen environmental governance. Key priorities for action to improve the implementation and enforcement of existing policies and laws include improving public information about the state of the environment and environmental laws, and raising awareness. Increasing the capacity of government staff who are responsible for administering and implementing policies, laws, and regulations at all levels is a second priority.

8.2.3 OPPORTUNITIES FOR HEALTH AND NUTRITION ACTIVITIES (DO3) TO CONTRIBUTE TO ENVIRONMENTAL PROTECTION AND BIODIVERSITY CONSERVATION

Significant opportunities exist to link health sector interventions with biodiversity and forest conservation, and we recommend that they be thoroughly explored in USAID/Rwanda's future programming. The diverse ways in which human health is dependent on healthy natural ecosystems—forests and wetlands in particular—have been discussed in Subsections 3.3 and 6.2.7 of this report. Opportunities exist not only for thematic linkages between health and environment, but also for creating "win-win" synergies between human and environmental health through geographic linkages, such as co-locating health activities in communities with the most direct effects on protected areas, critical watersheds, and forests and wetlands.

The ETOA Team believes that opportunities to integrate health and environment exist within the CDCS Results Framework's DO3, Health and Nutrition, and its IR 3.1, "strengthened capacity of health sector to deliver high quality services." We believe that one way to improve the quality of health and health services is to make the health sector much more cognizant of environmental linkages than they now appear to be.

The USAID/Rwanda health strategy considers the importance of family planning and reproductive health; maternal, neonatal, and child health; and nutrition. All of these are factors that enable a country to pass through the demographic transition to a stable population. Any opportunity to hasten the demographic transition through improvements in maternal and child health, nutrition, family planning services, and improved water supply and sanitation will have the indirect benefit of reducing some of the causes of the threats to biodiversity and tropical forests.

8.2.4 OPPORTUNITIES FOR EDUCATION AND WORKFORCE PREPARATION ACTIVITIES (DO4) TO CONTRIBUTE TO ENVIRONMENTAL PROTECTION AND BIODIVERSITY CONSERVATION

If Rwanda is to realize its "green development" aspirations, laid out in its strategies, policies, and laws (see Section 5), a large shift in the knowledge, skills, practices, and behaviors of its citizens will be necessary. The ETOA Team believes that the Education and Workforce Preparation DO of the new CDCS provides

an avenue for supporting some of the actions necessary to realize a green society and economy; in particular, the DO helps to:

- Prepare young people from rural communities for off-farm livelihood alternatives that will provide them with employment and income without creating further stress to the environment (see Subsection 6.2.8);
- Prepare the current and future workforce for employment in clean, low-carbon energy production, whether that be in sustainable forest management for biomass energy, water resources management for hydropower, or solar energy development (see Subsection 6.2.9); and
- Prepare the current and future workforce for jobs that will make Rwanda more resilient to climate change, whether through conservation agriculture, sustainable forestry, nature-based tourism, or climate-resilient industries (see Subsection 6.2.10).

The ETOA Team sees DO4: Education and Workforce Preparation, as a vehicle for contributing to Rwanda's green development aspirations.

8.3 FAA SECTION 117 ANALYSIS

The SOW for this ETOA called on the Team to "…provide a first environmental review of the CDCS to identify potential environmental impacts of planned activities and propose recommendations to each DO [in order to] implement the CDCS in an environmentally sustainable manner, to mitigate the potential threats to the environment, and identify opportunities to enhance the quality of the natural resource base." The ETOA Team was not provided with a copy of the full draft CDCS by USAID/Rwanda, but we were allowed to review the draft Results Framework for the CDCS, which listed the Mission's proposed new DOs, IRs, and sub-IRs, and briefly summarized each. To conduct the requested FAA Section 117 analysis, we screened the proposed DOs, IRs, and sub-IRs for potential risks or threats to biodiversity, tropical forests, and/or environment in general (Exhibit 27). In only a very few cases did we conclude that there might potentially be some negative environmental impact from activities that are likely to be proposed. We noted that negative environmental impacts might be expected from: 1) peat energy development; 2) agricultural activities that lead to conversion or degradation of forests, wetlands, or other natural ecosystems (e.g. rice irrigation); and 3) any development activities (e.g., health, education, agriculture) in areas with potential for future restoration of natural habitats adjacent to current protected areas, including in the "Central Valley" area west of Akagera National Park, an area that has potential for re-acquisition by the park, and or areas suitable for potential future forest corridor restoration between Gishwati and Mukura Forest Reserves and Nyungwe National Park. In Section 9.2, we recommend that, in order to comply with FAA Section 117 and avoid later problems with environmental compliance under Regulation 22 CFR 216, USAID/Rwanda will need to avoid supporting any of these activities, due to their potential negative environmental consequences.

Exhibit 27. Screening of Proposed Results Framework for Environmental Risks

CDCS Results Framework DOs and IRs	Potential Risk of Negative Impact to Biodiversity, Tropical Forests, and/or Environment
DO1: Economic opportunities increased and sustained IR 1.1: Increased agricultural productivity and nutrition outcomes of agriculture (includes plans to support maize, beans, dairy, pyrethrum, and other?) IR 1.2: Enhanced Rwandan private sector competitiveness (includes sub-IR 1.2.3, Enhanced capacity for energy resources management)	• Support for any type of agricultural expansion in areas of natural ecosystems such as forests or wetlands/marshlands • Support for maize or bean agriculture on inappropriately steep slopes • Support for any agricultural development in Central Valley west of Akagera National Park • Support for any agricultural development in the area where a forest corridor might be restored between Gishwati, Mukura, and Nyungwe forests • Support for peat energy development in wetlands
DO2: Improve conditions for durable peace and development through strengthened democratic processes IR 2.1: Increased civic participation and consultation in decision-making at all levels IR 2.2: Improved social cohesion	None
DO3: Health and nutritional status of Rwandans improved IR 3.1: Strengthened capacity of health sector to deliver high quality services IR 3.2: Increased utilization of quality health services/products by target populations and communities	• Support for any development in Central Valley west of Akagera National Park • Support for any development in the area where a forest corridor might be restored between Gishwati, Mukura, and Nyungwe forests
DO4: Increased opportunities for Rwandan children and youth to succeed in schooling and the modern workplace IR 4.1: Improved literacy and numeracy outcomes for children in primary IR 4.2: Increased stable employment for vulnerable youth	• Support for any development in Central Valley west of Akagera National Park • Support for any development in the area where a forest corridor might be restored between Gishwati, Mukura, and Nyungwe forests

9. RECOMMENDATIONS

In Section 1, we stated that the main objectives of the ETOA were to assist USAID/Rwanda to better integrate environment and conservation in programs and projects to be designed under its new CDCS by providing:

- recommendations for linkages and synergies with Mission Development Objectives ("do good if possible");
- advance warning to avoid later environmental impact issues ("do no harm"); and
- Foreign Assistance Act (FAA) Sections 118, 119 compliance ("comply with the law").

Our SOW required that we "analyze and summarize planned programs of the mission CDCS and assess their potential environmental impacts and provide recommendations to the mission on how to maximize the environmental benefit as the mission is implementing its CDCS."

In this concluding section, we provide our recommendations, which fall into two categories: 1) recommendations for maximizing environmental benefits of the mission's CDCS through integration and resulting synergies, and 2) recommendations for general and specific activities to avoid because of potential negative environmental effects.

9.1 INTEGRATE BIODIVERSITY AND ENVIRONMENT INTO MISSION DEVELOPMENT OBJECTIVES

USAID's policies and guidance generally describe both biodiversity conservation and climate change adaptation as cross-cutting, cross-sectoral issues. For biodiversity, USAID's *Biodiversity Conservation: A Guide for USAID Staff and Partners* states that "one of USAID's strengths in biodiversity conservation is its insistence that biodiversity conservation be integrated with development activities and goals," and further that "we have … expanded the vision of biodiversity conservation cross-sectorally by actively linking with other sectors to … take advantage of cross-sectoral synergies …" (USAID, 2005a). The new USAID *Biodiversity Policy*, launched in 2014, states that "USAID will promote the use of integrated approaches that support both biodiversity conservation and improved development outcomes," and that

> … opportunities to promote integration of biodiversity and development may be best addressed in the context of engagement with specific development sectors, i.e., as they relate to sustaining or increasing access to biodiversity goods and ecosystem services to support development outcomes in those sectors. USAID will pursue opportunities in key sectors such as agriculture, food security ... health, governance, economic growth, and trade. (USAID, 2014)

USAID's *Climate Change and Development Strategy* similarly states that "consideration of climate change … across a wide range of development sectors is essential to the success of USAID's mission" (USAID, 2012).

9.1.1 DEVELOP A PLAN FOR INTEGRATING BIODIVERSITY AND ENVIRONMENT INTO THE USAID/RWANDA PROJECT DESIGN CYCLE

The ETOA Team recommends that USAID/Rwanda develop a plan for facilitating the integration of biodiversity conservation called for in the *Biodiversity Policy*. At the time of writing, the USAID/Rwanda CDCS is nearing approval, so our recommendation aims at integration of biodiversity and environmental considerations in the project design cycle to follow. The *Biodiversity Policy* says that

> The CDCS process provides an entry point to integrate biodiversity conservation by
>
> - using the results of the mission's required periodic analysis of the conservation and sustainable use of tropical forests and biodiversity (FAA Sections 118 and 119 analysis);

- evaluating the importance of biodiversity and ecosystem-based approaches to achieving national development goals (e.g., in food security, health, and mitigating and adapting to climate change);
- providing opportunities to analyze trade-offs between conservation and development objectives;
- studying and adopting development pathways that support biodiversity conservation; and
- recognizing and managing the potential negative impact on biodiversity of pursuing some development objectives.

> Options for integration and collaboration during activity design include … selecting interventions where opportunities for outcomes in biodiversity and other sectors coincide. (USAID, 2014)

Integrating environmental considerations, including biodiversity conservation and climate change, in its project design cycle would be in line with the GoR's *Vision 2020,* EDPRS II, and all the sectoral development policies reviewed in Section 5, which call for the same kind of integration advocated in the USAID *Biodiversity Policy*.

9.1.2 DESIGNATE AN IN-HOUSE CHAMPION FOR INTEGRATION

The *Biodiversity Policy* also states that

> Much of the focus of this objective [i.e., integrated approaches to biodiversity conservation and development] is on 'internal change for external impact'; that is, building USAID's internal capabilities and systems to more effectively integrate biodiversity conservation and development in support of achieving external results through Agency programs. (USAID, 2014)

We recommend that USAID/Rwanda identify and designate an in-house champion to promote the concept and lead the process of integrating environment and biodiversity considerations across the mission's portfolio in order to support this "internal change for external impact." A parallel need is for active support from USAID/Washington (E3 and Africa bureaus, and probably the Policy, Planning and Learning (PPL) Bureau, for this "mainstreaming"; we recommend that USAID/Rwanda request that needed support).

9.1.3 PROVIDE A MODEL OF INTEGRATION FOR OTHER USAID MISSIONS

Although USAID policies and guidance clearly describe both biodiversity and climate change as cross-cutting, cross-sectoral issues, in practice these issues seem sometimes to be viewed by some people in USAID as "sectors" for programming. The Agency has separate funding streams for biodiversity, climate change adaptation, and climate change mitigation. Each of these themes has its own top-level standard indicators for performance monitoring and evaluation, just as other USAID development sectors do (US Department of State, 2011). This fact presents a challenge for the Agency in implementing its stated view of the role of biodiversity as the foundation for sustainable development, and of climate change adaptation and biodiversity conservation as cross-sectoral issues. USAID missions sometimes feel that their "hands are tied" with congressional earmarks or presidential initiatives that are anything but integrated—they are often "stove-piped" and narrowly sectoral, whether the President's Emergency Fund for AIDS Relief (PEPFAR), Feed the Future, the Global Climate Change Initiative, or the Biodiversity Earmark. Stove-piped indicators for earmarks and initiatives make designing integrated programs a challenge.

How could USAID/Rwanda work around these disincentives for integrated programming when it is clear what is needed on the ground? By integrating biodiversity and environment considerations into its health, economic growth, agriculture, democracy and governance, and education objectives—and obtaining

support for this integration from USAID/Washington—USAID/Rwanda could serve as a leader and model for the Africa Bureau and Agency as a whole if it sincerely attempts to implement the *Biodiversity Policy*.

9.1.4 SUPPORT INITIATIVES OF THE GOVERNMENT OF RWANDA AND OTHER DONORS TO RESTORE GISHWATI AND MUKURA FORESTS

In Section 2, we noted that Gishwati and Mukura forests are important fragments of Afromontane forest ecosystems in Western Province, lying between Volcanoes and Nyungwe National Parks. Both are important for the eco-hydrological services they provide to downstream communities, and both remain under threat from various causes, including mining and overexploitation of forest resources. Gishwati Forest was reduced from an area of about 28,000 hectares in 1970 to 600 in 2005, mainly due to the return and settlement of refugees after the Genocide. Efforts by international donors gradually protected and restored small areas of Gishwati, and these efforts continue. In October 2014, a Draft Law was written to make these forest reserves into the Gishwati-Mukura National Park. USAID/Rwanda should consider joining with international donors to support the further conservation and restoration of these forests, as long as proper social safeguards are followed so that communities already living near these areas are not displaced, and benefit from forest restoration.

9.2 AVOID NEGATIVE ENVIRONMENTAL IMPACTS

As mentioned in the Introduction to this ETOA report, one reason that the USAID Africa Bureau has often encouraged missions to broaden the FAA 118-119 analysis requirements into an ETOA is that the latter can serve as a strategy-level "preview" environmental assessment that can give a USAID mission advance warning about possible environmental compliance problems that they could later face if they propose a program that might either directly or indirectly threaten biodiversity, tropical forests, or the environment. Based on our screening of USAID/Rwanda's CDCS Results Framework, described in Section 8.3, we recommend the following:

9.2.1 AVOID SUPPORTING PEAT FOR ELECTRIC POWER GENERATION

The GoR is promoting the use of peat energy from wetlands associated with the Akanyaru and Nyabarongo rivers. "The Rwabusoro marshland and Rucahabi in the districts of Nyanza and Bugesera present significant opportunity for large-scale peat harvesting for power generation. Rwanda plans to develop its peat resources to generate about 200 MW of power by 2017" (MININFRA/EWSA/RDB, 2014). Peat is a nonrenewable fossil fuel, although formed more recently than coal deposits. Like any fossil fuel, it adds carbon dioxide to the atmosphere when burned, contributing to global warming. Its energy content and high ash content make it an even less-desirable fuel for electric generation than low-grade lignite. In Section 2, we described the high national and global biodiversity value of Rwanda's wetlands, and in Section 3 discussed their value in providing important ecosystem services, maintaining water quality and flows in Rwanda and the Nile Basin. Harvesting peat from wetland areas contradicts one of the main actions necessary for environmental conservation that we heard from our key informants, "protect and restore all remaining natural forests and wetland habitats," as discussed in Section 7. The ETOA Team believes that USAID/Rwanda should not support any programs or activities that would encourage peat energy development.

9.2.2 AVOID SUPPORTING AGRICULTURAL ACTIVITIES THAT CONVERT OR DEGRADE WETLANDS OR FORESTS

The ETOA Team saw many examples of papyrus swamps and other natural wetlands being converted to agriculture, especially rice cultivation. As mentioned above in relation to peat energy development, conversion of natural wetlands for irrigated agriculture contradicts one of the main actions necessary for environmental conservation that we heard from our key informants, "protect[ing] and restore[ing] all remaining natural forests and wetland habitats." Such conversion discounts the value of wetlands to the hydrology of Rwanda and the upper Nile Basin, creating long-term costs for perceived short-term economic benefits. Like wetlands, forests are also being converted to agriculture in some areas. We

recommend that USAID/Rwanda carefully avoid supporting any agricultural programs or activities that would lead, directly or indirectly, to the degradation or loss of forests, wetlands, or other natural habitats. Strategic or Programmatic Environmental Assessments may be a tool for anticipating such impacts before agricultural programs or activities become so developed that they are difficult to change.

Agricultural activities supported by the Mission should also take into account the importance of permanent vegetation to soil and water conservation on existing agricultural lands, especially on slopes, and its contribution to watershed protection. USAID/Rwanda's agricultural program should not promote agricultural activities on agricultural lands that have too little permanent vegetation or are too steep to effectively retain water, soil, and soil nutrients.

9.2.3 AVOID SUPPORTING DEVELOPMENT ACTIVITIES IN THE CENTRAL VALLEY WEST OF AKAGERA NATIONAL PARK

The Akagera National Park, now being managed by the Akagera Management Company, is a joint venture between the RDB and the African Parks Network and is seen by the RDB as a potential model for the financial sustainability of Rwanda's national park system. The "Central Valley," a valley along the southwestern boundary of Akagera NP, north-northwest of the main gate at Kiyonza, was once part of the park. It was part of the 1,415 km² area degazetted from the original park in 1997 to accommodate refugees returning after the war and genocide (Briggs and Booth, 2012). The land in this area, although relatively marginal for agriculture, was an important dry-season habitat for the large mammals of the park. The new fence along the western boundary of the park now prevents this movement, and park ecologists do not know what the effect will be on the recovery and re-establishment of populations of large mammals, important to the development of nature tourism in the park. Some park staff and other Rwandan ecologists still hope that funds can be raised to re-acquire lands in the Central Valley to restore the ecological integrity of the park. Agriculture or water development activities in the marginal lands of the Central Valley will increase the human population there, which would make it more difficult and expensive to restore the park to its old boundaries in the future. The ETOA Team recommends that USAID/Rwanda avoid supporting development activities in the sectors of the Kayonza District in the Central Valley area bordering Akagera National Park that would complicate future efforts to re-acquire land for the park and restore its ecological integrity.

9.2.4 AVOID SUPPORTING DEVELOPMENT ACTIVITIES IN THE AREA WHERE A FOREST CORRIDOR MIGHT BE RESTORED BETWEEN GISHWATI, MUKURA, AND NYUNGWE FORESTS

As in the case of the savannah shrublands in the Central Valley area west of Akagera National Park, development activities in certain areas with the potential for future restoration of natural forest between Gishwati and Mukura Forest Reserves and Nyungwe National Park could make it more difficult to restore a forest corridor because they would attract settlement to those areas. As discussed in Section 2.5, forest restoration efforts supported by the Government of Rwanda and donors have already begun around Gishwati, and further restoration efforts are being planned as part of the designation of Gishwati and Mukura as Rwanda's fourth national park.

ANNEX A: STATEMENT OF WORK

SECTION C - DESCRIPTION / SPECIFICATIONS / STATEMENT OF WORK

Environmental Threats and Opportunities Assessment (ETOA) with Special Focus on Biological Diversity and Tropical Forestry

STATEMENT OF WORK

C.1 Purpose

The purpose of this task order is to deliver to USAID/Rwanda a countrywide Environmental Threats and Opportunities Assessment (ETOA) that will inform the Environmental Compliance Annex of the USAID/Rwanda Country Development Cooperation Strategy (CDCS).

C.2 Background

USAID/Rwanda is currently in the process of finalizing its five year CDCS. Incorporation of environmental threats and opportunities into USAID/Rwanda's strategic planning process will help to ensure that activities are conducted in an environmentally sustainable manner, while at the same time identifying opportunities for enhancing the quality of the natural resource base and improve development outcomes. The Mission will also use this assessment to assess potential vulnerabilities in USAID/Rwanda's development portfolio to better mainstream climate change into its programs. Updating the ETOA (FAA 117 analysis) and revisiting FAA 118/ 119 analyses are justified by two main reasons:

The first reason is related to the strategic planning process and implementation of USAID Forward through the use of host country systems. The ETOA will help USAID/Rwanda update its data and assumptions on the environment of Rwanda as a whole and better integrate environment while implementing its CDCS. The ETOA occurs at a time when the GoR has just adopted its second Economic Development and Poverty Reduction Strategy (EDPRS II) for the period of 2013 through 2017. In the context of implementing USAID Forward's procurement reform, the Mission is increasingly interested in trying to use host country systems and local implementing partners. The Mission would like to use this assessment to review the GoR's organizational capacity to effectively mitigate environmental impacts of development programs as the country implements its EDPRS II.

A second reason of updating the ETOA and the 118/ 119 analyses is linked to the environment requirements.

- FAA 117 on "*Environment and Natural Resources*" requires that operating units implement their programs with an aim toward maintaining (and restoring) natural resources upon which economic growth depends, and consider the impact of their activities on the environment. USAID/Rwanda recognizes that protection of the environment and wise management of the natural resource base are absolute requirements of any successful development program. The legal requirements of the FAA arc reflected in USAID's *ADS Chapter 204 "Environmental Procedures,* " which provides essential procedures and policy on the application of *22 CFR Part 216.* This regulation codifies the Agency's procedures "to ensure that environmental factors and values are integrated into the USAID decision making process." Further, 22 CFR 216.5 requires USAID operating units to conduct their assistance programs in ways that are sensitive to the protection of endangered or threatened species and their critical habitats. The purpose of this ETOA is not to provide Regulation 216 review, and once the new CDCS is approved every Development Objective (DO) under the new CDCS will have individual IEEs prepared and approved prior to obligation of funds. The issues of environmental quality and management will be reinforced and mainstreamed through the IEE process. However, this ETOA will provide a first level of analysis on which

USAID/Rwanda's compliance with the Regulation 216 requirements can be subsequently satisfied. This section will be focused around each proposed Development Objective.

- Sections 118 "*Tropical Forests*" and 119 "*Endangered Species*" of the FAA codify the more specific U.S. interests in forests and biological diversity. These two provisions require that all USAID missions conduct a periodic country analysis of the conservation and sustainable use of tropical forests and biological diversity. Specifically, FAA Sections 118 and 119 require that all country plans include: (a) an analysis of the actions necessary in that country to achieve conservation and sustainable management of tropical forests (118) and conserve biological diversity (119); and (b) the extent to which current or proposed USAID actions meet those needs. By mandating these analyses, Congress is recognizing the fundamental role that tropical forests and the conservation of biodiversity play in sustainable development.

C.3 USAID's Programs in Rwanda

USAID/Rwanda's CDCS Goal seeks to strengthen Rwanda's successful growth and development with a focus on capacity building, sustainability, and adaptation to local conditions through increased consultation. USAID/Rwanda is implementing three presidential initiatives: Feed the Future, the Global Health Initiative, and the Global Climate Change Initiative, and its programs in Rwanda fall into four development objectives. The Mission also receives funding for clean water and sanitation services, and funds under the biodiversity earmark.

DO1: Economic Growth

Rwanda has been selected as one of the priority countries under the Feed the Future initiative. Rwanda is also a recipient of funding for the Global Climate Change Initiative. USAID/Rwanda investments under the Economic Growth objective focus on expanding economic opportunities in rural areas by transforming the agriculture sector from its current subsistence nature to market-led, demand-driven agriculture, while supporting the role of agriculture in improving the nutrition status of the population. In addition, efforts to improve the capacity to manage natural resources and adapt to climate change will contribute to increased agricultural productivity. USAID/Rwanda investments also help the GoR improve the environment for investment promotion, and support both the GoR and the private sector in taking full advantage of the opportunities that regional integration offers, as well as help the GoR harness Rwanda's energy resources.

DO2: Democracy and Governance

USAID/Rwanda Democracy and Governance investments focus on improving conditions for durable peace and development through strengthened democratic processes by building the capacity of civil society to participate in the political sphere, while consolidating peace and stability. The Mission will promote social cohesion, peace building, and reconciliation, specifically focusing on grievances that have the potential to lead to a resurgence of ethnic tensions and violence through a series of activities designed to: (1) increase civic participation in order to strengthen citizens' democratic engagement by improving the capacity of CSOs and communities to influence GoR public-policy decision-making; and (2) improve social cohesion through continued peace-building and reconciliation efforts that foster a more adaptable and stable society in which citizens can freely engage with government on a wide range of issues.

To do this the Mission works with government, media and civil society to strengthen democracy and governance in Rwanda. This is achieved through four program areas: (I) rule of law and human rights; (2) good governance; (3) political competition and consensus building; and (4) civil society.

DO3: Health

Rwanda's core health indicators have improved dramatically in recent years, but maintaining this accelerated progress is essential. USAID supports the GoR's initiatives to fight HIV/AIDS, malaria and

tuberculosis, increase the quality and use of family planning and reproductive health services, improve maternal newborn and child health and strengthen the overall health sector. In addition to supporting the immediate goal of improving Rwandans' health and saving lives, USAID's health activities also support the long-term development of the Rwandan health system and support WASH and nutrition activities.

Significant support is provided through technical assistance to the Government of Rwanda for decentralization in the health sector, health policy development, strengthening health care financing, developing the pharmaceutical logistics system, and building capacity of service providers.

DO4: Education

USAID/Rwanda education investments focus on strengthening the quality of basic education at the primary level. Additionally, the Education DO includes activities designed to increase skill levels and income generating opportunities for youth, particularly out-of-school youth. USAID/Rwanda will continue to work on developing the work-readiness skills and basic literacy and numeracy competencies of targeted youth, and with prospective employers to provide on-the-job learning opportunities that will enhance their long-term employment prospects, including self-employment through entrepreneurship.

C.4 Objectives and Proposed Activities

This task order bas four complementary objectives:

1. This ETOA will address the requirements of sections 118(e) and 119(d) of the Foreign Assistance Act (FAA) of 1961, as amended and ADS 201.3.8.2 regarding tropical forestry and biodiversity analyses for country strategic plans. Additionally, it will provide the first level of analysis on the environmental impact of activities proposed for support under the CDCS, in light of other applicable legislation and Agency regulations.
2. The FAA section 117 on "Environment and Natural Resources," requires that operating units implement their programs with an aim toward maintaining (and restoring) natural resources upon which economic growth depends, and to consider the impact of their activities on the environment. This assessment will also identify important issues with respect to environmental conditions and threats which USAID/Rwanda must be aware of as it implements its CDCS. The purpose of this ETOA is not to provide Regulation 216 review. Once the new CDCS is approved, each project under the new CDCS will have individual Initial Environmental Examinations (IEE) prepared and approved prior to obligation of funds. The issues of environmental quality and management will be reinforced and mainstreamed through the IEE process. However, this ETOA will provide a first level of analysis on which USAID/Rwanda's compliance with the Regulation 216 requirements can be subsequently satisfied.
3. The Mission would like to include a climate change vulnerability assessment focused on potential vulnerabilities in of its development portfolio in the new ETOA. The vulnerability assessment will not be for the whole country, but will focus on specific sectors the Mission is investing in or planning investing in the previous ETOA, conducted in 2008, did not include this analysis.
4. As the Mission is planning to implement USAID Forward through the use of local solutions, the Mission wants the new ETOA to include an assessment the quality of Government of Rwanda (GoR) environmental systems, especially enforcement, to inform environmental compliance of Government-to-Government (G2G) programming.

C.5 Services and Tasks Required

C.5 (a) Evaluation Requirements

The evaluation team shall perform the following tasks:

1. Document the state of key natural resources by quantifying trends in their management, biophysical condition, productivity, abundance and distribution and identifying the threats (e.g., degradation, depletion, pollution) to which they are subjected. For the purpose of this analysis, the key natural resources to be assessed include forests andwoodlands, wildlife, natural water bodies (including wetlands, rivers and lakes), and soils (fertility and stability) as related to agricultural systems and other forms of land use.
2. Conduct an analysis of how past events and current initiatives have shaped the country's development trajectory. The concern is how Rwanda will respond to the global economy, and how its geopolitical position and internal development agenda will affect environmental sustainability (Section 117), tropical forest conservation, (118) and biodiversity (119). This assessment should assess how USAID and GoR's current strategies will likely affect the environment, tropical forests, and biodiversity.
3. Analyze existing and proposed laws, policies, and initiatives that have implications for the environment. Of particular relevance are: l) policies, codes, protocols and regulations (both draft and in force) related to natural resources, e.g. biodiversity and wildlife policies; 2) water resources management legislation and wetlands law; 3) land tenure legislation and/or initiatives; agribusiness and private sector promotion provisions; and 4) other related policies, laws and strategies.
4. Identify and analyze gaps in the existing knowledge base, both within and outside the purview of existing agencies. Collect available data, conduct interviews, and recommend needed follow up work.
5. Conduct the Section 118(e)/119(d) analysis. The assessment will (a) describe the actions necessary to conserve tropical forests (if any) and biodiversity in Rwanda, and (b) describe the extent to which the actions proposed for support in the CDCS meet those needs. This latter section will be organized around (1) the needs identified for Rwanda, and relate the proposed activities to those needs; and (2) issues identified where proposed USAID programs may have adverse effects on biodiversity and tropical forests. Where possible this should include suggestions to eliminate adverse effects. Where identified needs are not being addressed by the CDCS, this should be expressly stated. Where appropriate, to the analysis should note other donors or partners who are addressing the needs not proposed for support under the CDCS and/or describe the reason for the CDCS not proposing support for those needs (the strategy focuses on the highest-priority needs, other partners are addressing certain high-priority needs, conflict prevents access to high-priority needs, other needs are higher priority in the development context, etc.).
6. Conduct the Section 117 analysis. The assessment ill provide a first environmental review of the CDCS to identify potential environmental impacts of planned activities and propose recommendations to each DO implement the CDCS in an environmentally sustainable manner, to mitigate the potential threats to the environment, and identify opportunities to enhance the quality of the natural resource base.
7. Conduct a climate change vulnerability assessment of proposed USAID/Rwanda strategy components. The Mission is not expecting the contractor to conduct a countrywide climate vulnerability assessment but rather is interested in a focused assessment of potential vulnerabilities in USAID/Rwanda's development strategy will help the mission implement its strategy taking into account potential climate impacts. This section will be organized around the proposed DOs, and will make suggestions regarding those DOs.
8. Conduct an assessment of the GoR environmental management systems, including a review of national environmental assessment processes and other mechanisms for mainstreaming environment in national plans.

C.5 (b) Data Collection Methods

In preparing this evaluation, the team will ensure that their research includes the following activities:

A) Data Collection:

- Prior to departure, hold meetings with the USAID/Washington Africa Bureau, and E3 Bureau climate, biodiversity, forestry specialists (as available) and the Africa Bureau Environment Officer to gather relevant information and guidance. In addition, hold meetings with relevant Washington, D.C., based organizations (such as conservation NGOs with active programs in Rwanda to gather relevant information on regional programs and agency environmental regulations).
- After arrival in the field, meet with USAID/Rwanda to go over the SOW, get an understanding of the Mission's ongoing sectoral assessments, program goals, and objectives under its proposed strategy. The Mission will provide the team with advice and protocol on approaching US AID 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.
- The Mission Environment Officer {MEO) will facilitate meetings with other DO Teams at USAID to allow the team to gain a full understanding of the country program and strategy. The MEO will help facilitate interaction and information exchange with any other assessment teams in the field as necessary. As appropriate, the MEO will also facilitate de-brief meetings with specific DO to discuss particular issues or findings from the analysis
- Obtain, review, and analyze existing strategic documents in Rwanda, including the EDPRS II and different sector strategies. The Mission will provide a substantial portion of these materials.
- Obtain, review, and analyze existing documentation on biodiversity and tropical forest conservation in Rwanda, such as that prepared by government agencies, bilateral donors, and national and international NGOs. Examples of such documentation may include the National Biodiversity Conservation Strategies and Action Plan, National Green Growth and climate change strategy; Global Environment Fund projects reports; reports by FAO, UNESCO, UNEP, and/or UNDP; reports by conservation NGOs, etc.
- Obtain, review and analyze documents related to national environmental systems including the national environmental laws and regulations, guidelines for environment assessments. The Mission will provide a substantial portion of the materials.
- Hold meetings with relevant ministries and agencies, donor organizations, NGOs, and other organizations which are involved in forest and biodiversity conservation, cross-cutting issues, or which are implementing noteworthy projects, and gather relevant information.
- Conduct one to three priority site visits, if necessary, to supplement the understanding gained from interviews, literature, and other second-hand sources.

B) Analysis:

- Analyze and summarize the status of biodiversity and tropical forests in Rwanda, Summarize the social, economic, institutional, legal, and policy context for their use and conservation, including actions currently being taken by government, other donors, NGOs, and the private sector. Identify the key direct and indirect threats to biodiversity and tropical forests. Identify the actions necessary to conserve and sustainably manage natural resources and biodiversity and tropical forests in Rwanda in the current context, based on analysis of donor and NGO responses to meet these needs. Identify opportunities for USAID programming to positively affect conservation of Rwanda's biodiversity and tropical forests. Identify issues and areas of concern where current or proposed USAID programming may negatively affect biodiversity and tropical forests.
- Analyze and summarize planned programs of the mission CDCS and assess their potential environmental impacts and provide recommendations to the mission on how to maximize the environmental benefit as the mission is implementing its CDCS.

- Analyze potential climate vulnerability of the proposed programs in the CDCS and provide recommendations to the mission about how to integrate climate change in the implementation of its strategy.
- Analyze and summarize the social, economic, institutional, legal, and policy context for environment management and identify issues and areas of concern where USAID could provide GoR support in improving its environment management and monitoring systems.

C) Report:

- Prepare a report describing the analysis and conclusions.
- This report shall clearly meet the legal requirements of FAA Sec 119 and Sec 118 by: 1) clearly articulating the actions necessary to conserve biodiversity (and tropical forests) in Rwanda, 2) clearly describing the extent to which actions proposed in new the USAID/Rwanda CDCS meet or affect the needs identified.
- This report also shall clearly articulate the actions necessary to be undertaken by the mission in implementing its CDCS to minimize the impacts on environment and integrate climate change in its programs.
- The report should also provide recommendations about the gaps in the GoR environment systems as the mission is considering G2G programming.

C.6 General Program Implementation Guidelines

C.6 (a) Assessment Team Composition

The assessment will be led by a Team Leader provided by the Contractor. The Contractor's team should include at least one member with an understanding of climate change adaptation integration in development.

1. The Team Leader should be a Senior Level Natural Resource Management Specialist with the following qualifications:

a. Post-graduate qualifications (Master's level degree or higher) in biology, zoology, forestry, or closely related field in natural resource management or natural resource economics.
b. Background in tropical biodiversity and natural resource conservation. Knowledge of USAID's Strategic Planning process related to Tropical Forestry and Biodiversity (FAA Sections 118 and L 19). Knowledge of 22 CFR 216 and of FAA 117 is also desirable.
c. Demonstrated expertise in assessing development programs for impacts on environment and tropical ecosystems and of environmental impact assessments. Experience in the East Africa region and in Rwanda desirable. S/he must have professional experience coordinating assessment, and leading teams composed of multiple stakeholders. The candidate must have exceptional organizational, analytical, writing, and presentation skills. S/he must be fluent in English and knowledge of French is preferred.

The Team Leader will oversee the overall drafting of the assessment framework, including methodology determinations; organization of calendar/travel/meetings; coordinating the desk study, interview, survey and other data collection; and analyzing the data with input from team members and USAID to draft an evaluation report. In the field, the Team Leader will be responsible for day-to-day direction of team members. All evaluation team members should have defined roles and know in advance an outline of the report and the portion they are expect to draft.

The Team Leader will be assisted by a two-person team. The following composition and expertise is required to conduct this analysis:

2. International Technical Assistance (1 person):

a. Environment Specialist with post-graduate qualifications in environmental law.
b. Demonstrated experience in environmental law, policy and legal frameworks governing environmental management and biodiversity/forestry conservation and the analysis of relevant policies.
c. Demonstrated expertise in assessing development programs for impacts on environment and tropical ecosystems.
d. Experience in Eastern or Central African region and in Rwanda desirable.

3. Local Technical Assistance (2 People):

a. Environmental Management Specialist or Environmental Policy Analyst with demonstrated experience in Rwandan environmental law, the policy and legal frameworks governing environmental management and biodiversity/forestry conservation in Rwanda and the analysis of relevant policies.
b. Demonstrated expertise in assessing development programs for impacts on environment and tropical ecosystems.
c. Demonstrated expertise in the design and production of environmental impact assessments.
d. Good contacts within Rwanda government agencies, NGOs, international donors, and private sector preferred.
e. Proficiency both in English and French preferred.

The contractor may choose to propose additional technical/support personnel as needed to comply with the requirements of the assessment.

C.6 (b) Schedule and Logistics

The assignment is expected to be approximately three months, with approximately one month of field work in Rwanda. The team will coordinate logistical arrangements with the USAID/Rwanda Mission Environment Officer. The Mission will assist the team by providing key references and contacts as well as logistical support where necessary. USAID/Rwanda's Program Office will also help facilitate meetings with other Mission DO Team Leaders or their staff to fully brief the team on USAID's program and future vision for their strategy.

C. 7 Deliverables

The following deliverables are required. All written documentation for submission by the Contractor to USAID must be in English.

C.7 (a) Work Planning Briefing

The Contractor will have a briefing session with USAID Rwanda to specify the schedule of the work (including field work) one week after the start of the task order

C.7 (b) Assessment De-Briefing

The Contractor is required to provide a de-briefing presentation to USAID/Rwanda and stakeholders approved in content and format by the Mission. The presentation will take place at the end of the field work and will describe preliminary findings and recommendations.

C.7 (c) Final Assessment Report

A final assessment report, including an executive summary, is required and must be approved in content and format by the Mission. In order to ensure the highest quality reporting, the final report of 40-50 pages in length (excluding appendices), will follow the requirements set forth below:

- The report should have a clear 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.
- The report should provide the following information:
- Overview of the status of biodiversity and tropical forests in Rwanda, including ecosystem diversity, species diversity, threatened and endangered species, genetic diversity, agricultural biodiversity, ecological processes and ecosystem services, and values and economics of biodiversity and forests. A map of potential natural vegetation and of land use or land/forest cover should be provided if available.
- Overview of the social, economic, and political context for sustainable natural resources management and the conservation of biodiversity and forests in Rwanda, including the social and economic environment; institutions, policies, and laws affecting conservation; the national protected area system including all IUCN categories of protected areas; laws affecting the protection of endangered species; and participation in international treaties. A map of the protected areas system should be provided.
- Review and summary of government, NGO, and donor programs and activities that contribute to conservation and sustainable natural resources management, and an assessment of their effectiveness, strengths, and weaknesses.
- Assessment of the threats to biodiversity, including direct threats and indirect threats or root causes of the direct threats:
- Description of the actions necessary to conserve biodiversity and forests in Rwanda, logically flowing from the review of the threat~, and what is currently being done by government, NGO, and donor programs that address those threats.
- Overview of the mission strategy and its potential impacts on environment and vulnerability to climate change and recommendations to the mission about how to mitigate environmental impacts and to reduce the impacts of climate change on the mission programs.
- Overview of the capacity of GoR to effectively implement its own environment policies and recommendations about how to fill identified gaps in the systems.
- The report should give a review of the proposed US AID/Rwanda 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. This section should also describe and list-out any threats to biodiversity and forests from activities proposed for USAID support, and suggest mitigating actions where possible or if a non-correctable threat would be realized if programming progressed. It should also identify opportunities for cross-cutting, cross-sectoral 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).
- All references used and cited in the report should be listed; web URLs for information resources should also be provided.
- Appendices to the report should contain, at minimum the Statement of Work for the analysis, biographical sketches of team members, and a list of persons contacted.

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ANNEX C: BIOGRAPHICAL SKETCHES OF THE ETOA TEAM

BRUCE BYERS, TEAM LEADER

Dr. Bruce Byers is a biodiversity conservation and natural resources management specialist with more than 25 years of experience in program assessments and evaluations, strategic planning, project design, outreach, communications, and behavior change strategies. He works 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 seven previous USAID biodiversity and tropical forestry assessments or ETOAs. 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***, the senior advisor and lead technical writer in preparation of the USAID guide for biodiversity conservation programming: ***Biodiversity Conservation: A Guide for USAID Staff and Partners (2005)***. In 2008, he led the final evaluation of the USAID Global Conservation Program, and in 2013 led a study on ***Integrating Climate Change Adaptation into Biodiversity and Forestry Assessments and Programming*** for the USAID African and Latin American Adaptation to Climate Change (ARCC) Project.

EMMANUEL HAKIZIMANA, NATURAL RESOURCE MANAGEMENT SPECIALIST

Mr. Emmanuel Hakizimana has over 18 years of experience in 10 African countries, conducting environmental and social impact assessments, needs assessments, baseline studies, and project evaluations, and national reports on environmental needs and vulnerabilities. Mr. Hakizimana has conducted environmental impact assessments of peat energy development, hydroelectric plants, electrical transmission lines, mining projects, and hotel developments. He has worked on studies of wetlands and climate change, and was on a team that evaluated the effectiveness of USAID/Rwanda investments in Nyungwe National Park. From 2003 to 2008 he served as Director of the Department of Planning, Research and Monitoring in the Rwandan Office of Tourism and National Parks. Emmanuel is the President of the oldest nature-conservation NGO in Rwanda, the Association pour la Conservation de la Nature au Rwanda (ACNR). He currently works in the Ministry of Health as an entomologist specializing in the ecology and control of vector-borne diseases, including malaria.

SERGE JORUM NSENGIMANA, BIODIVERSITY CONSERVATION SPECIALIST

Mr. Serge Nsengimana has more than 20 years of experience in biodiversity conservation and climate change adaptation in Rwanda. He is currently the Executive Director of the Association pour la Conservation de la Nature au Rwanda (ACNR), the oldest nature-conservation NGO in Rwanda, which serves as the national partner of BirdLife International. From 2002 to 2007 Mr. Nsengimana worked for the Dian Fossey Gorilla Fund International at the Karisoke Research Centre in Volcanoes National Park, as the Conservation Education and Biodiversity Training Program Manager. As the leader of ACNR, Serge is currently active in technical working groups dealing with environment and climate change, forest and nature conservation, integrated water resources management, and REDD+. He has been active in supporting ecotourism and avitourism in Rwanda.

EUGENE RUTAGARAMA, INSTITUTIONAL AND POLICY SPECIALIST

Mr. Eugene Rutagarama has 25 years of experience in biodiversity conservation project design, management, and implementation with extensive experience in Great Lakes region of Africa. His expertise includes building partnerships for conservation with a broad range of stakeholders, management of multi-donor projects, strategic planning, and organizational development. Mr. Rutagarama recently served as the Senior Technical Advisor to the Greater Virunga Transboundary Collaboration (GVTC). From 1997 to

2012 Eugene was the leader of the International Gorilla Conservation Programme (IGCP), a joint program of the African Wildlife Foundation (AWF), Fauna and Flora International (FFI), and World Wide Fund for Nature (WWF). Mr. Rutagarama has also held senior positions with the Wildlife Conservation Society (WCS) as the Director of the Nyungwe Forest Conservation project, and with Dian Fossey Gorilla Fund's Karisoke Research Centre.

LAURENT GRANIER, LEGAL AND POLICY SPECIALIST

Mr. Laurent Granier contributed to Chapter 5 of this report. Laurent is a Legal and Policy Specialist with experience in more than 15 African countries. He is currently helping to revise the Congo (DRC) forestry law and decrees which underpin the DRC legal environmental framework. He has also provided technical assistance to the DRC Ministry of the Environment. Mr. Granier is a member of IUCN's Environmental Law Commission and the African Francophone Environmental Lawyers Network.

ANNEX D: ACTIONS NEEDED GROUPED BY THEME

1) Implement and Enforce Existing Policies and Laws

- Government should share funds for implementation and enforcement of environmental protection with NGOs if it does not have capacity itself
- Grassroots stakeholders give feedback upward to government about environmental policies and regulations
- Communities, NGOs, and gov't have ongoing engagement and communication
- Capacity of civil society organizations' capacity to advocate and implement environmental actions is built
- Implement and enforce existing laws and policies
- Strengthen RDB capacity for law enforcement in national parks (training, ranger posts, equipment)
- Harmonize/coordinate responsibilities for environmental management and conservation among the various ministries in which these responsibilities lie
- Improve law enforcement to reduce illegal mining
- Identify govt entity to be responsible for the conservation of wildlife/nature in general in and outside protected areas, to consolidate roles now scattered among different ministries and agencies
- Develop an integrated program to address the causes of threats to forests and biodiversity
- Increase community awareness and vigilance to stop collection of crane eggs
- Increase the width of the riparian buffer zone up to the 10 meters stipulated in the Environment Law, which is not now enforced
- Implement and enforce the requirements of the mining law and policy
- Enforce the 2005 Environmental Law through more rangers and collaboration with courts and police

N = 15

2) Integrate Environment and Biodiversity Conservation into All Development Sectors

- Undertake more comprehensive research on environmental impacts of mining
- Increase knowledge for integrated land use planning and management
- Revise/reform the institutional structure of RDB to balance conservation with investment promotion and revenue generation
- Strengthen the RDB Conservation Department
- "Reinforce mainstreaming " of biodiversity and forest conservation and environmental protection in District Development Plans
- Align District Development Plans with conservation of national parks and other protected areas so that all efforts to improve livelihoods can link with conservation
- Donors leverage their investments in agriculture, health, DG, and other sectors when working in communities around protected areas
- Find project models that bring multiple benefits (to environment, health, education, DG, agriculture, economic growth) from USAID investments
- Increase understanding about conservation in RDB – right now they mostly focus on tourism
- Promote integrated natural resources management
- Support model "green villages"
- Mainstream environment and biodiversity conservation in all policies, all sectors
- Balance the power between the tourism business/revenue generation section and the conservation section of RDB

N= 13

3) Promote Conservation Agriculture that Links Food Security and Environmental Conservation

- Plant trees planting for fruit, erosion control, windbreaks
- Develop compost manure sites
- Utilize technologies in agriculture and energy to reduce environmental impact per person
- Develop small animal livestock production
- Take advantage of opportunities for biodiversity conservation in agricultural landscapes
- Encourage cropping systems for multiple crops on the same field as alternatives to monoculture
- Improve the national gene bank to conserve traditional varieties, traditional agro-biodiversity
- Apply better land management and erosion control (terraces, tree planting, gabions)
- Establish community agreements not to grow maize, which is prone to crop-raiding by primates, close to the forest reserve
- Find a sustainable source of sticks for growing beans other than cutting them in the forest
- Develop programs to cultivate bamboo outside the Nyungwe and Volcanoes National Parks
- Minimize the use of chemical fertilizers and maximize the use of organic ones
- Align agroforestry, terraces, and other soil conservation measures with land consolidation and the transformation of agriculture

N = 13

4) Emphasize Water as an Integrating Ecosystem Service

- Ensure access to clean water from rooftop rainwater harvesting and storage
- Treat water as a cross-cutting issue; treat water as the natural resource that integrates health, energy, food security, and climate resilience
- Reduce forest degradation and loss to provide downstream ecosystem services benefits (esp. water)
- Integrate responsibilities for water management among the agencies in which various responsibilities are now scattered
- Integrate water resource management, an ecosystem-based approach
- Organize District Hydrological Committees and support them in developing catchment plans in districts
- Determine the proper institutional arrangement for watershed-based catchment management
- Design programs that integrate water, forest management, and agriculture
- Develop a better understanding of the water balance in Rwanda's catchments, through monitoring, modelling, and analysis
- Improve the hydrological monitoring system and automate it
- Improve management of watersheds to stabilize wet season and dry season flows, for hydropower, drinking water, and irrigation

N = 12

5) Protect and Restore All Remaining Natural Forests and Wetland Habitats

- Conceive of strategic approaches for conserving and restoring small native forest patches
- Identify simple and efficient monitoring of indicators of conservation status and environmental health (such as "Ranger-based Monitoring")
- Continue to monitor birds and mammals in protected areas; monitor birds in Akagera NP in order to comply with the Migratory Bird Convention
- Develop protection of riverine buffer zones along rivers
- Prevent further drainage of Rugezi Swamp and allow papyrus restoration in lower part
- Establish community agreements to keep cattle in fenced areas near Gishwati Forest

- Promote indigenous tree species in afforestation and forest restoration, with establishment of indigenous tree nurseries
- Conduct research on the carrying capacity for various big mammal species given the new boundary fence in Akagera NP and lack of access to the Central Valley
- Conduct research on many ecological aspects of Akagera NP to inform management actions
- Discourage GoR support for irrigated rice cultivation in the Central Valley, so that perhaps one day it can be re-incorporated into Akagera NP

N = 11

6) Develop Financial Mechanisms and Incentives for Conservation of Natural Ecosystems

- Create a policy to facilitate more investment by the private sector in ecotourism development
- Develop sustainable financial mechanisms for watershed management
- Develop a framework for "payments for ecosystem services" (PES) for eco-hydrological services in watersheds
- Develop a national policy or legal framework for Payments for Ecosystem Services (PES)
- Identify new models of financial sustainability for parks
- Take advantage of opportunities for Payments for Ecosystem Services in watersheds, through a national framework for PES
- Develop models of voluntary PES mechanisms with water-dependent industries like tea producers
- Gain support to re-incorporate the Central Valley into Akagera National Park, and fundraise to provide funds for purchasing the land
- Reconsider whether RDB should not be sharing more revenue with local communities around national parks – say 10% rather than 5%

N = 10

7) Integrate Health with Environment and Biodiversity Conservation

- Speed up the demographic transition and stabilize population
- Reduce human pressure, by increasing awareness and implementation of family planning
- Improve the management and disposal of medical waste and liquid waste
- Encourage education on ecosystem health and conservation (e.g., zoonotic diseases) in local schools and communities near protected areas
- Provide access to forests for the sustainable collection/harvest of traditional medicines
- Co-locate activities to improve livelihoods and health in communities neighboring protected areas with conservation activities to achieve win-win benefits
- Support medical checkups and treatment of park staff working on tourism and conservation with chimpanzees and gorillas
- Develop a program to prevent rabies around Volcanoes NP and to control feral dogs inside the park

N = 9

8) Develop Off-Farm Livelihood Alternatives in Rural Communities

- Increase off-farm and ag-processing jobs, linked to ag. value chains, to relieve demographic pressure on land
- Explore technologies and extension services for modern beekeeping and honey harvesting
- Encourage projects to create off-farm jobs from value-chain processing etc. of agricultural products
- Develop and pilot micro-credit models
- Reduce over-dependence on natural resources by providing alternative economic/livelihood opportunities

• Develop livelihood opportunities that are compatible with conservation of forests • Support for the community tourism project at Cyamodongo Forest and Nyungwe NP through revenue sharing • Promote tourism and share revenue with communities N = 8
9) Link Environmental Protection and Energy Development • Promote the use of fuel efficient cook stoves • Reduce the sediment in the Sebeya River to protect turbine blades at the Gisenyi Hydroelectic Station and reduce costs of blade replacement • Support and promote the efficient use of wood fuel as a "green," renewable, low-carbon energy source • Support renewable energy development N = 7
10) Improve Climate Change Resilience • Take actions to increase resilience to climate change • Develop climate change adaptation strategies appropriate for each region • Protect what is left of forests and other natural ecosystems to maintain resilience, esp. in the face of climate change • Strengthen resilience to climate variability and change • Establish an improved meteorological and hydrological monitoring system, with more weather and river monitoring stations • Conduct a study of how climate change might shift gorilla food plants and create a risk to them N = 6

ANNEX E: PERSONS CONTACTED

Institutions	Names	Position	Contact phone
Akagera Management Company Ltd/Akagera National Park	Mrs. Sarah Hall	Tourism and Marketing Manager	sarahh@african-parks.org +250782166015
	Mr. Eugene Mutangana	Head of Low Enforcement (Deputy CEO)	eugenem@african-parks.org +250788623113
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Association Rwandaise des Ecologistes	Mr. Aloys Bicamumpaka	Administration and Finance Manager	arecorwa@yahoo.fr alobica2@yahoo.fr +250788633409
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	Mr. Francois Xavier Nsengumuremyi	Secretary	
Development Alternatives Inc.	Mr. Moise Bigirabagabo	Business Development Services and Field Coordinator	+250786102956
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	Mr. Boaz Tumwesigye	Chief of Party, Strengthening Sustainable Ecotourism in and Around Nyungwe National Park; "Nyungwe Nziza" Project	Boaz_tumwesigye@dai.com +250788309833
Fishermen Cooperative Union, Rubavu district.	Mrs. Cecile Ntabanganyimana	Vice President	+250788703492
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	Mr. James Byamukama	Program Manager GVTC	jbyamukama@greatervirunga.org, +250789199937
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Ministry of Agriculture and Animal resources	Mr. Raphael Rurangwa	Director General, Planning	Raphael.rurangwa@gmail.com +250788301498

Ministry of Health	Mr. Enock Karakezi	Acting Head of Environmental Health Division	kex005@yahoo.com, +250788487018
Ministry of Natural Resources	Mr. Innocent Musabyimana, Director of Planning and M&E		
Nile Basin Discourse Forum	Mr. John Gakumba Walter	National Coordinator	+250788307662
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RDB-Nyungwe National Park	Mr. Ildephonse Kambogo	Tourism Warden	+250788436763
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	Mr. Nolbert Kaligire	Community Conservation Warden (Nyamasheke Sector)	+250788865212
	Mr. Elie Musabyimana	Community Conservation Warden (Nyaruguru and Nyamagabe Sectors)	elimusa2020@yahoo.fr, +250788223727
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Rwanda Energy Corporation: Gisenyi-Rubavu	Mr. Kamanzi Corneille	Technical Engeneer	corneillekamanzi@yahoo.fr +250788812373
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Rwanda Environment Management Authority (REMA)	Dr. Rose Mukankomeje	Director General	dgrema@gmail.com; +250788300208
Rwanda Environmental Development Organizations	Mr. Damascene Gashumba	Executive Director	redorwanda@yahoo.com +250788408910
Rwanda Integrated Water Security Program (RIWSP)	Mr. Egide Nkuranga	Country Program Director	enkuranga@globalwaters.net +250788308737
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Rwanda Natural Resources Authority (RNRA)	Mr. Vincent de Paul Kabalisa	Deputy Director General in Charge of Integrated Water Resources Management	kabalisa@hotmail.com; +250785545307
	Mr. Dismas Bakundukize	Director of Forest Management Unit	dismas.bakundukize@rnra.rw, +250788625426
	Mr. Felix Rurangwa	Director of Forestry Extension and Natural Ecosystem	rurangwafelix@gmail.com

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Water and Sanitation Corporation: Bihira/Rubavu	Mr. Justin Mwikarago	Plant Manager	jmwikarago@ewa.rw +250788308564
Watershed Management and Ecotourim Cooperative/ Rugezi Wetland	Mr. Berchimas Ayubusa	Chairman Cooperative and Rugezi Wetland Guide	+250783181219
Wildlife Conservation Society	Dr. Michel Masozera	Country Director	mmasozera@wcs.org +250788300483
	Ms. Chloe Cipoletta	Nyungwe Project Director	ccipolletta@wcs.org +250787112074
Wildlife Conservation Society/NNP	Mrs. Claudine Tuyishime	Conservation Education, WCS/Rwanda Program	ctuyishime@wcs.org, +250783056565

ANNEX F: NGO, DONOR, AND PRIVATE SECTOR PROGRAMS AND ACTIVITIES RELATED TO THE ENVIRONMENT

Programs and activities of NGOs, international donors, and the private sector with relevance to threats to the environment and biodiversity are listed below.

Local NGOs

Name	Activity Focal Themes
Association pour la Conservation de la Nature au Rwanda (ACNR)	- Biodiversity research, bird conservation, and IBAs monitoring - Ecosystems restoration and watershed management - Local empowerment and environmental and conservation education - Climate change
Association Rwandaise des Ecologistes (ARECO Rwanda Nziza)	- Environmental Protection Activities - Environmental Education
Rwanda Environnemental Conservation Organisation (RECOR)	- Environment Conservation - Environmental Education
Rwanda Bamboo Organisation (RBO)	- Community Development and Environmental Protection Activities - Promotion of bamboo resources - Education for Sustainable Development
Rural Environment and Development Organization (REDO)	- Beekeeping - Energy cooking stoves
Nile Basin Discourse Forum(NBDF) Rwanda	- Integrated water resources management - Climate change adaptation - Interested in soil conservation and water quality
Nile Basin Discourse Forum(NBDF) Rwanda	- Integrated water resources management - Community-based adaptation to climate change - Interested in soil conservation and water quality
Helpage Rwanda	- Integrated Natural Resources Management - Community livelihoods
Duhamic ADRI	- Tree planting - Tree sawing & carpentry

International NGOs

Name	Activity Focal Themes
International Gorilla Conservation Programme (IGCP)	- Gorilla protection - Improvement of population living conditions around the Volcanoes National Park
Dian Fossey Gorilla Foundation International (DFGFI) / Karisoke Research Center (KRC)	- Gorilla protection - Research on gorilla: behavior, monitoring - Plants and animal inventory - Improvement of population living conditions -
Greater Virunga Transboundary Collaboration (GVTC)	- Protection of the Volcanoes Parks in Rwanda, Democratic Republic of Congo and Uganda
Mountain Gorilla Veterinary Project (MGVP)	- Health care provision to gorilla in the
Wildlife Conservation Society (WCS)	- Environmental Protection Activities - Environmental Education

ICRAF	- Agroforestry systems - Tree products and markets - Tree diversity, domestication and delivery - Land health decisions - Environmental services - Climate change
Vi-Agro-forestry	- Agroforestry and land conservation - Sustainable Agricultural Productivity
International Fertilizer Development Center (IFDC)	- Catalyze Accelerated Agricultural Intensification for Social and Environmental Stability (CATALIST) - Privatization of Rwanda's Fertilizer Import and Distribution System (PReFER) - Rwanda Agro-Dealer Development (RADD)
Albertine Rift Conservation Society (ARCOS)	- Collaborative conservation and sustainable management of natural resources in the Albertine Rift Region - Payment for Ecosystem Services (PES) - Environmental Impact Assessment (EIA) - Community livelihoods
World Vision	- Transforming subsistence farmers into large-scale commercial producers - Farmers Managed Natural regeneration

Donors

Name	Activity Focal Themes
World Bank (WB)	- Lake Victoria environment management project phase ii (LVEMP II)
Global Environment Facility (GEF)	- Conservation of the Montane Forest Protected Area System in Rwanda - Integrated Management of Critical Ecosystems Project - National Biodiversity Strategy, Action Plan and Country Report to the COP - Clearing House Mechanism Enabling Activity - Integrated Management of Critical Ecosystems - Enabling Activities for the Preparation of Initial National Communication Related to the UNFCCC - Enabling activities to facilitate early action on the implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs) in Rwanda - Sustainable Energy Development Project (SEDP) - BS Support to Implementation of National Biosafety Framework for Rwanda - Management of PCBs stockpiles and equipment containing PCBs - Landscape Approach to Forest Restoration and Conservation (LAFREC) - Building Resilience of Communities Living in Degraded Forests, Savannahs and Wetlands of Rwanda Through an Ecosystem Management Approach - Enabling Activities to Review and Update the National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (POPs) - Increasing Capacity of Vulnerable Rwandan Communities to Adapt to Adverse Effects of Climate Change: Livelihood Diversification and Investment in Rural Infrastructures
African Development Bank (ADB)	- Projet d'Appui à l'Aménagement Forestier
Swedish International Development Cooperation Agency(SIDA)	- Natural resources and environment management in Rwanda (NREP) - Forestry sector development project in Rwanda - Strengthening Capacity of CGIS–NUR for Quality Research and Adequate Delivery of Post-graduate Academic Programmes in the field of Geo-Information Science and Earth Observation towards Sustainable

	Environment, Natural Resources Management and Socio-economic Transformation
United Kingdom's Department for International Development (DFID)	- Systematic Land Registration (SLR) - Provision of finance to Rwanda Fund for Climate Change and Environment - Rwanda Land Tenure Regularization Programme - Support to Low-Carbon Development and Climate Change - Support to Rwanda Agriculture sector
European Union (EU)	- Technical Assistance for Energy Policy and Utility Management in the framework of 'Sustainable Energy for All' - Support food security and income impact analysis of agricultural sector strategy 2009-12 (SPAT-2) to inform the sector strategy 2013-17 (SPAT-3) - Technical Assistance to Mainstream Food Security and Nutrition in the Agricultural Sector in Rwanda - Strategic Environmental Assessment (SEA) of Agriculture Sector in Rwanda
International Fund for Agricultural Development (IFAD)	- Support Smallholder Cash and Export Crops Development Project (PDCRE) - Support Project for Strategic Plan for Transformation of Agriculture (PAPSTA) - Kirehe Community-based Watershed Management Project (KWAMP)
United Nations Development Program (UNDP)	- LDCF - Rwanda - Reducing Vulnerability to Climate Change by Establishing Early Warning and Disaster Preparedness Systems and Support for Integrated Watershed Management in Flood Prone Areas (Video available) - Decentralization and environment management project (DEMP II)
Belgian Technical Cooperation (BTC)	- Support program to the reforestation in RWANDA (PAREF II) - Support program for reforestation of 9 districts in northern and western provinces in Rwanda - Improvement of access to (micro-hydro) energy in Rwanda European Commission 4,125,000 - Rural drinking water supply program, Southern province, district of Nyaruguru - Huye and Gisagara
Food and Agriculture Organization (FAO)	- Securing community livelihoods through promotion and utilization of bamboo resources in Rwanda
United National Environment Program (UNEP)	- Poverty and Environment Initiative
Netherlands Embassy	- Support program to the reforestation in Rwanda (PAREF I) - Strengthening the capacity of Geo-Information and Earth Observation sciences at the University of Rwanda, for the sustainable environmental and socio-economic development of Rwanda
FFBC	- Projet de gestion durable des boisements et restauration des forets naturelles au Rwanda
IUCEA/VICRES	- Trade-Offs and Synergies in Managing Wetlands Resources for Improved Food Security and Adaptation to Climate Change in the Lake Victoria Basin

Private Sector

Name	Activity Focal Themes
Rwanda Private Sector Federation (RPSF)/ Chamber of Agriculture and Livestock	- Coffee, Tea, Rice, Irish potatoes, Horticulture, Apiculture, Fisheries - Linking Famers to Markets (LIFAM) project, to strengthen the Chamber of Rwanda Farmers; funded by Netherlands
New Forest Company	- Contracted for harvesting of 8600 ha of plantations around Nyungwe NP - Committed to setting up three modern factories for added-value wood processing

Association pour le Développement de l'Artisannat au Rwanda (ADARWA)	- Sawed timber marketing & carpentry
Tea factories (Pfunda, Shagasha, etc.)	- Use water from protected forests (Gishwati, Mukura, Nyungwe, Cyamudongo) for tea processing
Brailirwa Brewery (Heinekin)	- Use water from Sebeya watershed (Gishwati Forest) for brewing

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